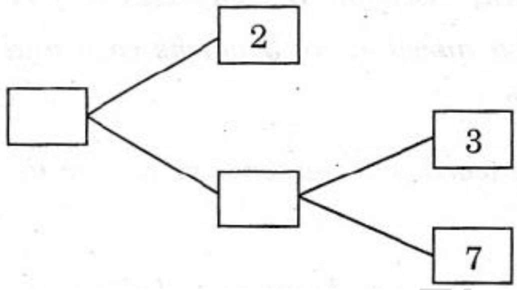
Ch. 1 Real Numbers

1. Use Euclid's Division Lemma to show tht the square of any posive integer is either of the form 3m or (3m+1) for some integer m. **[2008, 2012, 2015]**

2. If $\frac{p}{q}$ is a rational number $(q \neq 0)$, what is condition on q so that the decimal representatio of $\frac{p}{q}$ is termination? **[2008]**

3. Show that $2 - \sqrt{3}$ is an irrational number. **[2008]**

4. Complete the missing entries in the following factor tree: **[2008]**



5. Show that the square of any positive odd integer is of the form $8m + 1$, for some integer m. **[2009]**

6. The decimal expansion of the rational number $\frac{43}{2^4 \times 5^3}$, will terminate after how many places of decimals? **[2009]**

7. Prove that $7 + 3\sqrt{2}$ is not a rational number. **[2009]**

8. Write whether the rational number $\frac{51}{1500}$ will have a terminating decimal expansion or a non-terminating repeating decimal expansion. **[2009]**

9. Prove that $5 - 2\sqrt{3}$ is not a rational number. **[2009]**

10. Prove that $3 + 5\sqrt{2}$ is an irrational number. **[2009]**

11. Prove that $\sqrt{5}$ is an irrational number. **[2009, 2016]**

12. Find the [HCF×LCM] for the numbers 100 and 190. **[2009]**

13. The HCF of 45 and 105 is 15. Write their LCM. **[2010]**

14. Has the rational number $\frac{441}{2^2 \times 5^7 \times 7^2}$ a terminating or a non-terminating decimal representation? **[2010]**

15. Which of the following numbers has terminating decimal expansion? **[2010, 2013, 2016]**

(a) $\frac{37}{45}$ (b) $\frac{21}{2^3 5^6}$ (c) $\frac{17}{49}$ (d) $\frac{89}{2^2 3^2}$

16. The $[HCF \times LCM]$ for the numbers 50 and 20 is **[2010, 2016]**

(a) 10 (b) 100 (c) 1000 (d) 50

17. Check whether 6^n can end with the digit 0 for any natural number n? **[2010]**

18. Prove that $\sqrt{7}$ is an irrational number. **[2010, 2015]**

19. Prove that $3 + \sqrt{5}$ is an irrational number. **[2010, 2015]**

20. Use Euclid's division algorithm to find the HCF of 10224 and 9648. **[2010, 2014]**

21. Write whether $\frac{2\sqrt{45}+3\sqrt{20}}{2\sqrt{5}}$ on simplification gives a rational or irrational number. **[2010]**

22. Prove that $2\sqrt{3}-1$ is an irrational number. **[2010]**

23. Prove that $2-3\sqrt{5}$ is an irrational number. **[2010]**

24. Prove that $\sqrt{2}$ is an irrational number. **[2010]**

25. Prove that $7-2\sqrt{3}$ is an irrational number. **[2010]**

26. Prove that $5+3\sqrt{2}$ is an irrational number. **[2010]**

27. H.C.F. of two consecutive even numbers is: **[2011]**

(a) 0 (b) 1 (c) 4 (d) 2

28. If the HCF of 85 and 153 is expressible in the form $85n-153$, then value of n is: **[2011]**

(a) 3 (b) 2 (c) 4 (d) 1

29. Prove that $\frac{2\sqrt{3}}{5}$ is an irrational number. **[2011]**

30. Show that 4^n can never end with the digit zero for any natural number n. **[2011]**

31. If d is the HCF of 45 and 27, find x, y satisfying $d = 27x + 45y$. **[2011]**

32. An army contingent of 1000 members is to march behind an army band of 56 members in a parade. The two groups are to march in the same number of columns. What is the maximum number of columns in which they can march? **[2011]**

33. Prove that $15+17\sqrt{3}$ is an irrational number. **[2011]**

34. Show that any positive odd integer is of the form $4q+1$ or $4q+3$ where q is a positive integer. **[2011, 2014]**

36. Decimal expansion of $\frac{23}{2^3 5^2}$ will be: **[2012]**

(a) terminating (b) non-terminating

(c) non-terminating and repeating (d) non-terminating and non-repeating

37. Using Euclid's division algorithm, find whether the pair of numbers 847, 2160 are coprimes or not. **[2012]**

38. The LCM of two numbers is 14 times their HCF. The sum of LCM and HCF is 600. If one number is 280, then find the other number. **[2012]**

39. Using Euclid's algorithm, find the HCF of 240 and 228. **[2012]**

40. L. C. M. of $2^3 \times 3^2$ and $2^2 \times 3^3$ is: **[2012]**

(a) 2^3 (b) 3^3 (c) $2^3 \times 3^2$ (d) $2^2 \times 3^2$

41. Express the number $0.3\overline{178}$ in the form of rational number $\frac{a}{b}$. **[2012]**

42. If $\frac{241}{4000} = \frac{241}{2^m 5^n}$, find the values of m and n where m and n are non-negative integers. Hence write its decimal expansion without actual division. **[2012]**

43. Find the LCM and HCF of 336 and 54 and verify that LCM×HCF = Product of the two numbers. **[2012]**

44. If a rational number x is expressed as $x = \frac{p}{q}$, where p, q are integer, $q \neq 0$ and p, q have no common factor (except 1), then the decimal expansion of x is terminating if and only if q has a prime factorization of the form: **[2013]**

(a) $2^m.5^n$ (b) $2^m.3^n$ (c) $2^m.7^n$ (d) $5^m.3^n$

Where m and n are non-negative integers.

45. Which of the following numbers has non-terminating repeating decimal expansion? **[2013]**

(a) $\frac{7}{80}$ (b) $\frac{17}{320}$ (c) $\frac{20}{100}$ (d) $\frac{93}{420}$

46. $n^2 - 1$ is divisible by 8, if n is **[2013]**

(a) an integer (b) a natural number (c) an odd integer (d) an even number

47. Use Euclid's division algorithm to find HCF of 870 and 225. **[2013]**

48. Explain $5 \times 4 \times 3 \times 2 \times 1 + 3$ is a composite number. **[2013]**

49. Prove that $3 + \sqrt{2}$ is an irrational number. **[2009]**

OR

Prove that $3 + \sqrt{2}$ is not a rational number. **[2013]**

50. Prove that $5\sqrt{2}$ is an irrational number. **[2013]**

51. Show that 5^n can't end with the digit 2 for any natural number n. **[2013]**

52. Find HCF of 65 and 117 and find a pair of integral values of m and n such that $HCF = 65m + 117n$. **[2013]**

53. The HCF of two numbers is 145 and their LCM is 2175. If one number is 725, then the other number is **[2014]**

(a) 415 (b) 425 (c) 435 (d) 445

54. If HCF (96, 404) = 4, then LCM (96, 404) is **[2014]**

(a) 9626 (b) 9696 (c) 9656 (d) 9676

55. Check whether 6^n can end with the digit 0 for any natural number n. **[2014, 2017]**

56. Prove that $\sqrt{3} + \sqrt{5}$ is an irrational number. **[2014]**

57. Prove that $5 + \sqrt{2}$ is an irrational number. **[2014]**

58. If HCF of 144 and 180 is expressed in the form $13m - 3$, find the value of m. **[2014]**

59. Show that 9^n can not end with digit zero for any natural number n. **[2014]**

60. Express 5050 as product of its prime factors. Is it unique? **[2014]**

61. Determine the values of p and q so that the prime factorisation of 2520 is expressible as $2^3 \times 3^q \times q \times 7$. **[2014]**

62. Show that $2\sqrt{2}$ is an irrational number. **[2014]**

63. By using Euclid's algorithm, find the largest number which divides 650 and 1170. **[2014]**

64. State Fundamental theorem of arithmetic. **[2014]**

Is it possible that HCF and LCM of two numbers be 24 and 540 respectively? Justify your answer.

65. Show that reciprocal of $3 + 2\sqrt{2}$ is an irrational number. **[2014]**

66. Find HCF of 378, 180 and 420 by prime factorisation method. Is HCF × LCM of three numbers equal to the product of the three numbers? **[2014]**

67. Which of the following is not a rational number? **[2015]**

(a) $\sqrt{3}$ (b) $\sqrt{9}$ (c) $\sqrt{16}$ (d) $\sqrt{25}$

68. Find the LCM and HCF of 510 and 92 by the prime factorization method. **[2015]**

69. Apply Euclid's division algorithm to find HCF of numbers 4052 and 420. **[2015]**

70. Show that $(\sqrt{3} + \sqrt{5})^2$ is an irrational number. **[2015]**

71. Three bells toll at intervals of 12 minutes, 15 minutes and 18 minutes respectively. If they start tolling together, after what time will they next toll together? **[2015]**

72. If the HCF of 210 and 55 is expressible in the form $210 \times 5 + 55 \times p$, then the value of p is **[2016]**

(a) -17 (b) -18 (c) -20 (d) -19

73. The $[HCF \ \times LCM]$ for the number 50 and 20 is **[2016]**

(a) 10 (b) 1000 (c) 100 (d) 110

74. Prove that $\left(5 + 3\sqrt{2}\right)$ is an irrational number. **[2016]**

75. Prove that for any positive integer n, $n^3 - n$ is divisible by 6. **[2016]**

76. Two tankers contain 850 litres and 680 litres of petrol respectively. Find the maximum capacity of a container which can measure the petrol of either tanker in exact number of times. **[2016]**

77. Find the value of $(-1)^n + (-1)^{2n} + (-1)^{2n+1} + (-1)^{4n+2}$, where n is any positive odd integer. **[2016]**

78. Find whether decimal expansion of $\frac{13}{64}$ is a terminating or non-terminating decimal. If it terminates, find the number of decimal places its decimal expansion has. **[2016]**

79. Explain whether the number $3 \times 5 \times 13 \times 46 + 23$ is a prime number or a composite number. **[2016]**

80. Prove that the product of any three consecutive positive integers is divisible by 6. **[2016]**

81. Find HCF and LCM of 510 and 92 and verify that HCF × LCM = Product of two given numbers. **[2017]**

82. Prove that $\frac{7}{3}\sqrt{5}$ is irrational number. **[2017]**

83. Prove that $5 - 2\sqrt{3}$ is an irrational number. **[2017]**

84. Prove that $n^2 - n$ is divisible by 2 for any positive integer n. **[2017]**

85. The largest number that will divide 398, 436 and 542 leaving remainder 7, 11 and 15 respectively is **[2017]**

(a) 11 (b) 17 (c) 34 (d) 51

86. What is the HCF of the smallest prime number and the smallest composite number? **[2018]**

87. Given that $\sqrt{2}$ is irrational, prove that $\left(5 + 3\sqrt{2}\right)$ is an irrational number. **[2018]**

88. Find HCF and LCM of 404 and 96 and verify that HCF × LCM = Product of the two given numbers. **[2018]**

Ch. 2 – Polynomials

1. Find the values of k so that $(x - 1)$ is a factor of $k^2x^2 - 2kx - 3$. **[2003]**

2. If $(x + a)$ is a factor of $2x^2 + 2ax + 5x + 10$, find a. **[2008]**

3. Find all the zeroes of the polynomial $x^4 + x^3 - 34x^2 - 4x + 120$, if two of its zeroes are 2 and -2. **[2008]**

4. Write the zeroes of the polynomial $x^2 - x - 6$. **[2008]**

5. Find the zeroes of the quadratic polynomial $6x^2 - 3 - 7x$ and verify the relationship between the zeroes and the coefficients of the polynomial. **[2008]**

6. Find all the zeroes of the polynomial $2x^4 + 7x^3 - 19x^2 - 14x + 30$, if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$. **[2008]**

7. For what value of k, (-4) is a zero of the polynomial $x^2 - x - (2k + 2)$? **[2009]**

8. Write the polynomial, the product and sum of whose zeroes are $-\frac{9}{2}$ and $-\frac{3}{2}$ respectively. **[2009]**

9. Find the third zero of the polynomial $x^3 + 3x^2 - 2x - 6$, if two of its zeroes are $-\sqrt{2}$ and $\sqrt{2}$. **[2009]**

10. If 1 is a zero of the polynomial $p(x) = ax^2 - 3(a - 1)x - 1$, then find the value of a . **[2009]**

11. If the polynomial $6x^4 + 8x^3 + 17x^2 + 21x + 7$ is divided by another polynomial $3x^2 + 4x + 1$, the remainder comes out to be $(ax + b)$, find a and b. **[2009]**

12. If the polynomial $x^4 + 2x^3 + 8x^2 + 12x + 18$ is divided by another polynomial $x^2 + 5$, the remainder comes out to be $px + q$. **[2009]**

13. If the polynomial $6x^4 + 8x^3 - 5x^2 + ax + b$ is exactly divisible by the polynomial $2x^2 - 5$, then find the values of a and b. **[2009]**

14. Find all the zeroes of the polynomial $2x^3 + x^2 - 6x - 3$, if two of its zeroes are $-\sqrt{3}$ and $\sqrt{3}$. **[2009]**

15. Find all the zeroes of the polynomial $x^3 + 3x^2 - 2x - 6$, if two of its zeroes are $-\sqrt{2}$ and $\sqrt{2}$. **[2009]**

16. The value of p for which the polynomial $x^3 + 4x^2 - px + 8$ is exactly divisible by $(x - 2)$ is **[2010]**

(a) 0 (b) 3 (c) 5 (d) 16

17. If α and β are zeroes of the quadratic polynomial $x^2 - 6x + a$; find the value of 'a' if $3\alpha + 2\beta = 20$. **[2010]**

18. If α and β are the zeroes of a polynomial, such that $\alpha + \beta = 6$ and $\alpha\beta = 4$, then write the polynomial. **[2010]**

19. If α and β are zeroes of the quadratic polynomial $2y^2 + 7y + 5$, write the value of $\alpha + \beta + \alpha\beta$. **[2010]**

20. If -1 and 2 are two zeroes of the polynomial $2x^3 - x^2 - 5x - 2$, find its third zero. **[2010]**

21. If one zero of the polynomial $x^2 - 4x + 1$ is $2 + \sqrt{3}$, write the other zero. **[2010]**

22. If two zeroes of the polynomial $x^3 - 4x^2 - 3x + 12$ are $\sqrt{3}$ and $-\sqrt{3}$, then find its third zero. **[2010]**

23. Divide $30x^4 + 11x^3 - 82x^2 - 12x + 48$ by $3x^2 + 2x - 4$ and verify the result by division algorithm. **[2010, 2013]**

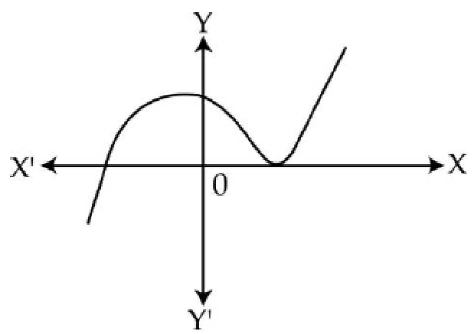
24. If $\sqrt{5}$ and $-\sqrt{5}$ are two zeroes of the polynomial $x^3 + 3x^2 - 5x - 15$, find its third zero. **[2010]**

25. For what value of k, is 3 a zero of the polynomial $2x^2 + x + k$? **[2010]**

26. Divide $(2x^2 + x - 20)$ by $(x + 3)$ and verify the result by division algorithm. **[2011]**

27. It is given that 1 is one of the zeroes of the polynomial $7x - x^3 - 6$. Find its other zeroes. **[2011]**

28. The graph of $y = p(x)$ is given below. The number of zeroes of $p(x)$ are: **[2011]**



(a) 0 (b) 3 (c) 2 (d) 4

29. On dividing the polynomial $p(x)$ by a polynomial $g(x) = 4x^2 + 3x - 2$ the quotient $q(x) = 2x^2 + 2x - 1$ and remainder $r(x) = 14x - 10$. Find the polynomial $p(x)$. **[2011]**

30. Obtain all the zeroes of the polynomial $f(x) = x^4 - 7x^3 + 10x^2 - 14x - 2$, if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$. **[2011]**

31. Divide $x^4 - 3x^2 + 4x + 1$ by $x^2 - x + 1$, find quotient and remainder. **[2011]**

32. If 2 and -3 are the zeroes of the quadratic polynomial $x^2 + (a + 1)x + b$, then find the values of a and b. **[2011]**

33. It being given that 1 is one of the zeroes of the polynomial $7x - x^3 - 6$. Find its other zeroes. **[2011]**

34. If the polynomial $6x^4 + 8x^3 + 17x^2 + 21x + 7$ is divided by another polynomial $3x^2 + 4x + 1$, then what will be the quotient and remainder? **[2011]**

35. On dividing the polynomial $4x^4 - 5x^3 - 39x^2 - 46x - 2$ by the polynomial $g(x)$, the quotient and remainder were $x^2 - 3x - 5$ and $-5x + 8$ respectively. Find $g(x)$. **[2011]**

36. Obtain all zeroes of the polynomial $f(x) = x^4 - 3x^3 - x^2 + 9x - 6$ if two of its zeroes are $-\sqrt{3}$ and $\sqrt{3}$. **[2011, 2013]**

37. Find other zeroes of the polynomial $x^4 - 7x^2 + 12$, if it is given that two of its zeroes are $-\sqrt{3}$ and $\sqrt{3}$. **[2011]**

38. Divide $2x^4 - 9x^3 + 5x^2 + 3x - 8$ by $x^2 - 4x + 1$ and verify the result by division algorithm. **[2011]**

39. The polynomial whose zeroes are -5 and 4 is: **[2012]**

(a) $x^2 - 5x + 4$ (b) $x^2 + 5x + 4$ (c) $x^2 + x - 20$ (d) $x^2 - 9x - 20$

40. If the zeroes of the polynomial $x^2 + px + q$ are double in value to the zeroes of $2x^2 - 5x - 3$, find the value of p and q. **[2012]**

41. Show that $\frac{1}{2}$ and $\frac{-3}{2}$ are the zeroes of the polynomial $4x^2 + 4x - 3$ and verify the relationship between zeroes and coefficients of polynomial. **[2012]**

42. Find the value of b for which $(2x + 3)$ is a factor of $2x^3 + 9x^2 - x - b$. **[2012]**

43. Given that $x - \sqrt{5}$ is a factor of the polynomial $x^3 - 3\sqrt{5}x^2 - 5x + 15\sqrt{5}$, find all the zeroes of the polynomial. **[2012]**

44. If the polynomial $x^4 - 6x^3 + 16x^2 - 25x + 10$ is divided by $(x^2 - 2x + k)$ the remainder comes out to be $x + a$, find k and a. **[2012]**

45. What must be subtracted or added to $p(x) = 8x^4 + 14x^3 - 2x^2 + 8x - 12$ so that $(4x^2 + 3x - 2)$ is a factor of $p(x)$? **[2012]**

46. Find a quadratic polynomial whose zeroes are $2 + \sqrt{3}$ and $2 - \sqrt{3}$. **[2012]**

47. Find the quadratic polynomial whose sum and product of the zeroes are $\frac{21}{8}$ and $\frac{5}{16}$ respectively. **[2012]**

48. Find the zeroes of the following quadratic polynomial and verify the relationship between the zeroes and the coefficients $2x^2 - 3 + 5x$. **[2012]**

49. Find all the zeroes of $x^3 + 11x^2 + 23x - 35$, if two of its zeroes are 1 and -5. **[2012]**

50. If the polynomial $x^4 - 6x^3 + 16x^2 - 25x + 10$ is divided by $(x^2 - 2x + k)$ the remainder comes out to be $x + a$, find k and a. **[2012]**

51. If one of the zeroes of the quadratic polynomial $(k - 1)x^2 + kx + 1$ is -3, then the value of k is **[2013]**

(a) $-\frac{4}{3}$ (b) $\frac{4}{3}$ (c) $\frac{2}{3}$ (d) $-\frac{2}{3}$

52. The value of p for which the polynomial $x^3 + 4x^2 - px + 8$ is exactly divisible by $(x - 2)$ is **[2013]**

(a) 1 (b) 0 (c) 15 (d) 16

53. If α and β are the zeroes of the quadratic polynomial $p(x) = x^2 - ax + b$, then find the value of $\alpha^2 + \beta^2$. **[2013]**

54. Find a quadratic polynomial with zeroes $3 + \sqrt{2}$ and $3 - \sqrt{2}$. **[2013, 2016]**

55. Find a quadratic polynomial with zeroes $\frac{3+\sqrt{5}}{5}$ and $\frac{3-\sqrt{5}}{5}$. **[2013]**

56. Verify whether 2, 3 and $\frac{1}{2}$ are the zeroes of the polynomial $f(x) = 2x^3 - 11x^2 + 17x - 6$. **[2013]**

57. Obtain all other zeroes of the polynomial $f(x) = x^4 + 4x^3 - 2x^2 - 20x - 15$ if two of its zeroes are $-\sqrt{5}$ and $\sqrt{5}$. **[2013]** **[2014]**

58. If the product of zeroes of the polynomial $ax^2 - 6x - 6$ is 4, find the value of 'a'. **[2014]**

59. When a polynomial $6x^4 + 8x^3 + 29x^2 + 21x + 7$ is divided by another polynomial $3x^2 + 4x + 1$ the remainder is in the form $ax + b$. Find a and b. **[2014]**

60. If α and β the zeroes of the quadratic polynomial $f(x) = ax^2 + bx + c$, then evaluate **[2014]**

    (i) $\frac{1}{a\alpha + b} + \frac{1}{a\beta + b}$ (ii) $a\left[\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}\right] + b\left[\frac{\alpha}{\beta} + \frac{\beta}{\alpha}\right]$

61. If the product of zeroes of the polynomial $ax^2 - 6x - 6$ is 4, find the value of a. find the sum of zeroes of the polynomial. **[2014]**

62. Find the zeroes of the quadratic polynomial $3t^2 - 6t + 1$ and verify the relationship between the zeroes and the coefficients. **[2014]**

63. If α and β are the zeroes of a polynomial $x^2 + 6x + 9$, then form a polynomial whose zeroes are $-\alpha$ and $-\beta$. **[2014]**

64. Find the zeroes of the quadratic polynomial $3x^2 - 2$ and verify the relationship between the zeroes and the coefficients. **[2014, 2016]**

65. If a polynomial $x^4 - 3x^3 - 6x^2 + kx - 16$ is exactly divisible by $x^2 - 3x + 2$, then find the value of k. **[2014]**

66. Obtain all other zeroes of the polynomial $x^4 - 17x^2 + 36x - 20$, if two of its zeroes are $+5$ and -2. **[2014, 2016]**

67. Obtain all other zeroes of the polynomial $x^4 - 3\sqrt{2}x^3 + 3x^2 + 3\sqrt{2}x - 4$, if two of its zeroes are $\sqrt{2}$ and $2\sqrt{2}$. **[2014]**

68. Find a quadratic polynomial, the sum and product of whose zeroes are 0 and $2\sqrt{2}$ respectively. **[2014]**

69. Find the zeroes of the quadratic polynomial $8x^2 - 21 - 22x$ and verify the relationship between the zeroes and the coefficients of the polynomial. **[2015]**

70. If α and β are the zeroes of the quadratic polynomial such that $\alpha + \beta = 24$ and $\alpha - \beta = 8$, find a quadratic polynomial having α and β as its zeroes. **[2015]**

71. Divide the polynomial $x^4 - 9x^2 + 9$ by the polynomial $x^2 - 3x$ and verify the division algorithm. **[2015]**

72. If one zero of the quadratic polynomial $f(x) = 4x^2 - 8kx + 8x - 9$ is negative of the other, then find the zeroes of $kx^2 + 3kx + 2$. **[2015]**

73. An NGO decided to distribute books and pencils to the students of a school running by some other NGO. For this they collected some amount from different people. The total amount collected is represented by $4x^4 + 2x^3 - 8x^2 + 3x - 7$. From this fund each student received an equal amount. The number of students, who received the amount, is represented by $x - 2 + 2x^2$. After distribution, $5x - 11$, amount is left with the NGO which they donated to school for their infrastructure. Find the amount received by each student from the NGO. What value has been depicted here? **[2015, 2016]**

74. If α and β are the zeroes of the quadratic polynomial $p(x) = x^2 - (k+6)x + 2(2k-1)$, then find the value of k, if $\alpha + \beta = \frac{1}{2}\alpha\beta$. **[2016]**

75. If α and β are the zeroes of the quadratic polynomial $f(x) = x^2 - 1$, find a quadratic polynomial whose zeroes are $\frac{2\alpha}{\beta}$ and $\frac{2\beta}{\alpha}$. **[2016]**

76. Find the zeroes of the polynomial $f(x) = x^3 - 5x^2 - 16x + 80$, if its two zeroes are equal in magnitude but opposite in sign. **[2016]**

77. If $x^3 - 6x^2 + 6x + k$ is completely divisible by $x - 3$, then find the value of k. **[2016]**

78. If one zero of a polynomial $2x^3 + x^2 - 7x - 6$ is 2, then find all the zeroes. **[2016]**

79. On dividing $x^3 - 8x^2 + 20x - 10$ by a polynomial $g(x)$, the quotient and the remainder were $(x - 4)$ and 6 respectively. Find $g(x)$. **[2016]**

80. Quadratic polynomial $2x^3 - 3x + 1$ has zeroes as α and β. Now form a quadratic polynomial whose zeroes are 3α and 3β. **[2016]**

81. Divide the polynomial $x^4 - 17x^2 + 34x - 12$ by $x - 2$ and find the quotient and the remainder. Also verify the division algorithm. **[2016]**

82. If α and β are the zeroes of the quadratic polynomial $p(x) = ax^2 + bx + c$, then evaluate: $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$. **[2017]**

83. If α and β are the zeroes of the quadratic polynomial $p(x) = x^2 - px + q$, prove that **[2017]**

$$\frac{\alpha^2}{\beta^2} + \frac{\beta^2}{\alpha^2} = \frac{p^4}{q^2} - \frac{4p^2}{q} + 2$$

84. Find all zeroes of the polynomial $f(x) = 2x^4 - 2x^3 - 7x^2 + 3x + 6$, if it's two zeroes are $-\sqrt{\frac{3}{2}}$ and $\sqrt{\frac{3}{2}}$. **[2017]**

85. Find all zeroes of the polynomial $2x^4 - 9x^3 + 5x^2 + 3x - 1$ if two if its zeroes are $(2 + \sqrt{3})$ and $(2 - \sqrt{3})$. **[2018]**

Ch. 3. A pair of linear equations in two variables

1. The ages of two girls are in the ratio $5 : 7$. Eight years ago, their ages were in the ratio $7 : 13$. Find their present ages. **[1999, 2003]**

2. Find the value of k for which the system of equation $8x + 5y = 9$, $kx + 10y = 15$ has no solution. **[1999, 2003]**

3. For what value of k will the following system of linear equations have an infinite number of solutions: $2x + 3y = 2$; $(k + 2)x + (2k + 1)y = 2(k - 1)$? **[2000]**

4. Determine graphically the co-ordinates of the vertices of the triangle, the equation of whose sides are: $y = x$, $3y = x$, $x + y = 8$. **[2000]**

5. Solve for x and y: $ax + by = a - b$; $bx - ay = a + b$. **[2000, 2005]**

6. A part of monthly hostel charges in a college are fixed and the remaining depends on the number of days one has taken food in the mess. When a student A takes food for 20 days, he has to pay Rs. 1000 as hostel charges where as a student B, who takes food for 26 days, pays Rs. 1180 as hostel charges. Find the fixed charge and the cost of food per day. **[2000]**

7. Solve the equations graphically and shade the region between two lines and x-axis. $2x + 3y = 12$; $x - y = 1$. **[2001]**

8. Find the values of p and q for which the following system has infinite solutions. **[2001]**
$2x + 3y = 7$; $(p + q)x + (2p - q)y = 21$.

9. A man travels 600 km by train partly by car. If he covers 400 km by train and rest by car, it takes him $6\frac{1}{2}$ hours. But if he travels 200 km by train and rest by car, it takes him half an hour longer. Find the speed of the car and the train. **[2001]**

10. Draw the graph of $x - y + 1 = 0$ and $3x + 2y - 12 = 0$, calculate the area bounded by these lines and x-axis. **[2002]**

11. Draw the graph of $2x + y = 6$ and $2x - y + 2 = 0$. Shade the region bounded by these lines and x-axis. Find the area of the shaded region. **[2002]**

12. Draw the graph of the system of equations $x + y = 5$ and $2x - y + 2 = 0$. Shade the region bounded by these lines and x-axis. Find the area of the shaded region. **[2002]**

13. Two places A and B are 120 km apart from each other on a highway. A car starts from A and another from B at the same time. If they move in the same direction, they meet in 6 hours and if they move in the opposite directions, they meet in 1 hour and 12 minutes, find the speed of the cars. **[2002]**

14. The sum of a two-digit number and the number obtained by reversing the order of the digits is 165. If the difference of digits differs by 3, find the number. **[2002]**

15. For what value of a, the system of linear equations: $ax + 3y = a - 3$; $12x + ay = a$ has no solution? **[2003]**

16. Solve the following system of linear equations graphically: $2x - 3y = 1$; $3x - 4y = 1$. Does the point (3, 2) lie on any of the lines? Write its equation. **[2003]**

17. Solve for x and y: $\frac{4}{x} + 5y = 7$; $\frac{3}{x} + 4y = 5$. **[2003]**

18. Father's age is three times the sum of ages of his two children. After 5 years his age will be twice the sum of age of two children. Find the age of father. **[2003]**

19. Solve for x and y: $6(ax+by)=3a+2b,\ 6(bx-ay)=3b-2a$ **[2004]**

20. Solve the following system of linear equations graphically $5x-6y+30=0$, $5x+4y-20=0$. Also, find the vertices of the triangle formed by the above two lines and x-axis. **[2004]**

21. Solve for x and y: $\frac{x}{a}+\frac{y}{b}=2;\ ax-by=a^2-b^2$ **[2005]**

22. Solve the following system of equations graphically: $x+2y=5; 2x-3y=-4$. Also, find the points where the lines meet the x-axis. **[2005]**

23. Solve the following system of equations graphically: $2x-y=4;\ 3y-x=3$. Find the points where the lines meet the y-axis. **[2005]**

24. Solve for x and y: $47x+31y=63;\ 31x+47y=15$ **[2006]**

25. Draw the graphs of the equations: $4x-y-8=0$ and $2x-3y+6=0$. Also, determine the vertices of the triangle formed by the lines and the x-axis. **[2006]**

26. Solve for x and y: $\frac{ax}{b}-\frac{by}{a}=a+b;\ ax-by=2ab.$ **[2006, 2009]**

27. Solve for x and y: $\frac{bx}{a}-\frac{ay}{b}+a+b=0$ and $bx-ay+2ab=0$. **[2006]**

28. The sum of the digits of a two-digit number is 12. The number obtained by interchanging the two digits exceeds the given number by 18. Find the number. **[2006]**

29. A train travels a distance of 300 km at a uniform speed. If the speed of the train is increased by 5 km an hour, the journey would have taken two hours less. Find the original speed of the train. **[2006]**

30. Draw the graphs of the following equations: $3x-4y+6=0; 3x+y-9=0$. Also, determine the co-ordinates of the vertices of the triangle formed by these lines and the x-axis. **[2006]**

32. Solve for x and y: $\frac{2x}{a}+\frac{y}{b}=2;\quad \frac{x}{a}-\frac{y}{b}=4$ **[2007]**

33. Solve for x and y: $31x+29y=33;\ 29x+31y=27$ **[2007]**

34. Solve the following system of equations graphically: $2x+y=8;\quad x+1=2y$ **[2007]**

35. Solve for x and y: $31x+23y=39;\quad 23x+31y=15$ **[2007]**

36. Solve for x and y: $\frac{2}{x}+\frac{3}{y}=13;\ \frac{5}{x}-\frac{4}{y}=-2$, where $x\neq 0, y\neq 0$. **[2007]**

37. Solve the following system of equtions graphically: $x+2y+2=0;\ 3x+2y-2=0$. **[2007]**

38. Solve for x and y: $8x-9y=6xy;\quad 10x+6y=19xy$ **[2007]**

39. Solve for x and y: $4x+\frac{y}{3}=\frac{8}{3};\quad \frac{x}{2}+\frac{3y}{4}=-\frac{5}{2}$ **[2007]**

40. Solve the following system of linear equations graphically: $2x+3y=12; 2y-1=x$. **[2007]**

41. Solve for x and y: $x+\frac{6}{y}=6; 3x-\frac{8}{y}=5$ **[2007]**

42. Solve the following system of linear equations graphically: $2x+3y=8;\ x+4y=9$ **[2007]**

43. Represent the following pair of equations graphically and write the coordinates of points where the lines intersect y-axis: $x + 3y = 6$; $2x - 3y = 12$. Also, find the area of the triangle formed by the lines representing the given equations with y-axis. **[2008, 2012]**

44. Represent the following system of linear equations graphically. From the graph, find the points where the lines intersect y-axis: $3x + y - 5 = 0$; $2x - y - 5 = 0$. **[2008]**

45. Find the value of k so that the following system of equations has no solution: **[2008]**

$$3x - y - 5 = 0;\ 6x - 2y - k = 0.$$

46. Find the value(s) of k for which the pair of linear equations $kx + 3y = k - 2$ and $12x + y = k$ has no solution. **[2009]**

47. Solve for x and y: $\frac{5}{x-1} + \frac{1}{y-2} = 2$; $\frac{6}{x-1} - \frac{3}{y-2} = 1$ **[2009, 2012, 2014]**

48. Solve for x and y: $\frac{10}{x+y} + \frac{2}{x-y} = 4$; $\frac{15}{x+y} - \frac{5}{x-y} = -2$. **[2009]**

49. Write whether the following pair of linear equations is consistent or not: $x + y = 14$; $x - y = 4$ **[2009]**

50. Without drawing the graph, find out whether the lines representing the following pair of linear equations intersect at a point, are parallel or coincident: $9x - 10y = 21$; $\frac{3}{2}x - \frac{5}{3}y = \frac{7}{2}$. **[2009]**

51. Without drawing the graph, find out whether the lines representing the following pair of linear equations intersect at a point, are parallel or coincident: $18x - 7y = 24$; $\frac{9}{5}x - \frac{7}{10}y = \frac{9}{10}$. **[2009]**

52. Find the number of solutions of the following pair of linear equations: $x + 2y - 8 = 0$; $2x + 4y = 16$ **[2009]**

53. Find the value of $\boldsymbol{a}$ so that the point $(3, a)$, lies on the line represented by $2x - 3y = 5$. **[2009]**

54. For what value of k will the following pair of linear equations have no solution? **[2010]**
$2x + 3y = 9$; $6x + (k - 2)y = (3k - 2)$

55. Solve for x and y: $2(ax - by) + (a + 4b) = 0$; $2(bx + ay) + (b - 4a) = 0$ **[2010]**

56. A number consists of two digits. When the number is divided by the sum of its digits, the quotient is 7. If 27 is subtracted form the number, the digits interchange their places. Find the number. **[2010]**

57. Find the value of k for which the following pair of linear equations have infinitely many solutions: $2x + 3y = 7$; $(k - 1)x + (k + 2)y = 3k$. **[2010]**

58. The sum of numerator and denominator of a fraction is 3 less than twice the denominator. If each of the numerator and denominator is decreased by 1, the fraction becomes $\frac{1}{2}$. Find the fraction. **[2010]**

59. The sum of the numerator and the denominator of a fraction is 4 more than twice the numerator. If 3 is added to each of the numerator and denominator, their ratio becomes 2 : 3. Find the fraction. **[2010]**

60. Solve for x and y: $\frac{4}{x} + 3y = 8$; $\frac{6}{x} - 4y = -5$ **[2010]**

61. The value of k for which the pair of linear equations $4x + 6y - 1 = 0$ and $2x + ky - 7 = 0$ represents parallel lines is **[2010]**

(a) $k = 3$ (b) $k = 2$ (c) k = 4 (d) $k = -2$

62. Solve for x and y: $4x + \frac{y}{3} = \frac{8}{3}$; $\frac{x}{2} + \frac{3y}{4} = -\frac{5}{2}$. **[2010]**

63. The sum of the numerator and the denominator of a fraction is 8. If 3 is added to both the numerator and the denominator, the fraction becomes $\frac{3}{4}$. Find the fraction. **[2010, 2014]**

64. Check graphically whether the pair of linear equations $4x - y - 8 = 0$ and $2x - 3y + 6 = 0$ is consistent. Also, find the vertices of the triangle formed by these lines with the x-axis. **[2010]**

65. For what value of p will the following pair of linear equations have infinitely many solutions? $(p-3)x + 3y = p$; $px + py = 12$. **[2010]**

66. Find the values of a and b for which the following pair of linear equations has infinitely many solutions: $2x + 3y = 7$; $(a+b)x + (2a-b)y = 21$. **[2010]**

67. Find the value of m for which the pair of linear equations $2x + 3y - 7 = 0$ and $(m-1)x + (m+1)y = (3m-1)$ **[2010]**

68. One equation of a pair of dependent linear equations is $-5x + 7y = 2$, the second equation can be: **[2011]**

(a) $10x + 14y + 4 = 0$ (b) $-10x - 14y + 4 = 0$

(c) $-10x + 14y + 4 = 0$ (d) $10x - 14y = -4$

69. For what value of p will the following system of equations have no solution **[2011]**

$(2p-1)x + (p-1)y = 2p + 1$; $y + 3x - 1 = 0$.

70. Solve the following system of linear equations by cross multiplication method : **[2011]**

$2(ax - by) + (a + 4b) = 0$; $2(bx + ay) + (b - 4a) = 0$.

71. Solve for x and y: $99x + 101y = 499$; $101x + 99y = 501$. **[2011]**

72. Draw the graph of $2x + y = 6$ and $2x - y + 2 = 0$. Shade the region bounded by these lines with x-axis. Find the area of the shaded region. **[2011]**

73. For what value of k will the pair of equations have no solution? **[2011, 2012]**

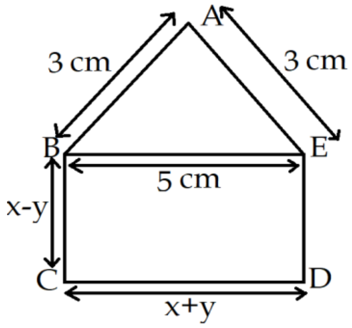
$3x + y = 1$; $(2k-1)x + (k-1)y = 2k + 1$

74. The sum of the digit of a two digit number is 12. The number obtained by interchanging the two digits exceeds the given number by 18. Find the number. **[2011]**

75. The sum of the numerator and the denominator of a fraction is 12.. If 1 is added to both the numerator and the denomiator, the fraction becomes $\frac{3}{4}$. Find the fraction. **[2011]**

76. 4 men and 6 boys can finish a piece of work in 5 days while 3 men and 4 boys can finish it in 7 days. Find the time taken by 1 man alone or that by 1 boy alone. **[2011]**

77. In the figure, ABCDE is a pentagon with BE ∥ CD and BC ∥ DE. BC is perpendicular to CD. If the perimeter of ABCDE is 21cm, find the value of x and y. **[2011]**



78. A man travels 600 km partly by train and partly by car. It takes 8 hours and 40 minutes if he travels 320 km by train and the rest by car. It would take 30 minutes more if he travels 200 km by train and the rest by car. Find the speed of the train and the car separately. **[2011]**

79. Solve the equations graphically: $2x + y = 2$; $2y - x = 4$. What is the area of the triangle formed by the two lines and the line $y = 0$? **[2011]**

80. Draw the graphs of the following equations: $x + y = 5$; $x - y = 5$. (i) Find the solution of the equations from the graph. (ii) Shade the triangular region formed by the lines and the y-axis. **[2011]**

81. $x = 2, y = 3$ is a solution of the linear equation: **[2012]**

(a) $2x + 3y - 13 = 0$ (b) $3x + 2y - 13 = 0$

(c) $2x - 3y + 13 = 0$ (d) $2x + 3y + 13 = 0$

82. For what value of k will the pair of equations have no soultion? **[2012]**

$3x + y = 1$; $(2k - 1)x + (k - 1)y = 2k + 1$

83. Solve the following pair of linear equaations graphically. $x + 3y = 6$; $2x - 3y = 12$. Also, find the area of the triangle formed by the lines representing the given equations with y-axis. **[2012]**

84. Check graphically, whether the pair of equations $x + 3y = 6$; $2x - 3y = 12$ is consistent. If so, then solve them graphically. **[2012]**

85. For which value of k will the following pair of linear equations have no solution? **[2012]**

$3x + y = 1$, $(2k - 1)x + (k - 1)y = 2k + 1$.

86. The sum of digits of a two-digit numbers is 7. If the digits are reversed, the new number decreased by 2 equals twice the original number. Find the number. **[2012]**

87. Solve for x and y: $\frac{5}{x-1} + \frac{1}{y-2} = 2$; $\frac{6}{x-1} - \frac{3}{y-2} = 1$. **[2012]**

88. If the system os equations $6x + 2y = 3$ and $kx + y = 2$ has a unique solution, find the value of k. **[2013]**

89. Determine the value of m and n so that the following pair of linear equations have infinitely many solutions? $(2m - 1)x + 3y = 5$; $3x + (n - 1)y = 2$. **[2013]**

90. For what values of p and q will the following pair of linear equations has infinitely many solutions? $4x + 5y = 2$; $(2p + 7q)x + (p + 8q)y = 2q - p + 1$. **[2013]**

91. Solve for x and y: $\frac{ax}{b} - \frac{by}{a} = a + b; ax - by = 2ab.$ **[2013]**

92. 8 men and 12 boys can finish a piece of work in 10 days, while 6 men and 8 boys can finish it in 14 days. Find the time taken by one man alone and that by one boy alone to finish the work. **[2013]**

93. A two digit number is equal to 7 times the sum of its digits. The number formed by reversing its digits is less than the original number by 18. Find the original number. **[2013]**

94. Places A and B are 80 km apart from each other on a highway. A car starts from A and another from B at the same time. If they move in same direction they meet in 8 hrs and if they move in opposite directions they meet in 1 hr 20 minutes. Find speeds of the cars. **[2013]**

95. The age of the father is twice the sum of the ages of his 2 children. After 20 years, his age will be equal to the sum of the ages of his children. Find the age of the father. **[2013]**

96. Solve for x and y: $37x + 43y = 123, \quad 43x + 37y = 117.$ **[2013]**

97. Solve for x and y: $x + \frac{6}{y} = 6, \quad 3x - \frac{8}{y} = 5.$ **[2013]**

98. A and B are friends and their ages differ by year. A's father D is twice as old as A and B is twice as old as his sister C. The age of D and C differ by 40 years. Find the ages of A and B. **[2013]**

99. Form the pair of linear equations in the following problem and find their solutions graphically. 10 students of Class X took part in a Mathematics quiz. If the number of girls is 4 more than the number of boys, find the number of boys and girls who took part in the quiz. **[2013]**

100. If the pair of linear equations $2x + 3y = 7$ and $2\alpha x + (\alpha + \beta)y = 28$ has infinitely many solutions, then the values of α and β are: **[2014]**

(a) 3 and 5 (b) 4 and 8 (c) 4 and 7 (d) 4 and 5

101. The lines representing the linear equations $2x - y = 3$ and $4x - y = 5$ **[2014]**

(a) intersect at a point (b) are parallel

(c) are coincident (d) intersect at exactly two points

102. If the pair of linear equations $10x + 5y - (k - 5) = 0$ and $20x + 10y - k = 0$ have infinitely many solutions, then the value of k is: **[2014]**

(a) 2 (b) 11 (c) 10 (d) 8

103. 2 tables and 3 chairs together cost Rs. 3500 whereas 3 tables and 2 chairs together cost Rs. 4000. Find the cost of a table and a chair. **[2014]**

104. Solve for x and y: $4x + \frac{y}{3} = \frac{8}{3}; \quad \frac{x}{2} + \frac{3y}{4} = -\frac{5}{2}$ **[2014]**

105. Solve for x and y: $6(ax + by) = 3a + 2b;\ 6(bx - ay) = 3b - 2a.$ **[2014]**

106. Solve for x and y: $\frac{1}{x} - \frac{4}{y} = 2$ and $\frac{1}{x} + \frac{3}{y} = 9.$ **[2014]**

107. Solve for x and y: $2x = 5y + 4;\ 3x - 2y + 16 = 0.$ **[2014]**

108. Determine graphically whether the following pair of linear equations $2x - 3y = 5$; $3x + 4y = -1$ has (i) a unique solution (ii) infinitely many solutions or (iii) no solution. **[2014]**

109. Solve the following system of equations graphically and find the vertices of the triangle formed by these lines and the x-axis: $4x - 3y + 4 = 0$; $4x + 3y - 20 = 0$. **[2014]**

110. Find those integral values of m for which the x-coordinate of the point of intersection of lines represented by $y = mx + 1$ and $3x + 4y = 9$ is an integer. **[2014]**

111. In a two digit number, the digit in the unit place is twice of the digit in the tenth place. If the digits are reversed, the new number is 27 more than the given number. Find the number. **[2014]**

112. Solve the following system of linear equations graphically $3x + y - 12 = 0$; $x - 3y + 6 = 0$. Shade the region bounded by the lines and and x-axis. Also, find the area of shaded region. **[2014]**

113. The owner of a taxi company decides to run all the taxi on CNG fuels instead of petrol/diesel. The taxi charges in city comprises of fixed charges together with the charge for the distance covered. For a journey of 13 km, the charge paid is Rs. 129 and for journey of 22 km, the charge paid is Rs. 210. (i) What will a person have to pay for travelling a distance of 32 km? (ii) Why did he decide to use CNG for his taxi as a fuel? **[2014]**

114. Shyam has donated some money in two orphanages. A part of the donation is fixed and remaining depends on the number of children in the orphanage. If he donated Rs. 9,500 in the orphanage having 50 children and Rs. 13,250 with 75 children, find the fixed part of donation and the amount donated for each child. In your opinion why do Shyam did so? **[2014]**

115. A fraction becomes $\frac{1}{2}$ when 1 is added to the numerator and it becomes $\frac{1}{3}$ when 1 is subtracted from the numerator and 2 is added to the denominator. Find the fraction. Also find the number obtained when 5 is added to numerator and 4 is subtracted from the denominator. **[2014]**

116. The area of a rectangle reduces by 160 m^2 if its length is increased by 5 m and breadth is reduced by 4 m. However, if length is decreased by 10 m and breadth is increased by 2 m, then its area is decreased by 100 m^2. Find the dimensions of the rectangle. **[2014]**

117. At a certain time in a zoo, the number of heads and the number of legs of tiger and peacocks were counted and it was found that there were 47 heads and 152 legs. Find the number of tigers and peacocks in the zoo. Why it is necessary to conserve these animals? **[2014]**

118. If $x = a$, $y = b$ is the solution of the equations $x + y = 50$; $4x + 5y = 225$, then the values of $\boldsymbol{a}$ and $\boldsymbol{b}$ are respectively: **[2015]**

(a) 10 and 40 (b) 25 and 25 (c) 23 and 27 (d) 20 and 30

119. Solve for x and y: $37x + 43y = 123$; $43x + 37y = 117$. **[2015]**

120. Solve for x and y: $x + 2y - 3 = 0$; $3x - 2y + 7 = 0$. **[2015]**

121. For what value of 'k' will the following pair of linear equations have infinitely many solutions: $kx + 3y = k - 3$; $12x + ky = k$. **[2015]**

122. Given a linear equation $3x - 5y = 11$. Form another linear equaitonin these variables such that the geometric representation of the pair so formed is: (i) intersecting lines (ii) coincident lines (iii) parallel lines. **[2015]**

123. Find whether the lines representing the following pair of linear equations intersect at a point, are parallel or coincident: $2x - 3y + 6 = 0$, $4x - 5y + 2 = 0$. **[2015]**

124. Solve for x and y: $\frac{5}{x+y} - \frac{2}{x-y} = -1$; $\frac{15}{x+y} + \frac{7}{x-y} = 10$ **[2015]**

125. 4 chairs and 3 tables cost Rs. 2100 and 5 chairs and 2 tables cost Rs. 1750. Find the cost of one chair and one table separately. **[2015]**

126. Ram travels 760 km go his home, partly by train and partly by car. He takes 8 hours if he travels 160 km by train and the rest by the car. He takes 12 minutes more if he travels 240 km by train and the rest by car. Find the speed of the train and the car separately. **[2015]**

127. Solve the following system of linear equations graphically: $2x + y = 8$; $3x - 2y = 12$. Also, find the coordinates of the points where the lines meet the x-axis. **[2015]**

128. The value of k for which the pair of linear equations $4x + 6y - 1 = 0$ and $2x + ky - 7 = 0$, represents parallel lines is: **[2016]**

(a) 3 (b) -3 (c) 2 (d) -2

129. If the pair of linear equations $3x + 2y = 1$; $(2k + 1)x + (k + 2)y = k - 1$ has infinitely many solution, then the value of k is **[2016]**

(a) 2 (b) 4 (c) 3 (d) 5

130. Solve for x and y: $y - 4x = 1$; $6x - 5y = 9$. **[2016]**

131. Solve for x and y: $\frac{5}{x} + \frac{1}{y} = 2$; $\frac{6}{x} - \frac{3}{y} = 1$; $x \neq 0, y \neq 0$. **[2016]**

132. Solve using cross multiplication method: $x + y = 7$; $2x - 3y = 11$. **[2016]**

133. Draw the graphs of the pair of equations: $x + 2y = 5$ and $2x - 3y = -4$. Also find the points where the lines meet the x-axis. **[2016]**

134. A and B each have certain number of oranges. A says to B, "If you give me 10 of your oranges, I will have twice the number of oranges left with you". B replies, "If you give me 10 of your oranges, I will have the same number of oranges as left with you". Find the number of oranges with A and B separately. **[2016]**

135. A part of monthly Hostel charge is fixed and the remaining depends on the number of days one has taken food in the mess. When Swati takes food for 20 days, she has to pay Rs. 3000 as Hostel charges whereas, Mansi who takes food for 25 days pays Rs. 3500 as Hostel charges. Find the fixed charges and the cost of food per day. **[2016]**

136. A two-digit number is obtained by either multiplying sum of the digits by 8 and adding 1 or by multiplying the difference of the digits by 13 and adding 2. Find the numbers. **[2016]**

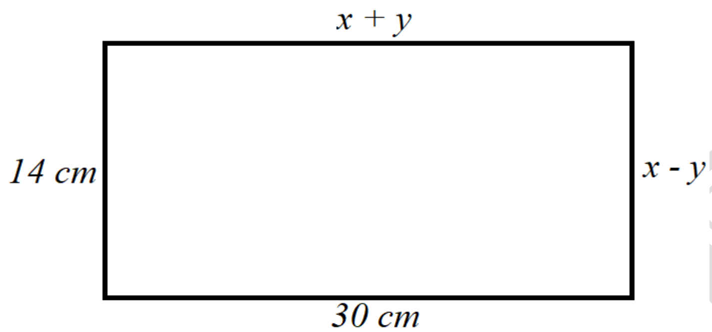
137. Reena has pens and pencils which together are 40 in number. If she has 5 more pencils and 5 less pens, then number of pencils would become 4 times the number of pens. Find the original number of pens and pencils **[2017]**

138. Places A and B are 100 km apart on a highway. One car starts from A and another from B at the same time. If the cars travel in the same direction at different speeds, they meet in 5 hours. If they travel towards each other, they meet in 1 hour. What are the speeds of the two cars? **[2017]**

139. Reena has pens and pencils which together are 40 in number. If she has 5 more pencils and 5 less pens, then number of pencils would become 4 times the number of pens. Find the original number of pens and pencils. **[2017]**

140. Solve for x and y: $\frac{10}{x+y}+\frac{2}{x-y}=4;\quad \frac{15}{x+y}-\frac{5}{x-y}=-2$ **[2017]**

141. In figure, ABCD is a rectangle. Find the values of x and y. **[2018]**



Ch. 4. Quadratic Equations

1. Find the value of c for which the quadratic equation $4x^2-2(c+1)x+(c+4)=0$ has equal roots. **[1999, 2003]**

2. Find the value of k such that sum of the roots of the quadratic equation $3x^2+(2k+1)x-(k+5)=0$ is equal to the product of its roots. **[2000]**

3. If the roots of the equation $(a-b)x^2+(b-c)x+(c-a)=0$ are equal, prove that $2a=b+c$. **[2000]**

4. Find two consecutive numbers, whose square have sum 85. **[2000]**

5. If α,β are the roots of the equation $x^2+kx+12=0$ such that $\alpha-\beta=1$, find k. **[2001]**

6. Solve for x: $4\left(x-\frac{1}{x}\right)^2-4\left(x+\frac{1}{x}\right)+1=0.$ **[2001]**

7. Solve for x: $\left(\frac{x-1}{x+1}\right)^4-13\left(\frac{x-1}{x+1}\right)^2+36=0,\ x\neq 1.$ **[2001]**

8. Solve for x: $\sqrt{2x+3}-\sqrt{x+1}=1, x\epsilon R.$ **[2001]**

9. Solve for x: $\sqrt{(2x+9)(x+3)}-\sqrt{x^2-x-12}=3\sqrt{x+3}.$ **[2002]**

10. If α,β are the roots of the equation $2x^2-5x-7=0$, form the quadratic equation whose roots are $\alpha+2\beta, 2\alpha+\beta$. **[2002]**

11. If one root of the quadratic equation $2x^2+kx-6=0$ is 2, find the value of k. Also find the other root. **[2002]**

12. If α,β are the roots of the equation $kx^2+4x-4=0$ such that $\alpha^2+\beta^2=24$, find the value of k. **[2002]**

13. Determine value(s) of p for which the quadratic equation $4x^2-3px+9=0$ has real roots. **[2003]**

14. The distance between Mumbai and Pune is 192 km. Travelling by Deccan Queen, it takes 48 minutes less than another train. Calculate the speed of the Deccan Queen if the speed of the two trains differ by 20 km/h. **[2003]**

15. A farmer wishes to grow a 100 m^2 rectangular vegetable garden. Since he has with him only 30 m barbed wire, he fences three sides of the rectangular garden letting compound wall of his house act as the fourth side-fence, Find the dimensions of his garden. **[2003]**

16. Using quadratic formula, solve the following quadratic equation for x: $p^2x^2 + (p^2 - q^2)x - q^2 = 0$. **[2004]**

17. Solve for x: $\left(\frac{4x-3}{2x+1}\right) - 10\left(\frac{2x+1}{4x-3}\right) = 3; x \neq \frac{-1}{2}; x \neq \frac{3}{4}$ **[2004]**

18. Solve for x: $\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}; a \neq 0, b \neq 0, x \neq 0.$ **[2005]**

19. Solve for x: $\frac{x-1}{x-2} + \frac{x-3}{x-4} = 3\frac{1}{3}$. **[2005]**

20. Solve for x: $a^2 + b^2x^2 + b^2x - a^2x - 1 = 0.$ **[2005]**

21. Solve for x: $abx^2 + (b^2 - ac)x - bc = 0.$ **[2005]**

22. A two-digit number is four times the sum of its digits and twice the product of the digits. Find the number. **[2005]**

23. A two-digit number is such that the product of its digits is 15. If 18 is added to the number, the digits interchange their places, find the number. **[2005]**

24. The sum of two numbers a and b is 15, and the sum of their reciprocals is $\frac{3}{10}$. Find the numbers a and b. **[2005]**

25. Solve for x: $12abx^2 - (9a^2 - 8b^2)x - 6ab = 0$ **[2006]**

26. A two-digit number is such that the product of its digits is 35. When 18 is added to the number, the digits interchange their places. Find the number. **[2006]**

27. Using the quadratic formula, solve the equation: $a^2b^2x^2 - (4b^4 - 3a^4)x - 12a^2b^2 = 0$ **[2006]**

28. The sum of two natural numbers is 8. Determine the numbers if the sum of their reciprocals is $\frac{8}{15}$. **[2006]**

29. The speed of a boat in still water is 11 km/h. It can go 12 km upstream and return downstream to the original point in 2 hours 45 minutes. Find the speed of the stream. **[2006]**

30. The difference of two numbers is 5 and the difference of their reciprocals is $\frac{1}{10}$. Find the numbers. **[2007]**

31. By increasing the list price of a book by Rs. 10 a person can buy 10 less books for Rs. 1200. Find the original list price of the book. **[2007]**

32. The side of a square exceeds the side of another square by 4 cm and the sum of areas of two squares is 400 sq. cm. Find the dimension of the squares. **[2007]**

33. A fast train takes 3 hours less than a slow train for a journey of 600 km. If the speed of the slow train is 10 km/h less than that of the fast train, find the speeds of the two trains. **[2007]**

34. A passenger train takes 3 hours less for a journey of 360 km, if its speed is increased by 10 km/h. What is the usual speed? **[2007]**

35. The sum of the squares of two consecutive odd numbers is 394. Find the integers. **[2007, 2009, 2014]**

36. The numerator of a fraction is one less than its denominator. If three is added to each of the numerator and denominator, the fraction is increased by $\frac{3}{28}$. Find the fraction. **[2007]**

37. The difference of two numbers is 5 and the difference of their reciprocals is $\frac{1}{10}$. Find the numbers. **[2007]**

38. The difference of squares of two natural numbers is 45. The square of the smaller number is four times the larger number. Find the numbers. **[2007]**

39. By increasing the list price of a book by Rs. 10 a person can buy 10 less books for Rs. 1,200. Find the original list price of the book. **[2007]**

40. Find the roots of the following equation: $\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$; $x \neq -4, 7$ **[2008]**

41. Show that $x = -2$ is a solution of of $3x^2 + 13x + 14 = 0$. **[2008]**

42. In a class test, the sum of the marks obtained by P in Mathematics and Science is 28. Had the got 3 more marks in Mathematics and 4 marks less in Science, the product of marks obtained in the two subjects would have been 180. Find the marks obatained in the two subjects separately. **[2008]**

43. The sum of the areas of two squares is 640 m^2. If the difference in their perimeters be 64 m, find the sides of the two squares. **[2008]**

44. Show that $x = -3$ is a solution of $x^2 + 6x + 9 = 0$. **[2008]**

45. The difference of two numbers is 4. If the difference of their reciprocals is $\frac{4}{21}$, find the two numbers. **[2008]**

46. If – 5 is a root of the quadratic equation $2x^2 + px - 15 = 0$ and the quadratic equation $p(x^2 + x) + k = 0$ has equal roots, find the value of k. **[2009, 2014, 2016]**

47. Places A and B are 100 km apart on a highway. One car starts from A and another from B at the same time. If the cars travel in the same direction at different speeds, they meet in 5 hours. If they travel towards each other, they meet in one hour. What are the speeds of the two cars? **[2009]**

48. A trader bought a number of articles for Rs. 900. Five articles were found damaged. He sold each of the remaining articles at Rs. 2 more than what he paid for it. He got a profit of Rs. 80 on the whole transaction. Find the number of articles he bought. **[2009]**

49. Two years ago a man's age was three times the square of his son's age. Three years hence his age will be four times his son's age. Find their present ages. **[2009]**

50. Find the discriminant of the quadratic equation: $3\sqrt{3}x^2 + 10x + \sqrt{3} = 0$ **[2009]**

51. Write the nature of roots of quadratic equation $4x^2 + 4\sqrt{3}x + 3 = 0$. **[2009]**

52. The sum of two numbers is 8. Determine the numbers if the sum of their reciprocals is $\frac{8}{15}$. **[2009]**

53. Solve the equation for x: $9x^2 - 9(a + b)x + (2a^2 + 5ab + 2b^2) = 0$. **[2009]**

54. Some students planned a picnic. The total budget for food was Rs. 2,000. But 5 students failed to attend the picnic and thus the cost of food for each member increased by Rs. 20. How many students attended the picnic and how much did each student pay for the food? **[2010]**

55. Solve the following equation for x: $\frac{3x-4}{7}+\frac{7}{3x-4}=\frac{5}{2},\ x\neq\frac{4}{3}$ **[2010]**

56. Three consecutive positive integers are such that the sum of the square of the first and the product of the other two is 46, find the integers. **[2010]**

57. The difference of squares of two numbers is 88. If the larger number is 5 less than twice the smaller number, then find the two numbers. **[2010]**

58. A girl is twice as old as her sister. Four years hence, the product of their ages (in years) will be 160. Find their present ages. **[2010]**

59. The roots of the equation $x^2-3x-m(m+3)=0$, where m is a constant, are **[2011]**

(a) $m,\ m+3$ (b) $-m,\ m+3$ (c) $m,\ -(m+3)$ (d) $-m,\ -(m+3)$

60. Find the value of '**m**' so that the quadratic equation $mx(x-7)+49=0$ has two equal roots. **[2011]**

61. Find the roots of the equation $\frac{1}{2x-3}+\frac{1}{x-5}=1, x\neq\frac{3}{2},\ 5.$ **[2011]**

62. Find the roots of the following quadratic equation: $x^2-3\sqrt{5}x+10=0.$ **[2011]**

63. The roots of the quadratic equation $x^2+5x-(\alpha+1)(\alpha+6)=0$, where α is a constant, are **[2011]**

(a) $\alpha+1, \alpha+6$ (b) $(\alpha+1),\ -(\alpha+6)$

(c) $-(\alpha+1),\ (\alpha+6)$ (d) $-(\alpha+1),\ -(\alpha+6)$

64. For what value of k does the quadratic equation $(k-5)x^2+2(k-5)x+2=0$ have equal roots? **[2011]**

65. Find the roots of the following quadratic equation: $\sqrt{3}x^2-2\sqrt{5}x-2\sqrt{3}=0.$ **[2011]**

66. Solve the following equation for x: $\frac{1}{x+1}+\frac{2}{x+2}=\frac{5}{x+4}, x\neq -1, -2, -4.$ **[2011]**

67. The roots of the equation $x^2+x-p(p+1)=0$, where p is a constant, are **[2011]**

(a) $p, p+1$ (b) $-p,\ p+1$ (c) p, $-(p+1)$ (d) $-p,\ -(p+1)$

68. For what value of k, are the roots of the quadratic equation $kx(3x-10)+25=0$ equal? **[2011]**

69. For what value of m, are the roots of the quadratic equation $mx(5x-6)+9=0$ equal? **[2011]**

70. For what value of m, are the roots of the quadratic equation $mx(x-7)+49=0$ equal? **[2011]**

71. For what values of k, are the roots of the quadratic equation $(k-5)x^2+2(k-5)x+2=0$ equal? **[2011]**

72. Two water taps together can fill a tank in 6 hours. The tap of larger diameter takes 9 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank. **[2011]**

73. Solve for x: $2\sqrt{3}x^2-5x+\sqrt{3}=0.$ **[2011]**

74. Solve for x: $\sqrt{3}x^2-2\sqrt{2}x-2\sqrt{3}=0.$ **[2011]**

75. Solve for x: $3x^2+2\sqrt{5}x-5=0.$ **[2011]**

76. A motor boat whose speed is 20 km/h in still water, takes one hour more to go 48 km upstream than to return downstream to the same spot. Find the speed of the stream. **[2011]**

77. Solve for x: $\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}, x \neq -4,\ 7.$ **[2011]**

78. Solve for x: $\frac{1}{2x-3} + \frac{1}{x-5} = 1, x \neq \frac{3}{2},\ 5.$ **[2011]**

79. Solve for x: $\frac{1}{x+1} + \frac{2}{x+2} = \frac{5}{x+4};\ \ x \neq -1, -2, -4.$ **[2011]**

80. A train travels 180 km at a uniform speed. If the speed had been 9 km/h more, it would have taken one hour less for the same journey. Find the speed of the train. **[2011]**

81. For what value of p, are the roots of the quadratic equation $px(x-3)+9=0$ equal? **[2011, 2012]**

82. The roots of the quadratic equation $2x^2 - x - 6 = 0$ are **[2012]**

(a) $-2, \frac{3}{2}$ (b) $2, -\frac{3}{2}$ (c) $-2, -\frac{3}{2}$ (d) $2, \frac{3}{2}$

83. If the sum of two natural numbers is 8 and their product is 15, find the numbers. **[2012]**

84. The numerator of a fraction is 3 less than its denominator. If 1 is added to the denominator, the fraction is decreased by $\frac{1}{15}$. Find the fraction. **[2012]**

85. In a flight of 2800 km, an aircraft was slowed down due to bad weather. Its average speed is reduced by 100 km/h and time increased by 30 minutes. Find the original duration of the flight. **[2012]**

86. Solve for x: $x^2 - 4ax - b^2 + 4a^2 = 0.$ **[2012]**

87. For what values of k, are the roots of the quadratic equation $2x^2 + kx + 3 = 0$ equal? **[2012]**

88. For what values of k, are the roots of the quadratic equation $3x^2 - 2kx + 12 = 0$ equal? **[2012]**

89. For what values of m, are the roots of the quadratic equation $mx(6x+10)+25=0$ equal? **[2012]**

90. For what values of k, are the roots of the quadratic equation $kx(3x-4)+4=0$ equal? **[2012]**

91. Find the value of p for which the roots of the equation $px(x-2)+6=0$, are equal. **[2012]**

92. For what values of p, are the roots of the quadratic equation $(p+3)x^2 + 2(p+3)x + 4 = 0$ equal? **[2012]**

93. For what values of k, are the roots of the quadratic equation $(k-4)x^2 + 2(k-4)x + 2 = 0$ equal? **[2012]**

94. For what values of a, are the roots of the quadratic equation $2(a+5)x^2 - (a+5)x + 1 = 0$ equal? **[2012]**

95. Solve for x: $4x^2 - 4ax + (a^2 - b^2) = 0.$ **[2012]**

96. Solve for x: $x^2 - 4ax - b + a^2 = 0.$ **[2012]**

97. Solve for x: $3x^2 - 2\sqrt{6}x + 2 = 0.$ **[2012]**

98. Solve for x: $x^2 - 5\sqrt{5}x + 30 = 0.$ **[2012]**

99. Solve for x: $x^2 + \sqrt{5}x - 60 = 0$. **[2012]**

100. Solve for x: $4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$. **[2012, 2013]**

101. Find two consecutive natural numbers, the sum of whose squares is 145. **[2012]**

102. The sum of two numbers is 9 and the sum of their reciprocals is $\frac{1}{2}$. Find the numbers. **[2012]**

103. The numerator of a fraction is 3 less than its denominator. If 1 is added to the denominator, the fraction is decreased by $\frac{1}{15}$. Find the fraction. **[2012]**

104. A two-digit number is such that the product of its digits is 14. When 45 is added to the number, the digits interchange their places. Find the number. **[2012]**

105. For what values of k, are the roots of the quadratic equation $(k+4)x^2 + (k+1)x + 1 = 0$ equal? **[2013]**

106. For what values of k, are the roots of the quadratic equation $(k-4)x^2 + (k-4)x + 4 = 0$ equal? **[2013]**

107. For what values of k, are the roots of the quadratic equation $x^2 - (3k-1)x + 2k^2 + 2k - 11 = 0$ equal? **[2013]**

108. For what values of k, are the roots of the quadratic equation $(k-12)x^2 + 2(k-12)x + 2 = 0$ equal? **[2013]**

109. For what values of k, are the roots of the quadratic equation $y^2 + k^2 = 2(k+1)y$ equal? **[2013]**

110. For what value of k, are the roots of the quadratic equation $kx(x-2) + 6 = 0$ equal? **[2013]**

111. For what value of k, are the roots of the quadratic equation $kx\left(x - 2\sqrt{5}\right) + 10 = 0$ equal? **[2013]**

112. For what values of m, are the roots of the quadratic equation $x^2 - 2x(1+3m)x + 7(3+2m) = 0$ equal? **[2013]**

113. Solve for x: $\frac{1}{x-3} + \frac{2}{x-2} = \frac{8}{x}$; $x \neq 0, 2, 3$. **[2013]**

114. Solve for x: $\frac{1}{2x-3} + \frac{1}{x-5} = 1$; $x \neq \frac{3}{2}, 5$. **[2013]**

115. Solve for x: $\frac{1}{x-2} + \frac{2}{x-1} = \frac{6}{x}$; $x \neq 0, 1, 2$. **[2013]**

116. Solve for x: $\frac{4}{x} - 3 = \frac{5}{2x+3}$; $x \neq 0, \frac{-3}{2}$. **[2013, 2014]**

117. Solve for x: $\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$. **[2013]**

118. Solve for x: $abx^2 = (a+b)^2(x-1)$. **[2013]**

119. Solve for x: $x^2 - \left(\sqrt{2}+1\right)x + \sqrt{2} = 0$. **[2013]**

120. Solve the following for x: $\frac{1}{2a+b+2x} = \frac{1}{2a} + \frac{1}{b} + \frac{1}{2x}$. **[2013]**

121. Sum of the areas of two squares is 400 cm^2. If the difference of their perimeters is 16 cm, find the sides of the squares. **[2013]**

122. The present age of a father is equal to the square of the present age of his son. One year ago, the age of the father was 8 times the age of his son. Find their present ages. **[2013]**

123. While boarding an aeroplane, a passenger got hurt. The pilot, showing promptness and concern, made arrangements to hospitalise the injured and so the plane started late by 30 minutes. To reach the destination, 1500 km away, in time, the pilot increased the speed by 100 km/hour. Find the original speed/hour of the plane. Do you apprecieate the values shown by the pilot, namely, promptness in providing help to the injured and his efforts to reach in time? **[2013]**

124. Solve for x: $\sqrt{3}x^2 - 2\sqrt{2}x - 2\sqrt{3} = 0.$ **[2014, 2015, 2016]**

125. Solve for x: $2\left(\frac{2x-1}{x+3}\right) - 3\left(\frac{x+3}{2x-1}\right) = 5;\ \ x \neq -3,\ \frac{1}{2}.$ **[2014]**

126. Solve for x : $\frac{x-4}{x-5} + \frac{x-6}{x-7} = \frac{10}{3};\ \ x \neq 5, 7$ **[2014]**

127. Solve for x: $2x^2 + ax - a^2 = 0.$ **[2014]**

128. Find the values of p for which the quadratic equation $4x^2 + px + 3 = 0$ has equal roots. **[2014]**

129. Find the values of k for which the quadratic equation $9x^2 - 3kx + k = 0$ has equal roots. **[2014]**

130. Find the values of k for which the quadratic equation $(k+4)x^2 + (k+1)x + 1 = 0$ has equal roots. Also find these roots. **[2014]**

131. Solve for x: $\frac{3}{x+1} - \frac{1}{2} = \frac{2}{3x-1};\ \ x \neq -1,\ \frac{1}{3}.$ **[2014]**

132. Solve for x: $\frac{14}{x+3} - 1 = \frac{5}{x+1};\ \ x \neq -3, -1.$ **[2014]**

133. Solve for x: $\frac{16}{x} - 1 = \frac{15}{x+1};\ \ x \neq 0, -1.$ **[2014]**

134. Find the value of p for which the quadratic equation $(2p+1)x^2 - (7p+2)x + (7p-3) = 0, p \neq -1$ has equal roots. Also, find the roots of the equation. **[2014]**

135. Solve for x: $3\left(\frac{3x-1}{2x+3}\right) - 2\left(\frac{2x+3}{3x-1}\right) = 5;\ \ x \neq \frac{1}{3}, -\frac{3}{2}.$ **[2014]**

136. Solve for x: $3\left(\frac{7x+1}{5x-3}\right) - 4\left(\frac{5x-3}{7x+1}\right) = 11;\ \ x \neq \frac{3}{5}, -\frac{1}{7}.$ **[2014]**

137. The sum of the squares of two consecutive multiples of 7 is 637. Find the multiples. **[2014]**

138. The difference of two natural numbers is 5 and the difference of their reciprocals is $\frac{1}{10}$. Find the numbers. **[2014]**

139. If $x = -\frac{1}{2}$ is a solution of the quadratic equation $3x^2 + 2kx - 3 = 0$, find the value of k. **[2015]**

140. If the quadratic equation $px^2 - 2\sqrt{5}px + 15 = 0$ has equal roots, then find the value of p. **[2015]**

141. Solve for x: $4x^2 - 4a^2x + (a^4 - b^4) = 0.$ **[2015]**

142. Solve for x: $9x^2 - 6b^2x + (a^4 - b^4) = 0.$ **[2015]**

143. Solve for x: $4x^2 + 4bx - (a^2 - b^2) = 0.$ **[2015]**

144. Solve for x: $x^2 - 2ax - (4b^2 - a^2) = 0.$ **[2015]**

145. Solve for x: $x^2 - (\sqrt{3} + 1)x + \sqrt{3} = 0$. **[2015]**

146. Solve for x: $4x^2 - 4a^2x + (a^4 - b^4) = 0$. **[2015]**

147. Find the value of p for which the quadratic equation $(p+1)x^2 - 6(p+1)x + 3(p+9) = 0, \quad p \neq -1$ has equal roots. Hence, find the roots of the equation. **[2015]**

148. Find that non-zero value of k, for which the quadratic equation $kx^2 + 1 - 2(k-1)x + x^2 = 0$ has equal roots. Hence, find the roots of the equation. **[2015]**

149. Solve for x: $2x^2 + 6\sqrt{3}x - 60 = 0$. **[2015]**

150. Solve for x: $x^2 + 5x - (a^2 + a - 6) = 0$. **[2015]**

151. Solve for x: $x^2 - (2b - 1)x + (b^2 - b - 20) = 0$. **[2015]**

152. Solve for x: $x^2 + 6x - (a^2 + 2a - 8) = 0$. **[2015]**

153. Solve for x: $\frac{2}{x+1} + \frac{3}{2(x-2)} = \frac{23}{5x}; \quad x \neq 0, -1, 2$. **[2015]**

154. Solve for x: $\frac{3}{x+1} + \frac{4}{x-1} = \frac{29}{x-1}; \quad x \neq 1, -1, \frac{1}{4}$. **[2015]**

155. The numerator of a fraction is 3 less than its denominator. If 2 is added to both the numerator and the denominator, then the sum of the new fraction and original fraction is $\frac{29}{20}$. Find the original fraction. **[2015]**

156. To fill a swimming pool two pipes are to be used. If the pipe of larger diameter is used for 4 hours and the pipe of smaller diameter for 9 hours, only half the pool can be filled. Find, how long it would take for each pipe to fill the pool separately, if the pipe of smaller diameter takes 10 hours more than the pipe of larger diameter to fill the pool. **[2015]**

157. The diagonal of a rectangular field is 16 metres more than the shorter side. If the longer side is 14 metres more than the shorter side, then find the lengths of the sides of the field. **[2015]**

158. A train travels at a certain average speed for distance of 54 km and then travels a distance of 63 km at an average speed of 6 km/h more than the first speed. If it takes 3 hours to complete the total journey, what is its first speed? **[2015]**

159. If $x = -\frac{1}{2}$, is a solution of the quadratic equation $3x^2 + 2kx - 3 = 0$, find the value of k. **[2015]**

160. If $x = -2$ is a root of the equation $3x^2 + 7x + p = 0$, find the values of k so that the roots of the equation $x^2 + k(4x + k - 1) + p = 0$ are equal. **[2015]**

161. The total cost of a certain length of a piece of cloth is Rs.200. If the piece was 5 cm longer and each metre of cloth costs Rs. 2 less, the cost of the piece would have remained unchanged. How long is the piece and what is its riginal rate per metre? **[2015]**

162. Find the value of p, for which one root of the quadratic equation $px^2 - 14x + 8 = 0$ is 6 times the other. **[2016]**

163. Solve for x: $\frac{1}{(x-1)(x-2)} + \frac{1}{(x-2)(x-3)} = \frac{2}{3}; \quad x \neq 1, 2, 3$. **[2016]**

164. Solve for x: $\frac{2x}{x-3} + \frac{1}{2x+3} + \frac{3x+9}{(x-3)(2x+3)} = 0, \quad x \neq 3, -\frac{3}{2}$. **[2016]**

165. Solve for x: $\frac{1}{x}+\frac{2}{2x-3}=\frac{1}{x-2}$; $x \neq 0, \frac{3}{2}, 2$. **[2016]**

166. Solve for x (in terms of a and b): $\frac{a}{x-b}+\frac{b}{x-a}=2$; $x \neq a, b$. **[2016]**

167. Find x in terms of a, b and c: $\frac{a}{x-a}+\frac{b}{x-b}=\frac{2c}{x-c}$; $x \neq a, b, c$. **[2016]**

168. Solve for x: $\frac{x+1}{x-1}+\frac{x-2}{x+2}=4-\frac{2x+3}{x-2}$; $x \neq 1, -2, 2$. **[2016]**

169. Solve for x: $\frac{1}{x-3}-\frac{1}{x+5}=\frac{1}{6}$, $x \neq 3, -5$. **[2016]**

170. Solve for x: $x^2+\left(\frac{a}{a+b}+\frac{a+b}{a}\right)x+1=0$. **[2016]**

171. Solve for x: $9x^2-9(a+b)x+(2a^2+5ab+2b^2)=0$. **[2016]**

172. If $x=\frac{2}{3}$ and $x=-3$ are roots of the quadratic equations $ax^2+7x+b=0$, find the values of a and b. **[2016]**

173. If the roots of the quadratic equation $(a-b)x^2+(b-c)x+(c-a)=0$ are equal, prove that $2a=b+c$. **[2016]**

174. If roots of the quadratic equation $x^2+2px+mn=0$ are real and equal, show that the roots of the quadratic equation $x^2-2(m+n)x+(m^2+n^2+2p^2)=0$ are also equal. **[2016]**

175. Find the positive value(s) of k for which quadratic equations $x^2+kx+64=0$ and $x^2-8x+k=0$ both will have real roots. **[2016]**

176. Three consecutive natural numbers are such that the square of the middle numbers exceeds the difference of the squares of the other two by 60. Find the numbers. **[2016]**

177. The denominator of a fraction is one more than twice its numerator. If the sum of the fraction and its reciprocal is $2\frac{16}{21}$, find the fraction. **[2016]**

178. If $ad \neq bc$, then prove that the equation $(a^2+b^2)x^2+2(ac+bd)x+(c^2+d^2)=0$ has no real roots. **[2016]**

179. Two water taps together can fill a tank in 9 hours 36 minutes. The tap of larger diameter takes 8 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank. **[2016]**

180. Two pipes running together can fill a tank in $11\frac{1}{9}$ minutes. If one pipe takes 5 minutes more than the other to fill the tank separately, find the time in which each pipe would fill the tank separately. **[2016]**

181. A pole has to be errected at a point on the boundary of a circular park of diameter 17 m in such a way that the differences of its distances from two diametrically opposite fixed gates A and B on the boundary is 7 metres. Find the distances from the two gates where the pole is to be errected. **[2016]**

182. The time taken by a person to cover 150 km was $2\frac{1}{2}$ hours more than the time taken in the return journey. If he returned at a speed of 10 km/h more than the speed while going, find the speed per hour in each direction. **[2016]**

183. A rectangular park is to be designed whose breadth is 3 m less than its length. Its area is to be 4 square metres more than the area of a park that has already been made in the shape of an isosceles triangle with its base as the breadth of the rectangular park and of altitude 12 m. Find the length and breadth of rectangular park. **[2016]**

184. A passenger, while boarding the plane, slipped from the stairs and got hurt. The pilot took the passenger in the emergency clinic at the airport for treatment. Due to this, the plane got delayed by half an hour. To reach the destination 1500 km away in time, so that the passengers could catch the connecting flight, the speed of the plane was increased by 250 km/h, than the usual speed. Find the usual speed. What value is depicted in this question? **[2016]**

185. Two taps running together can fill a tank in $3\frac{1}{13}$ hours. If one tap takes 3 hours more than the other to fill the tank, then how much time will each tap take to fill the tank? **[2016]**

186. A two digit number is four times the sum of the digits. It is also equal to 3 times the product of digits. Find the number. **[2016]**

187. Solve for x: $\frac{1}{x+1}+\frac{3}{5x+1}=\frac{5}{x+4},\ x \neq -1, -\frac{1}{5}, -4.$ **[2016]**

188. Solve for x: $\sqrt{2x+9}+x=13.$ **[2016]**

189. Solve for x: $\sqrt{6x+7}-(2x-7)=0.$ **[2016]**

190. Solve for x: $\frac{1}{x+1}+\frac{2}{x+2}=\frac{4}{x+4},\ x \neq -1, -2, -4$ **[2017]**

191. Solve for x: $\frac{1}{(x-1)(x-2)}+\frac{1}{(x-2)(x-3)}=\frac{2}{3},\ x \neq 1, 2, 3$ **[2017]**

192. Find the roots of the quadratic equation $\sqrt{2}x^2+7x+5\sqrt{2}=0.$ **[2017]**

193. Find the value of k for which the equation $x^2+k(2x+k-1)=0$ has real and equal roots. **[2017]**

194. If the equation $(1+m^2)x^2+2mcx+c^2-a^2=0$ has equal roots then show that $c^2=a^2(1+m^2).$ **[2017]**

195. A motor boat whose speed is 24 km/h in still water takes 1 hour more to go 32 km upstream than to return downstream to the same spot. Find the speed of the stream. **[2017]**

196. Speed of a boat in still water is 15 km/h. It goes 30 km upstream and returns back at the same point in 4 hours 30 minutes. Find the speed of the stream. **[2017]**

197. If $x = 3$ is one root of the quadratic equation $x^2 - 2kx - 6 = 0$, then find the value of k. **[2018]**

198. A plane left 30 minutes late than its scheduled time and in order to reach the destination 1500 km away in time, it had to increase its speed by 100 km/h from the usual speed. Find its usual speed. **[2018]**

199. A motor boat whose speed is 18 km/h in still water takes 1hr more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream. **[2018]**

200. A train travels at a certain average speed for a distance of 63 km and then travels at a distance of 72 km at an average speed of 6 km/h more than its original speed. If it takes 3 hours to complete total journey, what is the original average speed? **[2018]**

Ch. 5. Arithmetic Progression

1.	How many terms of the sequence 18, 16, 14, ... should be taken so that their sum is zero?	**[2003]**
2.	Find the common difference of an A.P. whose first term is 100 and the sum of whose first six terms is 5 times the sum of the next 6 terms.	**[2003]**
3.	The 8^{th} term of an A.P. is 37 and its 12^{th} term is 57. Find the A.P.	**[2004]**
4.	Find the sum of the first 25 terms of an A.P. whose n^{th} term is given by $t_n = 7 - 5n$.	**[2004]**
5.	Find 10th term from end of the A.P. 4, 9, 14, ... 254.	**[2005]**
6.	Find the number of terms of the A.P. 54, 51, 48 ... so that their sum is 513.	**[2005]**
7.	If the n^{th} term of an A.P. is (2n + 1), find the sum of first **n** terms of the A.P.	**[2005]**
8.	Find the sum of all two-digit odd positive numbers.	**[2005]**
9.	The 8^{th} term of an Arithmetic progression is zero. Prove that its 38^{th} term is triple its 18^{th} term.	**[2005]**
10.	The 6^{th} term of an Arithmetic Progression (AP) is -10 and the term is -26. Determine the 15^{th} term of the AP.	**[2006]**
11.	Find the sum of all the two-digit natural numbers when are divisible by 4.	**[2006]**
12.	The 5^{th} term of an Arithmetic Progression (A.P.) is 26 and the 10^{th} term is 51. Determine the 15^{th} term of the A.P.	**[2006]**
13.	Find the sum of all the natural numbers less than 100 which are divisible by 6.	**[2006]**
14.	Find the sum of first 25 terms of an A.P. whose n^{th} term is $1 - 4n$.	**[2007]**
15.	If the sum of first n terms of an A.P. is given by $S_n = n(n+1)$, find the 20^{th} term of the A.P.	**[2007]**
16.	Which term of the A.P. 72, 68, 64, 60, … is zero?	**[2007]**
17.	How many terms of the A.P. 17, 15, 13, 11, … must be added to get the sum 72? Explain the double answer.	**[2007]**
18.	In an A.P., the sum of its first n terms is $n^2 + 2n$. Find its 18^{th} term.	**[2007]**
19.	The first term, common difference and last term of an A.P. are 12, 6 and 252 respectively. Find the sum of all terms of this A.P.	**[2007]**
20.	Which term of the A.P. 3, 15, 27, 39, … Will be 132 more than its 54^{th} term?	**[2007]**
21.	How many three-digit natural numbers are divisible by 7?	**[2007]**
	OR	**[2013]**
	Find the sum of all three-digit whole numbers are divisible by 7?	
22.	For what value of n are the n^{th} terms of two Aps 63, 65, 67, … and 3, 10, 17, … equal?	**[2008]**
23.	If m times the m^{th} term of an A.P. is equal to n times its n^{th}term, find the $(m+n)^{th}$term of the A.P.	**[2008]**
24.	In an A.P., the first term is 8, n^{th} term is 33 and sum to first n terms is 123. Find n and d, the common difference.	**[2008]**

25. In an A.P., the first term is 25, n^{th} term is – 17 and sum to first n terms is 60. Find n and d, the common difference. **[2008]**

26. In an A.P., the first term is 22, n^{th} term is – 11 and sum to first n terms is 66. Find n and d, the common difference. **[2008]**

27. Find the 10th term from the end of the A.P. 8, 10, 12, ………, 126. **[2008]**

28. The first term of an A.P. is $\boldsymbol{p}$ and its common difference is $\boldsymbol{q}$. find its 10^{th} term. **[2008]**

29. The n^{th} term of an A. P. is $6n + 2$. Find its common difference. **[2008]**

30. For what value of p, are $2p - 1, 7$ and $3p$ three consecutive terms of an A.P.? **[2009]**

31. If S_n, the sum of first n terms of an A.P., is given by $S_n = 3n^2 - 4n$, then find its n^{th} term. **[2009]**

32. The sum of 4th and 8th terms of an A.P. is 24 and sum of 6th and 10th terms is 44. Find A.P. **[2009]**

33. For what value of k, are the numbers x, $2x + k$ and $3x + 6$ three consecutive terms of an A.P.? **[2009]**

34. The 17th term of an A.P. exceeds its 10th by 7. Find the common difference. **[2009]**

35. If 9th term of an A.P. is zero, prove that its 29th term is double of its 19th term. **[2009]**

36. If $\frac{4}{5}, a, 2$ are three consecutive terms of an A.P., then find the value of a. **[2009]**

37. Which term of the A.P. 3, 15, 27, 39, … will be 120 more than its 21st term? **[2009]**

38. The sum of first six terms of an arithmetic progression is 42. The ratio of its 10th term to its 30th term is $1:3$. Calculate the first and the thirteenth term of the A.P. **[2009]**

39. If the sum of first m terms of an A.P. is $2m^2 + 3n$, then what is its second term? **[2010]**

40. In an A.P., the first term is -4, the last term is 29 and the sum of all its terms is 150. Find its common difference. **[2010]**

41. The sum of the first sixteen terms of an A.P. is 112 and the sum of its next fourteen terms is 518. Find the A.P. **[2010]**

42. If the sum of first p terms of an A.P., is $ap^2 + bp$, find its common difference. **[2010]**

43. In an A.P., the first term is 2, the last term is 29 and sum of the terms is 155. Find the common difference of the A.P. **[2010]**

44. In an A.P., the sum of first ten terms is -150 and the sum of its next ten terms is -550. Find the A.P. **[2010]**

45. If the common difference of an A.P. is 3, then $a_{20} - a_{15}$ is **[2011]**

    (a) 5 (b) 3 (c) 15 (d) 20

46. Find an A.P. whose term is 9 and the sum of its sixth term and thirteenth term 40. **[2011]**

47. The first and the last terms of an A.P. are 8 and 350 respectively. If its common difference is 9, how many terms are there and what is their sum? **[2011]**

    How many multiples of 4 lie between 10 and 250? Also, find their sum. **[2011]**

48. The value of $a_{30} - a_{20}$ for the A.P. 2, 7, 12, 17, … is **[2011]**

(a) 100 (b) 10 (c) 50 (d) 20

49. Find the sum of first n terms of an A.P. whose nth term is $5n - 1$. Hence find the sum of first 20 terms. **[2011]**

50. In an A.P., if the 6th and 13th terms are 35 and 70 respectively, find the sum of its first 20 terms. **[2011]**

51. In an A.P., if $d = -2, n = 5$ and $a_n = 0$, then the value of a is **[2011]**

(a) 10 (b) 5 (c) $-$ 8 (d) 8

52. Find whether $-$ 150 is a term of the A.P. 17, 12, 7, 2, …? **[2011]**

53. Find the value of the middle term of the following A.P.: $-6, -2, 2, \ldots, 58$. **[2011]**

54. Determine the A.P. whose fourth term is 18 and difference of the ninth term from the fifteenth term is 30. **[2011]**

55. Find how many two-digit numbers are divisible by 6. **[2011]**

56. How many two-digit numbers are divisible by 3? **[2012]**

57. Find the sum of all multiples of 7 lying between 500 and 900. **[2012]**

58. Find the common difference of an A.P. whose first term is 5 and the sum of its first four terms is half the sum of the next four terms. **[2012]**

59. If the n^{th} term of an A.P. is $(2n + 1)$, then the sum of its first terms is **[2012]**

(a) $6n + 3$ (b) 15 (c) 12 (d) 21

60. The common difference of the AP $\frac{1}{2q}, \frac{1-2q}{2q}, \frac{1-4q}{2q}, \ldots \ldots \ldots$ is **[2013]**

(a) -1 (b) 1 (c) q (d) 2q

61. The common diffference of the AP $\frac{1}{p}, \frac{1-p}{p}, \frac{1-2p}{p}, \ldots \ldots \ldots$ is **[2013]**

(a) p (b) $-p$ (c) -1 (d) 1

62. Find the number of all three-digit natural numbers which are divisible by 9. **[2013]**

63. Find the number of terms of the AP $18, 15\frac{1}{2}, 13, \ldots \ldots, -49\frac{1}{2}$ and find the sum of all its terms. **[2013]**

64. The 19^{th} term of an AP is equal to three times its sixth term. If its 9^{th} is 19, find the AP. **[2013]**

65. The sum of first n terms of an AP is $5n^2 + 8n$. If its m^{th} term is 168, find the value of m. Also, find the 20^{th} term of this AP. **[2013]**

66. If the sum of first 7 terms of an A.P. is 49 and that of first 17 terms is 289, find the sum of its first n terms. **[2013]**

67. The next term of the A.P. $\sqrt{7}, \sqrt{28}, \sqrt{63}, \ldots$ is **[2014]**

(a) $\sqrt{70}$ (b) $\sqrt{84}$ (c) $\sqrt{97}$ (d) $\sqrt{112}$

69. The first three terms of an AP respectively are $3y - 1$, $3y + 5$ and $5y + 1$. Then y equals: **[2014]**

(a) -3 (b) 4 (c) 5 (d) 2

70. The sum of the first n terms of an A.P. is $3n^2 + 6n$. Find the n^{th} term of this A.P. **[2014]**

71. The sum of the first 7 terms of an A. P. is 63 and the sum of its next 7 terms is 161. Find the 28th term of this A.P. **[2014]**

72. If the seventh term of an AP is $\frac{1}{9}$ and its ninth term is $\frac{1}{7}$, find its 63^{rd} term. **[2014]**

73. The first and the last terms of an AP are 5 and 45 respectively. If the sum of all its terms is 400, find its common difference. **[2014]**

74. If S_n denotes the sum of the first n terms of an A.P., prove that $S_{30} = 3(S_{20} - S_{10})$. **[2014]**

75. In an AP of 50 terms, the sum of first 10 terms is 210 and the sum of its last 15 terms is 2565. Find the A.P. **[2014]**

76. Find the middle term of the A.P. 6, 13, 20, …, 216. **[2015]**

77. If S_n, denotes the sum of first n terms of an A.P., prove that $S_{12} = 3(S_8 - S_4)$. **[2015]**

78. Ramkali required Rs. 2500 after 12 weeks to send her daughter to school. She saved Rs. 100 in the frist week and increased her weekly saving by Rs. 20 every week. Find whether she will be able to send her daughter to school after 12 weeks. What value is generated in the above situation? **[2015]**

79. What is the common difference of an A.P. in which $a_{21} - a_7 = 84$? **[2016]**

80. Which term of the progression $20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}, \ldots$ is the first negative term? **[2016]**

81. The first term of an A.P. is 5, the last term is 45 and the sum of all its terms is 400. Find the number of terms and the common differenece of the A.P. **[2016]**

82. If the ratio of the sum of first n terms of two A.P.'s is $(7n + 1) : (4n + 27)$, find the ratio of their m^{th} terms. **[2016]**

83. Find how many integers between 200 and 500 are divisible by 8? **[2017]**

84. If m^{th} term of an A.P. is $\frac{1}{n}$ and n^{th} term is $\frac{1}{m}$, then find the sum of its first mn term. **[2017]**

85. Find the sum of n terms of the series $\left(4 - \frac{1}{n}\right) + \left(4 - \frac{2}{n}\right) + \left(4 - \frac{3}{n}\right) + \cdots$. **[2017]**

86. The ratio of the sums of first m and first n terms of an A.P. is $m^2 : n^2$. Show that the ratio of its m^{th} and n^{th} terms is $(2m - 1) : (2n - 1)$. **[2017]**

87. For what value of k will $k + 9$, $2k - 1$ and $2k + 7$ are the consecutive terms of an A. P.? **[2017]**

88. The houses in a row are numbered consecutively from 1 to 49. Show that there exists a value of X such that sum of numbers of houses preceding the house numbered X is equal to sum of the numbers of houses following X. **[2017]**

89. The 4^{th} term of an A.P. is zero. Prove that the 25^{th} term of the A.P. is three times its 11^{th} term. **[2017]**

90. In an AP, if the common difference (d) = – 4, and the seventh term (a_7) is 4, then find the first term. **[2018]**

91. Find the sum of first 8 multiples of 3. **[2018]**

92. The sum of four consecutive numbers in an AP is 32 and the ratio of the product of the first and the last term to the product of two middle terms is 7 : 15. Find the numbers. **[2018]**

Ch. 6. Triangles

1. Determine the length of an altitude of an equilateral triangle of side $2a$ cm. **[1999]**

2. The hypotenuse of aright triangle is 6 m more than the twice of shortet side. If the third side is 2 m less than the hypotenuse,find the sides of a triangle. **[1999]**

3. $\Delta\, ABC$ and $\Delta\, DBC$ are on the same base BC. AD and BC intersect at O. prove that $\frac{ar(\Delta\, ABC)}{ar(\Delta\, DBC)} = \frac{AO}{DO}$. **[1999, 2005]**

4. "The ratio of the areas of two similar triangles is equal to the ratio of squares of their corresponding sides." **[1999]**

   Use the above in the following:

   In a trapezium ABCD, O is the point of intersection of AC and BD, $AB \parallel CD$ and AB = 2 CD. If the area of Δ AOB is 84 cm^2, find the area of Δ COD.

5. If the diagonals of a quadrilateral divide each other proportionally, prove that it is trapezium. **[1999]**

6. ABC is an isosceles triangle in which AB = AC and D is a point BC. Porve that $AB^2 - AD^2 = BD \times CD$. **[1999, 2007]**

7. ABC is a right triangle,right angled at C. Let $BC = a$, $CA = b$, AB = c and let p be the length of perpendicular from C on AB. Prove that (i) $cp = ab$ (ii) $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$. **[1999, 2002]**

8. Use the Pythagoras theorem to prove the following: **[1999, 2007, 2016]**

   ABC is an isosceles right triangle, right angled at C. Prove that $AB^2 = 2AC^2$

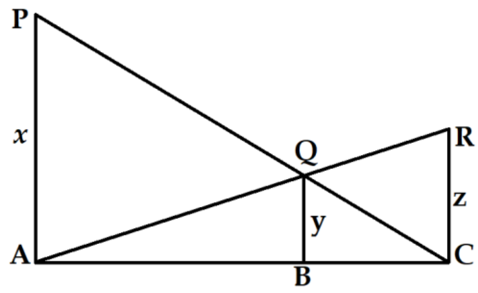
9. Prove that the ratio of the areas of two similar triangles is equal to the ratio of squares of their corresponding sides. **[1999, 2005, 2006, 2007, 2008, 2009, 2010, 2012, 2014, 2015, 2016]**

10. Prove that in a right-angled triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides. **[1999, 2000, 2002, 2003, 2004, 2005, 2006, 2007, 2011, 2014, 2015, 2016, 2017, 2018]**

11. Use the Pythagoras theorem to prove the following: **[2000, 2007]**

    In an isosceles $\Delta\, ABC$, if AC = BC and $AB^2 = 2BC^2$. Prove that $\angle\, C$ is a right angle.

12. In the given figure, PA, QB and RC are each perpendicular to AC, prove that $\frac{1}{x} + \frac{1}{z} = \frac{1}{y}$. **[2000]**



13. The perimeters of two similar triangles ABC and PQR are respectively 32 cm and 24 cm. If PQ = 12 cm. Find AB. **[2001]**

14. P and Q are the mid-points of the sides CA and CB respectively of a Δ ABC, right angled at C. Prove that (i) $4AQ^2 = 4AC^2 + BC^2$, (ii) $4BP^2 = 4BC^2 + AC^2$, (iii) $4(AQ^2 + BP^2) = 5AB^2$. **[2001]**

15. Prove "If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio". **[2001, 2002, 2011, 2013, 2014, 2017]**

16. In Δ ABC, $DE \parallel BC$ and $\frac{AD}{DB} = \frac{3}{5}$, if (i) AC = 5.6 cm, find AE. (ii) AC = 4.8 cm, find AE. **[2002]**

17. Find the length of the second diagonal of a rhombus whose side is 5 cm and one of the diagonals is 6 cm. **[2002]**

18. Prove that the equilateral triangle described on two sides of a right angled triangle are together equal to the equilateral triangle on the hypotenuse in terms of their areas. **[2002]**

19. Prove that three times the square of any side of an equilateral triangle is equal to four times the square of the altitude. **[2002]**

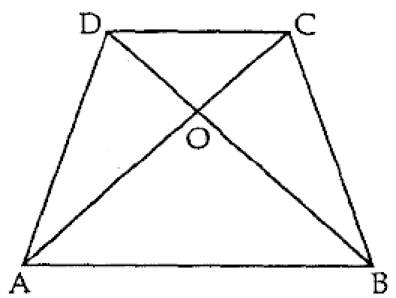
20. In Δ ABC, AD is bisector of $\angle BAC$. If BD = 2.8 cm, AB = 4.2 cm and AC = 5.1 cm. Find the length of BC. **[2002]**

21. "In a right-angled triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides." **[2002, 2003, 2004]**

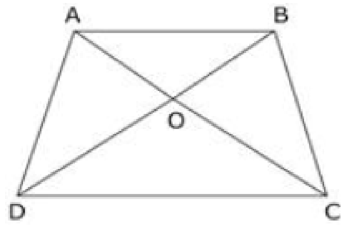
Using the above, prove that following:

In Δ ABC, $\angle A = 90°$ and AD ⊥ BC. Prove that $AB^2 + CD^2 = BD^2 + AC^2$.

22. In the figure, AB is parallel to CD. If $OA = 3x - 19$, $OB = x - 4$, $OC = x - 3$ and OD = 4, determine x. **[2002]**



23. In figure, ABCD is a trapezium in which $AB \parallel DC$. The diagonals AC and BD intersect at O. Prove that $\frac{AO}{OC} = \frac{BO}{DO}$. **[2004]**



24. "In a right-angled triangle the square on the hypotenuse is equal to the sum of the squares on other two sides." **[2005]**

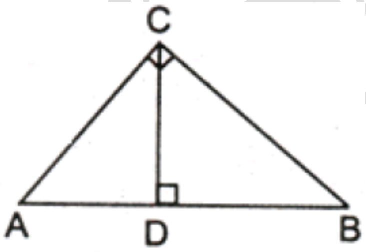
Using the above result, prove that the sum of squares on the sides of a rhombus is equal to sum of squares on its diagonals.

25. The perpendicular from vertex A on the side BC of triangle ABC intersects BC at point D such that DB = 3 CD. Prove that $2\,AB^2 = 2\,AC^2 + BC^2$. **[2005]**

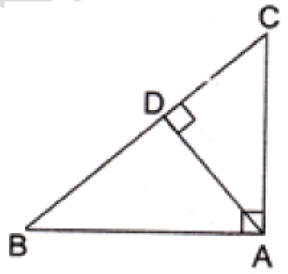
26. "The ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides." **[2006]**

Using the above, prove that the area of the equilateral triangle described on the side of a right-angled isosceles triangle is half the area of the equilateral triangle described on its hypotenuse.

27. In figure, $\angle ACB = 90°$, $CD \perp AB$, prove that $CD^2 = BD.AD$. **[2006]**



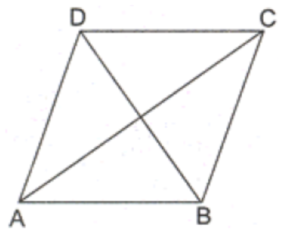
28. In figure, $\angle BAC = 90°$, $AD \perp BC$. Prove that $AB^2 + CD^2 = BD^2 + AC^2$ **[2006]**



29. "In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides." **[2006]**

Making use of the above, prove the following:

In figure, ABCD is a rhombus. Prove that $4AB^2 = AC^2 + BD^2$.



30. P and Q are points on sides CA and CB respectively of Δ ABC, right angled at C. Prove that $AQ^2 + BP^2 = AB^2 + PQ^2$ **[2007]**

31. D is any point on the side BC of a ΔABC such that $\angle ADC = \angle BAC$. Prove that $CA^2 = BC.CD$. **[2007]**

32. Prove that the sum of the squares of the diagonals of a parallelogram is equal to sum of squares of its sides. **[2007]**

33. In ΔABC, $AD \perp BC$ and $AD^2 = BD \times DC$. Prove that $\angle BAC$ is a right angle. **[2007]**

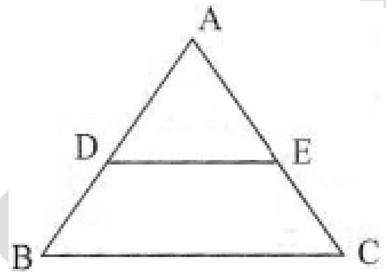
34. The perimeters of two similar triangles are 30 cm and 20 cm respectively. If one side of the first triangle is 12 cm, find the corresponding side of the second triangle. **[2007]**

35. If the areas of two similar triangles are equal, prove that they are congruent. **[2002, 2007, 2010, 2012, 2018]**

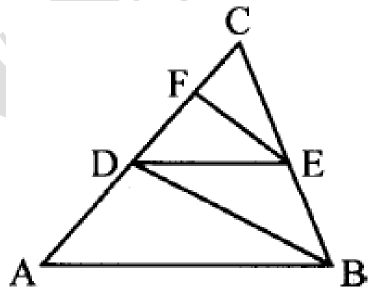
36. "If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio." **[2007, 2009, 2015]**

Using the above result, do the following:

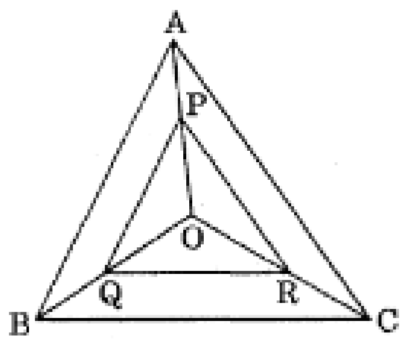
In figure, $DE \parallel BC$ and BD = CE. Prove that ΔABC is an isoceles triangle.



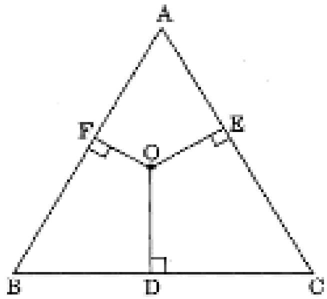
37. In figure, $DE \parallel AB$ and $FE \parallel DB$. Prove that $DC^2 = CF \times AC$. **[2007]**



38. In figure, $PQ \parallel AB$ and $PR \parallel AC$. Prove that $QR \parallel BC$. **[2007]**



39. In figure, O is any point in the interior of $\Delta\, ABC$. OD, OE and OF are drawn perpendiculars to the sides BC, CA and AB respectively. Prove that $AF^2 + BD^2 + CE^2 = OA^2 + OB^2 + OC^2 - OD^2 - OE^2 - OF^2$. **[2007]**



40. The lengths of the diagonals of a rhombus are 30 cm and 40 cm. Find the side of the rhombus. **[2008]**

41. E is a point on the side AD produced of a parallelogram ABCD and BE intersects CD at F. Show that $\Delta\, ABE \sim \Delta\, CFB$. **[2008]**

42. "The ratio of the areas of two similar traingles is equal to the ratio of squares of their corresponding sides." **[2008]**

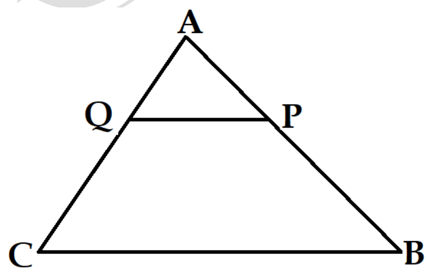
Using the above result, prove the following:

In a $\Delta\, ABC$, XY is parallel to BC and it divides $\Delta\, ABC$ into two parts of equal area. Prove that $\frac{BX}{AB} = \frac{\sqrt{2}-1}{\sqrt{2}}$.

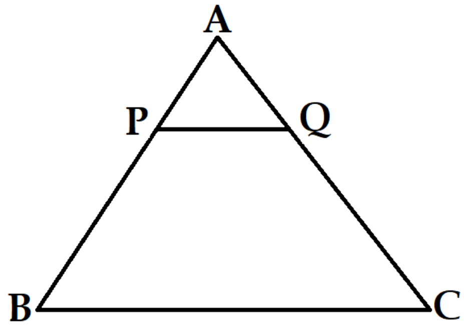
43. If the diagonals of a quadrilateral divided each other proportionally, prove that it is a trapezium. **[2008]**

44. Two triangles ABC and DBC are on the same base BC and on the same side of BC in which $\angle A = \angle D = 90°$. If CA and BD meet each other at E. Show that $AE \times EC = BE \times ED$. **[2008]**

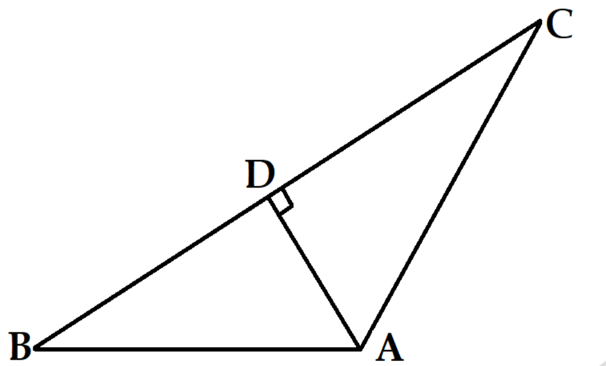
45. In figure, P and Q are points on the sides AB and AC respectively of $\Delta\, ABC$ such that $AP = 3.5\ cm$, $PB = 7\ cm$, $AQ = 3\ cm$ and $QC = 6\ cm$. If $PQ = 4.5\ cm$, find BC. **[2008]**



46. In figure, $PQ \parallel BC$ and $AP : PB = 1 : 2$. Find $\frac{\Delta\, APQ}{\Delta\, ABC}$. **[2008]**



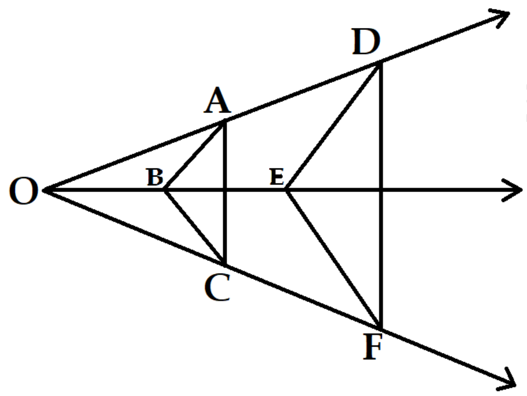
47. In figure, $AC \perp BD$. Prove that $AB^2 + CD^2 = BD^2 + AC^2$. **[2008]**



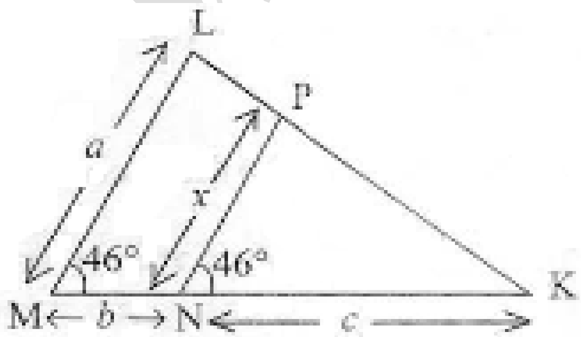
48. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, prove that the other two sides are divieded in the same ratio. **[2008]**

Using the above, prove the following:

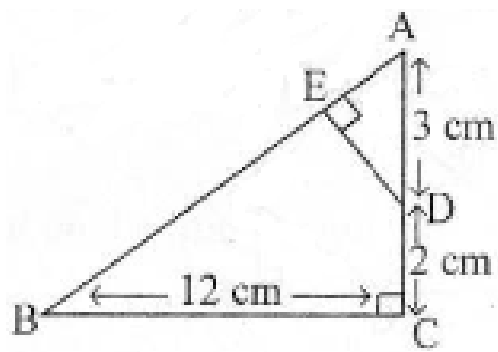
In figure, $AB \parallel DE$ and $BC \parallel EF$. Prove that $AC \parallel DF$.



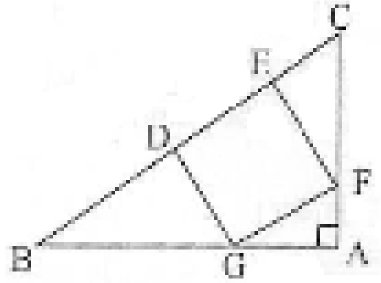
49. In figure, $\angle M = \angle N = 46°$. Express x in terms of a, b and c, where a, b and c are lengths of LM, MN and NK respectively. **[2009]**



50. In figure, $\Delta\, ABC$ is right angled at C and DE ⊥ AB. Prove that $\Delta\, ABC \sim \Delta\, ADE$ and hence find the lengths of AE and DE. **[2009]**



51. In figure, DEFG is a square and $\angle BAC = 90°$. Show that $DE^2 = BD \times EC$. **[2009]**



52. In a $\Delta\, ABC$, $DE \parallel BC$. If $DE = \frac{2}{3}BC$ and area of $\Delta\, ABC = 81\ cm^2$, find the area of $\Delta\, ADE$. **[2009]**

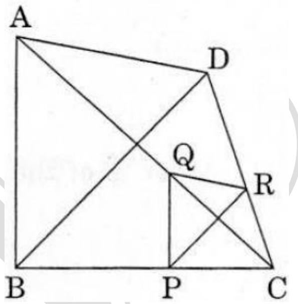
53. In a $\Delta\, LMN$, $\angle L = 50°$ and $\angle N = 60°$. If $\Delta\, LMN \sim \Delta\, PQR$, then find $\angle Q$. **[2009]**

54. "The ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides." **[2009]**

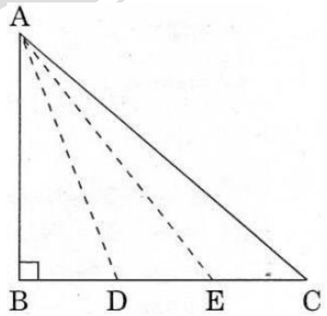
Using the above theorem prove the following:

The area of the equilateral triangle described on the side of a square is half the area of the equilateral triangle described on its diagonal.

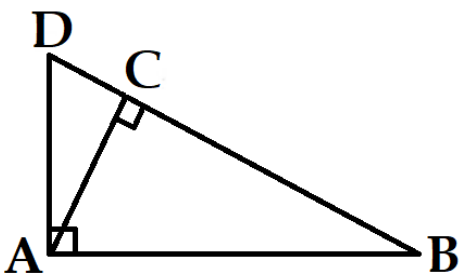
55. In figure, two triangles ABC and DBC lie on the same side of base BC. P is a point on BC such that $PQ \parallel BA$ and $PR \parallel BD$. Prove that $QR \parallel AD$. **[2009]**



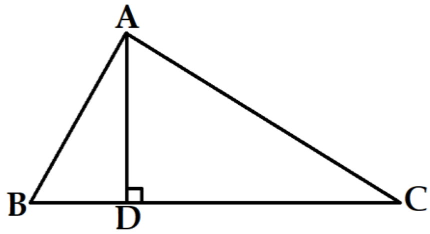
56. In figure, $\angle B$ is a right angle of a $\Delta\, ABC$. Points D and E divide the side BC in three equal parts. Prove that $8AE^2 = 3AC^2 + 5AD^2$. **[2009]**



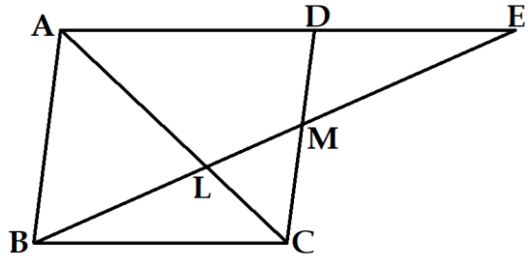
57. In figure, $\Delta\, ABD$ is a right triangle, right-angled at A and $AC \perp BD$. Prove that $AB^2 = BC.BD$. **[2009, 2013]**



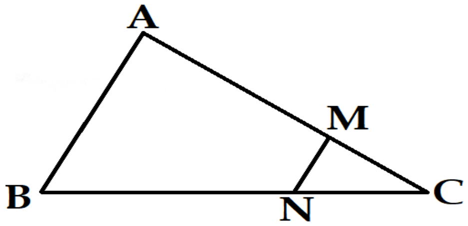
58. In figure, $AD \perp BC$ and $BD = \frac{1}{3} CD$. Prove that $2CA^2 = 2AB^2 + BC^2$ **[2009]**



59. In figure, M is mid-Point of side CD of a parallelogram ABCD. The line BM is drawn intersecting AC at L and AD produced at E. Prove that $EL = 2BL$. **[2009]**



60. In figure, $MN \parallel AB$, $BC = 7.5\ cm$, $AM = 4\ cm$ and $MC = 2\ cm$. Find the length BN. **[2010]**

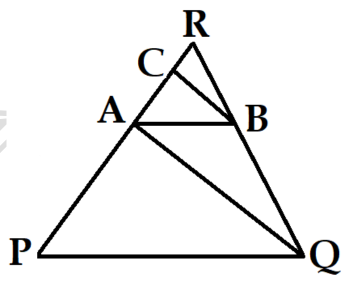


61. In ΔABC, right-angled at A, BL and CM are the two medians. Prove that $4(BL^2 + CM^2) = 5BC^2$. **[2010]**

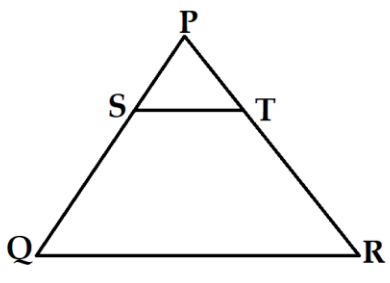
62. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, prove that the other two sides are divided in the same ratio. **[2010]**

Using the above, do the following:

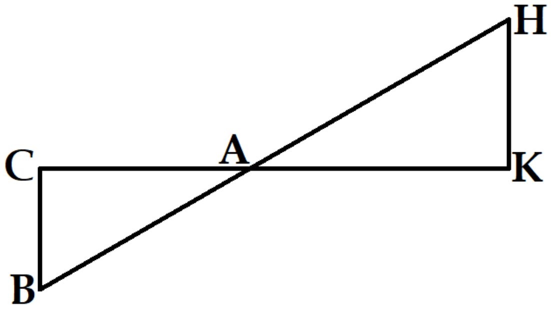
In figure, $PQ \parallel AB$ and $AQ \parallel CB$. Prove that $AR^2 = PR.CR$.



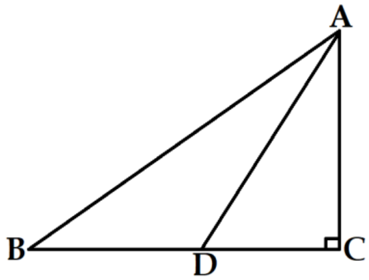
63. In figure, S and T are points on the sides PQ and PR, respectively of ΔPQR, such that PT = 2 cm, TR = 4 cm and ST is parallel to QR. Find the ratio of the areas of ΔPST and ΔPQR. **[2010]**



64. In figure, ΔAHK is similar to ΔABC. If AK = 10 cm, BC = 3.5 cm and HK = 7 cm, find AC. **[2010]**



65. In figure, ABC is a right triangle, right angled at C and D is the mid-point of BC. Prove that $AB^2 = 4AD^2 - 3AC^2$. **[2010]**

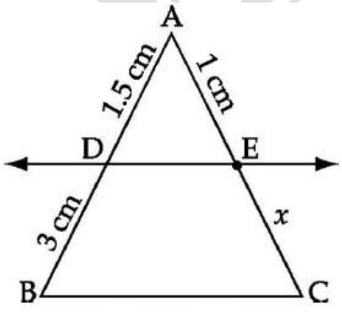


66. "The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides." **[2010]**

Using the above, prove the following:

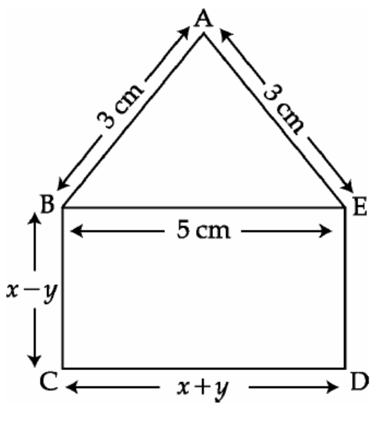
If the areas of two similar triangles are equal, then prove that the triangles are congruent.

67. In figure, $DE \parallel BC$ then x equals to: **[2011]**



(a) 2.5 cm (b) 2 cm (c) 1.4 cm (d) 4 cm

68. In the figure ABCDE is a pentagon with $BC \parallel DE$. BC is perpendicular to CD. If the perimeter of ABCDE is 21 cm, find the value of x and y. **[2011]**



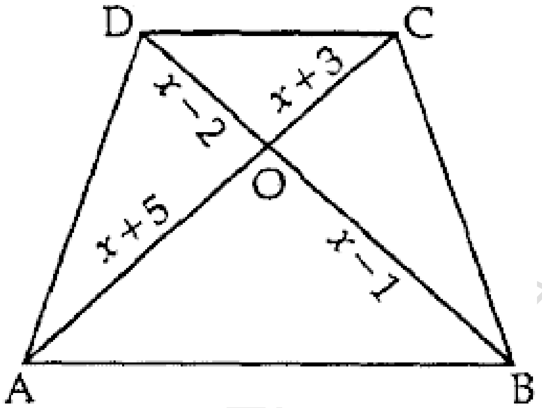
69. X and Y are points on the sides PQ and PR respectivley of a ΔPQR. If the lengths of PX, QX, PY and YR (in centimeters) are 4, 4.5, 8 and 9 respectively. Then show $XY \parallel QR$. **[2011]**

70. ΔABC is right-angled at B and D is mid-point of BC. Prove that: $AC^2 = 4AD^2 - 3AB^2$. **[2011]**

71. If $\Delta\, DEF \sim \Delta\, ABC, DE: AB = 2:3$ and $ar\ (DEF)$ is equal to 44 square units, then $ar\ (ABC)$ in square units is: **[2012]**

(a) 99 (b) 120 (c) $\frac{176}{9}$ (d) 66

72. In the given figure, if $AB \parallel DC$, find the value of x. **[2012]**

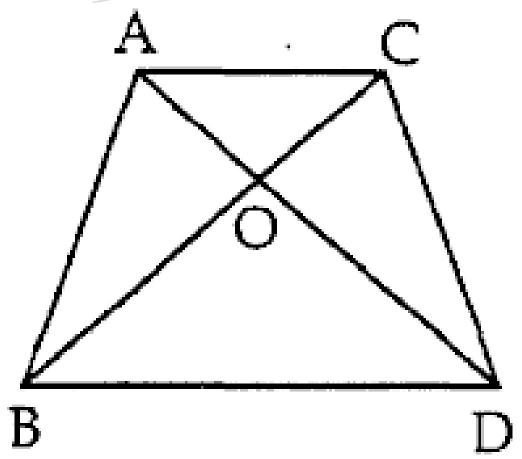


73. D, E, F are respectively the mid-point of the sides AB, BC and CA of Δ ABC. Find the ratio of the area of Δ DEF and Δ ABC. **[2012]**

74. Diagonals of a trapezium ABCD with $AB \parallel DC$ intersect each other at the point O. If $AB = 2CD$, find the ratio of the area of triangles AOB and COD. **[2012]**

75. Prove that the sum of the squares of the sides of a rhombus is equal to the sum of the squares of its diagonals. **[2012]**

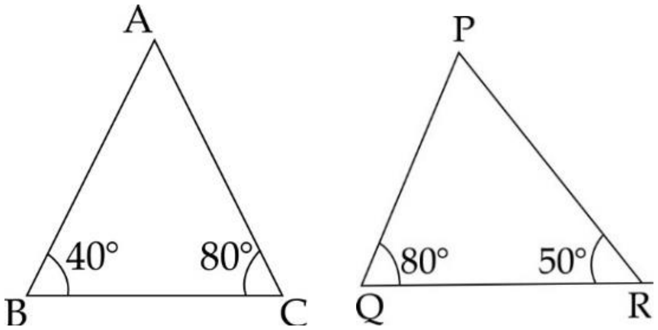
76. In the given figure, ABC and DBC are two triangles on the same base BC. If AD intersects BC at O, show that $\frac{ar(\Delta\, \text{ABC})}{ar(\Delta\, \text{DBC})} = \frac{AO}{DO}$. **[2012]**



77. In a right-angled triangle ABC, which is right angled at B, Medians AE and CD of respective lengths $\sqrt{40}$ cm and 5 cm are drawn. Find the length of the hypotenuse AC. **[2013]**

78. If in a triagnle, the square of one side is equal to the sum of the squares of the other two sides, then prove that the angle opposite to the first side is a right angle. **[2013]**

79. Is ΔABC similar to ΔPQR? **[2014]**



80. A traingle has sides 5 cm, 12 cm and 13 cm. Find the length to one decimal place, of the pependicular from the opposite vertex to the side whose length is 13 cm. **[2014]**

81. In ΔABC, D and E are points on the sides AB and AC respectively such that $DE \parallel BC$. If $\frac{AD}{DB} = \frac{2}{3}$ and AC = 18 cm, then AE is equal to **[2014]**

(a) 5.2 cm (b) 6.2 cm (c) 7.2 cm (d) 8.2 cm

82. Two poles of height 10 m and 15 m stand vertically on a plane ground. If the distance between their feet is $5\sqrt{3}$ m, find the distance between their tops. **[2014]**

83. If the sides of a rectangular plot are $5\sqrt{3}$ m and 5 m, then find the length of the diagonal. **[2014]**

84. Two triangles ABC and DBC are on the same base BC in which $\angle A = \angle D = 90°$. If CA and BD meet each other at E, show that $AE \times CE = BE \times ED$. **[2014]**

85. ΔABC and ΔPQR are similar triangles such that $\angle A = 32°$ and $\angle R = 65°$, then $\angle B$ is **[2015]**

(a) 83° (b) 33° (c) 63° (d) 93°

86. In a ΔABC, P and Q are points on sides AB and AC respectively, such that $PQ \parallel BC$. If AP = 2.4 cm, AQ = 2 cm, QC = 3 cm and BC = 6 cm, find AB and PQ. **[2015]**

87. Find the length of an altitude of an equilateral triangle of side 2 cm. **[2015]**

88. State and prove the converse of the following theorem: **[2015]**

In a right triangle, the square of the hypotenuse is equal to the sum of squares of the other two sides.

89. If $\Delta ABC \sim \Delta RPQ$, AB = 3 cm, BC = 5 cm, AC = 6 cm, RP = 6 cm and PQ = 10 cm, then find QR. **[2016]**

90. R and S are points on the sides DE and EF respectively of a ΔDEF such that ER = 5 cm, RD = 2.5 cm, SE = 1.5 cm and FS = 3.5 cm. Find whether $RS \parallel DF$ or not. **[2016]**

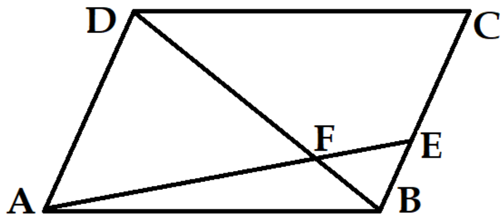
91. From airpot two aeroplanes start at the same tim. If the speed of first aeroplane due North is 500 km/h and that of other due East is 650 km/h, then find the distance between two aeroplanes after 2 hours. **[2016]**

92. ΔABC is right angled triangle which is right angled at C. If p is the length of the perpendicular from C to AB and a, b, c are the lengths of the sides opposite $\angle A$, $\angle B$, $\angle C$ respectively then prove that $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$. **[2016]**

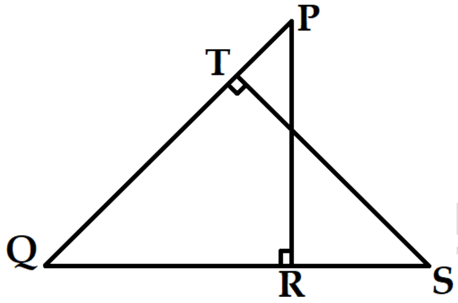
93. In ΔDEW, $AB \parallel EW$. If AD = 4 cm, DE = 12 cm and DW =24 cm, then find the value of DB. **[2016]**

94. A ladder is placed against a wall such that its foot is at distance of 5 m from the wall and its top reaches a window $5\sqrt{3}$ m above the ground. Find the length of the ladder. **[2016]**

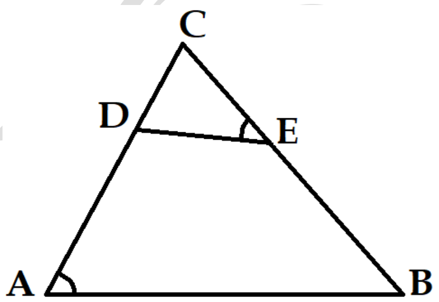
95. In the figure, ABCD is a parallelogram and E divides BC in the ratio 1 : 3. DB and AE intersect at E. Show that DF = 4 FB and AF = 4 FE. **[2016]**



96. In the figure, PQR and QST are two right triangles, right-angled at R and T respectively. Prove that $QR \times QS = QP \times QT$. **[2016]**



97. In figure, if $\angle CAB = \angle CED$, then prove that $AB \times DC = ED \times BC$. **[2016]**



98. If ABC is an equilateral triangle with $AD \perp BC$, then prove $AD^2 = 3DC^2$. **[2016]**

99. The diagonals of a trapezium ABCD with $AB \parallel DC$ intersect each other at point O. If AB = 2 CD, find the ratio of the ares of triangles AOB and COD. **[2016]**

100. If $\Delta ABC \cong \Delta RQP, \angle A = 80°$ and $\angle B = 60°$, the value of $\angle P$ is **[2017]**

(a) 80° (b) 30° (c) 40° (d) 50°

101. In an isosceles triangle ABC, $AB = AC = 25\ cm,\ BC = 14\ cm$. Calculate the altitude from A on BC. **[2017]**

102. Given $\Delta ABC \sim \Delta PQR$, if $\frac{AB}{PQ} = \frac{1}{3}$, then find $\frac{ar(\Delta ABC)}{ar(\Delta PQR)}$. **[2018]**

103. Prove that the area of an equilateral triangle described on one side of the square is equal to half the area of the quadrilateral triangle described on one of its diagonal. **[2018]**

104. In an equilateral ΔABC, D is a point on side BC such that $BD = \frac{1}{3}BC$. Prove that $9(AD)^2 = 7(AB)^2$. **[2018]**

Ch. 7. Coordinate Geometry

1. Find the centroid of Δ ABC, whose vertices are A $(-1,0)$, B $(5,-2)$ and C $(8,2)$. **[2003]**
2. Find the ratio in which the line segment joining $(2,-3)$ and (5, 6) is divided by x-axis. **[2003]**
3. Show that the points $A(2,-2), B(14,10), C(11,13)$ and $D(-1,1)$ are the vertices of a rectangle. **[2004]**
4. Prove that the coordinates of the centroid of a Δ ABC are given by $\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$, where $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$ are the vertices of the Δ ABC. **[2004]**
5. Find the value of x such that PQ = QR where the coordinates of P, Q and R are $(6,-1)$, $(1,3)$ and $(x, 8)$ respectively. **[2005]**
6. If the distance of $P(x, y)$ from two points with coordinates $(5,1)$ and $(-1,5)$ is equal, prove that $3x = 2y$. **[2005, 2007]**
7. Find a point on x-axis which is equidistant from the points (7, 6) and (- 3, 4). **[2005]**
8. The line-segment joining the points $(3,-4)$ and $(1,2)$ is trisected at the points P and Q. If the coordinates of P and Q are $(p,-2)$ and $\left(\frac{5}{3}, q\right)$ respectively, find the values of p and q. **[2005]**
9. Prove that the points (0, 0); (5, 5) and (-5, 5) are vertices of a right isosceles triangle. **[2005]**
10. The line joining the points (2, 1) and $(5,-8)$ is trisected at the points P and Q. If point P lies on the line $2x - y + k = 0$, find the value of k. **[2005]**
11. Show that the points A (1, 2), B (5, 4), C (3, 8) and D $(-1,6)$ are the vertices of a square. **[2006]**
12. Find the co-ordinates of the point equidistant from three given points A (5, 1), B $(-3,-7)$ and C $(7,-1)$. **[2006]**
13. Find the value of p for which the point $(-1,3)$, $(2,p)$ and $(5,-1)$ are collinear. **[2006]**
14. Show that the points A (6, 2), B (2, 1), C (1, 5) and D (5, 6) are the vertices of a square. **[2006]**
15. Find the co-ordinates of the point equidistant from three given points A $(5,3)$, B $(5,-5)$ and C $(1,-5)$. **[2006]**
16. Find the value of p for which the points $(-5,1)$, $(1,p)$ and $(4,-2)$ are collinear. **[2006]**
17. Show that the points $(7,10)$, $(-2,5)$ and $(3,-4)$ are the vertices of an isosceles right triangle. **[2007, 2009]**
18. In what ratio does the line $x - y - 2 = 0$ divides the line segment joining $(3,-1)$ and $(8,9)$? **[2007]**
19. The coordinates of the mid-points of the sides of a triangle are $(4,3)$, $(6,0)$ and $(7,-2)$. Find the coordinates of the centroid of the triangle. **[2007]**
20. Show that the points $(1,1)$, $(-2,7)$ and $(3,-3)$ are collinear. **[2007]**
21. Find the ratio in which $C(p,1)$ divides the join of $A(-4,4)$ and $B(6,-1)$ and hence find the value of p. **[2007]**
22. Three consecutive vertices of a parallelogram are $(-2,-1)$, $(1,0)$ and $(4,3)$. Find the coordinates of the fourth vertex. **[2007]**

23. If the point $C(-1, 2)$ divides the line segment AB in the ratio $3: 4$, where the coordinates of A are $(2, 5)$, find the coordinates of B. **[2007]**

24. Show that the points $(-2, 5), (3, -4)$ and $(7, 10)$ are the vertices of a right angled isosceles triangle. **[2007]**

25. In what ratio does the line $x - y - 2 = 0$ divides the line segment joining $(3, -1)$ and $(8, 9)$? **[2007]**

26. For what value of p, are points $(2, 1), (p, -1)$ and $(-1, 3)$ collinear? **[2008]**

27. Find the value of k if the points $(k, 3), (6, -2)$ and $(-3, 4)$ are collinear. **[2008]**

28. The mid-points of the sides of a triangle are $(3, 4), (4, 6)$ and $(5, 7)$. Find the coordinates of the vertices of the triangle. **[2008]**

29. Find the coordinates of a point P, which lies on the line segment joining the points $A(-2, -2)$ and $B(2, -4)$ such that $AP = \frac{3}{7}AB$. **[2008,2012]**

30. If the distances of $P(x, y)$ from the points $A(3,6)$ and $B(-3,4)$ are equal, prove that $3x + y = 5$. **[2008]**

31. Determine the ratio in which the line $3x + 4y - 9 = 0$ divides the line segment joining the points $(1, 3)$ and $(2, 7)$. **[2008]**

32. Find the value of '$\boldsymbol{a}$' so that the point $(3, a)$ lies on the line represented by $2x - 3y = 5$. **[2009]**

33. Find the distance between the points $\left(-\frac{8}{5}, 2\right)$ and $\left(\frac{2}{5}, 2\right)$. **[2009]**

34. Find the point on y-axis which is equidistant from the points $(5, -2)$ and $(-3, 2)$. **[2009]**

35. The line segment joining the points $A(2, 1)$ and $B(5, -8)$ is trisected at the points P and Q such that P is nearer to A. If P also lies on the line given by $2x - y + k = 0$, find the value of k. **[2009]**

36. If $P(x, y)$ is any point on the line joining the points $A(a, 0)$ and $B(0, b)$, then show that $\frac{x}{a} + \frac{y}{b} = 1$. **[2009]**

37. If the mid-point of the line segment joining the points $P(6,\ b - 2)$ and $Q(-2, 4)$ is $(2, -3)$, find the value of b. **[2009]**

38. The centre of a cicle is $(2\alpha - 1, 7)$ and it passes through the point $(-3, -1)$. If the diameter of the circle is 20 units, then find the value(s) of α. **[2009]**

39. If C is a point lying on the line segment AB joining A(1, 1) and $B(2, -3)$ such that $3AC = CB$, then find the coordinates of C. **[2009]**

40. Find a relation between x and y if the points (x, y), (1, 2) and (7, 0) are collinear. **[2009]**

41. If the points $A(4, 3)$ and $B(x, 5)$ are on the circle with the centre $O(2, 3)$, find the value of x. **[2009]**

42. Find the ratio in which the point (2, y) divides the line segment joining the points $A(-2, 2)$ and $B(3, 7)$. Also, find the value of y. **[2009]**

43. Find the area of the quadrilateral ABCD whose vertices are $A(-4, -2)$, $B(-3, -5)$, $C(3, -2)$ and $D(2, 3)$ **[2009]**

44. If $P(2, p)$ is the mid-point of the line segment joining the points $A(6, -5)$ and $B(-2, 11)$, find the value of p. **[2010]**

45. If $A(1, 2), B(4, 3)$ and $C(6, 6)$ are the three vertices of a parallelogram ABCD, find the coordinates of the fourth vertex D. **[2010]**

46. Point P divides the line segment joining the points $A(2, 1)$ and $B(5, -8)$ such that $\frac{AP}{AB} = \frac{1}{3}$. If P lies on the line $2x - y + k = 0$, find the value of k. **[2010]**

47. If $R(x, y)$ is a point on the line segment joining the points $P(a, b)$ and $Q(b, a)$, then prove that $x + y = a + b$. **[2010]**

48. Find the distance between the points, $A(2a, 6a)$ and $B(2a + \sqrt{3}a, 5a)$. **[2010]**

49. Find the value of k if $P(4, -2)$ is the mid point of the line segment joining the points $A(5k, 3)$ and $B(-k, -7)$. **[2010]**

50. If point $P\left(\frac{1}{2}, y\right)$ lies on the line segment joining the points A$(3, -5)$ and $B(-7, 9)$, then find the ratio in which P divides AB. Also, find the value of y. **[2010]**

51. Find the value of k for which the points $A(9, k), B(4, -2)$ and $C(3, -3)$ are collinear. **[2010]**

52. If $P\left(\frac{a}{2}, 4\right)$ is the mid-point of the line segment joining the points $A(-6, 5)$ and $B(-2, 3)$, then the value of a is **[2011]**

    (a) -8　　(b) 3　　(c) -4　　(d) 4

53. If A and B are the points $(-6, 7)$ and $(-1, -5)$ respectively, then the distance 2AB is equal to **[2011]**

    (a) 13　　(b) 26　　(c) 169　　(d) 238

54. Find the value of y for which the distance between the points $A(3, -1)$ and $B(11, y)$ is 10 units. **[2011]**

55. Point $P(x, 4)$ lies on the line segment joining the points $A(-5, 8)$ and $B(4, -10)$. Find the ratio in which point P divides the line segment AB. Also, find the value of x. **[2011]**

56. Find the area of the quadrilateral ABCD, whose vertices are $A(-3, -1), B(-2, -4), C(4, -1)$ and $D(3, 4)$. **[2011]**

57. Find the area of the triangle formed by joining the mid-points of the sides of the triangle whose vertices are $A(2, 1), B(4, 3)$ and $C(2, 5)$. **[2011]**

58. The area (in square units) of the triangle formed by the points $A(a, 0), O(0, 0)$ and $B(0, b)$ is **[2011]**

    (a) ab　　(b) $\frac{1}{2}ab$　　(c) $\frac{1}{2}a^2b^2$　　(d) $\frac{1}{2}b^2$

59. Find a relation between x and y such that the point $P(x, y)$ is equidistant from the points $A(1, 4)$ and $B(-1, 2)$. **[2011]**

60. Find the area of the quadrilateral ABCD whose vertices are $A(3, -1), B(9, -5), C(14, 0)$ and $D(9, 19)$. **[2011]**

61. Find the coordinates of the points which divide the line segment joining $A(2, -3)$ and $B(-4, -6)$ into three equal parts. **[2011]**

62. Show that the points $A(3,5), B(6,0), C(1,-3)$ and $D(-2,2)$ are the vertices of a square ABCD. **[2011]**

63. The point P which divides the line segment joining the points $A(2,-5)$ and $B(5,2)$ in the ratio 2 : 3 lies in the quadrant **[2011]**

(a) I (b) II (c) III (d) IV

64. The mid-point of segment AB is the point $P(0,4)$. If the coordinates of B are $(-2,3)$, then the coordinates of A are **[2011]**

(a) $(2,5)$ (b) $(-2,-5)$ (c) $(2,9)$ (d) $(-2,11)$

65. If $(3,3), (6,y), (x,7)$ and $(5,6)$ are the vertives of a parallelogram taken in order, find the values of x and y. **[2011]**

66. Find that value(s) of x for which the distance between the points $P(x,4)$ and $Q(9,10)$ is 10 units. **[2011]**

67. If two vertives of an equilateral triangle are $(3,0)$ and $(6,0)$, find the third vertex. **[2011]**

68. Find the value of k, if the points $P(5,4), Q(7,k)$ and $R(9,-2)$ are collinear. **[2011]**

69. Find the value of k, if the point $P(2,4)$ is equidistant from the points $A(5,k)$ and $B(k,7)$. **[2012]**

70. Find the area of the quadrilateral ABCD whose vertices are $A(-3,-1), B(-2,4), C(4,-1)$ and $D(3,4)$. **[2012]**

71. If the points $A(x,y), B(3,6)$ and $C(-3,4)$ are collinear, show that $x - 3y + 15 = 0$. **[2012]**

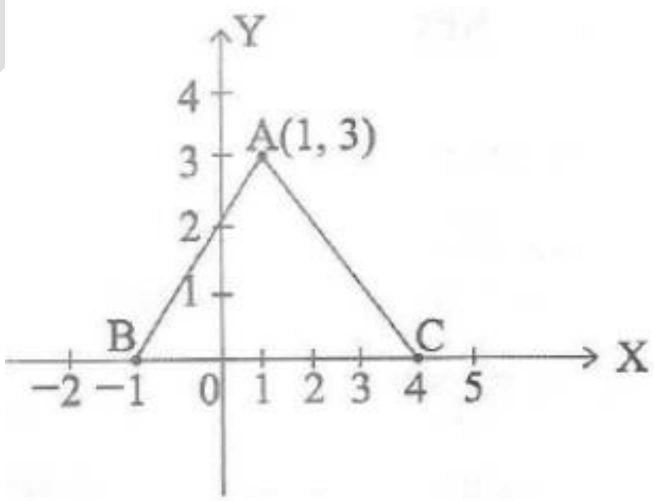
72. The distance of the point $(-3,4)$ from the x-axis is **[2012]**

(a) 3 (b) -3 (c) 4 (d) 5

73. In the figure, $P(5,-3)$ and $Q(3,y)$ are the points of trisection of the line segment joining $A(7,-2)$ and $B(1,-5)$. Then y equals **[2012]**

(a) 2 (b) 4 (c) -4 (d) $-\frac{5}{2}$

74. In figure, the area of triangle ABC (in sq. units) is: **[2013]**



(a) 1.5 (b) 10 (c) 7.5 (d) 2.5

75. Prove that the points $(7, 10)$, $(-2, 5)$ and $(3, -4)$ are the vertices of an isosceles right triangle. **[2013]**

76. Find the ratio in which the y-axis divides the line segment joining the points $(-4, -6)$ and $(10, 12)$. Also, find the coordinates of the point of division. **[2013]**

77. Find the ratio in which point $P(-1, y)$ lying on the line segment joinging points $A(-3, 10)$ and $B(6, -8)$ divides it. Also, find the value of y. **[2013]**

78. Prove that the points $A(2, 3), B(-2, 2), C(-1, -2)$ and $D(3, -1)$ are the vertices of a sqaure ABCD. **[2013]**

79. The three vertices of a parallelogram ABCD are $A(3, -4), B(-1, -3)$ and $C(-6, 2)$. Find the coordinates of vertex D and find the area of ABCD. **[2013]**

80. If the points $A(1, -2), B(2, 3), C(-3, 2)$ and $D(-4, -3)$ are the vertices of parallelogram ABCD, then taking AB as the base, find the height of this parallelogram. **[2013]**

81. The perimeter of a triangle with vertices (0, 4), (0, 0) and (3, 0) is **[2014]**

(a) $7 + \sqrt{5}$ (b) 5 (c) 10 (d) 12

82. If the points $A(x, 2)$, $B(-3, -4)$ and $C(7, -5)$ are collinear, then the value of x is: **[2014]**

(a) -63 (b) 63 (c) 60 (d) -60

83. Find the value(s) of k for which the points $(3k - 1, k - 2), (k, k - 7)$ and $(k - 1, -k - 2)$ are collinear. **[2014]**

84. Points P, Q, R and S divide the line segment joining the points $A(1, 2)$ and $B(6, 7)$ in 5 equal parts. Find the coordinates of the points P, Q and R. **[2014]**

85. The mid-point P of the line segment joining the points $A(-10, 4)$ and $B(-2, 0)$ lies on the line segment joining the points $C(-9, -4)$ and $D(-4, y)$. Find the ratio in which P divides CD. Also find the value of y. **[2014]**

86. If the points $A(-2, 1)$, $B(a, b)$ and $C(4, -1)$ are collinear and $a - b = 1$, find the values of a and b. **[2014]**

87. If the point $A(0, 2)$ is equidistant from the points $B(3, p)$ and $C(p, 5)$, find p. Also, find the length of AB. **[2014]**

88. Find the ratio in which the point $P(x, 2)$ divides the line segment joining the points $A(12, 5)$ and $B(4, -3)$. Also, find the value of x. **[2014]**

89. If $A(5, 2)$, $B(2, -2)$ and $C(-2, t)$ are the vertices of a right angled triangle with $\angle B = 90°$, then find the value of t. **[2015]**

90. Find the ratio in which the point $P\left(\frac{3}{4}, \frac{5}{12}\right)$ divides the line segment joining the points $A\left(\frac{1}{2}, \frac{3}{2}\right)$ and $B(2, -5)$. **[2015]**

91. Find the area of the triangle ABC with $A(1, -4)$ and mid-points of sides through A being $(2, -1)$ and $(0, -1)$. **[2015]**

92. If $A(-4, 8)$, $B(-3, -4)$, $C(0, -5)$ and $D(5, 6)$ are the vertices of a quadrilateral ABCD, find its area. **[2015]**

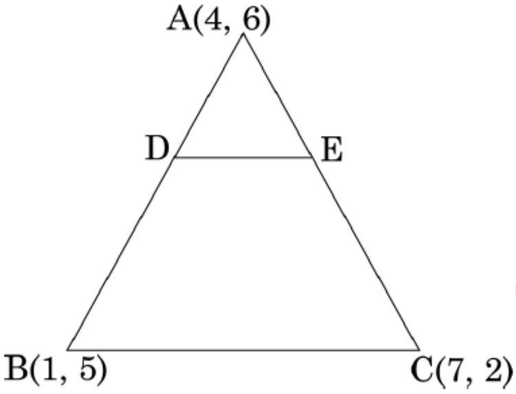
93. A line intersects the y-axis and x-axis at the points P and Q respectively. If $(2, -5)$ is the mid-point of PQ, then find the coordinates of P and Q. **[2016]**

94. If $P(x, y)$ from $A\ (5, 1)$ and $B(-1, 5)$ are equal, then prove that $3x = 2y$. **[2016]**

95. If the points $A(k+1, 2k)$, $B(3k, 2k+3)$ and $C(5k-1, 5k)$ are collinear, then find the value of k. **[2016]**

96. In what ratio does the point $\left(\frac{24}{11}, y\right)$ divide the line segment joining the points $P(2, -2)$ and $Q(3, 7)$? Also, find the value of y. **[2016]**

97. In figure, the vertices of $\Delta\, ABC$ are $A(4, 6), B(1, 5)$ and $C(7, 2)$. A line segment DE is drawn to intersect the sides AB and AC at D and E respectively such that $\frac{AD}{AE} = \frac{AE}{AC} = \frac{1}{3}$. Calculate the area of $\Delta\, ADE$ and compare it with area of $\Delta\, ABC$. **[2017]**



98. If the point $P(x, y)$ is equidistant from the points $A(a+b, b-a)$ and $P(a-b, a+b)$. Prove that $bx = ay$. **[2017]**

99. If the distance between the points $(4, k)$ and $(1, 0)$ is 5, then what can be the possible values of k? **[2017]**

100. Show that ΔABC, where $A(-2, 0)$, $B(2, 0)$, $C(0, 2)$ and ΔPQR where , $Q(4, 0), R(0, 4)$ are similar triangles. **[2017]**

101. The area of a triangle is 5 sq. units. Two of its vertices are $(2, 1)$ and $(3, -2)$. If the third vertex is $\left(\frac{7}{2}, y\right)$, find the value of y. **[2017]**

102. If $a \neq b \neq 0$, prove that the point $(a, a^2), (b, b^2), (0, 0)$ will not be collinear. **[2017]**

103. Let P and Q be the points of trisection of the line segment joining the points $A(2, -2)$ and $B(-7, 4)$ such that P is nearer to A. Find the coordinates of P and Q. **[2017]**

104. Prove that the point $(3, 0), (6, 4)$ and $(-1, 3)$ are the vertices of a right angled isosceles triangle. **[2017]**

105. Find the distance of a point P (x, y) from the origin. **[2018]**

106. Find the ratio in which $P\ (4, m)$ divides the line segment joining the points A (2, 3) and B $(6, -3)$. Hence find m. **[2018]**

107. If A $(-2, 1)$, B $(a, 0)$, C $(4, b)$ and D (1, 2) are the vertices of a parallelogram ABCD, find the values of a and b. Hence, find the lengths of its sides. **[2018]**

108. If A $(-5, 7)$, B $(-4, -5)$, C $(-1, -6)$ and D (4, 5) are the vertices of a quadrilateral, find the area of the quadrilateral ABCD. **[2018]**

Ch. 8. Introduction to Trigonometry

1. If ΔABC is right angled triangle, right angled at C, D is the mid-point of BC, $\angle ABC = \theta$ and $\angle ADC = \phi$, then show that $\frac{\tan\theta}{\tan\phi} = \frac{1}{2}$. **[1999]**

2. Evaluate without using trigonometric table: **[1999]**
$$\frac{\cos 75°}{\sin 15°} + \frac{\sin 12°}{\cos 78°} - \frac{\cos 18°}{\sin 72°}.$$

3. Evaluate: $(\sec^2 A - 1)(1 - \operatorname{cosec}^2 A)$. **[1999]**

4. If $\tan A = \frac{b}{a}$, where a and b are real numbers, find the value of $\sin^2 A$. **[1999]**

5. Prove that: $\sec^2\theta + \operatorname{cosec}^2\theta = \sec^2\theta \operatorname{cosec}^2\theta$. **[1999, 2001]**

6. Without using trigonometric table, show that: **[2000]**
$$\tan 7° . \tan 23° . \tan 60° . \tan 67° . \tan 83° = \sqrt{3}$$

7. Prove that: $(\sin\theta + \sec\theta)^2 + (\cos\theta + \operatorname{cosec}\theta)^2 = (1 + \sec\theta . \operatorname{cosec}\theta)^2$. **[2000]**

8. Show that: **[2000, 2018]**
$$\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$$

9. Show that: $\frac{\operatorname{cosec}\theta + \cot\theta}{\operatorname{cosec}\theta - \cot\theta} = 1 + 2\cot^2\theta + 2\operatorname{cosec}\theta\cot\theta$. **[2000]**

10. If $\tan\theta + \sin\theta = m$ and $\tan\theta - \sin\theta = n$, show that $m^2 - n^2 = 4\sqrt{mn}$. **[2000, 2001, 2002, 2010]**

11. Prove that: $\frac{\tan A + \sec A - 1}{\tan A - \sec A + 1} = \frac{1 + \sin A}{\cos A}$ **[2001, 2007]**

12. Prove that: $\frac{\sin\theta - \cos\theta}{\sin\theta + \cos\theta} + \frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \frac{2}{2\sin^2\theta - 1}$. **[2001]**

13. If $\sec\theta = x + \frac{1}{4x}$, prove that $\sec\theta + \tan\theta = 2x \; or \; \frac{1}{2x}$. **[2001]**

14. If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$, then show that $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$. **[2002]**

15. If $x = k\sin A\cos B$, $y = k\sin A\sin B$ and $z = k\cos A$, then prove that $x^2 + y^2 + z^2 = k^2$. **[2002]**

16. If $\sin\theta + \sin^2\theta = 1$, then prove that $\cos^2\theta + \cos^4\theta = 1$. **[2002]**

17. If $\cos^2\theta - \sin^2\theta = \tan^2\phi$, prove that $\cos\phi = \frac{1}{\sqrt{2}\cos\theta}$. **[2002]**

18. Prove that $\frac{1}{\operatorname{cosec}\theta - \cot\theta} - \frac{1}{\sin\theta} = \frac{1}{\sin\theta} - \frac{1}{\operatorname{cosec}\theta + \cot\theta}$. **[2002, 2006]**

19. Prove that: **[2003]**
$$\frac{\cos A}{1 - \tan A} - \frac{\sin^2 A}{\cos A - \sin A} = \sin A + \cos A.$$

20. Evaluate without using trigonometrical tables : $\frac{\cos 75°}{\sin 15°} + \frac{\sin 12°}{\cos 78°} - \frac{\cos 18°}{\sin 72°}$. **[2003]**

21. Evaluate : **[2003]**
$$\frac{\sec^2 A - 1}{1 - \operatorname{cosec}^2 A}.$$

22. If $\tan A = \frac{b}{a}$, where a and b are real numbers, find the value of $\sin^2 A$. **[2003]**

23. Without using trigonometrical tables, evaluate: **[2003, 2009]**

$$\frac{\cos 58°}{\sin 32°} + \frac{\sin 22°}{\cos 68°} - \frac{\cos 38° \operatorname{cosec} 52°}{\tan 18° \tan 35° \tan 60° \tan 72° \tan 55°}$$

24. Prove the following: $\frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A} = 1 + \tan A + \cot A$. **[2004, 2010, 2015, 2016, 2017]**

25. Without using trigonometrical tables, evaluate the following : **[2004]**

$$\frac{3 \tan 25° \tan 40° \tan 50° \tan 65° - \frac{1}{2}\tan^2 60°}{4(\cos^2 29° + \cos^2 61°)}$$

26. Prove that: **[2005]**

$$\tan^2 A - \tan^2 B = \frac{\sin^2 A - \sin^2 B}{\cos^2 A - \cos^2 B}.$$

27. Find the value of **[2005]**

$$\frac{-\tan\theta \,.\, \cot(90° - \theta) + \sec\theta \,.\, \operatorname{cosec}(90° - \theta) + \sin^2 35° + \sin^2 55°}{\tan 10° \,.\, \tan 20° \,.\, \tan 30° \,.\, \tan 70° \,.\, \tan 80°}$$

28. Prove that: $\frac{1}{\sec x - \tan x} - \frac{1}{\cos x} = \frac{1}{\cos x} - \frac{1}{\sec x + \tan x}$. **[2005]**

29. Evaluate: $\frac{\sec^2 54° - \cot^2 36°}{\operatorname{cosec}^2 57° - \tan^2 33°} + 2\sin^2 38° \sec^2 52° - \sin^2 45°$. **[2005]**

30. Prove that: **[2006]**

$$\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta}\frac{\sin\theta - \cos\theta}{\sin\theta + \cos\theta} = \frac{2\sec^2\theta}{\tan^2\theta - 1}.$$

31. Evaluate without using trigonometrical tables : **[2006]**

$$\frac{\sec^2(90° - \theta) - \cot^2\theta}{(\sin^2 25° + \sin^2 65°)} + \frac{2\cos^2 60° \tan^2 28° \tan^2 62°}{3(\sec^2 43° - \cot^2 47°)}$$

32. Evaluate without using trigonometrical tables : **[2006]**

$$\frac{\operatorname{cosec}^2(90° - \theta) - \tan^2\theta}{4(\cos^2 48° + \cos^2 65°)} - \frac{2\tan^2 60° \sec^2 28° \sin^2 62°}{\operatorname{cosec}^2 70° - \tan^2 20°}$$

33. Without using trigonometrical tables : **[2007]**

$$\tan 7° \,.\, \tan 23° \,.\, \tan 60° \,.\, \tan 67° \,.\, \tan 83° + \frac{\cot 54°}{\tan 36°} + \sin 20° \,.\, \sec 70° - 2$$

34. Prove that : $\frac{\cos A}{1 - \tan A} + \frac{\sin A}{1 - \cot A} = \sin A + \cos A$ **[2007, 2012]**

35. Show that : **[2007, 2010]**

$$\left(1 + \frac{1}{\tan^2\theta}\right)\left(1 + \frac{1}{\cot^2\theta}\right) = \frac{1}{\sin^2\theta - \sin^4\theta}.$$

36. Without using trigonometrical tables : **[2007]**

$$\frac{3\cos 55°}{7\sin 35°} - \frac{4(\cos 70° \,.\, \operatorname{cosec} 20°)}{7(\tan 5° \,.\, \tan 25° \,.\, \tan 45° \,.\, \tan 65° \,.\, \tan 85°)}$$

37. Prove that : **[2007]**

$$\left(1 + \frac{1}{\tan^2\theta}\right)\left(1 + \frac{1}{\cot^2\theta}\right) = \frac{1}{\sin^2\theta - \sin^4\theta}$$

38. If A, B and C are the interior angles of a triangle ABC, show that [2007, 2013]

$$\cos\left(\frac{B+C}{2}\right) = \sin\frac{A}{2}.$$

39. Show that : [2007]

$$\sec^4\theta\,(1 - \sin^4\theta) - 2\tan^2\theta = 1.$$

40. Without using trigonometrical tables, evaluate the following : [2007]

$$2(\sec^2 35° - \cot^2 55°) - \frac{\cos 28° \operatorname{cosec} 62°}{\tan 18° . \tan 36° . \tan 30° . \tan 54° . \tan 72°}$$

41. If $\tan A = \frac{5}{12}$, find the value of $(\sin A + \cos A)\sec A$. [2008]

42. In a ΔABC, right-angled at C, if $\tan A = \frac{1}{\sqrt{3}}$, find the value of $\sin A \cos B + \cos A \sin B$. [2008]

43. In a ΔABC, right-angled at A, if $\tan C = \sqrt{3}$, find the value of $\sin B \cos C + \cos B \sin C$. [2008]

44. Prove that : $(1 + \cot A + \tan A)(\sin A - \cos A) = \sin A \tan A - \cot A \cos A$. [2008]

45. If $\sec 4A = \operatorname{cosec}(A - 20°)$, where 4A is an acute angle, find the value of A. [2008]

46. Without using trigonometrical tables, find the value of the following expression : [2008]

$$2\left(\frac{\cos 58°}{\sin 32°}\right) - \sqrt{3}\left(\frac{\cos 38° \operatorname{cosec} 52°}{\tan 15° \tan 60° \tan 75°}\right)$$

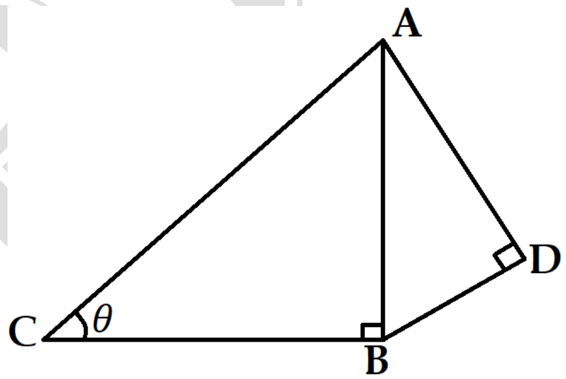
47. Without using trigonometrical tables, evaluate the following: [2008]

$$\frac{\sin 18°}{\cos 72°} + \sqrt{3}[\tan 10° \tan 30° \tan 40° \tan 50° \tan 80°]$$

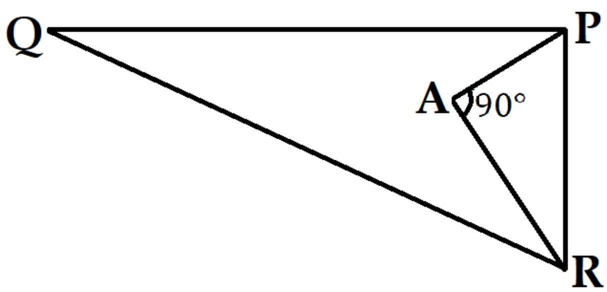
48. Prove that: $\frac{\cot A - \cos A}{\cot A + \cos A} = \frac{\operatorname{cosec} A - 1}{\operatorname{cosec} A + 1}$ [2008]

49. Prove that: $(1 + \cot A - \operatorname{cosec} A)(1 + \tan A + \sec A) = 2$ [2008]

50. In figure, $AD = 4\ cm, BD = 3cm$ and $CB = 12\ cm$, find $\cot\theta$. [2008]



51. In figure, $PQ = 24\ cm$, $QR = 26\ cm$, $\angle PAR = 90°$, $PA = 6\ cm$ and $AR = 8\ cm$. Find $\angle QPR$. [2008]



52. If $\sin\theta = \frac{1}{3}$, then find the value of $(2\cot^2\theta + 2)$. **[2009]**

53. Simplify: **[2009]**

$$\frac{\sin^3\theta + \cot^3\theta}{\sin\theta + \cos\theta} + \sin\theta\cos\theta.$$

54. Find the value of $\sin 30°$ geometrically. **[2009]**

55. If $\sec A = \frac{15}{7}$ and $A + B = 90°$, find the value of $\operatorname{cosec} B$. **[2009]**

56. Without using trigonometrical tables, evaluate **[2009]**

$$\frac{7}{2}\frac{\cos 70°}{\sin 20°} + \frac{3}{2}\frac{\cos 55° \operatorname{cosec} 35°}{\tan 5° \tan 25° \tan 45° \tan 85° \tan 65°}$$

57. Prove that: **[2009]**

$$\sec^2\theta - \frac{\sin^2\theta - 2\sin^4\theta}{2\cos^4\theta - \cos^2\theta} = 1$$

58. If $\sec^2\theta\,(1+\sin\theta)(1-\sin\theta) = k$, then find the value of k. **[2009]**

59. If $\cot\theta = \frac{15}{8}$, then evaluate **[2009]**

$$\frac{(2+2\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(2-2\cos\theta)}.$$

60. Find the value of $\tan 60°$ geometrically. **[2009]**

61. Evaluate: $\frac{2}{3}\operatorname{cosec}^2 58° - \frac{2}{3}\cot 58° \tan 32° - \frac{5}{3}\tan 13° \tan 37° \tan 45° \tan 53° \tan 77°$ **[2009]**

62. If $6x = \sec\theta$ and $\frac{6}{x} = \tan\theta$, find the value of $9\left(x^2 - \frac{1}{x^2}\right)$. **[2010]**

63. Without using trigonometrical tables, find the value of the following : **[2010]**

$$\cot\theta \,.\, \tan(90° - \theta) - \sec(90° - \theta)\,.\operatorname{cosec}\theta + \sqrt{3}.\tan 12°\,.\tan 60°\,.\tan 78°$$

64. Find the value of $\sec 45°$ geometrically. **[2010]**

65. If $3x = \operatorname{cosec}\theta$ and $\frac{3}{x} = \cot\theta$, find the value of $3\left(x^2 - \frac{1}{x^2}\right)$. **[2010]**

66. Without using trigonometrical tables, find the value of the following expression : **[2010]**

$$\frac{\sec(90° - \theta)\,.\operatorname{cosec}\theta - \tan(90° - \theta)\cot\theta + \cos^2 25° + \cos^2 65°}{3\tan 27°\,.\tan 63°}$$

67. Find the value of $\operatorname{cosec} 30°$ geometrically. **[2010]**

68. Prove the following: $(\operatorname{cosec} A - \sin A)(\sec A - \cos A) = \frac{1}{\tan A + \cot A}$. **[2010]**

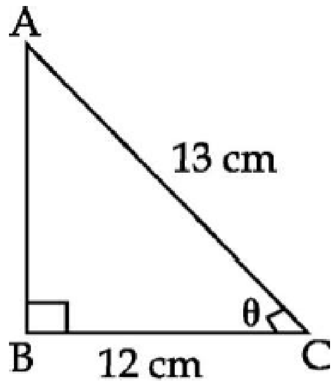
69. If $\sin\theta = \cos\theta$, then value of θ is: **[2011]**

(a) $0°$ (b) $45°$ (c) $30°$ (d) $90°$

70. If $a\cot\theta + b\operatorname{cosec}\theta = p$ and $b\cot\theta + a\operatorname{cosec}\theta = q$ then $p^2 - q^2$ is equal to: **[2011]**

(a) $a^2 - b^2$ (b) $b^2 - a^2$ (c) $a^2 + b^2$ (d) $b - a$

71. In figure, AC = 13 cm, BC = 12 cm, then $\sec\theta$ equals: **[2011]**



(a) $\frac{13}{12}$ (b) $\frac{5}{12}$ (c) $\frac{12}{13}$ (d) $\frac{5}{13}$

72. The value of $\tan 1°.\tan 2°.\tan 3° \ldots\ldots\ldots \tan 89°$ is: **[2011]**

(a) 0 (b) 1 (c) 2 (d) $\frac{1}{2}$

73. If $\tan(A+B)=\sqrt{3}$ and $\tan(A-B)=\frac{1}{\sqrt{3}}$, $0° < (A+B) \le 90°$; $A > B$, find A and B. **[2011]**

74. If $\sin(A+B)=\cos(A-B)=\frac{\sqrt{3}}{2}$ and A, B (A > B) are acute angles, find the values of A and B. **[2011]**

75. If $\operatorname{cosec}(A-B)=2$, $\tan(A+B)=\frac{1}{\sqrt{3}}$, $0° < (A+B) \le 90°$; $A > B$, find A and B. **[2011]**

76. Prove that $(\operatorname{cosec} A - \sin A)(\sec A - \cos A) = \frac{1}{\tan A + \cot A}$. **[2011]**

77. Prove that $\frac{\cot A + \operatorname{cosec} A - 1}{\cot A - \operatorname{cosec} A + 1} = \frac{1+\cos A}{\sin A}$. **[2011]**

78. Prove that $\tan^2\theta + \cot^2\theta + 2 = \sec^2\theta \operatorname{cosec}^2\theta$ **[2011]**

79. Prove that $(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$. **[2011]**

80. $3\sin^2 20° - 2\tan^2 45° + 3\sin^2 70°$ is equal to: **[2012]**

(a) 0 (b) 1 (c) 2 (d) -1

81. Given that $\sin\theta = \frac{a}{b}$, then $\tan\theta$ is equal to: **[2012]**

(a) $\frac{b}{\sqrt{a^2+b^2}}$ (b) $\frac{b}{\sqrt{b^2-a^2}}$ (c) $\frac{a}{\sqrt{a^2-b^2}}$ (d) $\frac{a}{\sqrt{b^2-a^2}}$

82. If $\sqrt{3}\sin\theta - \cos\theta = 0$ and $0° < \theta < 90°$, find the value of θ. **[2012]**

83. Prove that: **[2012]**

$$\frac{1 + \sec^2 A}{\sec A} = \frac{\sin^2 A}{1 - \cos A}$$

84. Prove that: $\frac{(1+\tan^2 A)\cot A}{\operatorname{cosec}^2 A} = \tan A$. **[2012]**

85. Prove that: $\frac{\sec\theta + \tan\theta - 1}{\tan\theta - \sec\theta + 1} = \frac{\cos\theta}{1-\sin\theta}$. **[2012]**

86. Evaluate: $\frac{\cot(90°-\theta)\sin(90°-\theta)}{\sin\theta} + \frac{\cot 40°}{\tan 50°} - (\cos^2 20° + \cos^2 70°)$. **[2012]**

87. If $0° < x < 90°$ and $2\sin^2 x = \frac{1}{2}$, then the value of x is **[2013]**

(a) 90° (b) 30° (c) 15° (d) 60°

88. If $\tan\theta = \frac{1}{\sqrt{7}}$, then the value of $\frac{\operatorname{cosec}^2\theta - \sec^2\theta}{\operatorname{cosec}^2\theta + \sec^2\theta}$ is **[2013]**

(a) $\frac{1}{5}$ (b) $\frac{3}{4}$ (c) $\frac{6}{4}$ (d) $\frac{4}{\sqrt{7}}$

89. If $\cot\theta + \frac{1}{\cot\theta} = 2$, then the value of $\cot^2\theta + \frac{1}{\cot^2\theta}$ is **[2013]**

(a) -1 (b) 1 (c) 2 (d) -2

90. The value of $\operatorname{cosec}^2 30° \sin^2 45° - \sec^2 60°$ **[2013]**

(a) -1 (b) 1 (c) -2 (d) 2

91. Without using trigonometric tables, find the value of **[2013]**

$$\frac{\cos 70°}{\sin 20°} + \cos 57° \operatorname{cosec} 33° - 2\cos 60°.$$

92. Prove that: $\frac{\cos\theta}{\operatorname{cosec}\theta+1} + \frac{\cos\theta}{\operatorname{cosec}\theta-1} = 2\tan\theta$ **[2013]**

93. In a right-angled triangle ABC, which is right angled at B, $BC = 7\ cm$ and $AC - AB = 1$ cm. Find the value of $\cos A - \sin A$. **[2013]**

94. Without using trigonometrical tables, evaluate the following: **[2013]**

$$\frac{\sec 37°}{\operatorname{cosec} 53°} + 2\cot 15° \cot 25° \cot 45° \cot 75° \cot 65° - 3(\sin^2 18° + \sin^2 72°).$$

95. Prove that: $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta \operatorname{cosec}\theta.$ **[2013]**

96. Prove that: **[2013]**

$$\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A + \tan A.$$

97. Prove that: $\sqrt{\frac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = 2\sec\theta$ **[2013]**

98. If $x = 3\sec^2\theta - 1$, $y = \tan^2\theta - 2$, then $x - 3y$ is equal to **[2014]**

(a) 3 (b) 4 (c) 5 (d) 8

99. If $\tan\theta = \frac{2}{3}$, then the value of $\frac{(2+2\sec\theta)(1-\sec\theta)}{(2+2\operatorname{cosec}\theta)(1-\operatorname{cosec}\theta)}$ is **[2014]**

(a) $\frac{81}{16}$ (b) $\frac{16}{81}$ (c) $\frac{75}{16}$ (d) $\frac{77}{16}$

100. If $\sin\theta + \sin^2\theta = 1$, then the value of $\cos^2\theta + \cos^4\theta$ is **[2014]**

(a) 2 (b) 1 (c) -2 (d) -1

101. Prove that $\sec^4\theta - \sec^2\theta = \tan^4\theta - \tan^2\theta.$ **[2014]**

102. Find acute angles A and B, if $\sin(A + 2B) = \frac{\sqrt{3}}{2}$ and $\cos(A + 4B) = 0$, A > B. **[2014]**

103. Prove that $\tan^2 A + \cot^2 A = \sec^2 A \operatorname{cosec}^2 A - 2.$ **[2014]**

104. Prove that **[2014]**

$$\sqrt{\frac{\sec\theta - 1}{\sec\theta + 1}} + \sqrt{\frac{\sec\theta + 1}{\sec\theta - 1}} = 2\operatorname{cosec}\theta.$$

105. Prove that $\frac{\cot\theta - 1 + \operatorname{cosec}\theta}{\cot\theta + 1 - \operatorname{cosec}\theta} = \frac{1}{\operatorname{cosec}\theta - \cot\theta}.$ **[2014]**

106. If $\tan\theta + \sin\theta = m$ and $\tan\theta - \sin\theta = n$, show that $(m^2 - n^2)^2 = 16mn$. **[2014]**

107. If $x = \cot A + \cos A$ and $y = \cot A - \cos A$, show that $x^2 - y^2 = 4\sqrt{xy}$. **[2014]**

108. If $\sin\alpha = \frac{1}{2}$, then the value of $4\cos^3\alpha - 3\cos\alpha$ is **[2015]**

(a) 0 (b) 1 (c) -1 (d) 2

109. If $\cos 2\theta = \sin(\theta - 12°)$, where 2θ and $(\theta - 12°)$ are both acute angles, then the value of θ is **[2015]**

(a) 24° (b) 28° (c) 32° (d) 34°

110. If $\tan 2A = \cot(A - 18°)$, where 2A is an acute angle, then the value of A is **[2015, 2017]**

(a) 24° (b) 12° (c) 36° (d) 63°

111. If $\sin 5\theta = \cos 4\theta$, where 5θ and 4θ are acute angles, then the value of θ is: **[2015]**

(a) 10° (b) 100° (c) 12° (d) 15°

112. If $\tan\theta = \frac{12}{13}$, then the value of $\frac{2\sin\theta\cos\theta}{\cos^2\theta - \sin^2\theta}$ is **[2015]**

(a) $\frac{307}{25}$ (b) $\frac{312}{25}$ (c) $\frac{309}{25}$ (d) $\frac{316}{25}$

113. Prove that $\frac{1+\cos A}{1-\cos A} = (\cot A - \operatorname{cosec} A)^2$. **[2015]**

114. If $\theta = 45°$, the value of $\operatorname{cosec}^2\theta$ is **[2016]**

(a) $\frac{1}{2}$ (b) 1 (c) $\frac{1}{\sqrt{2}}$ (d) 2

115. If $\sin(60° + \theta) - \cos(30° - \theta)$ is equal to **[2016]**

(a) $2\cos\theta$ (b) $2\sin\theta$ (c) 1 (d) 0

116. The value of $[(\sec\theta + \tan\theta)(1 - \sin\theta)]$ is equal to **[2016]**

(a) $\tan^2\theta$ (b) $\sin^2\theta$ (c) $\cos\theta$ (d) $\sin\theta$

117. If $\cot\theta = \frac{7}{8}$, find the value of $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$. **[2016]**

118. If $\angle A = 45°$ and $\angle B = 30°$, then the value of $\sin A\cos B + \cos A\sin B$ is **[2016]**

(a) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ (b) $\frac{\sqrt{3}+1}{2\sqrt{3}}$ (c) $\frac{\sqrt{3}-1}{2\sqrt{2}}$ (d) $\frac{\sqrt{3}-1}{2\sqrt{3}}$

119. If ABC is a triangle, right-angled at C. If $\angle A = 30°$ and AB = 50 units, find the remaining two sides and $\angle B$ of Δ ABC. **[2016]**

120. If ABC is a triangle, right-angled at B, AB = 5 cm, $\angle ACB = 30°$. Find the length of BC and AC. **[2016]**

121. Prove that: $\frac{1-\sin\theta}{1+\sin\theta} = (\sec\theta - \tan\theta)^2$. **[2016, 2017]**

122. Prove that: **[2016]**

$$\tan^2 A - \tan^2 B = \frac{\cos^2 B - \cos^2 A}{\cos^2 B\cos^2 A} = \frac{\sin^2 A - \sin^2 B}{\cos^2 A\cos^2 B}.$$

123. Prove that: $(\operatorname{cosec} A - \sin A)(\sec A - \cos A) = \frac{1}{\tan A + \cot A}$. **[2016]**

124. If $A = B = 60°$, then verify **[2016]**

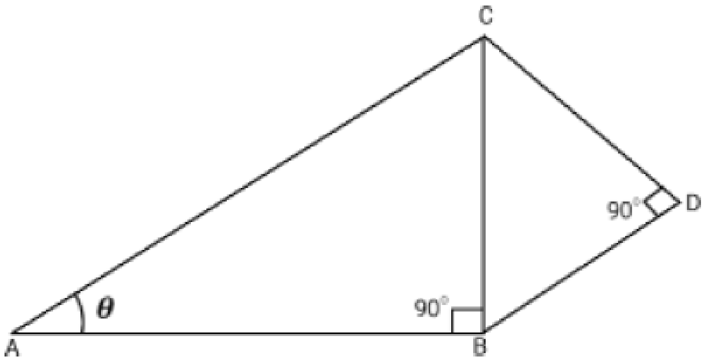
(i) $\cos(A-B) = \cos A \cos B + \sin A \sin B$

(ii) $\sin(A-B) = \sin A \cos B + \cos A \sin B$

(iii) $\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$.

125. Prove that: $\sqrt{\frac{\operatorname{cosec} A - 1}{\operatorname{cosec} A + 1}} + \sqrt{\frac{\operatorname{cosec} A + 1}{\operatorname{cosec} A - 1}} = 2 \sec A.$ **[2016, 2018]**

126. In figure, $AB = 5\sqrt{3}$ cm, DC = 4 cm, BD = 3 cm, then $\tan\theta$ is **[2017]**



(a) $\frac{1}{\sqrt{3}}$ (b) $\frac{2}{\sqrt{3}}$ (c) $\frac{4}{\sqrt{3}}$ (d) $\frac{5}{\sqrt{3}}$

127. If $\cos\theta + \cos^2\theta = 1$, then the value of $\sin^2\theta + \sin^4\theta$ is **[2017]**

(a) 0 (b) 1 (c) 2 (d) -1

128. If $\sec x + \tan x = p$, then $\sec x$ is equal to **[2017]**

(a) $\frac{p^2-1}{p}$ (b) $\frac{p^2+1}{p}$ (c) $\frac{p^2-1}{2p}$ (d) $\frac{p^2+1}{2p}$

129. If $\cos x = \cos 60° \cos 30° + \sin 60° \sin 30°$, then the value of x is **[2017]**

(a) 90° (b) 45° (c) 30° (d) 60°

130. Prove that: $\frac{\cos\theta}{1+\sin\theta} = \frac{1-\sin\theta}{\cos\theta}$ **[2017]**

131. Evaluate: $\frac{\tan 45°}{\operatorname{cosec} 30°} + \frac{\sec 60°}{\cot 45°} - \frac{5 \sin 90°}{2 \cos 0°}$. **[2017]**

132. Prove that: **[2017]**

(i) $\tan 20° \tan 35° \tan 45° \tan 55° \tan 70° = 1$

(ii) $\sin 48° \sec 42° + \operatorname{cosec} 42° = 2$

(iii) $\frac{\sin 70°}{\cos 20°} + \frac{\operatorname{cosec} 20°}{\sec 70°} - 2 \cos 70° \operatorname{cosec} 20° = 0.$

133. What is the value of $(cos^2 67° - sin^2 23°)$? **[2018]**

134. If $4\tan\theta = 3$, evaluate $\left(\frac{4\sin\theta - \cos\theta + 1}{4\sin\theta + \cos\theta - 1}\right)$. **[2018]**

135. If $\tan 2A = \cot(A - 18°)$, where 2A is an acute angle, find the value of A. **[2018]**

136. Prove that: **[2018]**

$$\frac{\sin A - 2\sin^3 A}{2\cos^3 A - \cos A} = \tan A$$

Ch. 9. Some Applications of Trigonometry

1. An aeroplane, when 3000 high, passes vertically above another aeroplane at an instant when the angles of elevation of the two aeroplanes from the same point on the ground are 60° and 45° respectively. Find the vertical distance between the two aeroplanes. **[1999]**

2. From the top of building AB, 60 m high, the angle of depression of the top and bottom of a vertical lamp post CD are observed to be 30° and 60° respectively. Find (i) the horizontal distance between AB and CD. (ii) the difference between the heights of the building and the lamp post. **[1999]**

3. From top of the tower, the angles of depression of two objects on the same side of the tower are found to be α and β $(\alpha < \beta)$. If the distance between the objectis is p meters. Show that the height of the twoer is given by $h = \frac{p \tan\alpha \tan\beta}{\tan\alpha - \tan\beta}$. Also determine the height of the tower if p = 50 meters. **[1999]**

4. A tower is 50 m high. Its shadow is x m shorter when sun's altitude is 45° than when it is 30°, find x correct to the nearest metres. **[1999]**

5. The angles of elevation of the top of a tower, as seen from two points A and B situated in the same line and at distances p and q respectively from the foot of the tower, are complementary. Prove that the height of the tower is $\sqrt{pq}$. **[2000]**

6. The angle of elevation θ, of a vertical tower from a point on the ground is such that its tangent is $\frac{5}{12}$. On walking 192 metres towards the tower in the same straight line, the tangent of the angle of elevation ϕ, is found to be $\frac{3}{4}$, find the height of the tower. **[2001]**

7. The angle of elevation θ of the top of a light house, as seen by a person on the ground, is such that $\tan\theta = \frac{5}{12}$. When the person moves a distance of 240 m towards the light house, the angle of elevation becomes ϕ, such that $\tan\phi = \frac{3}{4}$, find the height of the light house. **[2002]**

8. The angle of elevation of an aeroplane from a point P on the ground is 60°. After a flight of 15 seconds the angle of elevation changes to 30°. If the aeroplane is flying at a constant height of $1500\sqrt{3}$ m, find the speed of the aeroplane. **[2002]**

9. From a window, 60 metres high above the ground, of a house in a street the angles of elevation and depression of the top and the foot of another house on opposite side of street are 60° and 45° respectively. Show that the height of the opposite house is $60(1+\sqrt{3})$ metres. **[2003]**

10. If the angle of elevation of a cloud from a point h metres above a lake is α and the angle of depression of its reflection in the lake is β, prove that the height of the cloud is **[2003]**

$$\frac{h(\tan\beta + \tan\alpha)}{\tan\beta - \tan\alpha}.$$

11. A man standing on the deck of a ship, which is 10 m above water level, observes the angle of elevation of the top of a hill as 60° and angle of depression of the base of the hill as 30°. Find the distance of the hill from the ship and height of the hill. **[2004]**

12. On a horizontal plane there is a vertical tower with a flag pole on the top of the tower. At a point 9 metres away from the foot of the tower the angle of elevation of the top and bottom of the flag pole are 60° and 30° respectively. Find the height of the tower and flag pole mounted on it. **[2005]**

13. From a building 60 metres high the angles of depression of the top and bottom of a lamppost are 30° and 60° respectively. Find the distance between the lamppost and building. Also find the difference of height between building and lamppost. **[2005]**

14. Two pillars of equal height stand on either side of a roadway which is 150 m wide. From a point on the roadway between the pillars, the elevations of the top of the pillars are 60° and 30°. Find the height of the pillars and the position of the point. **[2005]**

15. A man on the deck of a ship is 10 m above water level. He observes that the angle of elevation of the top of a hill is 60° and the angle of depression of the base of the hill is 30°. Calculate the distance of the hill from the ship and the height of the hill. **[2005]**

16. The angle of elevation of the top of a tower as observed from a point on the ground is 'α' and on moving 'β' metres towards the tower, the angle of elevation is 'a'. Prove that the height of the tower is $\frac{a \tan\alpha \tan\beta}{\tan\beta - \tan\alpha}$. **[2006]**

17. The angles of depression of the top and the bottom of a building 50 metres high as observed from the top of a tower are 30° and 60° respectively. Find the height of the tower and also the horizontal distance between the building and the tower. **[2006]**

18. A man standing on the deck of a ship, which is 10 m above the water level, observes the angle of elevation of the top of a hill as 60° and the angle of depression of the base of the hill as 30°. Calculate the distance of the hill from the ship and the height of the hill. **[2006]**

19. From a window x metres high above the ground in a street, the angles of elevation and depression of the top and foot of the other house on the opposite side of the street are α and β respectively. Show that the height of the opposite house is $x(1 + \tan\alpha \cot\beta)$ metres. **[2006]**

20. A boy standing on a horizontal plane finds a bird flying at a distance of 100 m from him at an elevation of 30°. A girl standing on the roof of 20 metre high building, finds the angle of elevation of the same bird to be 45°. Both the boy and the girl are on opposite sides of the bird. Find the distance of bird from the girl. **[2007]**

21. An observer in a lighthouse observes two ships on the same side of the lighthouse, and in the same straight line with the base of the lighthouse. The angles of depression of the ships approaching it are 30° and 60°. If the height of the lighthouse is 150 m, find the distance between the ships. **[2007]**

22. The angle of elevation of the top of a tower from a point on the same level as the foot of the tower is 30°. On advancing 150 metres towards the foot of the tower, the angle of elevation becomes 60°. Find the height of the tower. **[2007]**

23. A pole 5 m high is fixed on the top of a tower. The angle of elevation of the top of the pole observed from a point A on the ground is 60° and angle of depression of point A from the top of the tower is 45°. Find the height of the tower. $\left[Use\ \sqrt{3} = 1.732\right]$ **[2007]**

24. The angle of elevation of an aeroplane from a point A on the ground is 60°. After a flight of 30 seconds, the angle of elevation changes to 30°. If the plane is flying at a constant height of $3600\sqrt{3}$ m, find the speed, in km/hour, of the plane. **[2008]**

25. A statue 1.46 m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point, the angle of elevation of the top of the pedestal is 45°. Find the height of the pedestal. $\left[Use\ \sqrt{3} = 1.73\right]$ **[2008]**

26. A peacock is sitting on the top of a pillar, which is 9 m high. From a point 27 m away from the bottom of the pillar, a snake is coming to its hole at the base of the pillar. Seeing the snake the peacock pounces on it. If their speeds are equal, at what distance from the hole is that snake caught? **[2008]**

27. An aeroplane, when 3000 m high, passes vertically above another aeroplane at an instant, when the angle of elevation of the two aeroplanes from the same point on the ground are 60° and 45° respectively. Find the vertical dostance between the aeroplanes. $\left[Use\ \sqrt{3} = 1.73\right]$ **[2008]**

28. A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of 30°, which is approaching the foot of the tower with a uniform speed. Six seconds later the angle of depression of the car is found to be 60°. Find the time taken by the car to reach the foot of the tower from this point. **[2008, 2009]**

29. An aeroplane when flying at a height of 3125 m from the ground passes vertically below another plane at an instant when the angles of elevation of the two planes from the same point on the ground are 30° and 60° respectively. Find the distance between the two planes at that instant. **[2009]**

30. The angle of elevation of the top of a building from the foot of a tower is 30° and the angle of elevation of the top of the tower from the foot of the building is 60°. If the tower is 50 m high, find the height of the building. **[2009]**

31. From a window (9 m above the ground) of a house in a street, the angles of eleation and depression of the top and foot of another house on the opposite side of the street are 30° and 60° respectively. Find the height of the opposite house and the width of the street. $\left[Use\ \sqrt{3} = 1.73\right]$ **[2010]**

32. A vertical pedestal stands on the ground and is surmounted by a vertical flag staff of height 5 m. At a point on the ground the angles of elevation of the bottom and the top of the flag staff are 30° and 60° respectively. Find the height of the pedestal. **[2010]**

33. From the top of a 7 m high building, the angle of elevation of the top of a tower is 60° and the angle of depression of the foot of the tower is 30°. Find the height of the tower. **[2010]**

34. From the top of a vertical tower, the angles of depression of two cars, in in the same straight line with the base of the tower, at an instant are found to be 45° and 60°. If the cars are 100 m apart and are on the same side of the tower, find the height of the tower. $\left[Use\ \sqrt{3} = 1.73\right]$ **[2011]**

35. The angle of elevation of the top of a vertical tower from a point on the ground is 60°. From another point 10 m vertically above the first, its angle of elevation is 30°. Find the height of the tower. **[2011]**

36. A ladder of length 6 m makes an angle of 45° with the floor while leaning against one wall of a room. If the foot of the ladder is kept fixed on the floor and it is made to lean against the opposite wall of the room, it makes an angle of 60° with the floor. Find the distance between these two walls of the room. **[2011]**

37. The shadow of a tower standing on a level ground is found to be 30 m longer when the sun's altitude is 30° than when it is 60°. Find the height of the tower. **[2011]**

38. A tower stands vertically on the ground. From a point on the ground which is 25 m away from the foot of the tower, the angle of elevation of the top of the tower is found to be 45°. Then the height (in meters) of the tower is **[2011]**

(a) $25\sqrt{2}$ (b) $25\sqrt{3}$ (c) 25 (d) 12.5

39. The angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of the tower is 45°. The height of the tower (in metres) is **[2011]**

(a) 15 (b) 30 (c) $30\sqrt{3}$ (d) $10\sqrt{3}$

40. From the top of a tower 100 m high, a man observes two cars on the opposite sides of the tower with angles of depression 30° and 45° respectively. Find the distance between the cars. $\left[Use\ \sqrt{3} = 1.73\right]$ **[2011]**

41. Two poles of equal heights are standing opposite to each other on either side of the road, which is 100 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30°, respectively. Find the height of the poles. **[2011]**

42. A pole of length 10 m casts a shadow 2 m long on the ground. At the same time a tower casts a shadow of length 50 m on the ground, then find the height of the tower. **[2011]**

43. The angles of depression of the top and bottom of a tower as seen from the top of a $60\sqrt{3}$ m high cliff are 45° and 60° respectively. Find the height of the tower. **[2012]**

44. The angles of elevation and depression of the top and bottom of a light-house from the top of a 60 m high building are 30° and 60° respectively. Find (i) the difference between the heights of the light-house and the building. (ii) the distance between the light-house and the building. **[2012]**

45. A kite is flying at a height of 30 m from the ground. The length of string from the kite to the ground is 60 m. Assuming that there is no slack in the string, the anlge of elevation of the kite at the ground is **[2012]**

(a) 45° (b) 30° (c) 60° (d) 90°

46. The angle of depression of a car, standing on the ground, from the top of a 75 m high tower, is 30°. The distance of the car from the base of the tower (in metre) is: **[2013]**

(a) $25\sqrt{3}$ (b) $50\sqrt{3}$ (c) $75\sqrt{3}$ (d) 150

47. The horizontal distance between two poles is 15 m. The angle of depression of the top of first pole as seen from the top of second pole is 30°. If the height of the second pole is 24 m, find the height of the first pole. $\left[Use\ \sqrt{3} = 1.73\right]$ **[2013]**

48. As observed from the top of a 60 m high lighthouse from the sea-level, the angles of depression of two ships are 30° and 45°. If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships. $\left[Use\ \sqrt{3} = 1.732\right]$ **[2013]**

49. The angle of elevation of the top of a building from the foot of the tower is 30° and the angle of elevation of the top of the tower from the foot of the building is 60°. If the tower is 60 m high, find the height of the building. **[2013]**

50. If the height of a vertical pole is $\sqrt{3}$ times the length of its shadow on ground, then the angle of elevation of the Sun at that time is **[2014]**

(a) 30° (b) 60° (c) 45° (d) 75°

51. A ladder makes an angle of 60° with the ground when placed against a wall. If the foot of the ladder is 2 m away from the wall, then the length of the ladder (in meters) is: **[2014]**

(a) $\frac{4}{\sqrt{3}}$ (b) $4\sqrt{3}$ (c) $2\sqrt{2}$ (d) 4

52. The angle of elevation of the top of a chimney from the foot of a tower is 60° and the angle of depression of the foot of the chimney from the top of tower is 30°. If the height of the tower is 40 m, find the height of the chimney. According to pollution control norms, the minimum height of a smoke emitting chimney should be 100 m. state if the height of the above mentioned chimney meets the pollution norms. What value is discussed in this question? **[2014]**

53. Two ships are there in the sea on either side of a light house in such a way that the ships and the light house are in the same straight line. The angles of depression of two ships as observed from the top of the light house are 60° and 45°. If the height of the light house is 200 m, find the distance between the two ships. [Use $\sqrt{3}$ = 1.73] **[2014]**

54. Two ships are approaching a light-house from opposite directions. The angles of depression of the two ships from the top of the light-house are 30° and 45°. If the distance between the two ships is 100 m, find the height of the light-house. [Use $\sqrt{3}$ = 1.732] **[2014]**

55. The angles of elevation and depression of the top and the bottom of a tower from the top of a building, 60 m high, are 30° and 60° respectively. Find the difference between the heights of the building and the tower and the distance between them. **[2014]**

56. The tops of two towers of height x and y, standing on level ground, subtend angles of 30° and 60° respectively at the centre of the line joining their feet, then find $x : y$. **[2015]**

57. The angle of elevation of the top of a building from the foot of the tower is 30° and the angle of elevation of the top of the tower from the foot of the building is 45°. If the tower is 30 m high, find the height of the building. **[2015]**

58. From a point P on the ground the angle of elevation of the top of a tower is 30° and that of the top of a flag staff fixed on the top of the tower, is 60°. If the length of the flag staff is 5 m, find the height of the tower. **[2015]**

59. A ladder, leaning against a wall, makes an angle of 60° with the horizontal. If the foot of the ladder is 2.5 m away from the wall, find the length of the ladder. **[2016]**

60. An aeroplane is flying at a height of 300 m above the ground. Flying at this height, the angles of depression from the aeroplane of two points on both banks of a river in opposite directions are 45° and 60° respectively. Find the width of the river. $\left[Use\ \sqrt{3} = 1.732\right]$ **[2016]**

61. If a tower 30 m high, casts a shadow $10\sqrt{3}$ m long on the ground, then what is the angle of elevation of the sun? **[2016]**

62. On a straight line passing through the foot of a tower, two points C and D are at distances of 4 m and 16 m from the foot respectively. If the angles of elevation from C and D of the top of the tower are complementary, then find the height of the tower. **[2016]**

63. The angle of elevation of the top Q of a vertical tower PQ from a point X on the ground is 60°. From a point Y, 40 m vertically above X, the angle of elevation of the top Q of tower is 45°. Find the height of the tower PQ and the distance PX. $\left[Use\ \sqrt{3} = 1.73\right]$ **[2017]**

64. The ratio of the height of a tower and the length of its shadow on the ground is $\sqrt{3} : 1$. What is the angle of elevation of the sun? **[2017]**

65. A man standing on the deck of a ship, which is 10 m above water level, observes the angle of elevation of the top of a hill as 60° and the angle of depression of the base of a hill as 30°. Find the distnace of the hill from the ship and the height of the hill. **[2017]**

66. A moving boat is observed from the top of a 150 m high cliff moving away from the cliff. The angle of depression of the boat changes from 60° to 45° in 2 minutes. Find the speed of the boat in m/h. **[2017]**

67. The angle of elevation of a cloud from a point 60 m above the surface of the water of a lake is 30° and the angle of depression of its shadow in water of lake is 60°. Find the height of the cloud from the surface of water. **[2017]**

68. A ladder, leaning against a wall, makes an angle of 60° with the horizontal. If the foot of the ladder is 2.5 m away from the wall, find the length of the ladder. **[2017]**

69. As observed from the top of a 100 m high light house from the sea-level, the angles of depression of two ships are 30° and 45°. If one ship is exactly behind the other on the same side of the light house, find the distance between two ships. $\left[Use\ \sqrt{3} = 1.732\right]$ **[2018]**

Ch. 10. Circles

1. If PAB is a secant to a circle intersecting the circle at A and B and PT is the tangent segment then prove that $PA \times PB = PT^2$. **[1999, 2000, 2001, 2002, 2005]**

2. Chords PQ and RS of a circle intersect at T. If RS = 18 cm, ST = 6 cm and PT = 18 cm, find the length of TQ. **[2000]**

3. A circle touches the side BC of $\Delta\, ABC$, at P and touch AB and AC produced at Q and R respectively. Prove that $AQ = \frac{1}{2}(Perimeter\ of\ \Delta\, ABC)$. **[2001, 2002]**

4. Prove that the parallelogram circumscribing a circle is a rhombus. **[2002, 2008, 2009, 2010, 2013, 2014]**

OR

If all sides of a parallelogram touch a circle, show that the parallelogram is a rhombus.

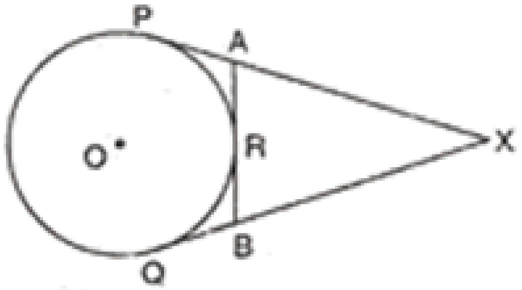
5. AB is a diameter and AC is a chord of a circle such that $\angle\, BAC = 30°$. If the tangent at C intersects AB produced in D, prove that BC = BD. **[2003]**

6. If a chord is drawn through the point of contact of tangent to a circle, then prove that the angles which this chord makes with the given tangent are equal respectively to the angles formed in the corresponding alternate segments. **[2003]**

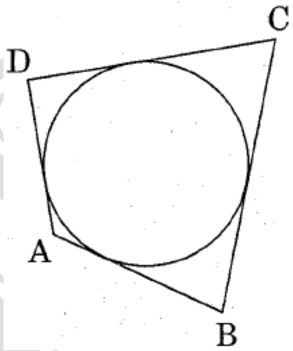
Using the above theorem, prove the following:

If Δ ABC is isosceles with AB = AC, prove that the tangent at A to the circumcircle of Δ ABC is parallel to BC.

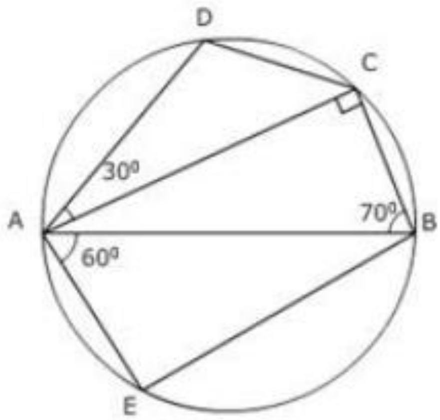
7. In figure, XP and XQ are two tangents to a circle with centre O from a point X outside the circle. ARB is tangent to circle at R. Prove that $XA + AR = XB + BR$. **[2003]**



8. In figure, a circle touches all the four sides of a quadrilateral ABCD where sides AB = 6 cm, BC = 7 cm and CD = 4 cm. Find the length of side AD. **[2003]**

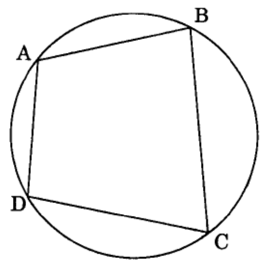


9. In figure, AB is a diameter of a circle, with centre O. If $\angle ABC = 70°$, $\angle CAD = 30°$ and $\angle BAE = 60°$. Find $\angle BAC$, $\angle ACD$ and $\angle ABE$. **[2004]**



10. Prove that the sum of either pair of opposite angles of a cyclic quadrilateral is 180°. Using the above, do the following: **[2004]**

In figure, ABCD is a cyclic quadrilateral in which $\angle A = (x + y + 10)°$, $\angle B = (y + 20)°$, $\angle C = (x + y - 30)°$ and $\angle D = (x + y)°$. Find x and y.



11. Prove that the angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle. **[2004]**

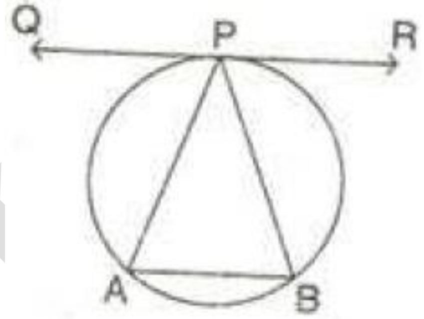
Using the above, do the following:

Prove that the angle formed by a chord in the major segment is acute.

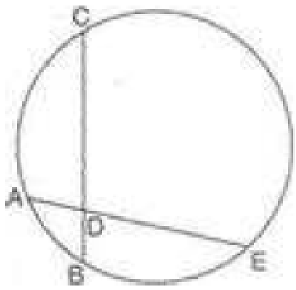
12. OD is perpendicular to a chord AB of a circle whose centre is O. If BC is a diameter, prove that CA = 2 OD. **[2005]**

13. If a line touches a circle and from the point of contact a chord is drawn, prove that the angles which this chord makes with the given line are equal respectively to the angles formed in the corresponding alternate segments. **[2005]**

Using the above theorem, prove the following: P is mid-point of arc APB. Prove that tangent QR drawn at P to the circle is parallel to AB.

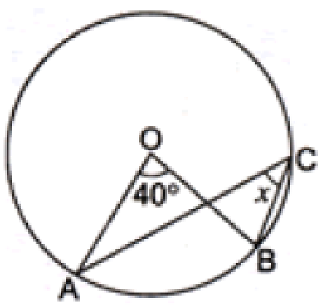


14. In the given figure, find the length of DE if $AE = 15\ cm$, $DB = 4\ cm$ and $CD = 9\ cm$. **[2005]**

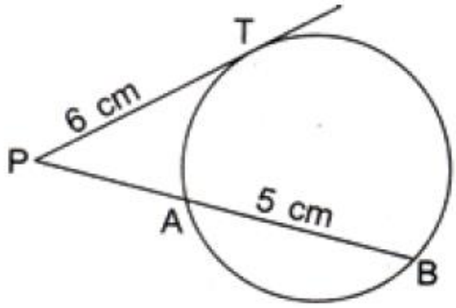


15. Prove that the angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle. **[2006]**

Using the above, find x from figure.



16. In figure, PT = 6 cm, AB = 5 cm. Find the length of PA. **[2006]**



17. Prove that if a line touches a circle and from the point of contact a chord is drawn, then the angles which this chord makes with the given line are equal respectively to the angles formed in the corresponding alternate segments. **[2006]**

Using the above, do the following:

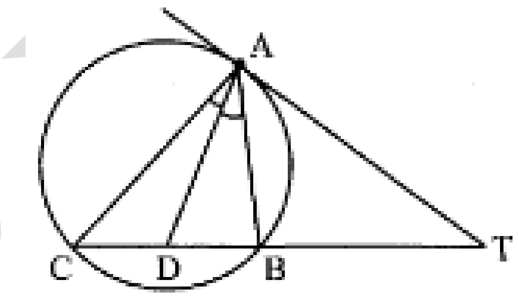
AB is a diameter and AC is a chord of a circle such that $\angle BAC = 30°$. The tangent at C intersects AR produced in a point I Prove that BC = RD.

18. In $\Delta\, ABC$, $AD \perp BC$ and $AD^2 = BD.DC$. Prove that $\angle BAC$ is a right angle. **[2007]**

19. Prove that any four vertices of a regular pentagon are cyclic. **[2007]**

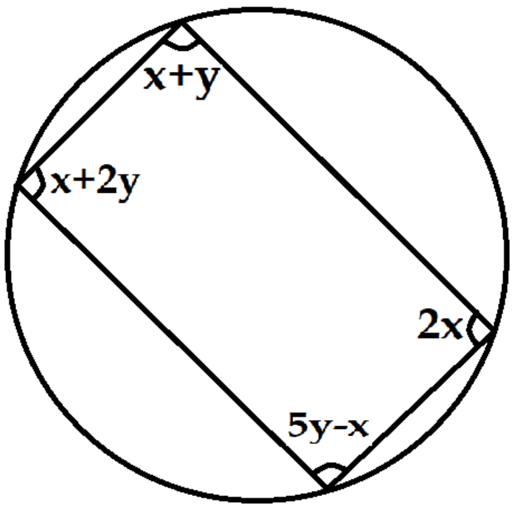
20. In a cyclic quadrilateral ABCD, diagonal AC bisects $\angle\, C$. Prove that the tangent to the circle at A is parallel to the diagonal BD. **[2007]**

21. In figure, TA is a tangent to the circle from a point T and TBC is a secant to the circle. If AD is the bisector of $\angle\, CAB$. Prove that $\Delta\, ADT$ is isosceles. **[2007]**

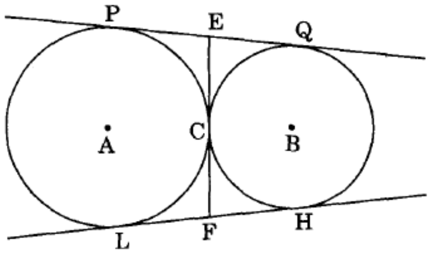


22. Prove that the sum of either pair of opposite angles of a cyclic quadrilateral is 180°. **[2007]**

Using the above, find x and y in figure.



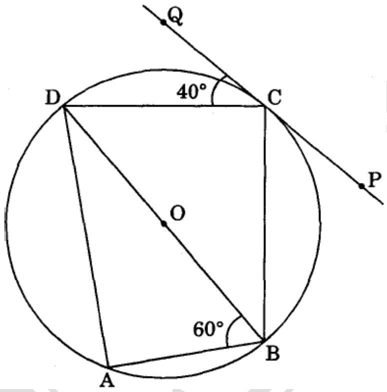
23. In figure, two circles touch each other externally at C. Prove that the common tangent at C bisects the other two common tangents. **[2007]**



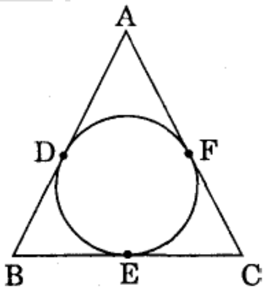
24. If a line touches a circle and from the point of contact a chord is drawn, prove that the angles which this chord makes with the given line are equal respectively to the angles formed in the corresponding alternate segments. **[2007]**

Use the above for the following:

In figure, ABCD is a cyclic quadrilateral and PQ is the tangent to the circle at C. If BD is the diameter and $\angle DCQ = 40°$ and $\angle ABD = 60°$, find (i) $\angle ADB$ (ii) $\angle BCP$.



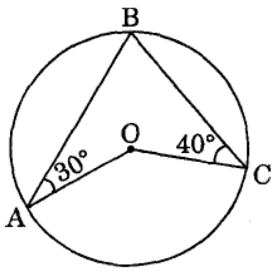
25. In figure, incircle of ΔABC touches its sides AB, BC and CA at D, E and F respectively. If AB = AC, prove that BE = EC. **[2007]**



26. Prove that the angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle. **[2007]**

Using the above, prove the following:

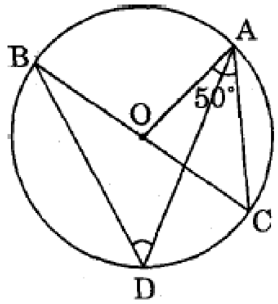
In figure, O is the centre of the circle. If $\angle BAO = 30°$ and $\angle BCO = 40°$, find the value of $\angle AOC$.



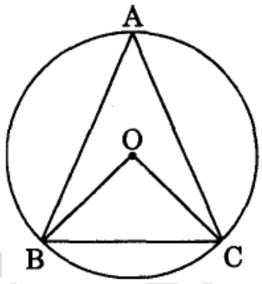
27. Prove that the angle subtended by an arc of a circle at the centre is double the angle subtended by it at any point on the remaining part of the circle. **[2007]**

Use the above and do the following:

In figure, O is the centre of the circle. If $\angle OAC = 50°$, find $\angle ADB$.



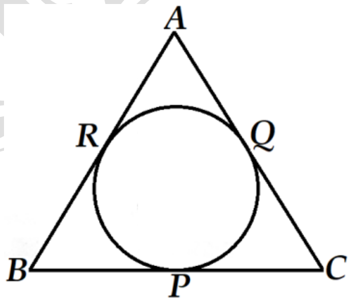
28. BC is a chord of a circle with centre O. A is a point on arc BAC as shown in figure. Prove that $\angle BAC + \angle OBC = 90°$. **[2007]**



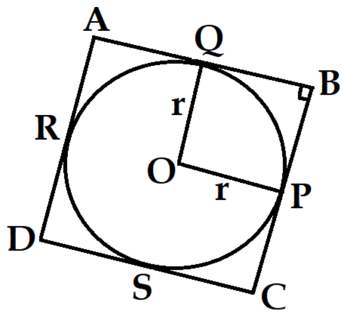
29. Prove that the lengths of tangents drawn from an external point to a circle are equal. **[2008]**

Using the above, prove the following:

ABC is an isosceles traingle in which AB = AC, circumscribed about a circle, as shown in the figure. Prove that the base is bisected by the point of contact.

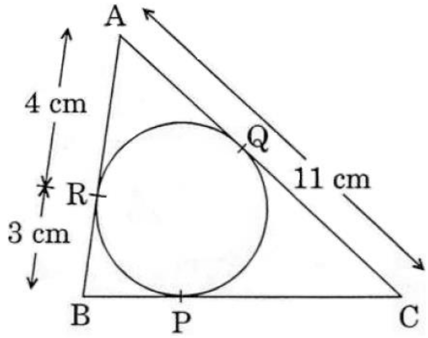


30. In figure, a circle is inscribed in a quadrilateral ABCD, in which $\angle B = 90°$. If $AD = 23\ cm$, $AB = 29\ cm$ and $DS = 5\ cm$, find the radius (r) of the circle. **[2008]**

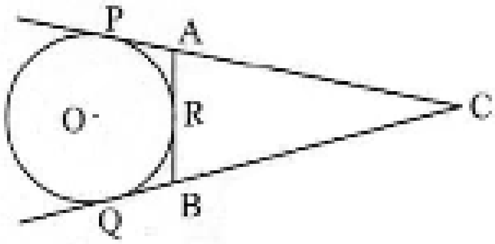


31. ABC is an isosceles triangle, in which $AB = AC$, circumscribed about a circle. Show that BC is bisected at the point of contact. **[2008]**

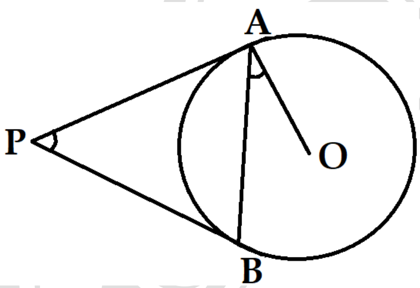
32. In figure, ΔABC is circumscribing a circle. Find the length of BC. **[2009]**



33. In figure, CP and CQ are tangents to a circle with centre O. ARB is another tangent touching the circle at R. if CP = 11 cm and BC = 7 cm then find the length of BR. **[2009]**



34. Two tangents PA and PB are drawn to a circle with centre O from an external point P. Prove that $\angle APB = 2\angle OAB$. **[2009]**

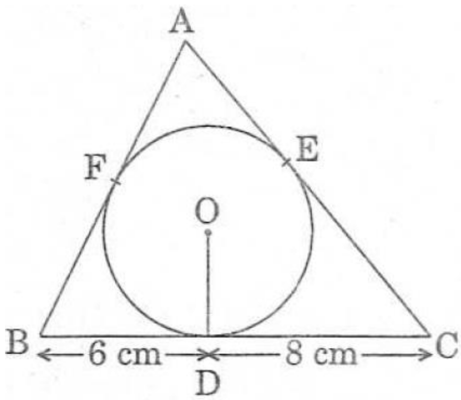


35. Prove that the lengths of the tangents drawn from an external point to a circle are equal. **[2009]**

Using the above theorem prove that:

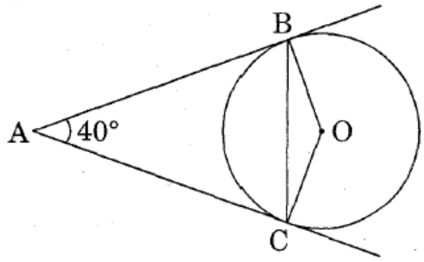
If quadrilateral ABCD is circumscribing a circle, then AB + CD = AD + BC.

36. In figure, a triangle ABC is drawn to circumscribe a circle of radius 3 cm, such that the segments BD and DC into which BC is divided by the point of contact D are of lengths 6 cm and 8 cm respectively. Find the side AB if the area of $\Delta ABC = 63\ cm^2$. **[2010]**



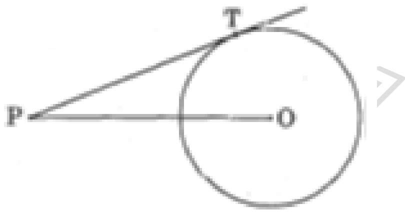
37. A tangent PQ at a point P of a circle of radius 5 cm meets a line through the centre O at a point Q so that OQ = 13 cm. Find the length PQ. **[2010]**

38. In figure, AB and AC are tangents to the circle with centre O such that $\angle BAC = 40°$. Then $\angle BOC$ is equal to **[2011]**



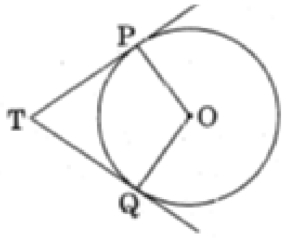
(a) 40° (b) 50° (c) 140° (d) 150°

39. In figure, point P is 26 cm away from the cintre O of a circle and the length PT of the tangent drawn from P to the circle is 24 cm. Then the radius of the circle is **[2011]**



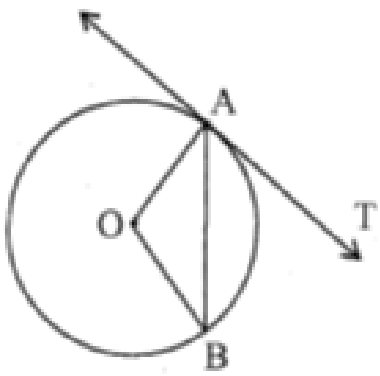
(a) 25 cm (b) 26 cm (c) 24 cm (d) 10 cm

40. In figure, TP and TQ are two tangents to a circle with centre O such that $\angle POQ = 110°$. Then $\angle PTQ$ is equal to **[2011]**



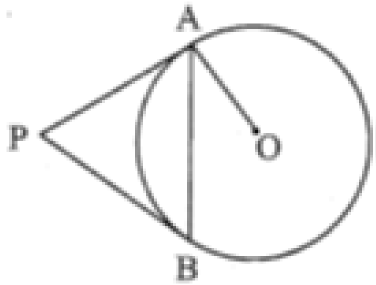
(a) 55° (b) 70° (c) 110° (d) 90°

41. In figure, O is the centre of a circle, AB is a chord and AT is the tangent at A. If $\angle AOB = 100°$, then $\angle BAT$ is equal to **[2011]**



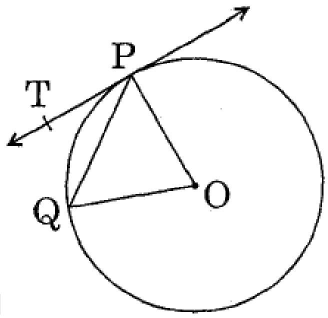
(a) 55° (b) 70° (c) 110° (d) 90°

42. In figure, PA and PB are tangents to the circle with centre O. If $\angle APB = 60°$, then $\angle OAB$ is **[2011]**



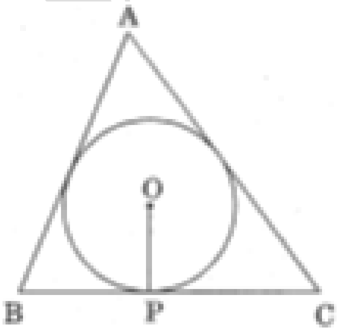
(a) 30° (b) 60° (c) 90° (d) 15°

43. In figure, O is the centre of a circle, PQ is a chord and PT is the tangent at P. If $\angle POQ = 70°$, then $\angle TPQ$ is equal to **[2011]**

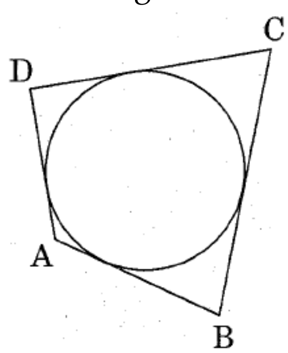


(a) 55° (b) 70° (c) 45° (d) 35°

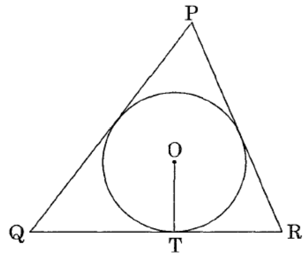
44. In figure, a triangle ABC is drawn to circumscribe a circle of radius 10 cm such that the segments BP and PC into which BC is divided by the point of contact P, are of lengths 15 cm and 20 cm respectively. If the area of $\Delta ABC = 525\ cm^2$, then find the lengths of sides AB and AC. **[2011]**



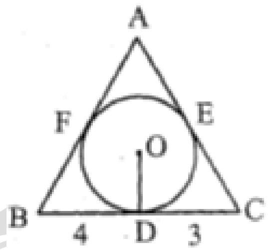
45. In figure, a circle touches all the four sides of a quadrilateral ABCD whose sides are AB = 6 cm, BC = 9 cm and CD = 8 cm. Find the length of side AD. **[2011]**



46. In figure, a triangle PQR is drawn to circumscribe a circle of radius 6 cm such that the segments QT and TR into which QR is divided by the point of contact T, are of lengths 12 cm and 9 cm respectively. If the area of $\Delta\, PQR = 189\ cm^2$, then find the lengths of sides PQ and PR. **[2011]**



47. In figure, a triangle ABC is drawn to circumscribe a circle of radius 2 cm such that the segments BD and DC into which BC is divided by the point of contact D are of lengths 4 cm and 3 cm respectively. If area of $\Delta\, ABC = 21\ cm^2$, then find the lengths of sides AB and AC. **[2011]**

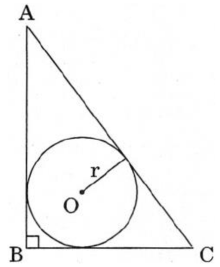


48. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact. **[2011, 2013, 2015]**

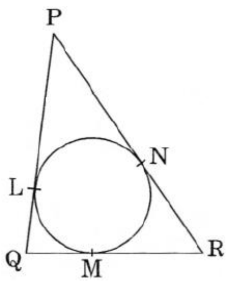
49. Prove that the length of tangents drawn from an external point to a circle are equal. **[2011, 2012, 2013, 2014, 2016, 2017, 2018]**

50. Two concentric circles are of radii 7 cm and r cm respectively, where $r > 7$. A chord of the larger circle, of length 48 cm , touches the smaller circle. Find the value of r. **[2011]**

51. In figure, a right triangle ABC, circumscribes a circle of radius r. If AB and BC are of lengths 8 cm and 6 cm respectively, find the value of r. **[2012]**



52. In figure, a circle is inscribed in a traingle PQR with PQ = 10 cm, QR = 8 cm and PR = 12 cm. Find the lengths QM, RN and PL. **[2012]**

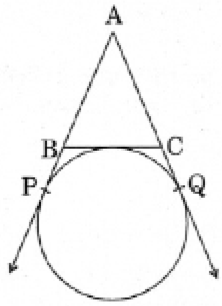


53. Prove that the tangents drawn at the ends of any diameter of a circle are parallel. **[2012, 2014, 2017]**

54. From a point Q, 13 cm away from the centre of a circle, the length of tangent PQ to the circle is 12 cm. The radius of the circle (in cm) is **[2012]**

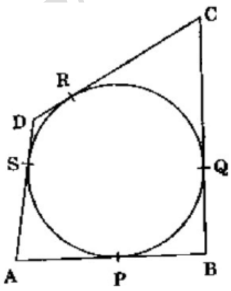
(a) 25 (b) $\sqrt{313}$ (c) 5 (d) 1

55. In figure, AP, AQ and BC are tangents to the circle. If AB = 5 cm, AC = 6 cm and BC = 4 cm, then the length of AP (in cm) is **[2012]**

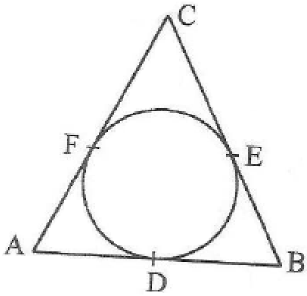


(a) 7.5 (b) 15 (c) 10 (d) 9

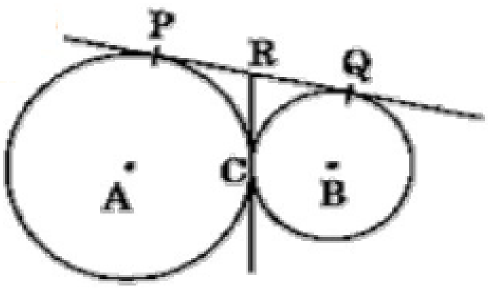
56. In figure, a quadrilateral ABCD is drawn to circumscribe a circle. Prove that $AB + CD = AD + BC$. **[2013]**



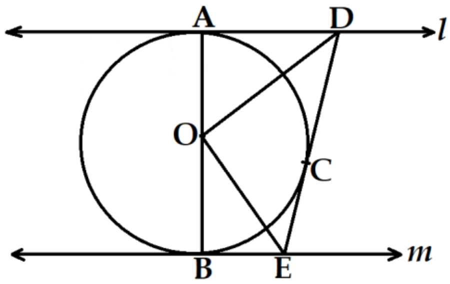
57. In figure, a circle inscribed in triangle ABC touches its sides AB, bc and AC at points D, E and F respectively. If AB = 12 cm, BC = 8 cm and AC = 10 cm, then find the lengths of AD, BE and CF. **[2013]**



58. In figure, two circles touch each other at the point C. Prove that the common tangent to the circles at C, bisects the common tangent at P and Q. **[2013]**



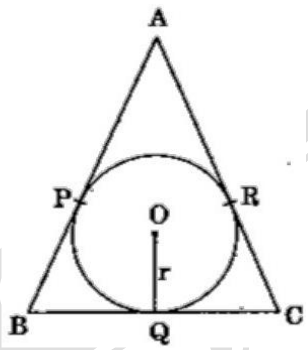
59. In figure, l and m are two parallel tangents to a circle with centre O, touching the circle at A and B respectively. Another tangent at C intersects the line l at D and m at E. Prove that $\angle DOE = 90°$. **[2013]**



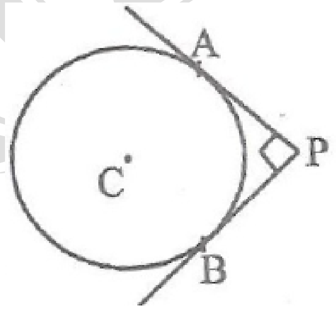
60. In figure, the sides AB, BC and CA of triangle ABC touch a circle with centre O and radius **r** at P, Q and R respectively. Prove that **[2013]**

(i) $AB + CQ = AC + BQ$

(ii) $Area\ (\Delta ABC) = \frac{1}{2}(Perimeter\ of\ \Delta ABC) \times r.$

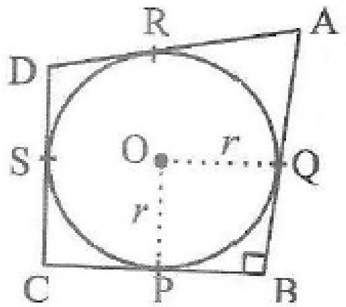


61. In figure, PA and PB are two tangents drawn from an external point P to a circle with centre C and radius 4 cm. If $PA \perp PB$, then the length of each tangent is: **[2013]**



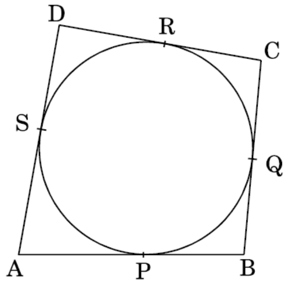
(a) 3 cm (b) 4 cm (c) 5 cm (d) 6 cm

62. In figure, a circle with centre O is inscribed in a quadrilateral ABCD such that, it touches the sides BC, AB, AD and CD at points P, Q, R and S respectively. If AB = 29 cm, AD = 23 cm, **[2013]**



(a) 11 (b) 18 (c) 6 (d) 15

63. In figure, a quadrilateral ABCD is drawn to circumscribe a circle such that its sides AB, BC, CD and AD touch the circle at P, Q, R and S respectively. If AB = x cm, BC = 7 cm, CR = 3 cm and AS = 5 cm, find x. **[2014]**

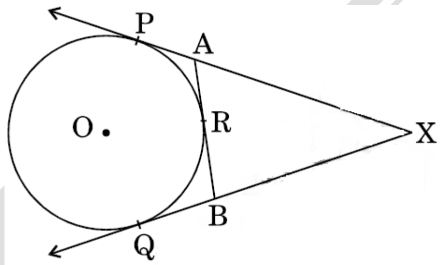


(a) 10 (b) 9 (c) 8 (d) 7

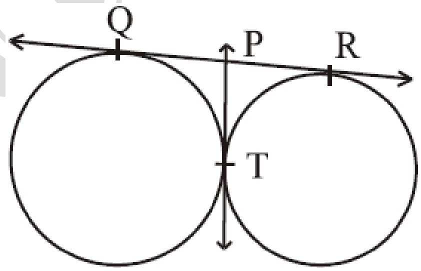
64. Two concentric circles are of radii 5 cm and 3 cm. Length of the chord of the larger circle, (in cm), which touches the smaller circle is **[2014]**

(a) 4 (b) 5 (c) 8 (d) 10

65. In figure, XP and XQ are two tangents to the circle with centre O, drawn from an external point X. ARB is another tangernt, touching the circle at R. Prove that $XA + AR = XB + BR$. **[2014]**

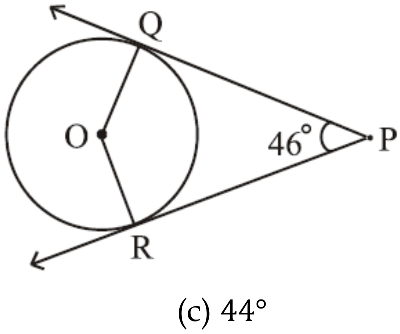


66. In figure, QR is a common tangent to the given circles, touching externally at the point T. The tangent T meets QR at P. If PT = 3.8 cm, then the length of QR (in cm) is: **[2014]**



(a) 3.8 (b) 7.6 (c) 5.7 (d) 1.9

67. In figure, PQ and PR are two tangents to a circle with centre O. If $\angle QPR = 46°$, then $\angle QOR$ equals: **[2014]**



(a) 67° (b) 134° (c) 44° (d) 46°

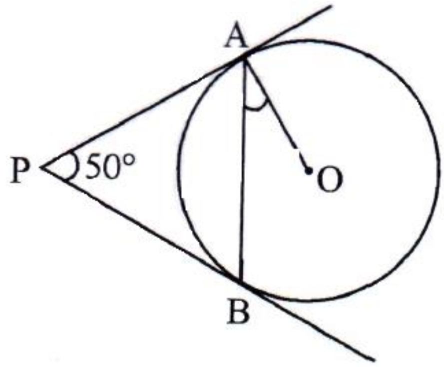
68. A quadrilateral is drawn to circumscribe a circle. Prove that the sums of opposite sides are equal. **[2014]**

69. If from an external point P of a circle with centre O, two tangents PQ and PR are drawn such that $\angle QPR = 120°$, prove that $2PQ = PO$. **[2014]**

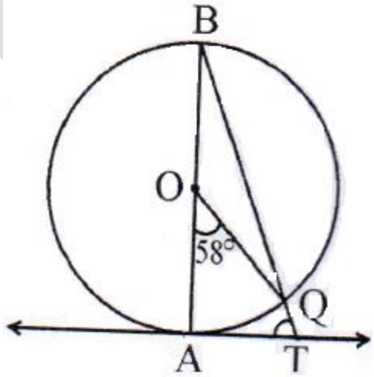
70. Prove that the line segment joining the points of contact of two parallel tangents of a circle, passes through its centre. **[2014]**

71. From a point T outside a circle of centre O, tangents TP and TQ are drawn to the circle. Prove that OT is the right bisector of line segment PQ. **[2015]**

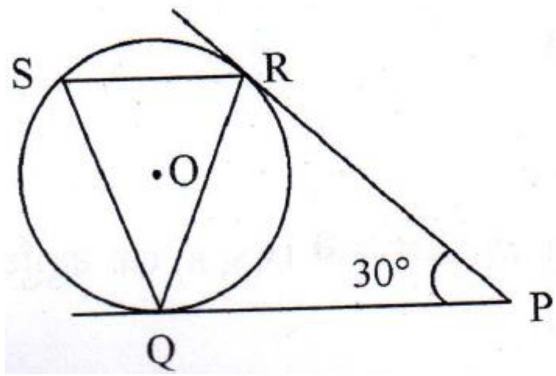
72. In figure, PA and PB are tangents to the circle with centre O such that $\angle APB = 50°$. Write the measure of $\angle OAB$. **[2015]**



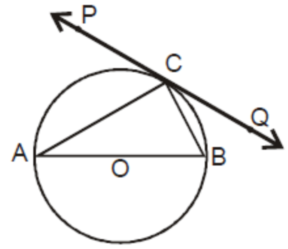
73. In figure, AB is the diameter of a circle with centre O and AT is a tangent. If $\angle AOQ = 58°$, find $\angle ATQ$. **[2015]**



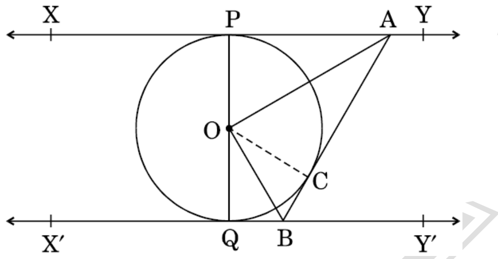
74. In figure, tangents PQ and PR are drawn from an external point P to a circle with centre O, such that $\angle RPQ = 30°$. A chord RS is drawn parallel to the tangent PQ. Find $\angle RQS$. **[2015]**



75. In figure, PQ is a tangent at a point C to a circle with centre O. If AB is a diameter and $\angle CAB = 30°$, find $\angle PCA$. **[2016]**



76. In the given figure, XY and X′Y′ are two parallel tangents to a circle with centre O and another tangent AB with point of contact C, is intersecting XY at A and X′Y′ at B. Prove that $\angle AOB = 90°$. **[2016]**

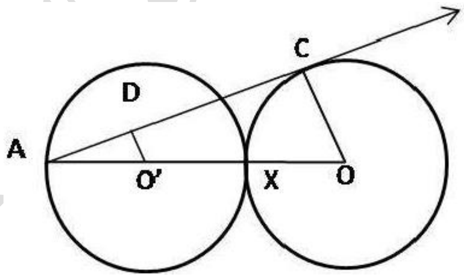


77. If the angle between two tangents drawn from an external point P to a circle of radius a and centre O is 60°, then find the length of OP. **[2016]**

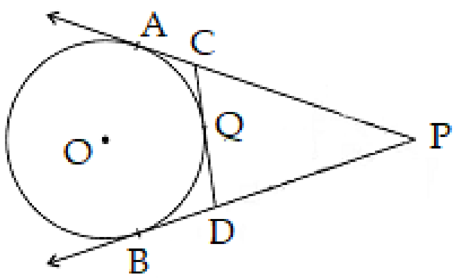
78. Prove that the tangents drawn at the end points of a chord of a circle make equal angles with the chord. **[2016]**

79. A circle touches all the four sides of a quadrilateral ABCD. $AB + CD = BC + DA$. **[2016]**

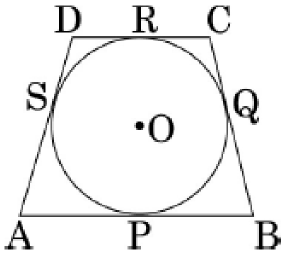
80. In figure, two equal circles, with centres O and O′, touch each other at X. OO′ produced meets the circle with center O′ at A. AC is tangent to the circle with center O, at the point C. O′D is perpendicular to AC. Find the value of $\frac{DO'}{CO}$. **[2017]**



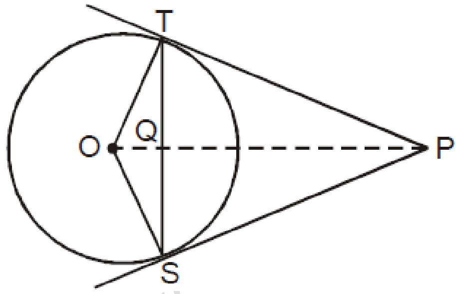
81. In the given figure, PA and PB are tangents to the circle from an external point P. CD is another tangent touching to circle at Q. If PA = 12 cm, QC = QD = 3 cm, then find $PC + PD$. **[2017]**



82. In figure, a quadrilateral ABCD is drawn to circumscribe a circle, with centre O, in such a way that the side AB, BC, CD and DA touch the circle at the points P, Q, R and S respectively. Prove that $AB + CD = BC + DA$. **[2017]**

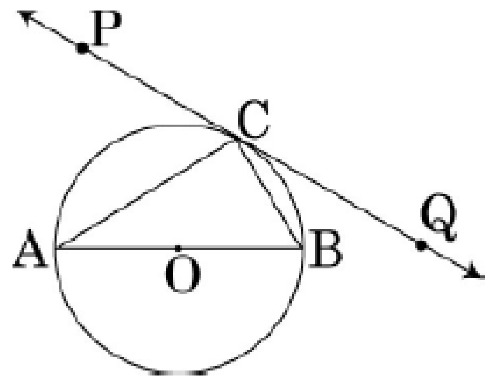


83. In figure, from an external point P, two tangents PT and PS are drawn to a circle with centre O and radius r. If $OP = 2r$, show that $\angle OTS = \angle OST = 30°$. **[2017]**



84. Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$. **[2017]**

85. In figure, PQ is a tangent at a point C to a circle with centre O. If AB is a diameter and $\angle CAB = 30°$, find $\angle PCA$. **[2017]**



86. Prove that the lengths of tangents drawn from an external point to a circle are equal. **[2018]**

Ch. 11. Constructions

1. Construct a triangle ABC with BC = 6 cm, $\angle A = 60°$ and median through A is 5 cm long. Construct a triangle $A'BC'$ similar to ΔABC, with BC′ = 8 cm. Write the steps of construction. **[1999]**

2. From a point P on the circle of radius 4 cm, draw a tangent to the circle without using the centre. Also write the steps of construction. **[2000]**

3. Draw a line segment AB = 7 cm. Divide it externally in the ratio (i) 3 : 5 (ii) 5 : 3. **[2000]**

4. Draw a circle of radius 4.5 cm. Take a point P on it. Construct a tangent at the point without using the centre of the circle. Write the steps of construction. **[2001]**

5. Construct a $\Delta\, ABC$ in which BC = 5 cm, $\angle A = 60°$ and the median from A on BC is of length 3.5 cm. **[2002]**

6. Construct a triangle ABC in which $BC\ = 6$ cm, $\angle A = 60°$ and median $AD\ = 5$ cm. Also, construct another triangle BPQ similar to Δ BCA such that the side $BP = \frac{3}{2}BC$. Also, write the steps of construction. **[2003]**

7. Construct a triangle ABC in which BC = 6.5 cm, $\angle A = 60°$ and altitude AD = 4.5 cm. **[2004]**

8. Draw a circle of radius 3.5 cm. From a point P outside the circle at a distance of 6 cm from the centre of circle, draw two tangents to the circle. **[2005]**

9. Construct a quadrilateral ABCD with $AB = 3$ cm, $AD = 2.7$ cm, $BD = 3.6$ cm, $\angle B = 120°$ and $BC = 4.2$ cm. Construct another quadrilateral A'BC'D' similar to quadrilateral ABCD so that diagonal $BD' = 4.8$ cm **[2005]**

10. Construct a triangle ABC is which $BC = 7$ cm, $\angle A = 60°$ and altitude $AD = 5$ cm. Write the steps of construction also. **[2006]**

11. Draw a Δ PQR with base QR = 6 cm, vertical angle P = 60° and median through P to the base is of length 4.5 cm. **[2007]**

12. Draw a circle of radius 4.5 cm. At a point A on it, draw a tangent to the circle without using the centre. **[2007]**

13. Draw a triangle ABC with BC = 6 cm, $\angle B = 45°$ and $\angle C = 60°$. Draw a circumcicle of Δ ABC. **[2007]**

14. Consturct a triangle with sides 5 cm, 5.5 cm and 6.5 cm. Now construct another triangle, whose sides are $\frac{3}{5}$ times the corresponding sides of the given triangle. **[2008]**

15. Contruct a Δ ABC in which $AB = 6.5\ cm$, $\angle B = 60°$ and $BC = 5.5\ cm$. Also construct a triangle $AB'C'$ similar to Δ ABC, whose each side is $\frac{3}{2}$ times the corresponding side of the Δ ABC. **[2008]**

16. Draw a right triangle in which sides (other than hypotenuse) are of lengths 8 cm and 6 cm. Then construct another triangle whose sides are $\frac{3}{4}$ times of the corresponding sides of the first triangle. **[2009]**

17. Construct a $\Delta\, ABC$ in which BC = 6.5 cm, AB = 4.5 cm and $\angle ABC = 60°$. Construct a triangle similar to this triangle whose sides are $\frac{3}{4}$ times of the corresponding sides of the triangle ABC. **[2009]**

18. Draw a circle of radius 3 cm. From a point P, 6 cm away from its centre, construct a pair of tangents to the circle. Measure the lengths of the tangents. **[2009]**

19. Draw a circle of radius 3 cm. From a point P, 7 cm away from the centre of the circle, draw two tangents to the circle. Also, measure the lengths of the tangents. **[2010]**

20. Construct a triangle ABC in which BC = 8 cm, $\angle B = 45°$ and $\angle C = 30°$. Construct another triangle similar to Δ ABC such that its sides are $\frac{3}{4}$ times of the corresponding sides of Δ ABC. **[2010]**

21. Draw a pair of tangents to a circle of radius 3 cm, which are inclined to each other at an angle of 60°. **[2011]**

22. Draw a line segment AB of length 7 cm. Using ruler and compasses, find a point P on AB such that $\frac{AP}{AB} = \frac{3}{5}$. **[2011]**

23. Draw a right triangle in which the sides (other than hypotenuse) are of lengths 4 cm and 3 cm. Then construct another triangle whose sides are $\frac{3}{5}$ times the corresponding sides of the given triangle. **[2011]**

24. Draw a line segment AB of length 7 cm. Taking A as centre, draw a circle of radius 3 cm and taking B as centre, draw another circle of radius 2 cm. Construct tangents to each circle from the centre of the other circle. **[2011]**

25. Construct an isosceles triangle whose base is 8 cm and altitude 4 cm and then construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of the isosceles triangle. **[2011]**

26. Draw a line segment of length 6 cm. Using compasses and ruler, find a point P on it which divides it in the ratio 3: 4. **[2011]**

27. Draw a triangle ABC in which AB = 5 cm, BC = 6 cm and $\angle ABC = 60°$. Then construct a triangle whose sides are $\frac{5}{7}$ times the corresponding sides of $\Delta\, ABC$. **[2011]**

28. Draw a triangle ABC with BC = 7 cm, $\angle B = 45°$ and $\angle C = 60°$. Then construct another triangle, whose sides are $\frac{3}{5}$ times the corresponding sides of Δ ABC. **[2012]**

29. Draw a pair of tangents to a circle of radius 4 cm, which are inclined to each other at an angle of 60°. **[2013]**

30. Construct a triangle with sides 5 cm, 4 cm and 6 cm. Then construct another triangle whose sides are $\frac{2}{3}$ times the corresponding sides of first triangle. **[2013]**

31. Construct a triangle ABC, in which AB = 5 cm, BC = 6 cm and AC = 7 cm. Then construct another triangle whose sides are $\frac{3}{5}$ times the corresponding sides of Δ ABC. **[2014]**

32. Draw a right triangle ABC in which AB = 6 cm, BC = 8 cm and $\angle B = 90°$. Draw BD perpendicular from B on AC and draw a circle passing through the points B, C and D. Construct tangents from A to this circle. **[2014]**

33. Construct a triangle ABC with BC = 7 cm, $\angle B = 60°$ and AB = 6 cm. Construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of Δ ABC. **[2015]**

34. Construct a triangle ABC with side BC = 7 cm, $\angle B = 45°$, $\angle A = 105°$. Then construct another triangle whose sides are $\frac{3}{4}$ times the corresponding sides of the Δ ABC. **[2016]**

35. Draw a circle of radius 4 cm. Draw two tangents to the circle inclined at an angle of 60° to each other. **[2017]**

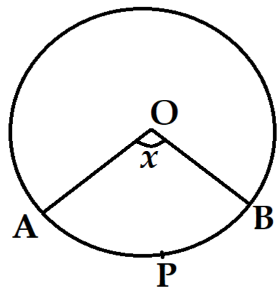
36. Draw a line segment of length 8 cm and divide it internally in the ratio 4 : 5. **[2017]**

37. Construct an isosceles triangle with base 8 cm and altitude 4 cm. Construct another triangle whose sides are $\frac{2}{3}$ times the corresponding sides of the isosceles triangle. **[2017]**

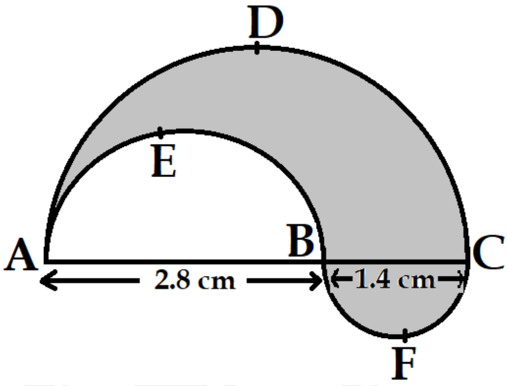
38. Draw a triangle ABC with BC = 6 cm, AB = 5 cm and $\angle ABC = 60°$. Then construct a triangle whose sides are $\frac{3}{4}$ of the corresponding sides of the $\Delta\, ABC$. **[2018]**

Ch. 12. Areas related to circles

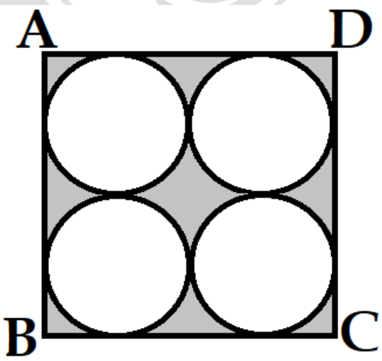
1. In figure, O is the centre of a circle. The area of sector OAPB is $\frac{5}{18}$ of the area of the circle. Find x. **[2008]**



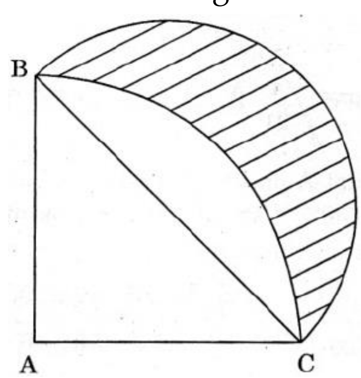
2. In figure, find the perimeter of shaded region where ADC, AEB and BFC are semi-circles on diameters AC, AB and BC respectively. **[2008]**



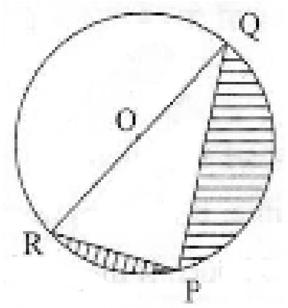
3. Find the area of the shaded region in figure, where ABCD is square of side 14 cm. **[2008]**



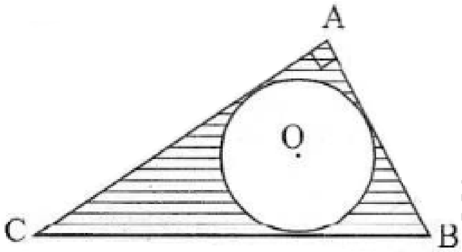
4. In figure, ABC is a quadrant of a circle of radius 14 cm and a semi-circle is drawn with BC as diameter. Find the area of the shaded region. **[2008]**



5. In figure, PQ = 24 cm, PR = 7 cm and O is the centre of the circle. Find the area of shaded region [$Use\ \boldsymbol{\pi} = 3.14$]. **[2009]**



6. In figure, ABC is a right triangle right anlged at A. Find the area of shaded region if AB = 6 cm, BC = 10 cm and O is the centre of the incircle of Δ ABC. [$Use\ \boldsymbol{\pi} = 3.14$] **[2009]**



7. The length of the minute hand of a wall clock is 7 cm. How much area does it sweep in 20 minutes? **[2009]**

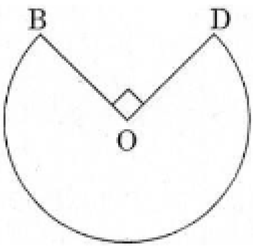
8. If the diameter of a semicircular protractor is 14 cm, then find its perimeter. **[2009]**

9. The area of an equilateral triangle is $49\sqrt{3}\ cm^2$. Taking each angular point as centre, circles are drawn with radius equal to half the length of the side of the triangle. Find the area of triangle not included in the circles. $\left[Use\ \sqrt{3} = 1.73\right]$ **[2009]**

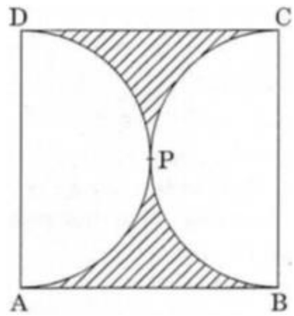
10. In the figure, the shape of the top of a table in a restaurant is that of a sector of a circle with centre O and $\angle BOD = 90°$. If BO = OD = 60 cm, find **[2009]**

(i) the area of the top of the table.

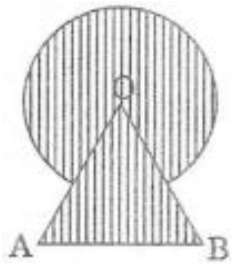
(ii) The perimeter of the table top. [$Use\ \boldsymbol{\pi} = 3.14$]



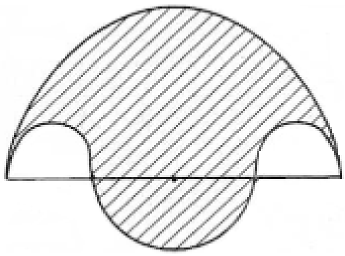
11. In figure, ABCD is a square of side 14 cm and APD and BPC are semicircles. Find the area of shaded region. $\left[Use\ \boldsymbol{\pi} = \frac{22}{7}\right]$ **[2009]**



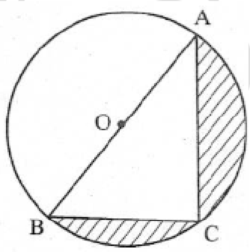
12. Find the area of the shaded region in figure, where a circular arc of radius 7 cm has been drawn with vertex O of an equilateral triangle OAB, of side 12 cm, as centre. **[2010]**



13. In figure, the boundary of shaded region consists of four semicirculars arcs, two smallest being equal. If diameter of the largest is 14 cm and that of the smallest is 3.5 cm, calculate the area of the shaded region. [Use $\pi = \frac{22}{7}$] **[2010]**



14. Find the area of the shaded region in figure, if AC = 24 cm, BC = 10 cm and O is the centre of the circle. $[Use\ \boldsymbol{\pi} = 3.14]$ **[2010]**



15. A chord of a circle of radius 14 cm subtends an angle of 120° at the centre. Find the area of the corresponding minor segment of the circle. $\left[Use\ \boldsymbol{\pi} = \frac{22}{7}\ and\ \sqrt{3} = 1.73\right]$ **[2011]**

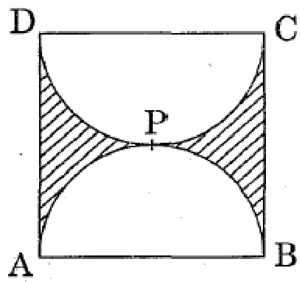
16. The radii of two circles are 4 cm and 3 cm respectively. The diameter of the circle having area equal to the sum of the areas of the two circles (in cm) is **[2011]**

(a) 5 (b) 7 (c) 10 (d) 14

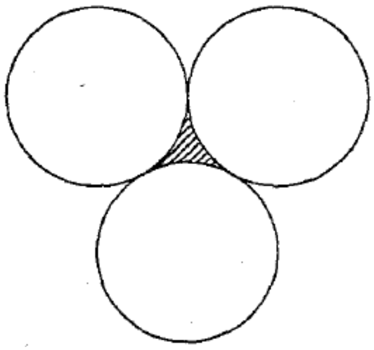
17. The perimeter (in cm) of a square circumscribing a circle of radius $'\boldsymbol{a}'$ cm, is **[2011]**

(a) $8a$ (b) $4a$ (c) $2a$ (d) $16a$

18. Find the perimeter of the shaded region in figure, if ABCD is a square of side 14 cm and APB and CPD are semicircles. $\left[Use\ \boldsymbol{\pi} = \frac{22}{7}\right]$ **[2011]**



19. In figure, three circles each of radius 3.5 cm are drawn in such a way that each of them touches the other two. Find the area enclosed between these three circles (shaded region). $\left[Use\ \boldsymbol{\pi} = \frac{22}{7}\right]$ **[2011]**

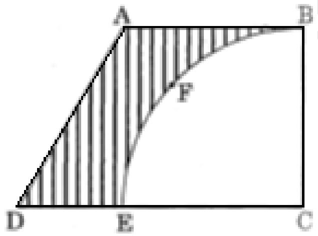


20. If the area of a circle is numerically equal to twice its circumference, then the diameter of the circle is **[2011]**

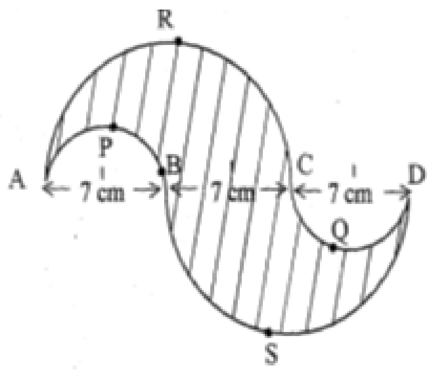
(a) 4 units (b) π units (c) 8 units (d) 2 units

21. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding minor segment and hence find the area of the major segment. $[Use\ \boldsymbol{\pi} = 3.14]$ **[2011]**

22. From a thin metallic piece, in the shape of a trapezium ABCD in which $AB \parallel CD$ and $\angle BCD = 90°$, a quarter circle BFEC is removed (figure). Given $AB = BC = 3.5\ cm$ and DE = 2 cm, calculate the area of the remaining (shaded) part of the metal sheet. $\left[Use\ \boldsymbol{\pi} = \frac{22}{7}\right]$ **[2011]**

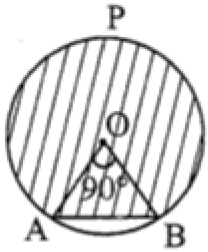


23. In figure, APB and CQD are semi-circles of diameter 7 cm each, while ARC and BSD are semi-circles of diameter 14 cm each. Find the perimeter of the shaded region. $\left[Use\ \boldsymbol{\pi} = \frac{22}{7}\right]$ **[2011]**

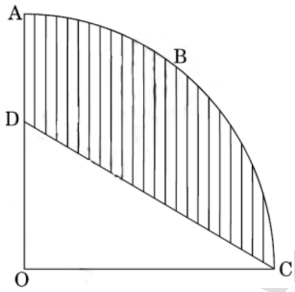


24. Find the area of a quadrant of a circle, where the circumference of circle is 44 cm. $\left[Use\ \boldsymbol{\pi} = \frac{22}{7}\right]$ **[2011]**

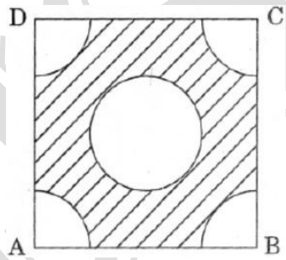
25. Find the area of the major segment APB, in figure, of a circle of radius 35 cm and $\angle AOB = 90°$. $\left[Use\ \boldsymbol{\pi} = \frac{22}{7}\right]$ **[2011]**



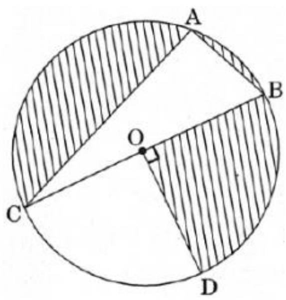
26. In figure, OABC is a quadrant of a circle of radius 7 cm. If OD = 4 cm, find the area of the shaded region. $\left[Use\ \boldsymbol{\pi} = \frac{22}{7}\right]$ **[2011] [2014]**



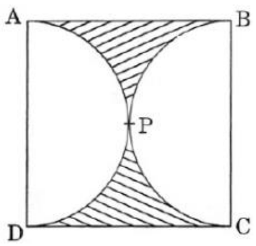
27. In figure, ABCD is a square of side 4 cm. A quadrant of a circle of radius 1 cm is drawn at each vertex of the square and a circle of diameter 2 cm is also drawn. Find the area of the shaded region. $[Use\ \boldsymbol{\pi} = 3.14]$ **[2012]**



28. In figure, O is the centre of the circle with AC = 24 cm, AB = 7 cm and , $\angle BOD = 90°$. Find the area of the shaded region. $[Use\ \boldsymbol{\pi} = 3.14]$ **[2012]**



29. In figure, find the area of the shaded region, if ABCD is a square of side 14 cm and APD and BPC are semicircles. **[2012]**



30. From a rectangular sheet of paper ABCD with AB = 40 cm and AD = 28 cm, a semi-circular portion with BC as diameter is cut off. Find the area of the remaining paper. [Use $\pi = \frac{22}{7}$] **[2012]**

31. The circumference of a circle is 22 cm. the area of its quadrant (in cm^2) is **[2012]**

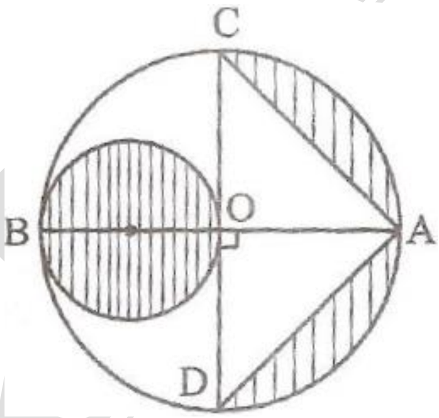
(a) $\frac{77}{2}$ (b) $\frac{77}{4}$ (c) $\frac{77}{8}$ (d) $\frac{77}{16}$

32. The length of the minute hand of a wall clock is 14 cm. How much area does it sweep in 5 minutes? **[2013]**

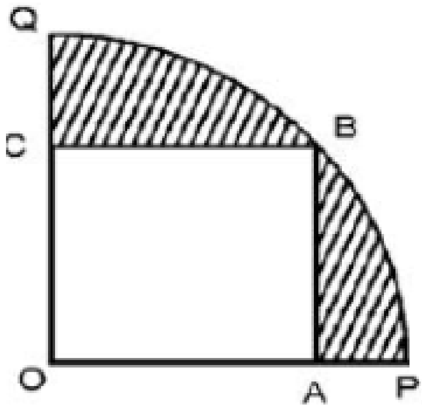
33. In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find (i) the length of the arc (ii) area of the sector formed by the arc. [Use $\pi = \frac{22}{7}$] **[2013]**

34. Two circular pieces of equal radii and maximum area, touching each other are cut out from a rectangular card board of dimensions $14\ cm \times 7\ cm$. Find the area of the remaining card board. [Use $\pi = \frac{22}{7}$] **[2013]**

35. In figure, AB and CD are two diameters of a circle with centre O, which are perpendicular to each other. OB is the diameter of the smaller circle. If OA = 7 cm, find the area of the shaded region. [Use $\pi = \frac{22}{7}$] **[2013]**



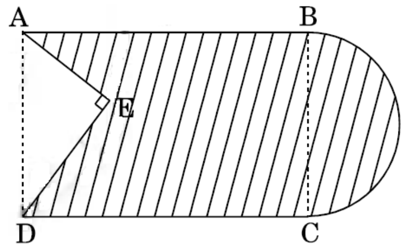
36. In figure, OABC is a square inscribed in a quadrant OPBQ. If OA = 21 cm, find the area of shaded region. [$Use\ \boldsymbol{\pi} = 3.14$] **[2013]**



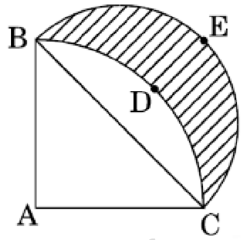
37. If the difference between the circumference and the radius of a circle is 37 cm, then using $\pi = \frac{22}{7}$, the circumference (in cm) of the circle is: **[2013]**

(a) 154 (b) 44 (c) 14 (d) 7

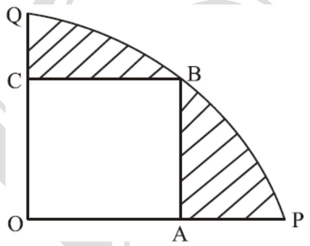
38. In figure, from a rectangular region ABCD with AB = 20 cm, a right triangle AED with AE = 9 cm and DE = 12 cm, is cut off. On the other end, taking BC as diameter, a semicircle is added on outside the region. Find the area of the shaded region. $\left[Use\ \boldsymbol{\pi} = \frac{22}{7}\right]$ **[2014]**



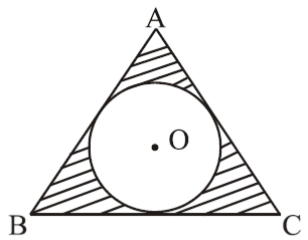
39. In figure, ABDC is a quadrant of a circle of radius 28 cm and a semi circle BEC is drawn with BC as diameter. Find the area of the shaded region. [Use $\pi = \frac{22}{7}$] **[2014]**



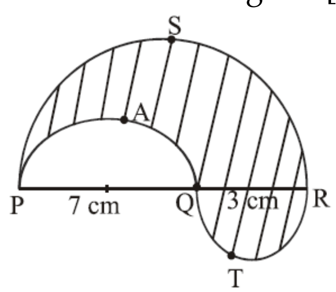
40. In figure, a square OABC is inscribded in a quadrant OPBQ of a circle. If OA = 20 cm, find the area of the shaded region. $[Use\ \boldsymbol{\pi} = 3.14]$ **[2014]**



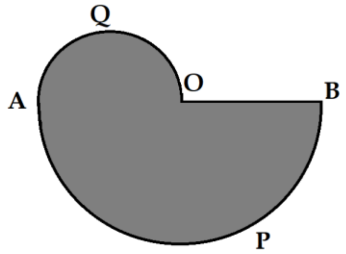
41. In figure, a circle is inscribed in an equilateral triangle ABC of side 12 cm. Find the radius of inscribed circle and the area of the shaded region. $\left[Use\ \boldsymbol{\pi} = 3.14\ and\ \sqrt{3} = 1.73\right]$ **[2014]**



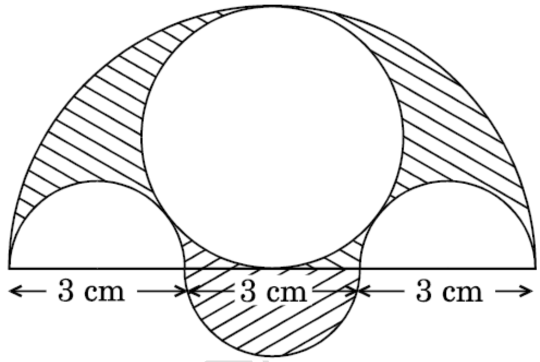
42. In figure, PSR, RTQ and PAQ are three semicircles of diameters 10 cm, 3 cm and 7 cm respectively. Find the perimeter of the shaded region. $[Use\ \boldsymbol{\pi} = 3.14]$ **[2014]**



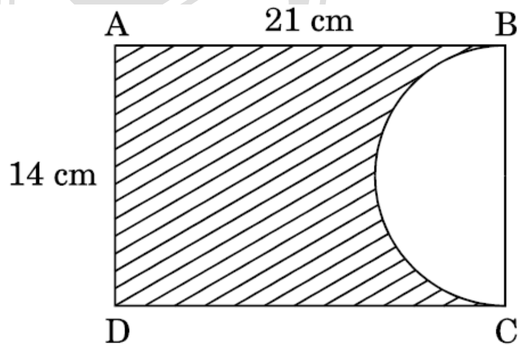
43. In figure, APB and AQO are semicircles, and AO=OB. If the perimeter of the figure is 40 cm, find the area of the shaded region. [Use $\pi = \frac{22}{7}$] **[2015]**



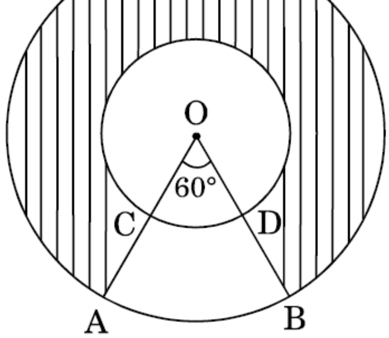
44. Three semicircles each of diameter 3 cm, a circle of diameter 4.5 cm and a semicircle of radius 4.5 cm are drawn in the given figure. Find the area of the shaded region. **[2016]**



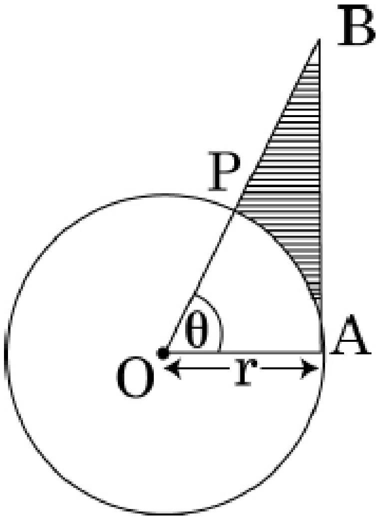
45. In the given figure, ABCD is a rectangle of dimensions $21\ cm \times 14\ cm$. A semicircle is drawn with BC as diameter. Find the area and the perimeter of the shaded region in the figure. **[2016]**



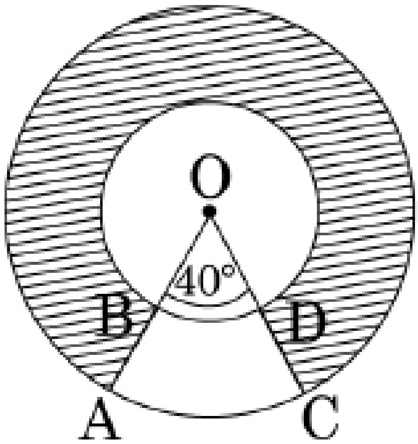
46. In figure, two concentric circles with centre O, have radii 21 cm and 42 cm. $\angle AOB = 60°$, find the area of the shaded region. [Use $\pi = \frac{22}{7}$] **[2016]**



47. In figure, is shown a sector OAP of a circle with centre O, containing angle θ. AB is perpendicular to the radius OQ and meeets OP produced at B. Prove that the perimeter of shaded region is $r\left[\tan\theta + \sec\theta + \frac{\pi\theta}{180} - 1\right]$. **[2017]**

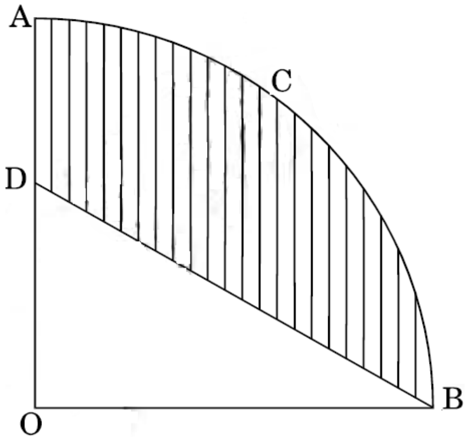


48. In figure, find the area of the shaded region, enclosed between two concentric circles of radii 7 cm and 14 cm where $\angle AOC = 40°$. [Use $\pi = \frac{22}{7}$] **[2017]**

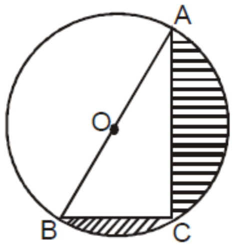


49. A chord PQ of a circle of radius 10 cm subtends an angle of 60° at the centre of circle. Find the area of major and minor segments of the circle. **[2017]**

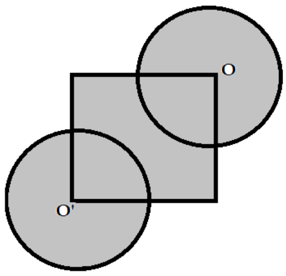
50. In the given figure, OACB is a quadrant of a circle with centre O and radius 3.5 cm. If OD = 2 cm, find the area of the shaded region. **[2017]**



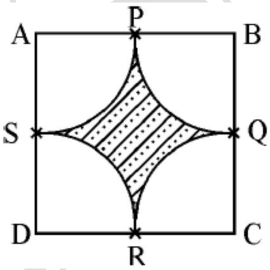
51. In figure, O is the centre of a circle such that diameter AB = 13 cm and AC = 12 cm. BC is joined. Find the area of the shaded region. [$Use\ \boldsymbol{\pi} = 3.14$] **[2017]**



52. In the given figure, the side of square is 28 cm and radius of each circle is half of the length of the side of the square where O and O′ are centres of the circles. Find the area of shaded region. **[2017]**



53. Find the area of the shaded region in figure, where arcs drawn with centres A, B, C and D intersect in pairs at mid-points P, Q, R and S of the sides AB, BC, CD and DA respectively of a square ABCD of side 12 cm. [$Use\ \boldsymbol{\pi} = 3.14$] **[2018]**



Ch. 13. Surface Areas and Volumes

1. The radius and height of a cylinder are in the ratio 5 : 7 and its volume is 550 cm^3. Find its radius. **[1999]**

2. The sum of the radius of the base and the height of a solid cylinder is 37 cm. if the total surface area of the solid cylinder is 1628 cm^2, find the volume of the cylinder. **[1999]**

3. A right circular cylinder having diameter 12 cm and height 15 cm is full of ice-cream. The ice-cream is to be filled incones of height 12 cm and diameter 6 cm having a hemispherical shape on the top. Find the number of such cones which can be filled with ice-cream. **[1999]**

4. The diameters of the internal and external surfaces of a hollow spherical shell are 6 cm and 10 cm respectively. If it is melted and recast into a solid cylinder of height $2\frac{2}{3}$ cm, find the diameter of the cylinder. **[1999]**

5. The circumference of the edge of a hemispherical bowl is 132 cm. Find the capacity of the bowl. [Use $\pi = \frac{22}{7}$] **[1999, 2003]**

6. If the radii of the circular ends of a conical bucket, which is 45 cm high are 28 cm and 7 cm, find the capacity of the bucket. **[2000]**

7. A cone of radius 10 cm is divided into two parts by drawing a plane through the mid-point of its axis, parallel to its base. Compare the volumes of the two parts. **[2000]**

8. A right circular cone of height 4 cm has a curved surface area 47.1 cm^2. Find the volume of the cone. **[2000]**

9. A cylindrical tub of radius 5 cm and length 9.8 cm is full of water. A solid in the form of a right circular cone mounted on a hemisphere is immersed into the tub. If the radius of the hemisphere is 3.5 cm and height of cone outside the hemisphere is 5 cm, find the volume of water left in the tub. [Use $\pi = \frac{22}{7}$] **[2000]**

10. A toy is in the form of a cone mounted on a hemisphere of radius 3.5 cm. The total height of the toy is 15.5 cm. Find the total surface area & volume of the toy. [Use $\pi = \frac{22}{7}$] **[2000, 2002, 2003]**

11. A toy is in the form of a cone mounted on a hemisphere of diameter 7 cm. The total height of the toy is 14.5 cm. Find the total surface area and volume of the toy. [Use $\pi = \frac{22}{7}$] **[2001]**

12. A toy is in the shape of a right circular cylinder with a hemisphere on one and a cone on the other. The radius and height of the cylindrical part are 5 cm and 13 cm respectively. The radii of the hemispherical and conical parts are the same as that of the cylindrical part. Find the surface area of the toy if the total height of the toy is 30 cm. **[2002]**

13. A toy is in the form of a cone mounted on a hemisphere of radius 3.5 cm. The total height of the toy is 15.5 cm. Find the total surface area of the toy. [Use $\pi = \frac{22}{7}$] **[2003]**

14. If the radii of the circular ends of a bucket, 45 cm high, are 28 cm and 7 cm, find the capacity of the bucket. **[2004]**

15. A hollow cone is cut by a plane parallel to the base and the upper portion is is removed. If the curved surface of the remainder is $\frac{8}{9}$ of the curved surface of the whole cone, find the ratio of the line segments into which the altitude of the cone is divided by the plane. **[2004]**

16. A hemispherical bowl of internal diameter 30 cm contains some liquid. This liquid is to be filled into cylindrical shaped bottles each of diameter 5 cm and height 6 cm. Find the number of bottles necessary to empty the bowl. **[2004]**

17. A hemispherical bowl of internal radius 9 cm is full of liquid. The liquid is to be filled into cylindrical shaped small bottles each of diameter 3 cm and height 4 cm. How many bottles are needed to empty the bowl? **[2005]**

18. A tent is in the shape of a right circular cylinder up to a height of 3 m and conical above it. The total height of the tent is 13.5 m and radius of base is 14 m. Find the cost of cloth required to make the tent at the rate of Rs 80 per sq. m. **[2005]**

19. The radii of circular ends of a solid frustum of a cone are 33 cm and 27 cm and its slant height is 10 cm. Find its total surface area. **[2005]**

20. The base radius and height of a right circular solid cone are 2 cm and 8 cm respectively. It is melted and recast into spheres of diameter 2 cm each. Find the number of spheres so formed. **[2005]**

21. A tent is in the form of a cylinder of diameter 4.2 m and height 4 m, surmounted by a cone of equal base and height 2.8 m. Find the capacity of the tent and the cost of canvas for making the tent at Rs 100 per sq. m. **[2005]**

22. If the radii of the ends of a bucket, 45 cm high, are 28 cm and 7 cm, determine the capacity and total surface area of the bucket. **[2005]**

23. The radius of the base and the height of a solid right circular cylinder are in the ratio $2:3$ and its volume is 1617 cu. cm. Find the total surface area of the cylinder. [Use $\pi = \frac{22}{7}$] **[2006]**

24. The rain water from a roof $22\, m \times 20\, m$ drains into a cylindrical vessel having diameter of base 2 m and height 3.5 m. lithe vessel is just full, find the rainfall in cm. **[2006]**

25. A bucket made up of a metal sheet is in the form of a frustum of a cone of height 16 cm with radii of its lower and upper ends as 8 cm and 20 cm respectively. Find the cost of the bucket if the cost of metal sheet used is Rs. 15 per 100 cm^2. [$Use\ \boldsymbol{\pi} = 3.14$] **[2006]**

26. A solid is in the form of a right circular cylinder with hemispherical ends. The total height of the solid is 58 cm and the diameter of the cylinder is 28cm. Find the total surface area of the sold. [Use $\pi = \frac{22}{7}$] **[2006]**

27. A bucket made up of a metal sheet is in the form of a frustum of a cone. Its depth is 24 cm and the diameters of the top and bottom are 30 cm and 10 cm respectively. Find the cost of milk which can completely fill the bucket at the rate of Rs. 20 per litre and the cost of the metal sheet used, if it costs Rs. 10 per 100 cm^2. **[2006]**

28. Water is flowing at the rate of 15 km/h through a pipe of diameter 14 cm into a rectangular tank which is 50 m long and 44 m wide. Find the time in which the level of water in the tank will rise by 21 cm. **[2006]**

29. Water flows out through a circular pipe whose internal radius is 1 cm, at the rate of 80cm/second into an empty cylindrical tank, the radius of whose base is 40 cm. By how much will the level of water rise in the tank in half an hour? **[2007]**

30. A sphere of diameter 12 cm, is dropped in a right circular cylindrical vessel, partly filled with water. If the sphere is completely submerged in water, the water level in the cylindrical vessel rises by $3\frac{5}{9}$ cm. Find the diameter of the cylindrical vessel. **[2007, 2016]**

31. A sphere of diameter 12 cm, is dropped in a right circular cylindrical vessel, partly filled with water. If the sphere is completely submerged in water, the water level in the cylindrical vessel rises by $3\frac{5}{9}$ cm. Find the diameter of the cylindrical vessel. **[2007]**

32. A tent is in the form of a right-circular cylinder surmounted by a cone. The diameter of the cylindrical portion is 24 cm and the height of the cylindrical portion is 11 m while the vertex of the cone is 16 m above the ground. Find the area of canvas required for making the tent. (Take $\pi = \frac{22}{7}$) **[2007]**

33. A toy is in the form of a cone mounted on a hemisphere of common base radius 7 cm. The total height of the toy is 31 cm. Find the total surface area of the toy. [Use $\pi = \frac{22}{7}$] **[2007, 2013]**

34. A solid right circular cone of diameter 14 cm and height 8 cm is melted to form a hollow sphere. If the external diameter of the sphere is 10 cm, find the internal diameter of the sphere. **[2007]**

35. The diameter of a solid copper sphere is 18 cm. It is melted and drawn into a wire of uniform cross-section. If the length of the wire is 108 m, find its diameter. **[2007]**

36. A hollow copper sphere of external and internal diameter 8 cm and 4 cm respectively is melted into a solid cone of base diameter 8 cm. Find the height of the cone. **[2007]**

37. If the radii of the circular ends of a bucket 45 cm high, are 28 cm and 7 cm, find the capacity and surface area of the bucket. [Use $\pi = \frac{22}{7}$] **[2007]**

38. A tent is in the form of a right-cicular cylinder surmounted by a cone. The diameter of the cylindrical portion is 24 cm and the height of the cylindrical portion is 11 m while the vetex of the cone is 16 m above the ground. Find the area of canvas required for making the tent. [Use $\pi = \frac{22}{7}$] **[2007]**

39. A solid iron rectangular block of dimensions $4.4\ m \times 2.6\ m \times 1\ m$ is cast into a hollow cylindrical pipe of internal radius 30 cm and thickness 5 cm. find the length of the pipe. [Use $\pi = \frac{22}{7}$] **[2007]**

40. Find the number of coins 1.5 cm in diameter and 0.2 cm thick, to be melted to form a right- circular cylinder of height 10 cm and diameter 4.5 cm. **[2007]**

41. A toy is in the form of a cone mounted on a hemisphere with same radius. The diameter of the base of the conical portion is 7 cm and the total height of the toy is 14.5 cm. find the volume of the toy. [Use $\pi = \frac{22}{7}$] **[2007]**

42. A hemispherical bowl of internal diameter 36 cm is full of some liquid. This liquid is to be filled in cylindrical bottles of radius 3 cm and height 6 cm. Find the number of bottles needed to empty the bowl. **[2007]**

43. A hollow sphere of internal and external diameters 4 cm and 8 cm respectively is melted to form a cone of base diameter 8 cm. find the height and the slant height of the cone. **[2007]** **[2011]**

44. The surface are of a sphere is 616 cm^2. Find its radius. **[2008]**

45. If the radii of the circular ends of a conical bucket, which is 16 cm high, are 20 cm and 8 cm, find the capacity and total surface area of the bucket. [Use $\pi = \frac{22}{7}$] **[2008]**

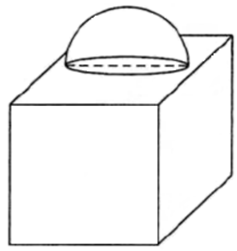
46. A bucket made up of a metal sheet is in the form of a frustum of a cone of height 16 cm with diameters of its lower and upper ends as 16 cm and 40 cm respectively. Find the volume of the bucket. Also, find the cost of the bucket if the cost of metal sheet used in Rs. 20 per 100 cm^2. [$Use\ \boldsymbol{\pi} = 3.14$] **[2008]**

47. A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank in his field which is 10 m in diameter and 2 m deep. If water flows through the pipe at the rate of 6 km/h, in how much time will the tank be filled? **[2008]**

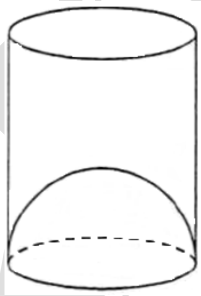
48. A cylindrical vessel with internal diameter 10 cm and height 10.5 cm is full of water. A solid cone of base diameter 7 cm and height 6 cm is completely immersed in water. Find the voume of (i) water displaced out of the cylindrical vessel. (ii) Water left in the cylindrical vessel. [Use $\pi = \frac{22}{7}$] **[2009]**

49. A cylinder and a cone are of same base radius and of same height. Find the ratio of the volume of cylinder to that of the cone. **[2009]**

50. The adjacent figure shows a decorative block which is made of two solids – a cube and a hemisphere. The base of the block is a cube with edge 5 cm and the hemisphere, fixed on the top, has a diameter of 4.2 cm. Find the total surface area of the block. [Use $\pi = \frac{22}{7}$] **[2009]**



51. A juice seller serves his customers using a glass as shown in figure. The inner diameter of the cylindrical glass is 5 cm, but the bottom of the glass has a hemispherical portion raised which reduces the capacity of the glass. If the height of the glass is 10 cm, find the apparent capacity of the glass and its actual capacity. [$Use\ \boldsymbol{\pi} = 3.14$] **[2009]**



52. From a solid cylinder whose height is 8 cm and radius 6 cm, a conical cavity of height 8 cm and of base radius 6 cm, is hollowed out. Find the volume of the remaining solid correct to two places of decimals. Also find the total surface area of the remaining solid. [$Use\ \boldsymbol{\pi} = 3.1416$] **[2009]**

53. A shperical copper shell, of external diameter 18 cm, is melted and recast into a solid cone of base radius 14 cm and height $4\frac{3}{7}$ cm. Find the inner diameter of the shell. **[2009]**

54. A bucket is in the form of a frustum of a cone with a capacity of 12308.8 cm^3. The radii of the top and bottom circular ends of the bucket are 20 cm and 12 cm respectively. Find the height of the bucket and also the area of metal sheet used in making it. [$Use\ \boldsymbol{\pi} = 3.14$] **[2009]**

55. The slant height of a frustum of a cone is 10 cm. If the height of the frustum is 8 cm then find the difference of the radii of its two circular ends. **[2010]**

56. The rain-water collected on the roof of a building, of dimensions $22\ m \times 20\ m$, is drained into a cylindrical vessel having base diameter 2 m and height 3.5 m. If the vessel is full up to the brim, find the height of rain-water on the roof. [Use $\pi = \frac{22}{7}$] **[2010]**

57. A container, open at the top, and made of a metal sheet, is in the form of a frustum of a cone of height 24 cm with radii of its lower and upper ends as 7 cm and 14 cm respectively. Find the cost of milk which can completely fill the container at the rate of Rs. 25 per litre. Also find the area of the metal sheet used to make the container. [Use $\pi = \frac{22}{7}$] **[2010]**

58. The slant height of a frustum of a cone is 4 cm and the perimeters (circumferences) of its circular ends are 18 cm and 6 cm. find the curved surface area of the frustum. [Use $\pi = \frac{22}{7}$] **[2010]**

59. A milk container is made of metal sheet in the shape of frustum of a cone whose volume is $10459\frac{3}{7}\ cm^3$. The radii of its lower and upper circular ends are 8 cm and 20 cm respectively. Find the cost of metal sheet used in making the container at the rate of Rs. 1.40 per square centimeter. [Use $\pi = \frac{22}{7}$] **[2010]**

60. A toy is in the form of a hemisphere surmounted by a right circular cone of the same base radius as that of the hemisphere. If the radius of base of the cone is 21 cm and its volume is $\frac{2}{3}$ of the volume of the hemisphere, calculate the height of the cone and the surface area of the toy. [Use $\pi = \frac{22}{7}$] **[2010]**

61. A cone of height 20 cm and radius of base 5 cm is made up of modelling clay. A child reshapes it in the form of a sphere. Find the diameter of the sphere. **[2011]**

62. Two cubes each of voulue 27 cm^3 are joined end to end to form a solid. Find the surface area of the resulting cuboid. **[2011]**

63. The radius (in cm) of the largest right circular cone that can be cut out from a cube of edge 4.2 cm is **[2011]**

(a) 4.2 (b) 2.1 (c) 8.4 (d) 1.05

64. An open metal bucket is in the shape of a frustum of a cone of height 21 cm with radii of its lower and upper ends as 10 cm and 20 cm respectively. Find the cost of milk which can completely fill the bucket at Rs. 30 per litre. [Use $\pi = \frac{22}{7}$] **[2011]**

65. Water is flowing at the rate of 15 km/hour through a pipe of diameter 14 cm into a cuboidal pond which is 50 m ling and 44 m wide. In what time will the level of water in the pond rise by 21 cm? **[2011]**

66. The dimensions of a metallic cuboid are $100\ cm \times 80\ cm \times 64\ cm$. It is melted and recast into a cube. Find the surface area of the cube. **[2011]**

67. A solid is hemispherical at the bottom and conical (of same radius) above it. If the surface areas of the two parts are equal, then the ratio of its radius and the slant height of the conical part is **[2011]**

(a) 2 : 1 (b) 1 : 2 (c) 1 : 4 (d) 4 : 1

68. From a solid cylinder of height 14 cm and base diameter 7 cm, two equal conical holes each of radius 2.1 cm and height 4 cm are cut off. Find the volume of the remaining solid. **[2011]**

69. Water is flowing at the rate of 6 km/h through a pipe of diameter 14 cm into a rectangular tank which is 60 m long and 22 m wide. Determine the time in which the level of the water in the tank will rise by 7 cm. [Use $\pi = \frac{22}{7}$] **[2011]**

70. The radii of the circular ends of a solid frustum of a cone are 18 cm and 12 cm and its height is 8 cm. find its total surface area. [$Use\ \boldsymbol{\pi} = 3.14$] **[2011]**

71. A sphere of diameter 18 cm is dropped into a cylindrical vessel of diameter 36 cm, partly filled with water. If the sphere is completely submerged, then the water level rises (in cm) by **[2011]**

(a) 3 (b) 4 (c) 5 (d) 6

72. Two cubes, each of side 4 cm are joined end to end. Find the surface area of the resulting cuboid. **[2011]**

73. The raii of the circular ends of a bucket of height 15 cm are 14 cm and r cm ($r < 14\ cm$). If the volume of bucket is 5390 cm^3, then find the value of r. [Use $\pi = \frac{22}{7}$] **[2011]**

74. From a solid cylinder whose height is 15 cm and diameter 16 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid. [$Use\ \boldsymbol{\pi} = 3.14$] **[2011]**

75. A solid sphere of radius 10.5 cm is melted and recast into smaller solid cones, each of radius 3.5 cm and height 3 cm. Find the number of cones so formed. [Use $\pi = \frac{22}{7}$] **[2012]**

76. A hemispherical bowl of internal radius 9 cm is full of water. Its contents are emptied in a cylindrical vessel of internal radius 6 cm. Find the height of water in the cylindrical vessel. **[2012]**

77. A hemispherical tank, full of water, is emptied by a pipe at the rate of $\frac{25}{7}$ litres per second. How much time will it take to empty half the tank if the diameter of the base of the tank is 3 m? **[2012]**

78. A drinking glass is in the shape of the frustum of a cone of height 14 cm. The diameters of its two circular ends are 4 cm and 2 cm. Find the capacity of the glass. [Use $\pi = \frac{22}{7}$] **[2012]**

79. A military tent of height 8.25 m is in the form of a right circular cylinder of base diameter 30 m and height 5.5 m surmounted by a right circular cone of same base radius. Find the length of the canvas use in making the tent, if the breadth of the canvas is 1.5 m. **[2012]**

80. A solid right circular cone is cut into two parts at the middle of its height by a plane parallel to its base. The ratio of the volume of the smaller cone to the whole cone is **[2012]**

(a) 1 : 2 (b) 1 : 4 (c) 1 : 6 (d) 1 : 8

81. A vessel is in the form of a hemispherical bowl surmounted by a hollow cylinder of same diameter. The diameter of the hemispherical bowl is 14 cm and the total height of the vessel is 13 cm. find the total surface area of the vessel. [Use $\pi = \frac{22}{7}$] **[2013]**

82. A solid cone of base radius 10 cm is cut into two parts through the mid-point of its height, by a plane parallel to its base. Find the ratio in the volumes of the two parts of the cone. **[2013]**

83. A solid metallic sphere of diameter 8 cm is melted and drawn into in cylindrical wire of uniform width. If the length of the wire is 12 m, find its width. **[2013]**

84. A wooden toy was made by scooping out a hemisphere of same radius from each end of a solid cylinder. If the height of the cyllinder is 10 cm and its base is of radius 3.5 cm, find the volume of wood in the toy. [Use $\pi = \frac{22}{7}$] **[2013]**

85. Water running in a cylindrical pipe of inner diameter 7 cm, is collected in a container at the rate of 192.5 litres per minute. Find the rate of flow of water in the pipe in km/h. [Use $\pi = \frac{22}{7}$] **[2013]**

86. Water is flowing through a cylindrical pipe, of internal diameter 2 cm, into a cylindrical tank of base radius 40 cm, at the rate of 0.4 m/s. Determine the rise in level of water in the tank in half an hour. **[2013]**

87. A bucket open at the top, and made up of a metal sheet is in the form of a frustum of a cone. The depth of the bucket is 24 cm and the diameters of its upper and lower circular ends are 30 cm and 10 cm respectively. Find the cost of metal sheet used in it at the rate of Rs. 10 per 100 cm^2. [$Use\ \boldsymbol{\pi} = 3.14$] **[2013]**

88. A container open at the top and made up of metal sheet is in the form of a frustum of a cone of height 16 cm with diameters of its lower and upper ends as 16 cm and 40 cm respectively. Find the cost of metal sheet used to make the container, if it costs Rs. 10 per 100 cm^2. [$Use\ \boldsymbol{\pi} = 3.14$] **[2013]**

89. Two circular pieces of equal radii and maximum area, touching each other, are cout out from a rectangular card board of dimensions $14\ cm \times 7\ cm$. Find the area of the remaining card board. [Use $\pi = \frac{22}{7}$] **[2013]**

90. A rectangular sheet of paper $40\ cm \times 22\ cm$, is rolled to form a hollow cylinder of height 40 cm. The radius of the cylinder (in cm) is **[2014]**

(a) 3.5 (b) 7 (c) $\frac{80}{7}$ (d) 5

91. The number of solid spheres, each of diameter 6 cm that can be made by melting a solid metal cylinder of height 45 cm and diameter 4 cm, is: **[2014]**

(a) 3 (b) 5 (c) 4 (d) 6

92. A 5 m wide cloth is used to make a conical tent of base diameter 14 m and height 24 m. Find the cost of cloth used at the rate of Rs. 25 per metre. [Use $\pi = \frac{22}{7}$] **[2014]**

93. A girl empties a cylindrical bucket, full of sand, of base radius 18 cm and height 32 cm, on the floor to form a conical heap of sand. If the height of this conical heap is 24 cm, then find its slant height correct upto one place of decimal. **[2014]**

94. A hemispherical depression is cut out from one face of a cubical block of side 7 cm, such that the diameter of the hemisphere is equal to the edge of the cube. Find the surface area of the remaining solid. [Use $\pi = \frac{22}{7}$] **[2014]**

95. A metallic bucket, open at the top, of heights 24 cm is in the form of the frustum of a cone, the radii of whose lower and upper circular ends are 7 cm and 14 cm respectively. Find (i) the volume of water which can completely fill the bucket. (ii) the area of the metal sheet used to make the bucket. [Use $\pi = \frac{22}{7}$] **[2014]**

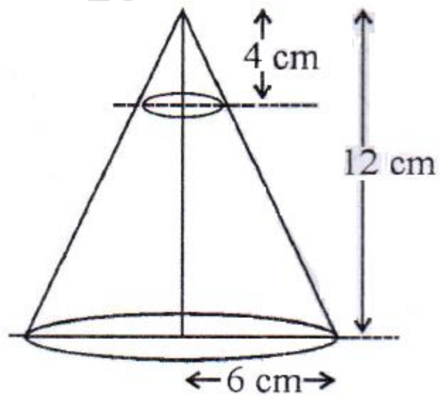
96. A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank which is 10 m in diameter and 2 m deep. If the water flows through the pipe at the rate of 4 km per hour, in how much time will the tank be filled completely? **[2014]**

97. A solid metallic right circular cone 20 cm high and whose vertical angle is 60°, is cut into two parts at the middle of its height by a plane parallel to its base. If the frustum so obtained be drawn into a wire of diameter $\frac{1}{12}$ cm, find the length of the wire. **[2014]**

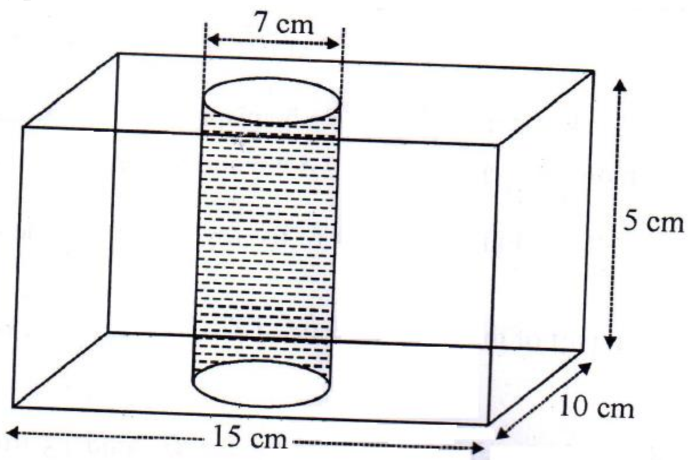
98. Sushant has a vessel, of the form of an inverted cone, open at the top, of height 11 cm and radius of top as 2.5 cm and is full of water. Metallic spherical balls each of diameter 0.5 cm are put in the vessel due to which $\left(\frac{2}{5}\right)^{th}$ of the water in the vessel flows out. Find how many balls were put in the vessel. Sushant made the arrangement so that the water that flows out irrigates the flower beds. What value has been shown by Sushant? **[2014]**

99. From a solid cylinder of height 2.8 cm and diameter 4.2 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid. [Take $\pi = \frac{22}{7}$] **[2014]**

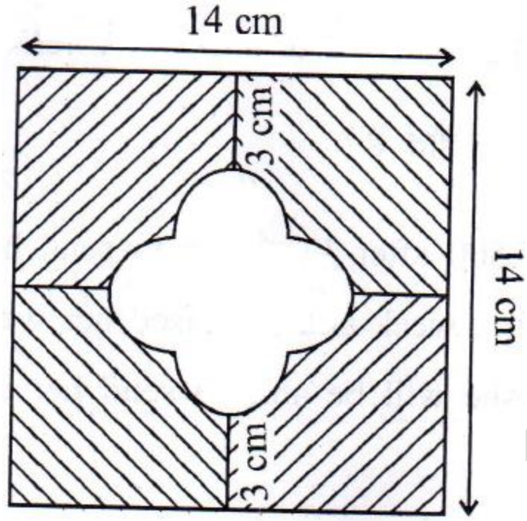
100. In figure, form the top of a solid cone of height 12 cm and base radius 6 cm, a cone of height 4 cm is removed by a plane parallel to the base. Find the total surface area of the remianing solid. [Use $\pi = \frac{22}{7}$ and $\sqrt{5} = 2.236$] **[2015]**



101. In figure, from a cuboidal solid metallic block, of dimensions $15\ cm \times 10\ cm \times 5\ cm$, a cylindrical hole of diameter 7 cm is drilled out. Find the surface area of the remaining block. [Use $\pi = \frac{22}{7}$] **[2015]**



102. In figure, find the area of the shaded region. [Use π = 3.14] **[2015]**



103. A solid wooden toy is in the form of a hemisphere surmounted by a cone of same radius. The radius of hemisphere is 3.5 cm and the total wood used in the making of toy is $166\frac{5}{6}\ cm^3$. Find the height of the toy. Also, find the cost of painting the hemispherical part of the toy at the rate of Rs. 10 per cm^2. [Use $\pi = \frac{22}{7}$] **[2015]**

104. A well of diameter 4 m is dug 14 m deep. The earth taken out is spread evenly all around the well to form a 40 cm high embankment. Find the width of the embankment. **[2015]**

105. Water is flowing at the rate of 2.52 km/h through a cylindrical pipe into a cylindrical tank, the radius of whose base is 40 cm. If the increase in the level of water in the tank, in half an hour is 3.15 m, find the internal diameter of the pipe. **[2015]**

106. In a rain-water harvesting system, the rain-water from a roof of $22\ m \times 20\ m$ drains into a cylindrical tank having diameter of base 2 m and height 3.5 m. If the tank is full, find the rainfall in cm. Write your views on water conservation. **[2016]**

107. A tent is in the shape of a cylinder surmounted by a conical top of same diameter. If the height and diameter of cylindrical part are 2.1 m and 3 m respectively and the slant height of conical part is 2.8 m, find the cost of canvas needed to make the tent if the canvas is available at the rate of Rs. 500/sq. metre. [Use $\pi = \frac{22}{7}$] **[2016]**

108. Water in a canal, 5.4 m wide and 1.8 m deep, is flowing with a speed of 25 km/h. How much area can it irrigate in 40 minutes, if 10 cm of standing water is required for irrigation? **[2016]**

109. The slant height of a frustum of a cone is 4 cm and the perimeters of its circular ends are 18 cm and 6 cm. Find the curved surface area of the frustum. **[2016]**

110. The dimensions of a solid iron cuboid are $4.4\ m \times 2.6\ m \times 1.0\ m$. It is melted and recast into a hollow cylindrical pipe of 30 cm inner radius and thickness 5 cm. Find the length of the pipe. **[2016]**

111. The $\left(\frac{3}{4}\right)^{th}$ part of a conical vessel of internal radius 5 cm and height 24 cm is full of water. The water is emptied into a cylindrical vessel with internal radius 10 cm. Find the height of water in cylindrical vessel. **[2017]**

112. Due to heavy floods in a state, thousands were rendered homeless. 50 schools collectively offered to the state government to provide place and the canvas for 1500 tents to be fixed by the governments and diecided to share the whole expenditure equally. The lower part of each tent is cylindrical of base radius 2.8 m and height 3.5 m, with conical upper part of same base radius but of height 2.1 m. If the canvas used to make the tents costs Rs. 120 per sq. m, find the amount shared by each school to set up the tents. What value is generated by the above problem? [Use $\pi = \frac{22}{7}$] **[2017]**

113. A conical vessel, with base radius 5 cm and height 24 cm, is full of water. This water is emptied into a cylindrical vessel of vase radius 10 cm. Find the height to which the water will rise in the cylindrical vessel. [Use $\pi = \frac{22}{7}$] **[2017]**

114. Volume and surface area of a solid hemisphere are numerically equal. What is the diameter of hemisphere? **[2017]**

115. The height of a cone is 10 cm. The cone is divided into two parts using a plane parallel to its base at the middle of its height. Find the ratio of the volumes of the two parts. **[2017]**

116. In a hospital used water is colleted in a cylindrical tnak of diameter 2 m and height 5 m. After recycling, this water is used to irrigate a park of hospital whose length is 25 m and breadth is 20 m. If tank is filled completely then what will be the height of standing water used for irriagating the park. Write your views on recycling of water. **[2017]**

117. A sphere of diameter 12 cm, is dropped in a right circular cylindirical vessel, partly filled with water. If the sphere is completely submerged in water, the water level in the cylindrical vessel rises by $3\frac{5}{9}$ cm. Find the diameter of the cylindrical vessel. **[2017]**

118. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in figure. If the height of the cylinder is 10 cm and its base is of radius 3.5 cm. Find the total surface area of the article. **[2018]**

119. A heap of rice is in the form of a cone of base diameter 24 m and height 3.5 m. Find the volume of the rice. How much canvs cloth is required to just cover the heap? **[2018]**

120. The diameters of the lower and upper ends of a bucket in the form of a frustum of a cone are 10 cm and 30 cm respectively. If its height is 24 cm, find (i) the area of the metal sheet used to make the bucket. (ii) Why we should avoid the bucket made by ordinary plastic? [Use π = 3.14] **[2018]**

Ch. 14. Statistics

1. Two groups of 30 and 50 items have average score 120 and 80 respectively. When a group of 40 items is added to the two groups, the combined average score of 120 items is 90. Find the average score of the new group of 40 items. **[1999]**

2. A cricketer has mean score of 58 runs in nine innings. Find out how many runs are to be scored in the tenth innings to raise the mean score to 61. **[1999, 2003]**

3. Find the mean of the following data: 46, 64, 87, 41, 58, 77, 35, 90, 55, 33, 92. If in the data, the observation 92 is replaced by 19, determine the new median. **[1999, 2003]**

4. The mean weight of 21 students of a class is 52 kg. If the mean weight of first 11 students of the class is 50 kg and that of last 11 students is 54 kg, find the weight of the 11^{th} student. **[2000]**

5. The following data has been arranged in ascending order: 12, 14, 17, 21, x, 26, 28, 32, 36. If the median of the data is 23, find x. If 32 is changed to 23, find the new median. **[2000]**

6. For what value of x, is the mode of the following data 5? **[2000]**

2, 4, 3, 5, 4, 5, 6, 4, x, 7, 5.

7. Find the mean of the following frequency distribution: **[2001]**

Class Interval	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	100 - 120
Frequency	20	35	52	44	38	31

8. Find the mean of the following distribution: **[2002]**

Class Interval	15 – 25	25 – 35	35 – 45	45 – 55	55 – 65
Frequency	60	35	22	18	15

9. The mean of 30 observations was 150. It was detected on checking that one observation of 165 was wrongly copied as 135 for the computation of mean. Find the correct mean. **[2003]**

10. Find the value of p if mean of the following distribution is 7.5: **[2003]**

x	3	5	7	9	11	13
y	6	8	15	p	8	4

11. The following data shows the expenditure of an individual over various items: **[2004]**

Item	Education	Food	Rent	Clothing	Others
Expenditure (in Rs.)	1600	3200	4000	2400	3200

12. The mean of the following frequency distribution is 57.6 and the sum of the observations is 50. Find the missing frequencies f_1 and f_2. **[2004]**

Class	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	100 – 120
Frequency	7	f_1	12	f_2	8	5

13. If the mean of the following data is 18.75 find the value of p: **[2005]**

x_i	10	15	p	25	30
f_i	5	10	7	8	2

14. The data on mode of transport used by students to come to school are given below: **[2005]**

Mode of transport	Bus	Cycle	Train	Car	Scooter
Number of students	120	180	240	80	100

Represent the above data by a pie-chart.

15. Find the mean of the following distribution: **[2005]**

Class	4 – 8	8 – 12	12 – 16	16 – 20	20 – 24	24 – 28	28 – 32	32 – 36
Number of students	2	12	15	25	18	12	13	3

16. Given below is the expenditure of a person on different items out of his salary of Rs. 14, 400. **[2005]**

Item	Clothing	Food	Rent	Education	Others	Grand total
Expenditure (in Rs.)	2800	3600	3600	1800	2600	14400

Draw a pie-chart to depict the above data.

17. The arithmetic Mean of the following frequency distribution is 50. Find the value of p. **[2006]**

Classes	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
Frequency	17	p	32	24	19

18. The following table shows the monthly expenditure of a company. Draw a pie chart for the data. **[2006]**

Item	Wages	Materials	Taxation	Adm. Exp.	Miscellaneous
Amount (in Rs.)	4800	3200	2400	3000	1000

19. The Arithmetic Mean of the following frequency distribution is 47. Determine the value of p. **[2006]**

Classes	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
Frequency	8	15	20	p	5

20. The following table shows the monthly expenditure of a family. Draw a pie chart for the data: **[2006]**

Item	Rent	Food	Clothing	Education	Misc.
Amount (In Rs.)	1500	3600	1200	2100	2400

21. The enrolment of a secondary school in different classes is given below: **[2007]**

Class	VI	VII	VIII	IX	X
Enrolment	600	500	400	700	200

Draw a pie chart to represent the above data.

22. The expenditure (in rupees) of a family for a month is as follows: **[2007]**

Item	Rent	Food	Education	Electricity and Water	Others
Expenditure	800	3000	1200	400	1800

Represent the above data by a pie-chart.

23. The number of students admitted in different faculties of a college are given below: **[2007]**

Faculty	Science	Art	Commerce	Law	Education
Number of Students	800	3000	1200	400	1800

Draw a pie-chart to represent the above data.

24. The expenditure on different heads of a household (in hundreds of rupees) is as follows: **[2007]**

Head	Education	Games	Entertainment	Gardening	Decoration
Expenditure	20	10	15	10	17

Draw a pie diagram to represent the above data.

25. If the mean of the following frequency distribution is 62.8, find the missing frequency x. **[2007, 2015]**

Classes	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	100 – 120
Frequency	5	8	x	12	7	8

26. If the mean of the following frequency distribution is 49, find the missing frequency p. **[2007]**

Class	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
Frequency	2	6	p	5	2

27. Find the mean of the following data: **[2007]**

Class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
Frequency	12	7	16	12	11	7	19	16

28. Find the mean of the following distribution: **[2007]**

Class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	8	12	10	11	9

29. Find the class marks of classes 10 – 25 and 35 – 55. **[2008]**

30. Find the Mean, Mode and Median for the following data: **[2008]**

Classes	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	100 – 120	120 – 140
Frequency	6	8	10	12	6	5	3

31. Find the Mean, Mode and Median for the following data: **[2008]**

C. I.	0 – 50	50 – 100	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350
f	2	3	5	6	5	3	1

32. Which measure of central tendency is giving by the x-coordinate of the point of intersection of the "more than ogive" and " less than ogive"? **[2008]**

33. 100 surnames were randomly picked up from a local telephone directory and distribution of number of letters of the English alphabet in the surnames was obtained as follows: **[2008]**

Number of letters	1 – 4	4 – 7	7 – 10	10 – 13	13 – 16	16 – 19
Number of surnames	6	30	40	16	4	4

Determine the median and mean number of letters in the surnames. Also, find the modal size of surnames.

34. Find the Mean, Mode and Median for the following frequency distribution: **[2008]**

Classes	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Frequency	6	8	10	15	5	4	2

35. Write the median class of the following distribution: **[2009]**

Classes	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Frequency	4	4	8	10	12	8	4

36. The following table gives the daily income of 50 workers of a factory: **[2009]**

Daily income (in Rs.)	100 – 120	120 – 140	140 – 160	160 – 180	180 – 200
Number of workers	12	14	8	6	10

Find the Mean, Mode and Median of the above data.

37. Find the Mean, Mode and Median for the following data: **[2009]**

Marks obtained	25 – 35	35 – 45	45 – 55	55 – 65	65 – 75	75 – 85
Number of students	7	31	33	17	11	1

38. What is the lower limit of the modal class of the following frequency distribution? **[2009]**

Age (in years)	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Number of patients	16	13	6	11	27	18

39. During the medical check-up of 35 students of a class their weights were recorded as follows: **[2009]**

Weight (in kg)	38 – 40	40 – 42	42 – 44	44 – 46	46 – 48	48 – 50	50 – 52
Number of students	3	2	4	5	14	4	3

Draw a less than type and a more than type ogive from the given data. Hence obtain the median weight from the graph.

40. Find the Mean, Mode and Median for the following frequency distribution: **[2010]**

Classes	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Frequency	4	4	7	10	12	8	5

41. If the mean of the following frequency distribution is 65.6, find the missing frequencies (f_1, f_2) : **[2010]**

Class	10 – 30	30 – 50	50 – 70	70 – 90	90 – 110	110 – 130	Total
Frequency	5	8	f_1	20	f_2	2	50

42. The mean and median of same data are 24 and 26 respectively. The value of mode is: **[2011]**

(a) 23 (b) 26 (c) 25 (d) 30

43. The ages of employees in a factory are as follows: **[2011]**

Age in years	17 – 23	23 – 29	29 – 35	35 – 41	41 – 47	47 – 53
No. of employees	2	5	6	4	2	1

Find the median age group of the employees.

44. Compute the median for the following data: **[2011]**

Class Interval	Less than 20	Less than 30	Less than 40	Less than 50	Less than 60	Less than 70	Less than 80	Less than 90	Less than 100
Cumulative Frequency	0	4	16	30	46	66	82	92	100

45. The following is the daily pocket money spent by students. **[2011]**

Pocket money (Rs.)	0 – 15	15 – 30	30 – 45	45 – 60	60 – 75
No. of students	8	15	7	4	6

Find the mode of the above data.

46. Find the mean of the following frequency distribution, using step deviation method. **[2011]**

Class	100 – 150	150 – 200	200 – 250	250 – 300	300 – 350
Frequency	4	5	12	2	2

47. The mean of the following distribution is 22, find the missing frequency f: **[2011]**

Class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	12	16	6	f	9

48. Find the missing frequency f if the mode of the given data is 154. **[2011]**

Class	120 – 130	130 – 140	140 – 150	150 – 160	160 – 170	170 – 180
Frequency	2	8	12	f	8	7

49. Relationship among mean, median and mode is: **[2012]**

(a) $3\ Median = Mode + 2\ Mean$ (b) $3\ Mean = Median + 2\ Mode$

(c) $3\ Mode = Mean + 2\ Median$ (d) $Mode = 3\ Mean - 2\ Median.$

50. Convert the following distribution to a 'more than type' cumulative frequency distribution: **[2012]**

Class	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Frequency	4	8	10	12	10

51. Calculate the median for the following distribution: **[2012]**

Marks obtained	Below 10	Below 20	Below 30	Below 40	Below 50	Below 60
No. of students	6	15	29	41	60	70

52. Compute the arithmetic mean for the following data: **[2012]**

Marks obtained	Less than 10	Less than 20	Less than 30	Less than 40	Less than 50	Less than 60
No. of students	14	22	37	58	67	75

53. For the following frequency distribution, draw a cumulative frequency curve of less than type. **[2012]**

Class	**Frequency**
200 – 250	30
250 – 300	15
300 – 350	45
350 – 400	20
400 – 450	25
450 – 500	40
500 – 550	10
550 – 600	15

54. Find the missing frequencies in the following frequency distribution table, if N = 100 and median is 32. **[2012, 2013]**

Marks obtained	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	Total
No. of students	10	?	25	30	?	10	100

55. Compute the median for the following cumulative frequency distribution: **[2013]**

Weight (in kg)	Less than 38	Less than 40	Less than 42	Less than 44	Less than 46	Less than 48	Less than 50	Less than 52
No. of students	0	3	5	9	14	28	32	35

56. The following frequency distribution gives the monthly consumption of electricity of 68 consumers of a locality. **[2013, 2017]**

Monthly Consumption (in units)	**Number of consumers**
65 – 85	4
85 – 105	5
105 – 125	13
125 – 145	20
145 – 165	14
165 – 185	8
185 – 205	4

Write the above distribution as less than type cumulative frequency distribution.

57. The mean of the following frequency distribution is 25.2. Find the missing frequency x. **[2013]**

Class Interval	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	8	x	10	11	9

58. Find the mode of the following data: **[2013]**

Class	0 – 20	20 – 40	40 – 60	60 – 80
Frequncy	15	6	18	10

59. The following distribution shows the daily pocket money of 40 students of a class. If the mean pocket money is Rs. 21.7, find the missing frequencies x and y. **[2014]**

Daily pocket money (in Rs.)	10 – 14	14 – 18	18 – 22	22 – 26	26 – 30	30 – 34	34 – 38
Number of students	8	7	4	x	6	y	3

60. 120 surnames were randomly picked up from a local telephone directory and the frequency distribution of the number of letters in the English alphabets in the surnames was recorded as follows: **[2014]**

Number of letters	0 – 3	3 – 6	6 – 9	9 – 12	12 – 15	15 – 18
No. of surnames	x	45	50	8	6	y

If mean of the above data is 7, find the missing frequencies x and y.

61. Construction of a cumulative frequency table is useful in determining the **[2014]**

(a) Mean (b) Mode (c) Median (d) all these three measures.

62. From the following cumulative frequency table, write the frequency of the class interval 30-40. **[2014]**

Marks	Less than 10	Less than 20	Less than 30	Less than 40	Less than 50
No. of students	2	15	40	71	85

63. Given below is a cumulative frequency distribution table showing daily income of 50 workers of a factory: **[2014]**

Daily income (in Rs)	More than or equal to 200	More than or equal to 300	More than or equal to 400	More than or equal to 500	More than or equal to 600
Number of workers	50	42	30	18	05

Draw cumulative frequency curve (ogive) of 'more than' type for this data.

64. Find the mean and median for the following data: **[2014]**

Class	0 – 4	4 – 8	8 – 12	12 – 16	16 – 20
Frequency	3	5	9	5	3

65. In a subji mandi, fruit vendors were selling apples in boxes, which carried varying number of apples. The following frequency distribution shows apples according to the number of boxes: **[2014]**

No. of apples in a box	10 – 12	12 – 14	14 – 16	16 – 18	18 – 20
No. of boxes	12	25	13	10	20

Find the mean number of apples kept in a packing box, using step deviation method.

66. Given below is the distribution of marks obatianed by 229 students: **[2014]**

Marks	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 - 70	70 – 80	Total
No. of students	12	30	34	65	45	25	18	229

Write the above distribution as more than as more than type cumulative frequesncy distribution.

67. In a retail market, fruit vendor were selling mangoes kept in packing boxes. These boxes contained varying numbers of mangoes. The following was the distribution of mangoes according to the number of boxes. **[2014]**

No. of mangoes	50 – 52	53 – 55	56 – 58	59 – 61	62 – 64
No. of boxes	15	110	135	115	25

Find the mean number of mangoes kept in a packing box, using step-deviation method.

68. The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is 18. Find the value of p. **[2014]**

Daily pocket allowance (in Rs.)	11 – 13	13 – 15	15 – 17	17 – 19	19 – 21	21 – 23	23 – 25
Number of children	7	6	9	13	p	5	4

69. The following table shows the ages of 100 persons of a locality. **[2014]**

Age (years)	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
No. of persons	5	15	20	23	17	11	9

Draw the less than ogive and the find the median.

70. The median of the following data is 20.75. Find the missing frequencies x and y, if the total frequency is 100. **[2014]**

C. I.	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35	35 – 40
f	7	10	x	13	y	10	14	9

71. For a given data with 100 observations the 'less than ogive and the more than ogive' intersect at (525, 50). The median of the data is **[2015]**

(a) 520 (b) 525 (c) 500 (d) 225

72. In the given data: **[2015]**

C. I.	65 – 85	85 – 105	105 – 125	125 – 145	145 – 165	165 – 185	185 – 205
f	4	5	13	20	14	7	4

the difference between the upper limit of the median class and the lower limit of the modal class is

(a) 0 (b) 20 (c) 10 (d) 30

73. Find the median class and the modal class for the following distribution. **[2015]**

C. I.	135 – 140	140 – 145	145 – 150	150 – 155	155 – 160	160 – 165
f	4	7	18	11	6	5

74. Find the mean of the following frequency distribution, using step-deviation method. **[2015]**

Class	25 – 29	30 – 34	35 – 39	40 – 44	45 – 49	50 – 54	55 – 59
Frequency	14	22	16	6	5	3	4

75. Find the mode of the following frequency distribution. **[2015]**

Classes	5 – 15	15 – 25	25 – 35	35 – 45	45 – 55	55 – 65	65 – 75
Frequency	2	3	5	7	4	2	2

76. Compute the missing frequencies, x and y in the following data if the mean is $166\frac{9}{26}$ and the sum of the observations is 52. Also, calculate the median. **[2015]**

C. I.	140 – 150	150 – 160	160 – 170	170 – 180	180 – 190	190 – 200	Total
f	5	x	20	y	6	2	52

77. If the median of the following data is 32.5, find the missing frequencies. Here, the sum of the observations is 40. **[2015]**

Class inverval	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Frequency	f_1	5	9	12	f_2	3	2

78. During the medical check-up of 35 students of a class, their weights were recorded as follows: **[2015]**

Weight (in kg)	Less than 38	Less than 40	Less than 42	Less than 44	Less than 46	Less than 48	Less than 50	Less than 52
No. of stds.	0	3	5	9	14	28	32	35

Draw a less than type ogive for the given data. Hence, obtain the median weight from the graph and verify the result by using the formula.

79. The mean of first 20 natural numbers is **[2016]**

(a) 7.5 (b) 8.5 (c) 9.5 (d) 10.5

80. The length of 42 leaves of a plant are measure correct up to the nearest millimeter and the data is as follows: **[2016, 2017]**

Length (in m)	118 – 126	126 – 134	134 – 142	142 – 150	150 – 158	158 – 166
No. of leaves	4	5	10	14	4	5

Find the mode length of the leaves.

81. The table below gives the percentage distribution of female teachers in primary schools of rural areas of various states and union territories (U. T.) of India. Find the mean percentage of female teachers by using step-deviation method. **[2016]**

Percentage of female teachers	15 – 25	25 – 35	35 – 45	45 – 55	55 – 65	65 – 75	75 – 85
No. of states/U.T.	6	11	7	4	4	2	1

82. The following distribution shows the number of runs scored by some top batsman of the world in one-day cricket matches: **[2016]**

Runs scored	Number of batsman
3000 – 4000	4
4000 – 5000	18
5000 – 6000	9
6000 – 7000	7
7000 – 8000	6
8000 – 9000	3
9000 – 10000	1
10000 – 11000	1

Find the mode.

83. Find mean of the following frequency distribution using step-deviation method: **[2017]**

C. I.	0 – 60	60 – 120	120 – 180	180 – 240	240 – 300
f	22	35	44	25	24

84. Then mean of the following distribution is 52.5, find the value of p. **[2017]**

Classes	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
Frequency	15	22	37	p	21

85. A survey regarding the height (in cm) of 51 girls of class X of a school was conducted and the following data was obtained: **[2017]**

Height (in cm)	Less than 140	Less than 145	Less than 150	Less than 155	Less than 160	Less than 165
No. of girls	4	11	29	40	45	51

Find the median height.

86. If the median of the distribution given below is 28.5, find the values of x and y, if the total frequecy is 60. **[2017]**

Class Interval	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	Total
Frequency	5	x	20	15	y	5	60

87. The following table shows the ages of 100 persons of a locality. **[2017]**

Age (in years)	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
No. of persons	5	15	20	23	17	11	9

Draw the less than ogive and find the median.

88. The table below shows the salaries of 280 persons: **[2018]**

Salary (in thousand Rs.)	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35	35 – 40	40 – 45	45 – 50
No. of persons	49	133	63	15	6	7	4	2	1

Calculate the median salary of the data.

89. The mean of the following distribution is 18. Find the frequency f of the class 19 – 21. **[2018]**

Class	11 – 13	13 – 15	15 – 17	17 – 19	19 – 21	21 – 23	23 – 25
frequency	3	6	9	13	f	5	4

90. The following distribution gives the daily income of 50 workers of a factory: **[2018]**

Daily income (in Rs.)	100 – 120	120 – 140	140 – 160	160 – 180	180 – 200
Number of workers	12	14	8	6	10

Convert the distribution above to a less than type cumulative frequency distribution and draw its ogive.

Ch. 15 Probability

1. A card is drawn from an ordinary pack and a gambler bets that it is a spade or an ace. What are the odds against his winning this bet? **[2003]**

2. A card is drawn at random from a well shuffled deck of 52 cards. Find the probability of getting (a) a Queen (b) a Diamond (c) a King or an Ace (d) a red Ace. **[2003]**

3. A bag contains 4 red, 5 black and 6 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is (i) white (ii) red (iii) not black (iv) red or white. **[2004]**

4. A card is drawn at random from a well shuffled pack of 52 cards. Find the Probability that the card drawn is neither a red card nor a queen. **[2005, 2017]**

5. A bag contains 8 red, 6 white and 4 black balls. A ball is drawn at random from the bag. Find the probability that the drawn ball is: (i) red or white (ii) not black (ii) neither white nor black. **[2005]**

6. A box contains 20 balls bearing numbers 1, 2, 3, 4, ..., 20. A ball is drawn at random from the box. What is the probability that the number on the ball is (a) an odd number (b) divisible by 2 or 3 (c) prime number (d) Not divisible by 10. **[2006]**

7. A card is drawn at random from a well- shuffled deck of playing cards. Find the probability that the card drawn is (i) a card of spades or an ace (ii) a red king (iii) neither a king nor a queen (iv) either a king or a queen. **[2006]**

8. An unbiased die is tossed once. Find the probability of getting (i) a multiple of 2 or 3 (ii) a prime number greater than 2. **[2007]**

9. From a pack of 52 cards, red face cards are removed. After that a card is drawn at random from the pack. Find the probability that the card drawn is (i) a queen (ii) a red card (iii) a spade card. **[2007]**

10. From a pack of 52 cards, a black jack, a red queen and two black kings fell down. A card was then drawn from the pack at random. Find the probability that the selected card is a (i) black card (ii) king (iii) red queen. **[2007]**

11. Two coins are tossed simultaneously. Find the probability of getting (i) two heads (ii) at least one tail. **[2007]**

12. A box contains 5 red balls, 4 green balls and 7 white balls. A ball is drawn at random from the box. Find the probability that the ball drawn is (i) white (ii) neither red nor white. **[2007]**

13. All the three face cards of spades are removed from a well-shuffled pack of 52 card. A card is then drawn at random from the remaining pack. Find the probability of getting (i) a black face card (ii) a queeen (iii) a black card. **[2007]**

14. Cards marked with numbers 3, 4, 5, ..., 50 are placed in a box and mixed thoroughly. One card is drawn at random from the box. Find the probability that number on the drawn card is (i) divisible by 7 (ii) a number which is a perfect square. **[2007]**

15. Tickets numbers 3, 5, 7, 9, . . ., 29 are placed in a box and mixed thoroughly. One ticket is drawn at random from the box. Find the probability that the number on the ticket is (i) a prime number (ii) a number less than 16 (iii) a number divisible by 3. **[2007]**

16. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball from the bag is thrice that of a red ball, find the number of blue balls in the bag. **[2007]**

17. From a well shuffled pack of cards, a card is drawn at random. Find the probability of getting a black queen. **[2008]**

18. A die is thrown once. Find the probability of getting (i) an even prime number (ii) a multiple of 3. **[2008]**

19. A pair of dice is thrown once. Find the probability of getting the same number on each dice. **[2008]**

20. A bag contains 4 red, 5 black and 3 yellow balls. A ball is taken out of the bag at random. Find the probability that the ball taken out is of (i) yellow colour (ii) not of red colour. **[2008]**

21. A bag contains tickets, numbered 11, 12, 13, …, 30. A ticket is taken out from the bag at random. Find the probability that the number on the drawn ticket (i) is a multiple of 7 (ii) is greater than 15 and a multiple of 5. **[2008]**

22. A die is thrown once. Find the probability of getting a number less than 3. **[2008]**

23. A die is thrown once. Find the probability of getting a number greater than 5. **[2008]**

24. The king, queen and jack of clubs are removed from a deck of 52 playing cards and the remaining cards are shuffled. A card is drawn from the remaining cards. Find the probability of getting a card of (i) heart (ii) queen (iii) clubs. **[2009]**

25. A box has cards numbered 14 to 99. Cards are mixed thoroughly and a card is drawn from the bag at random. Find the probability that the number on the card, drawn from the box is (i) an odd number (ii) a perfect square number (iii) a number divisible by 7. **[2009]**

26. Two coins are tossed simultaneously. Find the probability of getting exactly one head. **[2009]**

27. Two dice are thrown simultaneously. What is the probability that (i) 5 will not come up on either of them? (ii) 5 will come up on at least one? (iii) 5 will come up at both dice? **[2009]**

28. A die is thrown twice. What is the probability that the same number will come up either time? **[2010]**

29. From a will-shuffled pack of playing cards, black jacks, black kings and black aces are removed. A card is then drawn at random from the pack. Find the probability of getting (i) a red card (ii) not a diamond card. **[2010]**

30. Cards bearing numbers 1, 3, 5, …, 35 are kept in a bag. A card is drawn at random from the bag. Find the probability of getting a card bearing (i) a prime number less than 15 (ii) a number divisible by 3 and 5. **[2010]**

31. A card is drawn at random from a well shuffled pack of 52 playing cards. Find the probability of getting a red face card. **[2010]**

32. A card is drawn from a well-shuffled deck of 52 playing cards. The probability that the card will not be an ace is **[2011]**

(a) $\frac{1}{13}$ (b) $\frac{1}{4}$ (c) $\frac{12}{13}$ (d) $\frac{3}{4}$

33. The probability of throwing a number greater than 2 with a fair die is **[2011]**

(a) $\frac{2}{3}$ (b) $\frac{5}{6}$ (c) $\frac{1}{3}$ (d) $\frac{2}{5}$

34. Which of the following cannot be the probability of an event? **[2011]**

(a) 1.5 (b) $\frac{3}{5}$ (c) 25 % (d) 0.3

35. Two dice are rolled once. Find the probability of getting such numbers on the two dice, whose product is 12. **[2011]**

36. A box contains 80 discs which are numbered from 1 to 80. If one disc is drawn at random from the box, find the probability that it bears a perfect square number. **[2011]**

37. Two different dice are thrown at the same time. Find the probability that the sum of the two numbers appearing on the top of the dice is 7. **[2011]**

38. Cards marked with numbers 5, 6, 7, …, 74 are placed in a bag and mixed thoroughly. One card is drawn at random from the bag. Find the probability that the number on the card is a perfect square. **[2011]**

39. A coin is tossed two times. Find the probability of getting at least one head. **[2011]**

40. Two dice are rolled once. Find the probability of getting such numbers on two dice, whose product is a perfect square. **[2011]**

41. A game consists of tossing a coin 3 times and noting its outcome each time. Hanif wins if he gets three heads or three tails and loses otherwise. Calculate the probability that Hanif will lose the game. **[2011]**

42. A ticket is drawn at random from a bag containing tickets numbered from 1 to 40. Find the probability that the selected ticket has a number which is a multiple of 5. **[2011]**

43. Cards bearing numbers 2, 3, 4, …, 11 are kept in a bag. A card is drawn at random from the bag. The probability of getting a card with a prime number is **[2012]**

(a) $\frac{1}{2}$ (b) $\frac{2}{5}$ (c) $\frac{3}{10}$ (d) $\frac{5}{9}$

44. A card is drawn at random from a well-shuffled pack of 52 cards. Find the probability of getting (i) a red king (ii) a queen or a jack. **[2012]**

45. All kings, queeens and aces are removed from a pack of 52 cards. The remaining cards are well-shuffled and then a card is drawn from it. Find the probability of getting (i) a black face card (ii) a red card. **[2012]**

46. A box contains 90 discs, numbered from 1 to 90. If one disc is drawn at random from the box, the probability that it bears a prime number less than 23, is: **[2013]**

(a) $\frac{7}{90}$ (b) $\frac{10}{90}$ (c) $\frac{4}{45}$ (d) $\frac{9}{89}$

47. The probability of getting an even number, when a die is thrown once, is: **[2013]**

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{6}$ (d) $\frac{5}{6}$

48. A group consists of 12 persons of which are extremely patient, other 6 are extremely honest and rest are extremely kind. A person from the group is selected at random. Assuming that each person is equally likely to be seleted, find the probability of selecting a person who is (i) extremely patient (ii) extremely kind or honest. Which of the above values you prefer more. **[2013]**

49. A card is drawn at random from a well shuffled pack of 52 playing cards. Find the probability that the drawn card is neither a king nor a queen. **[2013]**

50. Two coins are tossed simultaneously. Find the probability of getting atleast one head. **[2013]**

51. A box contains cards numbered 3, 5, 7, 9, ……, 35, 37. A card is drawn at random from the box. Find the probability that the number on the drawn card is a prime number. **[2013]**

52. A bag contains cards numbered from 1 to 25. A card is drawn at random from the bag. The probability that the number on this card is divisible by both 2 and 3 is **[2014]**

(a) $\frac{1}{5}$ (b) $\frac{3}{25}$ (c) $\frac{4}{25}$ (d) $\frac{2}{25}$

53. Two different coins are tossed simultaneously. The probability of getting at least one head is **[2014]**

(a) $\frac{1}{4}$ (b) $\frac{1}{8}$ (c) $\frac{3}{4}$ (d) $\frac{7}{8}$

54. If two different dice are rolled together, the probability of getting an even number on both dice, is: **[2014]**

(a) $\frac{1}{36}$ (b) $\frac{1}{2}$ (c) $\frac{1}{6}$ (d) $\frac{1}{4}$

55. A number is selected at random from the numbers 1 to 30. The probability that it is a prime number is: **[2014]**

(a) $\frac{2}{3}$ (b) $\frac{1}{6}$ (c) $\frac{1}{3}$ (d) $\frac{11}{30}$

56. Two different dice are rolled simultaneously. Find the probability that the sum of numbers appearing on the two dice is 10. **[2014]**

57. Rahim tosses two different coins simultaneously. Find the probability of getting at least one tail. **[2014]**

58. Cards numbered 1 to 30 are put in a bag. A card is drawn at random from this bag. Find the probability that the number on the drawn card is (i) not divisible by 3 (ii) a prime number greater than 7 (iii) not a perfect square number. **[2014]**

59. A bag contains cards numbered from 1 to 49. A card is drawn from the bag at random, after mixing the card throughly. Find the probability that the number on the drawn card is (i) an odd number (ii) a multiple of 5 (iii) a perfect square (iv) an even prime number. **[2014]**

60. A letter of English alphabet is chosen at random. Determine the probability that the chosen letter is a consonant. **[2015]**

61. Two different dice are rolled together. Find the probability of getting: (i) the sum of numbers on two dice to be 5. (ii) even numbers on both dice. **[2015]**

62. A box contains 20 cards numbered from 1 to 20. A card is drawn at random from the box. Find the probability that the number on the drawn card is (i) divisible by 2 or 3 (ii) a prime number. **[2015]**

63. Two different dice are tossed together. Find the probability that the product of the two numbers on the top of the dice is 6. **[2015]**

64. The probability of selecting a red ball at random from a jar that contains only red, blue and orange balls is $\frac{1}{4}$. The probability of selecting a blue ball at random from the same jar is $\frac{1}{3}$. If the jar contains 10 orange balls, find the total number of balls in the jar. **[2015]**

65. A card is drawn at random from a well-shuffled deck of playing cards. Find the probability that the card drawn is (i) a card of spade or an ace (ii) a black king (iii) neither a jack nor a king (iv) either a king or a queen. **[2015]**

66. A game of chance consists of spinning an arrow which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8 and these are equally likely outcomes. Find the probability that the arrow will point at any factor 8. **[2015]**

67. A bag contains 18 balls out of which x balls are red. (i) If one ball is drawn at random from the bag, what is the probability that it is not red? (ii) If 2 more red balls are put in the bag, the probability of drawing a red ball will be $\frac{9}{8}$ times the probability of drawing a red ball in the first case. Find the value of x. **[2015]**

68. A box contains cards bearing numbers from 6 to 70. If one card is drawn at random from the box, find the probability that it bears (i) a one-digit number (ii) a number divisible by 5 (iii) an odd number less than 30 (iv) a composite number between 50 and 70. **[2015]**

69. A card is drawn at random from a well shuffled pack of 52 playing cards. Find the probability of getting neither a red card nor a queen. **[2016]**

70. Three different coins are tossed together. Find the probability of getting (i) exactly two heads (ii) at least two heads (iii) at least two tails. **[2016]**

71. The probability of selecting a rotten apple randomly from a heap of 900 apples is 0.18. What is the number of rotten apples in the heap? **[2016]**

72. Cards marked with number 3, 4, 5, ..., 50 are placed in a box and mixed thoroughly. A card is drawn at random from the box. Find the probability that the selected card bears a perfect square number. **[2016]**

73. In a single throw of a pair of different dice, what is the probability of getting (i) a prime number of each dice? (ii) a total of 9 or 11? **[2016]**

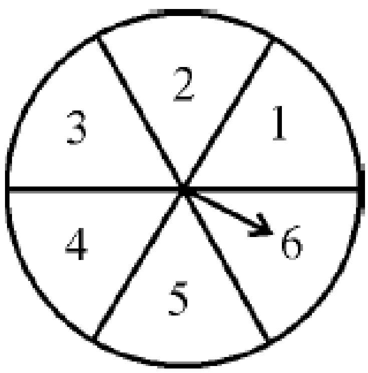
74. 20 tickets, on which numbers 1 to 20 are written, are mixed thoroughly and then a ticket is drawn at random out of them. Find the probability that the number on the drawn ticket is a multiple of 3 or 7. **[2016]**

75. A game consists of tossing a one-rupee coin 3 times and noting the outcome each time. Ramesh will win the game if all the tosses show the same result, (i.e. either all three heads or all three tails) and loses the game otherwise. Find the probability that Ramesh will lose the game. **[2016]**

76. A bag contains 15 white and some black balls. If the probability of drawing a black ball from the bag is thrice that of drawing a white ball, find the number of black balls in the bag. **[2016]**

77. A game of chance consists of spinning an arrow on a circular board, divided into 8 equal parts, which comes to rest pointing at one of the numbers 1, 2, 3, …, 8 (figure), which are equally likely outcomes. What is the probability that the arrow will point at (i) an odd number (ii) a number greater than 3 (iii) a number less than 9? **[2016]**

78. In figure, a disc is shown on which a player spins an arrow twice. The fraction $\frac{a}{b}$ is formed, where 'a' is the number of sector on which arrow stops on second spin. On each spin, each sector has equal chance of selection by the arrow. Find the probability that the fraction $\frac{a}{b} > 1$. **[2016]**



79. Two different dice are thrown together. Find the probability that the numbers obtained have (i) even sum (ii) even product. **[2016]**

80. A number x is selected at random from the numbers 1, 2, 3 and 4. Another number y is selected at random from the numbers 1, 4, 9 and 16. Find the probability that product of x and y is less than 16. **[2017]**

81. A card is drawn at random from a well shuffled pack of 52 playing cards. Find the probability of getting neither a red card nor a queen. **[2017]**

82. The probability of selecting a rotten apple randomly from a heap of 900 apples is 0·18. What is the number of rotten apples in the heap? **[2017]**

83. A number is chosen at random from the numbers $-3, -2, -1, 0, 1, 2, 3$. What will be the probability that square of this number is less than or equal to 1? **[2017]**

84. Two different dice are thrown together. Find the probability that the numbers obtained (i) have a sum less than 7 (ii) have a product less than 16 (iii) is a doublet of odd numbers? **[2017]**

85. Peter throws two different dice together and finds the product of the two numbers obtained. Rina throws a die and squares the number obtained. Who has the better chance to get the number 25. **[2017]**

86. Two different dice are thrown together. Find the probability that the product of the numbers appeared is less than 18. **[2017]**

87. Find the probability that in a leap year there will be 53 Tuesdays. **[2017]**

88. A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears (i) a two-digit number (ii) a number divisible by 5. **[2017]**

89. An integer is chosen at random between 1 and 100. Find the probability that is: (i) divisible by 8 (ii) not divisible by 8. **[2018]**

90. Two different dice are tossed together. Find the probability: (i) of getting a doublet (ii) of getting a sum 10, of the numbers on the two dice. **[2018]**