NCERT Mathematics Question Paper (Class - 10)

:: Chapter 1: Number System ::

Exercise 1.1

Question 1. Use Euclid's division algorithm to find the HCF of

(i) 135 and 225

(ii) 196 and 38220

(iii) 867 and 255

Question 2: Show that any positive odd integer is of the form 6q + 1, or 6q + 3, or 6q + 5, where q is some integer.

Question 3. An army contingent of 616 members is to march behind an army band of 32 members in a parade. The two groups are to march in the same number of columns. What is the maximum number of columns iwhich they can march?

Question 4. Use Euclid's division lemma to show that the square of any positive integer is either of the form 3m or 3m + 1 for some integer m

Question 5. Use Euclid's division lemma to show that the cube of any positive integer is of the form 9m, 9m + 1 or 9m + 8.

Exercise 1.2

Question 1. Express each number as a product of its prime factors: (i) 140 (ii) 156 (iii) 3825 (iv) 5005 (v) 7429

Question 2. Find the LCM and HCF of the following pairs of integers and verify that LCM × HCF = product of the two numbers. 26 and 91 (ii) 510 and 92 (iii) 336 and 54

Question 3. Find the LCM and HCF of the following integers by applying the prime factorization method.

(i) 12, 15 and 21

(ii) 17, 23 and 29

(iii) 8, 9 and 25

Question 4. Given that HCF (306, 657) = 9, find LCM (306, 657).

Question 5. Check whether 6n can end with the digit 0 for any natural number n.

Question 6. Explain why 7 × 11 × 13 + 13 and 7 × 6 × 5 × 4 × 3 × 2 × 1 + 5 are composite numbers.

Question 7. There is a circular path around a sports field. Sonia takes 18 minutes to drive one round of the field, while Ravi takes 12 minutes for the same. Suppose they both start at the same point and at the same time, and go in the same direction. After how many minutes will they meet again at the starting point?

Exercise 1.3

Question 1. Prove that $\sqrt{5}$ is irrational.

Question 2. Prove that $3 + 2\sqrt{5}$ is irrational.

Question 3. Prove that the following are irrationals: (i) $1/\sqrt{2}$ (ii) $7\sqrt{5}$ (iii) $6 + \sqrt{2}$

Exercise 1.4

Question 1. Without actually performing the long division, state whether the following rational numbers will have a terminating decimal expansion or a non-terminating repeating decimal expansion:

(i)13/3125

(ii)17/8

(iii)64/455

(iv)15/1600

(v)29/343

(vi)$23/2^3*5^2$

(vii)$129/2^2* 57* 75$

(viii)6/15

(ix)35/50

(x)77/210

Question 2. Write down the decimal expansions of those rational numbers in Question 1 above which have terminating decimal expansions.

(i)13/3125 = 0.009375

(ii)17/8

(iii)64/455 none- terminating

(iv)15/1600

(v)29/343 it is none – terminating

(vi)23/2^3*5^2 = 23/200

(vii)129/2^2* 57*75 it is none terminating

(viii) 6/15 = 2/5 = 0.4

(ix)35/50

Question 3. The following real numbers have decimal expansions as given below. In each case, decide whether they are rational or not. If they are rational, and of the form p , q you say about the prime factors of q?

:: Chapter 2: Polynomial ::

Exercise 2.1

Question 1. The graphs of y = p(x) are given in Fig. 2.10 below, for some polynomials p(x). Find the number of zeroes of p(x), in each case.

Exercise 2.2

Question 1. Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients.

(iii) $4u^2 + 8u$

Question 1. Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients.

(i) $x^2 – 2x – 8$

(ii) $4s^2 – 4s + 1$

(iii) $6x^2 – 3 – 7x$

(v) $t^2 – 15$

(vi)$3x^2 – x – 4$

Question 2. Find a quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively.

(i)1/4 , -1 (ii) √2 , 1/3 (iii) 0, √5 (iv) 1,1 (v) -1/4 ,1/4 (vi) 4,1

Exercise 2.3

1. Divide the polynomial p(x) by the polynomial g(x) and find the quotient and remainder in each of the following :

Question 2. Check whether the first polynomial is a factor of the second polynomial by dividing the second polynomial by the first polynomial:

Question 3. Obtain all other zeroes of 3x4 + 6x3 – 2x2 – 10x – 5, if two of its zeroes are √(5/3) and -√(5/3)

Question 4. On dividing x3 – 3x2 + x + 2 by a polynomial g(x), the quotient and remainder were x – 2 and –2x + 4, respectively. Find g(x).

Question 5. Give examples of polynomials p(x), g(x), q(x) and r(x), which satisfy the division algorithm

---

:: 3: MATRIX ::

Exercise 3.1

Question 1. Aftab tells his daughter, "Seven years ago, I was seven times as old as you were then .Also, three years from now, I shall be three times as old as you will be." (Isn't this interesting?) Represent this situation algebraically and graphically.

Question 2. The coach of a cricket team buys 3 bats and 6 balls for Rs 3900. Later, she buys another bat and 2 more balls of the same kind for Rs 1300. Represent this situation algebraically and geometrically.

Question 3. The cost of 2 kg of apples and 1kg of grapes on a day was found to be Rs 160. After a month, the cost of 4 kg of apples and 2 kg of grapes is Rs 300. Represent the situation algebraically and geometrically.

Exercise 3.2

Question 1 (ii). 5 pencils and 7 pens together cost Rs 50, whereas 7 pencils and 5 pens together cost Rs 46. Find the cost of one pencil and that of one pen

Question 2. On comparing the ratios a1/a2 , b1/b2 and c1/c2, find out whether the lines representing the following pairs of linear equations intersect at a point, are parallel or coincident:

Question 3. On comparing the ratios a1/a2 , b1/b2 and c1/c2 find out whether the following pair of linear equations are consistent, or inconsistent.

(i) 3x + 2y = 5 ; 2x – 3y = 7

(ii) 2x – 3y = 8 ; 4x – 6y = 9

(iii) 3/2x + 5/3 y = 7 ; 9x – 10y = 14

(iv) 5x – 3y = 11 ; – 10x + 6y = –22

(v)4/3x + 2y =8 ; 2x + 3y = 12

(i) 3x + 2y = 5 ; 2x – 3y = 7

Question 4. Which of the following pairs of linear equations are consistent/inconsistent? If consistent, obtain the solution graphically:

Question 5. Half the perimeter of a rectangular garden, whose length is 4 m more than its width, is 36 m. Find the dimensions of the garden.

Question 6. Given the linear equation 2x + 3y – 8 = 0, write another linear equation in two variables such that the geometrical representation of the pair so formed is:

Question 7. Draw the graphs of the equations x – y + 1 = 0 and 3x + 2y – 12 = 0. Determine the coordinates of the vertices of the triangle formed by these lines and the x-axis, and shade the triangular region.

Exercise 3.3

Question 1. Solve the following pair of linear equations by the substitution method.

(i) x + y = 14 ; x – y = 4

(ii) s – t = 3 ; s/3 + t/2 = 6

(iii) 3x – y = 3 ; 9x – 3y = 9

(iv) 0.2x + 0.3y = 1.3 ; 0.4x + 0.5y = 2.3

(v)√2 x+ √3y = 0 ; √3 x - √8y = 0 (vi)3/2 x - 5/3y = -2 ; x/3 + y/2 = 13/6

Question 2. Solve 2x + 3y = 11 and 2x – 4y = – 24 and hence find the value of 'm' for which y =mx + 3.

Question 3. Form the pair of linear equations for the following problems and find their solution by substitution method.

(i) The difference between two numbers is 26 and one number is three times the other. Find them.

(ii) The larger of two supplementary angles exceeds the smaller by 18 degrees. Find them.

(iii) The coach of a cricket team buys 7 bats and 6 balls for Rs 3800. Later, she buys 3 bats and 5 balls for Rs 1750. Find the cost of each bat and each ball

Exercise 3.4

Question 1. Solve the following pair of linear equations by the elimination method and the substitution method:

x + y =5 and 2x –3y = 4

3x + 4y = 10 and 2x – 2y = 2

3x – 5y – 4 = 0 and 9x = 2y + 7

x/2 + 2y /3 = - 1 and x – y/3 = 3

Question 2. Form the pair of linear equations in the following problems, and find their solutions (if they exist) by the elimination method:

(i) If we add 1tothe numerator and subtract 1fromthe denominator, a fractionreduces to 1. It becomes1/2 if we only add 1 to the denominator.What is the raction?

(ii) Five years ago, Nuri was thrice as old as Sonu. Ten years later, Nuri will be twice as old as Sonu. How old are Nuri and Sonu?

(iii) The sum of the digits of a t

Exercise 3.5

Question 1. Which of the following pairs of linear equations has unique solution, no solution, or infinitely many solutions In case there is a unique solution, find it by using cross multiplication method.

(i)x – 3y – 3 = 0 ; 3x – 9y – 2 =0

(ii)2x + y = 5 ; 3x +2y =8

(iii)3x – 5y = 20 ; 6x – 10y =40

(iv)x – 3y – 7 = 0 ;3x – 3y – 15= 0

Question 2. (i) For which values of a and b does the following pair of linear equations have an infinite number of solutions?

2x +3y =7; (a – b) x +(a +b) y =3a +b –2

Question 3. Solve the following pair of linear equations by the substitution and cross-multiplication methods:

8x +5y =9 …(1)

3x +2y =4 …(2)

Quesiton 4. Form the pair of linear equations in the following problems and find their solutions (if they exist) by any algebraic method :

(ii) A fraction becomes 1 3 when 1 is subtracted from the numerator and it becomes 1 4 when 8 is added to its denominator. Find the fraction.

(iii) Yash scored 40 marks in a test, getting 3 marks for each right answer and losing 1 mark for each wrong answer. Had 4 marks been awarded for each correct answer and 2 marks been deducted for each incorrect answer, then Yash would have scored 50 marks. How many questions were there in the test?

(iv) 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?

(v) The area of a rectangle gets reduced by 9 square units, if its length is reduced by 5 units and breadth is increased by 3 units. If we increase the length by 3 units and the breadth by 2 units, the area increases by 67 square units. Find the dimensions of the rectangle.

EXERCISE 3.6

Question 1. Solve the following pairs of equations by reducing them to a pair of linear equations:

Question 2. Formulate the following problems as a pair of equations, and hence find their solutions:

(i) Ritu can row downstream 20 km in 2 hours, and upstream 4 km in 2 hours. Find her speed of rowing in still water and the speed of the current.

(ii) 2 women and 5 men can together finish an embroidery work in 4 days, while 3 women and 6 men can finish it in 3 days. Find the time taken by 1 woman alone to finish the work, and also that taken by 1 man alone

(iii) Roohi travels 300 km to her home partly by train and partly by bus. She takes 4 hours if she travels 60 km by train and the remaining by bus. If she travels 100 km by train and the remaining by bus, she takes 10 minutes longer. Find the speed of the train and the bus separately.

EXERCISE 3.7

Question 1. The ages of two friends Ani and Biju differ by 3 years. Ani's father Dharam is twice as old as Ani and Biju is twice as old as his sister Cathy. The ages of Cathy and Dharam differ by 30 years. Find the ages of Ani and Biju.

Question 2. One says, "Give me a hundred, friend! I shall then become twice as rich as you". The other replies, "If you give me ten, I shall be six times as rich as you". Tell me what is the amount of their (respective) capital? [From the Bijaganita of Bhaskara II] [Hint : $x + 100 = 2(y - 100)$, $y + 10 = 6(x - 10)$

Question 3. A train covered a certain distance at a uniform speed. If the train would have been 10 km/h faster, it would have taken 2 hours less than the scheduled time. And, if the train were slower by 10 km/h; it would have taken 3 hours more than the scheduled time. Find the distance covered by the train.

Question 4. The students of a class are made to stand in rows. If 3 students are extra in a row, there would be 1 row less. If 3 students are less in a row, there would be 2 rows more. Find the number of students in the class.

Question 5. In a ΔABC, $\angle C = 3 \angle B = 2 (\angle A + \angle B)$. Find the three angles.

Question 6. Draw the graphs of the equations $5x - y = 5$ and $3x - y = 3$. Determine the co-ordinates of the vertices of the triangle formed by these lines and the y axis.

Question 7. Solve the following pair of linear equations:

:: Chapter 4 Quadratic Equations ::

EXERCISE 4.1

Question 1. Check whether the following are quadratic equations :

(i) (x + 1)2 = 2(x – 3)

(ii) x2 – 2x = (–2) (3 – x)

(iii) (x – 2)(x + 1) = (x – 1)(x + 3)

(iv) (x – 3)(2x +1) = x(x + 5)

(v) (2x – 1)(x – 3) = (x + 5)(x – 1)

(vi) x2 + 3x + 1 = (x – 2)2

(vii) (x + 2)3 = 2x (x2 – 1)

(viii) x3 – 4x2 – x + 1 = (x – 2)3

Question 2. Represent the following situations in the form of quadratic equations :

(i) The area of a rectangular plot is 528 m2. The length of the plot (in metres) is one more than twice its breadth. We need to find the length and breadth of the plot.

(ii) The product of two consecutive positive integers is 306. We need to find the integers.

(iii) Rohan's mother is 26 years older than him. The product of their ages (in years) 3 years from now will be 360. We would like to find Rohan's present age.

(iv) A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/h less, then it would have taken 3 hours more to cover the same distance. We need to find the speed of the train.

EXERCISE 4.2

Question 1. Find the roots of the following quadratic equations by factorisation:

(i) x2 – 3x – 10 = 0

(ii) 2x2 + x – 6 = 0

(iii) 2 x2 + 7 x + 5 2 = 0

(iv) 2x2 – x + 1 8 = 0

(v) 100 x2 – 20x + 1 = 0

Question 2. Solve the problems given in Example 1.

Question 3. Find two numbers whose sum is 27 and product is 182.

Question 4. Find two consecutive positive integers, sum of whose squares is 365.

Question 5. The altitude of a right triangle is 7 cm less than its base. If the hypotenuse is 13 cm, find the other two sides.

Question 6. A cottage industry produces a certain number of pottery articles in a day. It was observed on a particular day that the cost of production of each article (in rupees) was 3 more than

twice the number of articles produced on that day. If the total cost of production on that day was Rs 90, find the number of articles produced and the cost of each article.

EXERCISE 4.3

Question 1. Find the roots of the following quadratic equations, if they exist, by the method of completing the square:

(i) 2x2 – 7x + 3 = 0

(ii) 2x2 + x – 4 = 0

(iii) 4x2 + 4 3x + 3 = 0

(iv) 2x2 + x + 4 = 0

Question 2. Find the roots of the quadratic equations given in Q.1 above by applying the quadratic formula.

Question 3. The sum of the reciprocals of Rehman's ages, (in years) 3 years ago and 5 years from now is 1.3 Find his present age.

Question 4. In a class test, the sum of Shefali's marks in Mathematics and English is 30. Had she got 2 marks more in Mathematics and 3 marks less in English, the product of their marks would have been 210. Find her marks in the two subjects.

Question 5. The diagonal of a rectangular field is 60 metres more than the shorter side. If the longer side is 30 metres more than the shorter side, find the sides of the field.

Question 6. The difference of squares of two numbers is 180. The square of the smaller number is 8 times the larger number. Find the two numbers.

Question 7. A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.

Question 8. Two water taps together can fill a tank in 9 3 8 hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

Question 9. An express train takes 1 hour less than a passenger train to travel 132 km between Mysore and Bangalore (without taking into consideration the time they stop at intermediate stations). If the average speed of the express train is 11km/h more than that of the passenger train, find the average speed of the two trains.

Question 10. Sum of the areas of two squares is 468 m2. If the difference of their perimeters is 24 m, find the sides of the two squares.

EXERCISE 4.4

Question 1. Find the nature of the roots of the following quadratic equations. If the real roots exist, find them:

(i) 2x2 – 3x + 5 = 0

(ii) 3x2 – 4 3 x + 4 = 0

(iii) 2x2 – 6x + 3 = 0

Question 2. Find the values of k for each of the following quadratic equations, so that they have two equal roots.

(i) 2x2 + kx + 3 = 0

(ii) kx (x – 2) + 6 = 0

Question 3. Is it possible to design a rectangular mango grove whose length is twice its breadth, and the area is 800 m2? If so, find its length and breadth.

Question 4. Is the following situation possible? If so, determine their present ages. The sum of the ages of two friends is 20 years. Four years ago, the product of their ages in years was 48.

Question 5. Is it possible to design a rectangular park of perimeter 80 m and area 400 m2? If so, find its length and breadth.

:: Chapter 5 Arithmetic Progressions ::

EXERCISE 5.1

Question 1. In which of the following situations, does the list of numbers involved make an arithmetic progression, and why?

(i) The taxi fare after each km when the fare is Rs 15 for the first km and Rs 8 for each additional km.

(ii) The amount of air present in a cylinder when a vacuum pump removes 1 4 of the air remaining in the cylinder at a time.

(iii) The cost of digging a well after every metre of digging, when it costs Rs 150 for the first metre and rises by Rs 50 for each subsequent metre.

(iv) The amount of money in the account every year, when Rs 10000 is deposited at compound interest at 8 % per annum.]

EXERCISE 5.2

Question 1. Check whether – 150 is a term of the AP : 11, 8, 5, 2 . . .

Question 2. Find the 31st term of an AP whose 11th term is 38 and the 16th term is 73.

Question 3. An AP consists of 50 terms of which 3rd term is 12 and the last term is 106. Find the 29th term.

Question 4. If the 3rd and the 9th terms of an AP are 4 and – 8 respectively, which term of this AP is zero?

Question 5. The 17th term of an AP exceeds its 10th term by 7. Find the common difference.

Question 6. Which term of the AP : 3, 15, 27, 39, . . . will be 132 more than its 54th term?

Question 7. Two APs have the same common difference. The difference between their 100th terms is 100, what is the difference between their 1000th terms?

Question 8. How many three-digit numbers are divisible by 7?

Question 9. How many multiples of 4 lie between 10 and 250?

Question 10. For what value of n, are the nth terms of two APs: 63, 65, 67, . . . and 3, 10, 17, . . . equal? 16. Determine the AP whose third term is 16 and the 7th term exceeds the 5th term by 12.

EXERCISE 5.3

Question 1. Find the sum of the following APs:

(i) 2, 7, 12, . . ., to 10 terms.

(ii) –37, –33, –29, . . ., to 12 terms.

(iii) 0.6, 1.7, 2.8, . . ., to 100 terms.

(iv) 1 , 1 , 1 15 12 10 , . . ., to 11 terms.

Question 2. Find the sums given below :

(i) 7 + 10 1 2 + 14 + . . . + 84

(ii) 34 + 32 + 30 + . . . + 10

(iii) –5 + (–8) + (–11) + . . . + (–230) 3. In an AP:

(i) given a = 5, d = 3, an = 50, find n and Sn.

(ii) given a = 7, a13 = 35, find d and S13.

(iii) given a12 = 37, d = 3, find a and S12.

(iv) given a3 = 15, S10 = 125, find d and a10.

(v) given d = 5, S9 = 75, find a and a9. (vi) given a = 2, d = 8, Sn = 90, find n and an.

(vii) given a = 8, an = 62, Sn = 210, find n and d.

(viii) given an = 4, d = 2, Sn = –14, find n and a.

(ix) given a = 3, n = 8, S = 192, find d. (x) given l = 28, S = 144, and there are total 9 terms. Find a

Question 4. How many terms of the AP : 9, 17, 25, . . . must be taken to give a sum of 636?

Question 5. The first term of an AP is 5, the last term is 45 and the sum is 400. Find the number of terms and the common difference.

Question 6. The first and the last terms of an AP are 17 and 350 respectively. If the common difference is 9, how many terms are there and what is their sum?

Question 7. Find the sum of first 22 terms of an AP in which d = 7 and 22nd term is 149.

Question 8. Find the sum of first 51 terms of an AP whose second and third terms are 14 and 18 respectively.

Question 9. If the sum of first 7 terms of an AP is 49 and that of 17 terms is 289, find the sum of first n terms.

Question 10. Show that a1, a2, . . ., an, . . . form an AP where an is defined as below :
(i) an = 3 + 4n
(ii) an = 9 – 5n Also find the sum of the first 15 terms in each case.
Question 11. If the sum of the first n terms of an AP is 4n – n2, what is the first term (that is S1)? What is the sum of first two terms? What is the second term? Similarly, find the 3rd, the 10th and the nth terms.
Question 12. Find the sum of the first 40 positive integers divisible by 6.
Question 13. Find the sum of the first 15 multiples of 8.
Question 14. Find the sum of the odd numbers between 0 and 50.
Question 15. A contract on construction job specifies a penalty for delay of completion beyond a certain date as follows: Rs 200 for the first day, Rs 250 for the second day, Rs 300 for the third day, etc., the penalty for each succeeding day being Rs 50 more than for the preceding day. How much money the contractor has to pay as penalty, if he has delayed the work by 30 days?
Question 16. A sum of Rs 700 is to be used to give seven cash prizes to students of a school for their overall academic performance. If each prize is Rs 20 less than its preceding prize, find the value of each of the prizes.
Question 17. In a school, students thought of planting trees in and around the school to reduce air pollution. It was decided that the number of trees, that each section of each class will plant, will be the same as the class, in which they are studying, e.g., a section of Class I will plant 1 tree, a section of Class II will plant 2 trees and so on till Class XII. There are three sections of each class. How many trees will be planted by the students?
Question 18. A spiral is made up of successive semicircles, with centres alternately at A and B, starting with centre at A, of radii 0.5 cm, 1.0 cm, 1.5 cm, 2.0 cm, . . . as shown in Fig. 5.4. What is the total length of such a spiral made up of thirteen consecutive semicircles? (Take π = 22 7) 114 MATHEMATICS Fig. 5.4 [Hint : Length of successive semicircles is l1, l2, l3, l4, . . . with centres at A, B, A, B, . . ., respectively.]
Question 19. 200 logs are stacked in the following manner: 20 logs in the bottom row, 19 in the next row, 18 in the row next to it and so on (see Fig. 5.5). In how may rows are the 200 logs placed and how many logs are in the top row? Fig. 5.5
Question 20. In a potato race, a bucket is placed at the starting point, which is 5 m from the first potato, and the other potatoes are placed 3 m apart in a straight line. There are ten potatoes in the line (see Fig. 5.6). Fig. 5.6 A competitor starts from the bucket, picks up the nearest potato, runs back with it, drops it in the bucket, runs back to pick up the next potato, runs to the bucket to drop it in, and she continues in the same way until all the potatoes are in the bucket. What is the total distance the competitor has to run? [Hint : To pick up the first potato and the second potato, the total distance (in metres) run by a competitor is 2 × 5 + 2 × (5 + 3)]

EXERCISE 5.4

Question 1. Which term of the AP : 121, 117, 113, . . ., is its first negative term? [Hint : Find n for an < 0]

Question 2. The sum of the third and the seventh terms of an AP is 6 and their product is 8. Find the sum of first sixteen terms of the AP.

Question 3. A ladder has rungs 25 cm apart. (see Fig. 5.7). The rungs decrease uniformly in length from 45 cm at the bottom to 25 cm at the top. If the top and the bottom rungs are 2 1 2 m apart, what is the length of the wood required for the rungs? [Hint : Number of rungs = 250 25]

Question 4. The houses of a row are numbered consecutively from 1 to 49. Show that there is a value of x such that the sum of the numbers of the houses preceding the house numbered x is equal to the sum of the numbers of the houses following it. Find this value of x. [Hint : Sx – 1 = S49 – Sx]

Question 5. A small terrace at a football ground comprises of 15 steps each of which is 50 m long and built of solid concrete. Each step has a rise of 1 4 m and a tread of 1 2 m. (see Fig. 5.8). Calculate the total volume of concrete required to build the terrace. [Hint : Volume of concrete required to build the first step = 1 1 50 m3 4 2 × ×]

:: Chapter 6 Triangles ::

Theorems

Theorem 6.1: 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.

Theorem 6.8 : In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

:: Chapter 7 Coordinate Geometry ::

EXERCISE 7.1

Question 1. Find the distance between the following pairs of points :

(i) (2, 3), (4, 1)

(ii) (– 5, 7), (– 1, 3)

(iii) (a, b), (– a, – b)

Question 2. Find the distance between the points (0, 0) and (36, 15). Can you now find the distance between the two towns A and B discussed in Section 7.2.

Question 3. Determine if the points (1, 5), (2, 3) and (– 2, – 11) are collinear.

Question 4. Check whether (5, – 2), (6, 4) and (7, – 2) are the vertices of an isosceles triangle.

Question 5. In a classroom, 4 friends are seated at the points A, B, C and D as shown in Fig. 7.8. Champa and Chameli walk into the class and after observing for a few minutes Champa asks Chameli, "Don't you think ABCD is a square?" Chameli disagrees. Using distance formula, find which of them is correct.

Question 6. Name the type of quadrilateral formed, if any, by the following points, and give reasons for your answer:

(i) (– 1, – 2), (1, 0), (– 1, 2), (– 3, 0)

(ii) (–3, 5), (3, 1), (0, 3), (–1, – 4)

(iii) (4, 5), (7, 6), (4, 3), (1, 2)

Question 7. Find the point on the x-axis which is equidistant from (2, –5) and (–2, 9).

Question 8. Find the values of y for which the distance between the points P(2, – 3) and Q(10, y) is 10 units

Question 9. If Q(0, 1) is equidistant from P(5, –3) and R(x, 6), find the values of x. Also find the distances QR and PR.

Question 10. Find a relation between x and y such that the point (x, y) is equidistant from the point (3, 6) and (– 3, 4).

EXERCISE 7.2

Question 1. Find the coordinates of the point which divides the join of (–1, 7) and (4, –3) in the ratio 2 : 3.

Question 2. Find the coordinates of the points of trisection of the line segment joining (4, –1) and (– 2, –3).

Question 3. To conduct Sports Day activities, in your rectangular shaped school ground ABCD, lines have been drawn with chalk powder at a distance of 1m each. 100 flower pots have been placed at a distance of 1m from each other along AD, as shown in Fig. 7.12. Niharika runs 1 4 th the distance AD on the 2nd line and posts a green flag. Preet runs 1 5 th the distance AD on the eighth line and posts a red flag. What is the distance between both the flags? If Rashmi has to post a blue flag exactly halfway between the line segment joining the two flags, where should she post her flag?

Question 4. Find the ratio in which the line segment joining the points (– 3, 10) and (6, – 8) is divided by (– 1, 6).

Question 5. Find the ratio in which the line segment joining A(1, – 5) and B(– 4, 5) is divided by the x-axis. Also find the coordinates of the point of division.

Question 6. If (1, 2), (4, y), (x, 6) and (3, 5) are the vertices of a parallelogram taken in order, find x and y.

Question 7. Find the coordinates of a point A, where AB is the diameter of a circle whose centre is (2, – 3) and B is (1, 4).

Question 8. If A and B are (– 2, – 2) and (2, – 4), respectively, find the coordinates of P such that AP = 3 AB 7 and P lies on the line segment AB.

Question 9. Find the coordinates of the points which divide the line segment joining A(– 2, 2) and B(2, 8) into four equal parts.

Question 10. Find the area of a rhombus if its vertices are (3, 0), (4, 5), (– 1, 4) and (– 2, – 1) taken in order. [Hint : Area of a rhombus = 1 2 (product of its diagonals)]

EXERCISE 7.3

Question 1. Find the area of the triangle whose vertices are :

(i) (2, 3), (–1, 0), (2, – 4)

(ii) (–5, –1), (3, –5), (5, 2)

Question 2. In each of the following find the value of 'k', for which the points are collinear.

(i) (7, –2), (5, 1), (3, k)

(ii) (8, 1), (k, – 4), (2, –5)

Question 3. Find the area of the triangle formed by joining the mid-points of the sides of the triangle whose vertices are (0, –1), (2, 1) and (0, 3). Find the ratio of this area to the area of the given triangle.

Question 4. Find the area of the quadrilateral whose vertices, taken in order, are (– 4, – 2), (– 3, – 5), (3, – 2) and (2, 3).

Question 5. You have studied in Class IX, (Chapter 9, Example 3), that a median of a triangle divides it into two triangles of equal areas. Verify this result for Δ ABC whose vertices are A(4, – 6), B(3, –2) and C(5, 2).

EXERCISE 7.4

Question 1. Determine the ratio in which the line 2x + y – 4 = 0 divides the line segment joining the points A(2, – 2) and B(3, 7).

Question 2. Find a relation between x and y if the points (x, y), (1, 2) and (7, 0) are collinear.

Question 3. Find the centre of a circle passing through the points (6, – 6), (3, – 7) and (3, 3).

Question 4. The two opposite vertices of a square are (–1, 2) and (3, 2). Find the coordinates of the other two vertices.

Question 5. The Class X students of a secondary school in Krishinagar have been allotted a rectangular plot of land for their gardening activity. Sapling of Gulmohar are planted on the boundary

at a distance of 1m from each other. There is a triangular grassy lawn in the plot as shown in the Fig. 7.14. The students are to sow seeds of flowering plants on the remaining area of the plot.

(i) Taking A as origin, find the coordinates of the vertices of the triangle.

(ii) What will be the coordinates of the vertices of Δ PQR if C is the origin? Also calculate the areas of the triangles in these cases. What do you observe?

Question 6. The vertices of a Δ ABC are A(4, 6), B(1, 5) and C(7, 2). A line is drawn to intersect sides AB and AC at D and E respectively, such that AD AE 1 AB AC 4 = Calculate the area of the Δ ADE and compare it with the area of Δ ABC. (Recall Theorem 6.2 and Theorem 6.6).

Question 7. Let A (4, 2), B(6, 5) and C(1, 4) be the vertices of Δ ABC.

(i) The median from A meets BC at D. Find the coordinates of the point D.

(ii) Find the coordinates of the point P on AD such that AP : PD = 2 : 1

(iii) Find the coordinates of points Q and R on medians BE and CF respectively such that BQ : QE = 2 : 1 and CR : RF = 2 : 1.

(iv) What do yo observe?

[Note : The point which is common to all the three medians is called the centroid and this point divides each median in the ratio 2 : 1.]

:: Chapter 8 Introduction To Trigonometry ::

EXERCISE 8.1

Question 1. In Δ ABC, right-angled at B, AB = 24 cm, BC = 7 cm. Determine :

(i) sin A, cos A

(ii) sin C, cos C]

Question 2. In Fig. 8.13, find tan P – cot R.

Question 3. If sin A = 3 , 4 calculate cos A and tan A.

Question 4. Given 15 cot A = 8, find sin A and sec A.

Question 5. Given sec θ = 13 , 12 calculate all other trigonometric ratios.

Question 6. If ∠ A and ∠ B are acute angles such that cos A = cos B, then show that ∠ A = ∠ B.

Question 7. If cot θ = 7 , 8 evaluate :

(i) (1 sin) (1 sin) , (1 cos) (1 cos) + θ − θ + θ − θ

(ii) cot2 θ

Question 8. If 3 cot A = 4, check whether 2 2 1 tan A 1 + tan A − = cos2 A – sin2A or not.

Question 9. In triangle ABC, right-angled at B, if tan A = 1 , 3 find the value of: (i) sin A cos C + cos A sin C (ii) cos A cos C – sin A sin C

Question 10. In Δ PQR, right-angled at Q, PR + QR = 25 cm and PQ = 5 cm. Determine the values of sin P, cos P and tan P.

Question 11. State whether the following are true or false. Justify your answer.

(i) The value of tan A is always less than 1.

(ii) sec A = 12 5 for some value of angle A.

(iii) cos A is the abbreviation used for the cosecant of angle A.

(iv) cot A is the product of cot and A.

(v) sin θ = 4 3 for some angle θ.

EXERCISE 8.2

Question 1. Evaluate the following :

(i) sin 60° cos 30° + sin 30° cos 60°

(ii) 2 tan2 45° + cos2 30° – sin2 60°

Question 3. If tan (A + B) = 3 and tan (A – B) = 1 3 ; 0° < A + B ≤ 90°; A > B, find A and B.

Question 4. State whether the following are true or false. Justify your answer.

(i) sin (A + B) = sin A + sin B.

(ii) The value of sin θ increases as θ increases.

(iii) The value of cos θ increases as θ increases.

(iv) sin θ = cos θ for all values of θ.

(v) cot A is not defined for A = 0°.

EXERCISE 8.3

Question 1. Evaluate :

(i) sin 18 cos 72 ° °

(ii) tan 26 cot 64 ° °

(iii) cos 48° – sin 42°

(iv) cosec 31° – sec 59°

Question 2. Show that :

(i) tan 48° tan 23° tan 42° tan 67° = 1

(ii) cos 38° cos 52° – sin 38° sin 52° = 0

Question 3. If tan 2A = cot (A – 18°), where 2A is an acute angle, find the value of A.

Question 4. If tan A = cot B, prove that A + B = 90°. 5. If sec 4A = cosec (A – 20°), where 4A is an acute angle, find the value of A.

EXERCISE 8.4

Question 1. Express the trigonometric ratios sin A, sec A and tan A in terms of cot A.

Question 2. Write all the other trigonometric ratios of ∠ A in terms of sec A.

Question 3. Evaluate :

(i) 2 2 2 2 sin 63 sin 27 cos 17 cos 73 ° + ° ° + °

(ii) sin 25° cos 65° + cos 25° sin 65°

Question 4. Choose the correct option. Justify your choice.

(i) 9 sec2 A – 9 tan2 A =

(A) 1

(B) 9

(C) 8

(D) 0

(ii) (1 + tan θ + sec θ) (1 + cot θ – cosec θ) =

(A) 0

(B) 1

(C) 2

(D) –1

(iii) (sec A + tan A) (1 – sin A) =

(A) sec A

(B) sin A

(C) cosec A

(D) cos A

(iv) 2 2 1 tan A 1 + cot A + =

(A) sec2 A

(B) –1

(C) cot2 A

(D) tan2 A

Question 5. Prove the following identities, where the angles involved are acute angles for which the expressions are defined.

(i) (cosec θ – cot θ)2 = 1 cos 1 cos − θ + θ

(ii) cos A 1 sin A 2 sec A

(iii) tan cot 1 sec cosec 1 cot 1 tan θ θ + = + θ θ − θ − θ [Hint : Write the expression in terms of sin θ and cos θ]

(iv) 1 sec A sin2 A sec A 1 – cos A + = [Hint : Simplify LHS and RHS separately]

(v) cos A – sin A + 1 cosec A + cot A, cos A + sin A – 1 = using the identity cosec2 A = 1 + cot2 A.

(vi) 1 sinA sec A + tan A 1 – sin A + =

(vii) 3 3 sin 2 sin tan 2 cos cos θ − θ = θ θ − θ

(viii) (sin A + cosec A)2 + (cos A + sec A)2 = 7 + tan2 A + cot2 A

(ix) (cosec A – sin A)(sec A – cos A) 1 tanA + cot A = [Hint : Simplify LHS and RHS separately]

(x) 2 2 2 1 tan A 1 tanA 1 + cot A 1 – cot A = tan2 A

:: Chapter 9 Some Applications of Trigonometry ::

EXERCISE 9.1

Question 1. A circus artist is climbing a 20 m long rope, which is tightly stretched and tied from the top of a vertical pole to the ground. Find the height of the pole, if the angle made by the rope with the ground level is 30°

Question 2. A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle 30° with it. The distance between the foot of the tree to the point where the top touches the ground is 8 m. Find the height of the tree.

Question 3. A contractor plans to install two slides for the children to play in a park. For the children below the age of 5 years, she prefers to have a slide whose top is at a height of 1.5 m, and is inclined at an angle of 30° to the ground, whereas for elder children, she wants to have a steep slide at a height of 3m, and inclined at an angle of 60° to the ground. What should be the length of the slide in each case?

Question 4. 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 30°. Find the height of the tower.

Question 5. A kite is flying at a height of 60 m above the ground. The string attached to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is 60°. Find the length of the string, assuming that there is no slack in the string.

Question 6. A 1.5 m tall boy is standing at some distance from a 30 m tall building. The angle of elevation from his eyes to the top of the building increases from 30° to 60° as he walks towards the building. Find the distance he walked towards the building.

Question 7. From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower fixed at the top of a 20 m high building are 45° and 60° respectively. Find the height of the tower.

Question 8. A statue, 1.6 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.

Question 9. 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 50 m high, find the height of the building.

Question 10. Two poles of equal heights are standing opposite each other on either side of the road, which is 80 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 and the distances of the point from the poles.

Question 11. A TV tower stands vertically on a bank of a canal. From a point on the other bank directly opposite the tower, the angle of elevation of the top of the tower is 60°. From another point 20 m away from this point on the line joing this point to the foot of the tower, the angle of elevation of the top of the tower is 30° (see Fig. 9.12). Find the height of the tower and the width of the canal.

Question 12. From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°. Determine the height of the tower.

Question 13. As observed from the top of a 75 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.

Question 14. A 1.2 m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2 m from the ground. The angle of elevation of the balloon from the eyes of the girl at any instant is 60°. After some time, the angle of elevation reduces to 30° (see Fig. 9.13). Find the distance travelled by the balloon during the interval.

Question 15. 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.

Question 16. The angles of elevation of the top of a tower from two points at a distance of 4 m and 9 m from the base of the tower and in the same straight line with it are complementary. Prove that the height of the tower is 6 m.

:: Chapter 10 Circles ::

EXERCISE 10.1

Question 1. How many tangents can a circle have? 2. Fill in the blanks :

(i) A tangent to a circle intersects it in point (s).

(ii) A line intersecting a circle in two points is called a .

(iii) A circle can have parallel tangents at the most.

(iv) The common point of a tangent to a circle and the circle is called .

Question 2. 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 = 12 cm. Length PQ is :

(A) 12 cm

(B) 13 cm

(C) 8.5 cm

(D) 119 cm.

Question 3. Draw a circle and two lines parallel to a given line such that one is a tangent and the other, a secant to the circle.

EXERCISE 10.2

Question 1. From a point Q, the length of the tangent to a circle is 24 cm and the distance of Q from the centre is 25 cm. The radius of the circle is

(A) 7 cm

(B) 12 cm

(C) 15 cm

(D) 24.5 cm

Question 2. In Fig. 10.11, if TP and TQ are the two tangents to a circle with centre O so that ∠ POQ = 110°, then ∠ PTQ is equal to

(A) 60°

(B) 70°

(C) 80°

(D) 90°

Question 3. If tangents PA and PB from a point P to a circle with centre O are inclined to each other at angle of 80°, then ∠ POA is equal to

(A) 50°

(B) 60°

(C) 70°

(D) 80°

Question 4. Prove that the perpendicular at the point of contact to the tangent to a circle passes through the centre.

Question 5. The length of a tangent from a point A at distance 5 cm from the centre of the circle is 4 cm. Find the radius of the circle.

Question 6. Two concentric circles are of radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle.

Question 7. A quadrilateral ABCD is drawn to circumscribe a circle (see Fig. 10.12). Prove that AB + CD = AD + BC Fig. 10.12 Fig. 10.13

Question 8. In Fig. 10.13, XY and X′Y′ are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting XY at A and X′Y at B. Prove that ∠ AOB = 90°.

Question 9. Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line-segment joining the points of contact at the centre.

Question 10. Prove that the parallelogram circumscribing a circle is a rhombus.

Question 11. A triangle ABC is drawn to circumscribe a circle of radius 4 cm such that the segments BD and DC into which BC is divided by the point of contact D are of lengths 8 cm and 6 cm respectively (see Fig. 10.14). Find the sides AB and AC.

Question 12. Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

:: Chapter 11 Constructions ::

EXERCISE 11.1

In each of the following, give the justification of the construction also:

Question 1. Draw a line segment of length 7.6 cm and divide it in the ratio 5 : 8. Measure the two parts.

Question 2. Construct a triangle of sides 4 cm, 5 cm and 6 cm and then a triangle similar to it whose sides are 2 3 of the corresponding sides of the first triangle.

Question 3. Construct a triangle with sides 5 cm, 6 cm and 7 cm and then another triangle whose sides are 7 5 of the corresponding sides of the first triangle.

Question 4. Construct an isosceles triangle whose base is 8 cm and altitude 4 cm and then another triangle whose sides are 1 1 2 times the corresponding sides of the isosceles triangle.

Question 5. Draw a triangle ABC with side BC = 6 cm, AB = 5 cm and $\angle$ ABC = 60°. Then construct a triangle whose sides are 3 4 of the corresponding sides of the triangle ABC.

Question 6. Draw a triangle ABC with side BC = 7 cm, $\angle$ B = 45°, $\angle$ A = 105°. Then, construct a triangle whose sides are 4 3 times the corresponding sides of Δ ABC.

Question 7. 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 5 3 times the corresponding sides of the given triangle.

EXERCISE 11.2

In each of the following, give also the justification of the construction:

Question 1. Draw a circle of radius 6 cm. From a point 10 cm away from its centre, construct the pair of tangents to the circle and measure their lengths.

Question 2. Construct a tangent to a circle of radius 4 cm from a point on the concentric circle of radius 6 cm and measure its length. Also verify the measurement by actual calculation.
Question 3. Draw a circle of radius 3 cm. Take two points P and Q on one of its extended diameter each at a distance of 7 cm from its centre. Draw tangents to the circle from these two points P and Q.
Question 4. Draw a pair of tangents to a circle of radius 5 cm which are inclined to each other at an angle of 60°.
Question 5. Draw a line segment AB of length 8 cm. Taking A as centre, draw a circle of radius 4 cm and taking B as centre, draw another circle of radius 3 cm. Construct tangents to each circle from the centre of the other circle.

:: Chapter 12 Areas Related To Circles ::

EXERCISE 12.1

1 Unless stated otherwise, use π = 22/7 .

Question 1. The radii of two circles are 19 cm and 9 cm respectively. Find the radius of the circle which has circumference equal to the sum of the circumferences of the two circles.
Question 2. The radii of two circles are 8 cm and 6 cm respectively. Find the radius of the circle having area equal to the sum of the areas of the two circles.
Question 3. Fig. 12.3 depicts an archery target marked with its five scoring areas from the centre outwards as Gold, Red, Blue, Black and White. The diameter of the region representing Gold score is 21 cm and each of the other bands is 10.5 cm wide. Find the area of each of the five scoring regions.
Question 4. The wheels of a car are of diameter 80 cm each. How many complete revolutions does each wheel make in 10 minutes when the car is travelling at a speed of 66 km per hour?
Question 5. Tick the correct answer in the following and justify your choice : If the perimeter and the area of a circle are numerically equal, then the radius of the circle is
(A) 2 units
(B) π units
(C) 4 units
(D) 7 units

EXERCISE 12.2

Unless stated otherwise, use π = 22/7 .

Question 1. Find the area of a sector of a circle with radius 6 cm if angle of the sector is 60° .

Question 2. Find the area of a quadrant of a circle whose circumference is 22 cm.

Question 3. The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes.

Question 4. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding :

(i) minor segment

(ii) major sector. (Use π = 3.14)

Question 5. 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

(iii) area of the segment formed by the corresponding chord

Question 6. A chord of a circle of radius 15 cm subtends an angle of 60° at the centre. Find the areas of the corresponding minor and major segments of the circle. (Use π = 3.14 and 3 = 1.73)

Question 7. A chord of a circle of radius 12 cm subtends an angle of 120° at the centre. Find the area of the corresponding segment of the circle. (Use π = 3.14 and 3 = 1.73)

Question 8. A horse is tied to a peg at one corner of a square shaped grass field of side 15 m by means of a 5 m long rope (see Fig. 12.11). Find

(i) the area of that part of the field in which the horse can graze.

(ii) the increase in the grazing area if the rope were 10 m long instead of 5 m. (Use π = 3.14)

Question 9. A brooch is made with silver wire in the form of a circle with diameter 35 mm. The wire is also used in making 5 diameters which divide the circle into 10 equal sectors as shown in Fig. 12.12. Find :

(i) the total length of the silver wire required.

(ii) the area of each sector of the brooch.

Question 10. An umbrella has 8 ribs which are equally spaced (see Fig. 12.13). Assuming umbrella to be a flat circle of radius 45 cm, find the area between the two consecutive ribs of the umbrella.

Question 11. A car has two wipers which do not overlap. Each wiper has a blade of length 25 cm sweeping through an angle of 115°. Find the total area cleaned at each sweep of the blades.

Question 12. To warn ships for underwater rocks, a lighthouse spreads a red coloured light over a sector of angle 80° to a distance of 16.5 km. Find the area of the sea over which the ships are warned. (Use π = 3.14)

Question 13. A round table cover has six equal designs as shown in Fig. 12.14. If the radius of the cover is 28 cm, find the cost of making the designs at the rate of Rs 0.35 per cm2. (Use 3 = 1.7)

Question 14. Tick the correct answer in the following : Area of a sector of angle p (in degrees) of a circle with radius R is

(A) 2 R 180 p ×

(B) R2 180 p × π

(C) 2 R 360 p × π

(D) 2 R2 720 p ×

EXERCISE 12.3

Unless stated otherwise, use π = 22/ 7

Question 1. Find the area of the shaded region in Fig. 12.19, if PQ = 24 cm, PR = 7 cm and O is the centre of the circle.

Question 2. Find the area of the shaded region in Fig. 12.20, if radii of the two concentric circles with centre O are 7 cm and 14 cm respectively and ∠ AOC = 40°.

Question 3. Find the area of the shaded region in Fig. 12.21, if ABCD is a square of side 14 cm and APD and BPC are semicircles.

Question 4. Find the area of the shaded region in Fig. 12.22, where a circular arc of radius 6 cm has been drawn with vertex O of an equilateral triangle OAB of side 12 cm as centre.

Question 5. From each corner of a square of side 4 cm a quadrant of a circle of radius 1 cm is cut and also a circle of diameter 2 cm is cut as shown in Fig. 12.23. Find the area of the remaining portion of the square.

Question 6. In a circular table cover of radius 32 cm, a design is formed leaving an equilateral triangle ABC in the middle as shown in Fig. 12.24. Find the area of the design (shaded region).

Question 7. In Fig. 12.25, ABCD is a square of side 14 cm. With centres A, B, C and D, four circles are drawn such that each circle touch externally two of the remaining three circles. Find the area of the shaded region

Question 8. Fig. 12.26 depicts a racing track whose left and right ends are semicircular. The distance between the two inner parallel line segments is 60 m and they are each 106 m long. If the track is 10 m wide, find :

(i) the distance around the track along its inner edge

(ii) the area of the track.

Question 9. In Fig. 12.27, AB and CD are two diameters of a circle (with centre O) perpendicular to each other and OD is the diameter of the smaller circle. If OA = 7 cm, find the area of the shaded region.

Question 10. The area of an equilateral triangle ABC is 17320.5 cm2. With each vertex of the triangle as centre, a circle is drawn with radius equal to half the length of the side of the triangle (see Fig. 12.28). Find the area of the shaded region. (Use π = 3.14 and 3 = 1.73205)

Question 11. On a square handkerchief, nine circular designs each of radius 7 cm are made (see Fig. 12.29). Find the area of the remaining portion of the handkerchief.

Question 12. In Fig. 12.30, OACB is a quadrant of a circle with centre O and radius 3.5 cm. If OD = 2 cm, find the area of the (i) quadrant OACB, (ii) shaded region.

Question 13. In Fig. 12.31, a square OABC is inscribed in a quadrant OPBQ. If OA = 20 cm, find the area of the shaded region. (Use π = 3.14)

Question 14. AB and CD are respectively arcs of two concentric circles of radii 21 cm and 7 cm and centre O (see Fig. 12.32). If ∠ AOB = 30°, find the area of the shaded region.

Question 15. In Fig. 12.33, ABC is a quadrant of a circle of radius 14 cm and a semicircle is drawn with BC as diameter. Find the area of the shaded region.

Question 16. Calculate the area of the designed region in Fig. 12.34 common between the two quadrants of circles of radius 8 cm each

---

:: Chapter 13 Surface Areas and Volumes ::

EXERCISE 13.1

Unless stated otherwise, take π = 22 7

Question 1. 2 cubes each of volume 64 cm3 are joined end to end. Find the surface area of the resulting cuboid.

Question 2. A vessel is in the form of a hollow hemisphere mounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area of the vessel.

Question 3. A toy is in the form of a cone of radius 3.5 cm mounted on a hemisphere of same radius. The total height of the toy is 15.5 cm. Find the total surface area of the toy.

Question 4. A cubical block of side 7 cm is surmounted by a hemisphere. What is the greatest diameter the hemisphere can have? Find the surface area of the solid.

Question 5. A hemispherical depression is cut out from one face of a cubical wooden block such that the diameter l of the hemisphere is equal to the edge of the cube. Determine the surface area of the remaining solid.

Question 6. A medicine capsule is in the shape of a cylinder with two hemispheres stuck to each of its ends (see Fig. 13.10). The length of the entire capsule is 14 mm and the diameter of the capsule is 5 mm. Find its surface area.

Question 7. A tent is in the shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1 m and 4 m respectively, and the slant height of the top is 2.8 m, find the area of the canvas used for making the tent. Also, find the cost of the canvas of the tent at the rate of Rs 500 per m2. (Note that the base of the tent will not be covered with canvas.)

Question 8. From a solid cylinder whose height is 2.4 cm and diameter 1.4 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid to the nearest cm2.

Question 9. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in Fig. 13.11. 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.

EXERCISE 13.2

Unless stated otherwise, take π = 22 /7 .

Question 1. A solid is in the shape of a cone standing on a hemisphere with both their radii being equal to 1 cm and the height of the cone is equal to its radius. Find the volume of the solid in terms of π.

Question 2. Rachel, an engineering student, was asked to make a model shaped like a cylinder with two cones attached at its two ends by using a thin aluminium sheet. The diameter of the model is 3 cm and its length is 12 cm. If each cone has a height of 2 cm, find the volume of air contained in the model that Rachel made. (Assume the outer and inner dimensions of the model to be nearly the same.)

Question 3. A gulab jamun, contains sugar syrup up to about 30% of its volume. Find approximately how much syrup would be found in 45 gulab jamuns, each shaped like a cylinder with two hemispherical ends with length 5 cm and diameter 2.8 cm (see Fig. 13.15).

Question 4. A pen stand made of wood is in the shape of a cuboid with four conical depressions to hold pens. The dimensions of the cuboid are 15 cm by 10 cm by 3.5 cm. The radius of each of the depressions is 0.5 cm and the depth is 1.4 cm. Find the volume of wood in the entire stand (see Fig. 13.16).

Question 5. A vessel is in the form of an inverted cone. Its height is 8 cm and the radius of its top, which is open, is 5 cm. It is filled with water up to the brim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the vessel, one-fourth of the water flows out. Find the number of lead shots dropped in the vessel.

Question 6. A solid iron pole consists of a cylinder of height 220 cm and base diameter 24 cm, which is surmounted by another cylinder of height 60 cm and radius 8 cm. Find the mass of the pole, given that 1 cm3 of iron has approximately 8g mass. (Use π = 3.14)

Question 7. A solid consisting of a right circular cone of height 120 cm and radius 60 cm standing on a hemisphere of radius 60 cm is placed upright in a right circular cylinder full of water such that it touches the bottom. Find the volume of water left in the cylinder, if the radius of the cylinder is 60 cm and its height is 180 cm.

Question 8. A spherical glass vessel has a cylindrical neck 8 cm long, 2 cm in diameter; the diameter of the spherical part is 8.5 cm. By measuring the amount of water it holds, a child finds its volume to be 345 cm3. Check whether she is correct, taking the above as the inside measurements, and π = 3.14

EXERCISE 13.3

Take π = 22 7 , unless stated otherwise.

Question 1. A metallic sphere of radius 4.2 cm is melted and recast into the shape of a cylinder of radius 6 cm. Find the height of the cylinder.

Question 2. Metallic spheres of radii 6 cm, 8 cm and 10 cm, respectively, are melted to form a single solid sphere. Find the radius of the resulting sphere.

Question 3. A 20 m deep well with diameter 7 m is dug and the earth from digging is evenly spread out to form a platform 22 m by 14 m. Find the height of the platform.

Question 4. A well of diameter 3 m is dug 14 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 4 m to form an embankment. Find the height of the embankment.

Question 5. A container shaped like a right circular cylinder having diameter 12 cm and height 15 cm is full of ice cream. The ice cream is to be filled into cones 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.

Question 6. How many silver coins, 1.75 cm in diameter and of thickness 2 mm, must be melted to form a cuboid of dimensions 5.5 cm × 10 cm × 3.5 cm?

Question 7. A cylindrical bucket, 32 cm high and with radius of base 18 cm, is filled with sand. This bucket is emptied on the ground and a conical heap of sand is formed. If the height of the conical heap is 24 cm, find the radius and slant height of the heap.

Question 8. Water in a canal, 6 m wide and 1.5 m deep, is flowing with a speed of 10 km/h. How much area will it irrigate in 30 minutes, if 8 cm of standing water is needed?

Question 9. A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank in her field, which is 10 m in diameter and 2 m deep. If water flows through the pipe at the rate of 3 km/h, in how much time will the tank be filled?

EXERCISE 13.4

Use π = 22/7 unless stated otherwise.

Question 1. A drinking glass is in the shape of a 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.

Question 2. The slant height of a frustum of a cone is 4 cm and the perimeters (circumference) of its circular ends are 18 cm and 6 cm. Find the curved surface area of the frustum.

Question 3. A fez, the cap used by the Turks, is shaped like the frustum of a cone (see Fig. 13.24). If its radius on the open side is 10 cm, radius at the upper base is 4 cm and its slant height is 15 cm, find the area of material used for making it.

Question 4. A container, opened from the top and 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 milk which can completely fill the container, at the rate of Rs 20 per litre. Also find the cost of metal sheet used to make the container, if it costs Rs 8 per 100 cm2. (Take $\pi = 3.14$)

Question 5. A 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 1 cm, 16 find the length of the wire.

EXERCISE 13.5

Question 1. A copper wire, 3 mm in diameter, is wound about a cylinder whose length is 12 cm, and diameter 10 cm, so as to cover the curved surface of the cylinder. Find the length and mass of the wire, assuming the density of copper to be 8.88 g per cm3.

Question 2. A right triangle, whose sides are 3 cm and 4 cm (other than hypotenuse) is made to revolve about its hypotenuse. Find the volume and surface area of the double cone so formed. (Choose value of π as found appropriate.)

Question 3. A cistern, internally measuring 150 cm × 120 cm × 110 cm, has 129600 cm3 of water in it. Porous bricks are placed in the water until the cistern is full to the brim. Each brick absorbs one-seventeenth of its own volume of water. How many bricks can be put in without overflowing the water, each brick being 22.5 cm × 7.5 cm × 6.5 cm?

Question 4. In one fortnight of a given month, there was a rainfall of 10 cm in a river valley. If the area of the valley is 97280 km2, show that the total rainfall was approximately equivalent to the addition to the normal water of three rivers each 1072 km long, 75 m wide and 3 m deep.

Question 5. An oil funnel made of tin sheet consists of a 10 cm long cylindrical portion attached to a frustum of a cone. If the total height is 22 cm, diameter of the cylindrical portion is 8 cm and the diameter of the top of the funnel is 18 cm, find the area of the tin sheet required to make the funnel (see Fig. 13.25).

Question 6. Derive the formula for the curved surface area and total surface area of the frustum of a cone, given to you in Section 13.5, using the symbols as explained.

Question 7. Derive the formula for the volume of the frustum of a cone, given to you in Section 13.5, using the symbols as explained.

:: Chapter 14 Statistics ::

EXERCISE 14.1

Question 1. A survey was conducted by a group of students as a part of their environment awareness programme, in which they collected the following data regarding the number of plants in 20 houses in a locality. Find the mean number of plants per house.Which method did you use for finding the mean, and why?

Question 2. Consider the following distribution of daily wages of 50 workers of a factory Find the mean daily wages of the workers of the factory by using an appropriate method.

Question 3. The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is Rs 18. Find the missing frequency f.

Question 4. Thirty women were examined in a hospital by a doctor and the number of heart beats per minute were recorded and summarised as follows. Find the mean heart beats per minute for these women, choosing a suitable method.

Question 5. In a retail market, fruit vendors were selling mangoes kept in packing boxes. These boxes contained varying number of mangoes. The following was the distribution of mangoes according to the number of boxes. Find the mean number of mangoes kept in a packing box. Which method of finding the mean did you choose?

Question 6. The table below shows the daily expenditure on food of 25 households in a localityFind the mean daily expenditure on food by a suitable method.

Question 7. To find out the concentration of SO2 in the air (in parts per million, i.e., ppm), the data was collected for 30 localities in a certain city and is presented below: Find the mean concentration of SO2 in the air.

Question 8. A class teacher has the following absentee record of 40 students of a class for the whole term. Find the mean number of days a student was absent.

Question 9. The following table gives the literacy rate (in percentage) of 35 cities. Find the mean literacy rate

EXERCISE 14.2

Question 1. The following table shows the ages of the patients admitted in a hospital during a year: Find the mode and the mean of the data given above. Compare and interpret the two measures of central tendency.

Question 2. The following data gives the information on the observed lifetimes (in hours) of 225 electrical components : Determine the modal lifetimes of the components.

Question 3. The following data gives the distribution of total monthly household expenditure of 200 families of a village. Find the modal monthly expenditure of the families. Also, find the mean monthly expenditure :

Question 4. The following distribution gives the state-wise teacher-student ratio in higher secondary schools of India. Find the mode and mean of this data. Interpret the two measures.

Question 5. The given distribution shows the number of runs scored by some top batsmen of the world in one-day international cricket matches Find the mode of the data.

Question 6. A student noted the number of cars passing through a spot on a road for 100 periods each of 3 minutes and summarised it in the table given below. Find the mode of the data :

EXERCISE 14.3

Question 1. The following frequency distribution gives the monthly consumption of electricity of 68 consumers of a locality. Find the median, mean and mode of the data and compare them.

Question 2. If the median of the distribution given below is 28.5, find the values of x and y

Question 3. A life insurance agent found the following data for distribution of ages of 100 policy holders. Calculate the median age, if policies are given only to persons having age 18 years onwards but less than 60 year.

Question 4. The lengths of 40 leaves of a plant are measured correct to the nearest millimetre, and the data obtained is represented in the following table Find the median length of the leaves. (Hint : The data needs to be converted to continuous classes for finding the median, since the formula assumes continuous classes. The classes then change to 117.5 - 126.5, 126.5 - 135.5, . . ., 171.5 - 180.5.)

Question 5. The following table gives the distribution of the life time of 400 neon lamps : Find the median life time of a lamp.

Question 6. 100 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 obtained as follows: Determine the median number of letters in the surnames. Find the mean number of letters in the surnames? Also, find the modal size of the surnames.

Question 7. The distribution below gives the weights of 30 students of a class. Find the median weight of the students.

EXERCISE 14.4

Question 1. The following distribution gives the daily income of 50 workers of a factory. Convert the distribution above to a less than type cumulative frequency distribution, and draw its ogive.

Question 2. During the medical check-up of 35 students of a class, their weights were recorded as follows: 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.

Question 3. The following table gives production yield per hectare of wheat of 100 farms of a village.

:: Chapter 15 Probability ::

EXERCISE 15.1

Question 1. Complete the following statements:

(i) Probability of an event E + Probability of the event 'not E' = .

(ii) The probability of an event that cannot happen is . Such an event is called .

(iii) The probability of an event that is certain to happen is . Such an event is called .

(iv) The sum of the probabilities of all the elementary events of an experiment is .

(v) The probability of an event is greater than or equal to and less than or equal to .

Question 2. Which of the following experiments have equally likely outcomes? Explain.

(i) A driver attempts to start a car. The car starts or does not start.

(ii) A player attempts to shoot a basketball. She/he shoots or misses the shot.

(iii) A trial is made to answer a true-false question. The answer is right or wrong.

(iv) A baby is born. It is a boy or a girl.

Question 3. Why is tossing a coin considered to be a fair way of deciding which team should get the ball at the beginning of a football game?

Question 4. Which of the following cannot be the probability of an event?

(A) 2 3

(B) –1.5

(C) 15%

(D) 0.7

Question 5. If P(E) = 0.05, what is the probability of 'not E'?

Question 6. A bag contains lemon flavoured candies only. Malini takes out one candy without looking into the bag. What is the probability that she takes out

(i) an orange flavoured candy?

(ii) a lemon flavoured candy? 7. It is given that in a group of 3 students, the probability of 2 students not having the same birthday is 0.992. What is the probability that the 2 students have the same birthday?

Question 8. A bag contains 3 red balls and 5 black balls. A ball is drawn at random from the bag. What is the probability that the ball drawn is

(i) red ?

(ii) not red?

Question 9. A box contains 5 red marbles, 8 white marbles and 4 green marbles. One marble is taken out of the box at random. What is the probability that the marble taken out will be

(i) red ?

(ii) white ?

(iii) not green?

Question 10. A piggy bank contains hundred 50p coins, fifty Re 1 coins, twenty Rs 2 coins and ten Rs 5 coins. If it is equally likely that one of the coins will fall out when the bank is turned upside down, what is the probability that the coin

(i) will be a 50 p coin ?

(ii) will not be a Rs 5 coin?

Question 11. Gopi buys a fish from a shop for his aquarium. The shopkeeper takes out one fish at random from a tank containing 5 male fish and 8 female fish (see Fig. 15.4). What is the probability that the fish taken out is a male fish?

Question 12. 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 (see Fig. 15.5), and these are equally likely outcomes. What is the probability that it will point at

(i) 8 ?

(ii) an odd number?

(iii) a number greater than 2?

(iv) a number less than 9?

Question 13. A die is thrown once. Find the probability of getting

(i) a prime number

(ii) a number lying between 2 and 6

(iii) an odd number.

Question 14. One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting

(i) a king of red colour

(ii) a face card

(iii) a red face card

(iv) the jack of hearts

(v) a spade

(vi) the queen of diamonds

Question 15. Five cards—the ten, jack, queen, king and ace of diamonds, are well-shuffled with their face downwards. One card is then picked up at random.

(i) What is the probability that the card is the queen?

(ii) If the queen is drawn and put aside, what is the probability that the second card picked up is (a) an ace? (b) a queen?

Question 16. 12 defective pens are accidentally mixed with 132 good ones. It is not possible to just look at a pen and tell whether or not it is defective. One pen is taken out at random from this lot. Determine the probability that the pen taken out is a good one.

Question 17. (i) A lot of 20 bulbs contain 4 defective ones. One bulb is drawn at random from the lot. What is the probability that this bulb is defective?

(ii) Suppose the bulb drawn in (i) is not defective and is not replaced. Now one bulb is drawn at random from the rest. What is the probability that this bulb is not defective ?

Question 18. 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 perfect square number

(iii) a number divisible by 5.