Subject – Math SS1 Class – X

SECTION – A 10 x 1 = 10 mark

1) After how many decimal places, will the decimal expansion of 2437/23X54 ?

2) If x (x≠0) is a rational number and y is irrational number, then what can you say about x + y.

3) Find the condition that the pair of linear equations  has unique solution.

4) Write the zeroes of the polynomial px2 + qx + r.

5) In ∆ ABC, DE is parallel to BC and AD = 1 cm, BD = 2 cm. What is the ratio of the area of ∆ABC to the area of ∆ADE?

7) In,  DE || BC meeting AB at D and AC at E. If = 4 and CE = 2cm, find the length of AE.

8) Show that 

9) Find the median of first ten composite numbers.

SECTION - B 2 marks

5) If the zeroes of the polynomial x3-3x2 + x + 1 are p-q ,, p , ,p+q . Find value of p & q.

6) Evaluate 

.

SECTION - C 3 marks

7) Find the zeroes of the quadratic polynomial x2 – 5x – 6 and verify the relationship between the zeroes and the coefficients.

8)Prove that---

 OR 

9) Sides AB and AC and median AD of a triangle ABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that the triangles are similar

SECTION - D 3 marks

10) Two water taps together can fill a tank in  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.

11) Prove that the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides. Using the above, do the following: The area of two similar triangles ABC and PQR are in the ratio of 9 : 16. If BC = 4.5 cm, find the length of QR.

12) The following table shows the marks obtained by 100 students of class X. Find the mean

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Marks Less than | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 |
| No. of students | 7 | 21 | 34 | 46 | 66 | 77 | 92 | 100 |
|  |  |  |  |  |  |  |  |  |

**1. Linear Equations in Two Variables**

1. Express y in terms of x in the equation 2x + 3y = 11. Find the point where the line represented by the equation 2x + 3y = 11 cuts y-axis.

2. Solve for x and y : + = , + = 0 and hence find ‘a’ for which y = ax – 4.

3. Solve 4x + = 15 and 6x – = 14 and hence find ‘p’ if y = px – 2.

4. For what value of k will the system of linear equations have infinite number of solutions :

kx + 4y = k – 4, 16x + ky = k ?

5. Determine the value of k for which the following system of linear equations has infinite number of solutions : (k – 3)x + 3y = k; kx + ky = 12

6. For what value of k, will the following system of equations have infinite solutions :

2x + 3y = 4, (k + 2)x + 6y = 3k + 2 ?

7. For what value of k, will the following system of equations have infinite solutions :

2x – 3y = 7, (k + 2)x – (2k + 1)y = 3(2k – 1) ?

8. A person invested some amount at the rate of 10% simple interest and some other amount at the rate of 12% simple interest. He received yearly interest of Rs. 130. But if he had interchanged the amount invested, he would have received Rs. 4 more as interest. How much amount did he invest at different rates?

9. Solve the system of equations graphically : 2(x – 1) = y; x + 3y = 15. Also, find the co-ordinates of the points where the lines meet the axis of y.

10. Solve graphically the system of linear equations : 2x + 3y = 12; 2y – 1 = x. Also find the co-ordinates of the points where the lines meet the y-axis.

11. Ramesh travels 760 km to his home partly by train and partly by car. He takes 8 hrs, if he travels 160 km by train and the rest by 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.

12. Solve for x, y and z : x + y + z = 9; 2y – z = 2; z – x = 2.

13. Solve for x and y : 631x + 279y = 910; 279x + 631y = 910.

14. Solve for x and y : 6x + 3y = 8x + 9y – 5 = 10x + 12y – 8.

15. Solve the following equation by using the method of cross multiplication :

+ = a + b; + = 2.

16. Solve the following equation by using the method of cross multiplication :

a(x + y) + b(x – y) = a2 – ab + b2

a(x + y) – b(x – y) = a2 + ab + b2

17. Ratio between the girls and boys in a class of 40 students is 2 : 3. Five new students joined the class. How many of them must be boys so that the ratio between girls and boys becomes 4 : 5 ?

18. If you travel by an autorickshaw the fare for the first kilometre is different from the rate per km for the remaining distance. The total fare for a distance of 20 km is Rs. 37.70 and that for a distance of 26 km is Rs. 48.50. Find the auto fare for the first kilometre and for each successive kilometre.

19. Ten years ago, the sum of the ages of two sons was one third of their father’s age. One son is two years older than the other and sum of their present ages is 14 years less than the father’s present age. Find the present ages of all.

20 A villager went to a hotel in a town with his big family. They consumed 23 idlies, 18 pooris, 7 dosas and 19 vadas. The bill come to Rs. 108. On next day, they consumed 34 idlies, 8 vadas, 22 pooris and 7 dosas. The bill came to Rs. 114. If an idli costs the same as a vada, what is the cost of one poori?

21. A boat goes 24 km upstream and 28 km downstream in 6 hrs. It goes 30 km upstream and 21 km downstream in 6½ hrs. Find the speed of the boat in still water and also speed of stream.

22. A dealer sold a TV and VCR for Rs. 25,820 making a profit of 15% on TV and 10% on VCR. By selling them for Rs. 25,930, he would have realised a profit of 10% on TV and 15% on VCR. Find cost price of each.

23. A man sold a chair and a table together for Rs. 1520 there by making a profit of 25% on chair and 10% on table. By selling them together for Rs. 1535 he would have made a profit of 10% on the chair and 25% on the table. Find the cost price of each.

24 Solve for x and y :

– = – ;  + = 1 – x –

26. Solve for a and b : 2a + 3b = 17 and 2a + 2 – 3b + 1 = 5.

27. For what value of k, will the following system of equations have infinite solutions : 2x – 3y = 7, (k + x – (2k + 1)y = 3(2k – 1)?

**10. Similar Triangles**

.1 In the given figure, DE is parallel to BC, = ,If AE= 7.8 cm,   
find EC.

B

A

EE

Ca

Da

fig-ST-1.tif

2. In a right angled triangle with sides a and b and hypotenuse c, the altitude drawn on the

hypotenuse is x. Prove that + = .

3. In the given figure, base BC of a triangle ABC is bisected at D and ÐADB, ÐADC are bisected by DE and DF respectively meeting AB in E and AC in F. Show that EF||BC.

4. In the given figure, find the length of AD.

1. Given that : tan (1 + 2) =

2. Prove : + = 2

3. If tan  + cot  = 2, find the value of tan2 + cot2.

4. In the given figure, find the length of AE.

5. If sin  + cos  = 2 cos (90° – ), determine cot .

6. In the given figure, ABCD is a rectangle in which segments AP and AQ are drawn as shown. Find the length of (AP + AQ).

7. Show that : 1 + 1 + =

8. Show that : (sin  + cosec )2 + (cos  + sec )2 = 7 + tan2 + cot2.

9. If = m and = n, show that (m2 + n2) cos2 = n2.

10. Without using trigonometric tables, evaluate :

2 – – 2 sin 45°.

11. If x =  cos  sin , y =  cos  cos  and z =  sin , show that x2 + y2 + z2 = 2.

12. Find the value of : sin (50° + ) – cos (40° – ).

13. In the figure, ABC is a right angled triangle. D is the mid-point of BC. Show that = .

14. At a point on level ground, the angle of elevation of a vertical tower is found to be such tht its tanget is 5/12. On walking 192 metres towards the tower, the tanget of the angle is found to be   
3/4. Find the height of the tower.

15. Show that : = 1 + 2 cot2 + 2 cosec cot 

16. Solve for  : = 1 ; 0° <  < 90°.

17. A man is standing on the deck of a ship, which is 8 m above water level. He observes the angle of elevation of the top of a hill as 600 and the angle of depression of the base of the hill as 300. Calculate the distance of the hill from the ship and the height of the hill.

18. Determine the height of a mountain if the elevation of its top at an unknown distance from the base is 30° and at a distance 10 km further off from the mountain, along the same line, the angle of elevation is 15°. (Use tan 15° = 0.27)

19. From a window (h 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 the opposite side of the street are  and  respectively. Show that the height of the opposite house is h(1 + tan cot ).

20. From the top of a tower, the angles of depression of two objects on the same side of the tower are found to be  and  (>). If the distance between the objects is ‘p’ metres, show that the height ‘h’ of the tower is given by

h =

Also determine the height of the tower, if P = 50 m

 = 60°,  = 30°.

21. cot2A cosec2B – cot2B. cosec2A = cot2A – cot2B.

22. If x sin3 + y cos3 = sin  cos  and x sin  = y cos , prove x2 + y2 = 1.

23. If 7 cosec  – 3 cot  = 7, prove that 7 cot  – 3 cosec  = 3.

24. If = , find the value of .

25. tan 10°. tan 75° . tan 15° . tan 80° = 1.

26. (sin 72° + cos 18°)(sin 72° – cos 18°) = 0.

27. sin 63° . cos 27° + cos 63° . sin 27° = 1.

28. If A, B, C are the interior angles of a triangle ABC, prove that

tan = cot

29. If A and B are acute angles and tan A = 1, sin B = 1/ 2, find the value of cos (A + B).

30. If tan (A + B) = 1 and sin (2A – B) = 1, find A and B.

31. If cos  – sin  = 1, show that cos + sin = 1 or –1.

32. + = sec  . cosec  – 2 sin  cos .

33. If cot  + tan  = x and sec  – cos  = y, prove that (x2y)2/3 – (xy2)2/3 = 1.

34. If cosec  – sin  = a3, sec  – cos  = b3, prove that a2b2(a2 + b2) = 1.

35. Solve the following trigonometric equation for  : 3 tan  + cot  = 5 cosec .

36. Solve the following trigonometric equation for  : cosec2 – cot  (1 + 3) + ( 3 – 1) = 0.

37. If 5 sin  + 3 cos  = 4, find the value of 3 sin  – 5 cos .

38. Prove that : + = –

39. The shadow of a flagstaff is three times as long as the shadow of the flagstaff when the sunrays meet the ground at an angle of 60°. Find the angle between the sunrays and the ground at the time of longer shadow.

40. A fire in a building B is reported on telephone to two fire stations P and Q, 20 km apart from each other on a straight road. P observes that the fire is at the angle of 60° to the road and Q observes that it is at an angle of 45° to the road. Which station should send its team and how much will this team have to travel?

41. If the angle of elevation of a cloud from a point h metres above a lake is  and the angle of depression of its reflection in the lake is . Prove that the distance of the cloud from the point of

observation is .

42. A ladder rests against a wall at angle  to the horizontal. Its foot is pulled away from the wall through a distance ‘a’, so that it slides a distance b down the wall making an angle  with the

horizontal. Show that = .

43. From a window (P 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 the street are  and

 respectively. Show that the height of the opposite house is P .

44. The pilot of an aircraft flying horizontally at a speed of 1200 km/hr. Observes that the angle of depression of a point on the ground changes from 30° to 45° in 15 seconds. Find the height at which the aircraft is flying.

45. A flagstaff stands in the middle of a square tower. A man on the ground, opposite the middle of one face and distant 100 metre just sees the flag. On his receeding another 100 metre, the tangets of elevation of the top of the tower and top of the flagstaff are found to be 1/2 and 5/9. Find the dimensions of the tower and the height of the flagstaff, the ground being horizontal.

46. If tan A = 1/2 and tan B = 1/3, by using tan (A + B) = , prove that A + B = 45°.

47. Eleminate  from the following :

x cos  + x sin  = a; x cos  – x sin  = b.

1. In the given figure, DE is parallel to BC, = . If AE = 7.8 cm,   
find EC.

2. In a right angled triangle with sides a and b and hypotenuse c, the altitude drawn on the

hypotenuse is x. Prove that + = .

3. In the given figure, base BC of a triangle ABC is bisected at D and ÐADB, ÐADC are bisected by DE and DF respectively meeting AB in E and AC in F. Show that EF||BC.

4. In the given figure, find the length of AD.

5. In the given figure, AB || MN. If PA = x – 2, PM = x, PB = x – 1 and PN = x + 2, find the value of x.

6. In the trapezium ABCD, AB || CD and AB = 2CD. If area of AOB = 84cm2, find the area of COD.

7. From given figure, express x in terms of a, b and c.

8. In a ABC, AB = AC and D is a point on side AC, such that BC2 = AC x CD. Prove that   
BD = BC.

9. In figure, ÐA = ÐB abd AD = BE, show that DE || AB.

10. In the given figure, triangles ABC and DEF are similar. If area of ABC = 49 sq. cm, and area of DEF = 64 sq. cm. and AC = 4.8 cm, find DF.

11. In the figure given in the above question, DE is parallel to BC. If = and AC = 15 cm, find AE.

12. P and Q are points on the sides CA and CB respectively of a ABC right-angled at C. Prove that

AQ2 + BP2 = AB2 + PQ2.

13. ABCD is a quadrilateral in which AB = AD. The bisectors of ÐBAC and ÐCAD intersect the sides BC and CD respectively at the points E and F. Prove that the segment EF is parallel to the diagonal BD.

14. In the given figure, ABC is a right triangle, right-angled at B. AD and CE are the two medians drawn from A and C respectively. If

AC = 5 cm and AD = cm, find the length of CE.

15. In the given figure, M is the mid point of the side CD of parallelogram ABCD. BM, when joined meets AC in L and AD produced in E. Prove that EL = 2BL.

16. ABC is a right triangle, right-angled at C. If p is the length of the perpendicular from C to AB and a, b, c have the usual meaning, then prove that

(i) pc = ab (ii) = +

17. In an equilateral triangle PQR, the side QR is trisected at S. Prove that 9PS2 = 7PQ2.

18. ABCD is a square. F is the mid-point of AB. BE is one third of BC. If the area of the FBE is   
108 sq. cm, find the length of AC.

19. In the given figure, perpendiculars OD, OE and OF are drawn to sides BC, CA and AB respectively from a point O is the interior of a ABC. Prove that :

(i) AF2 + BD2 + CE2 = OA2 + OB2 + OC2 – OD2 – OE2 – OF2.

(ii) AF2 + BD2 + CE2 = AE2 + CD2 + BF2.

20. In the figure, if ÐA = ÐCED, AB = 9 cm, AD = 7 cm, CD = 8 cm and CE = 10 cm. Find DE.

21. In the given figure, ABC is a right angle triangle at ÐC. Prove that DABC ~ DADE and find the lengths of AE and DE..

22. In ABC, the bisector of ÐA intersects BC in D. If AB = 18 cm, AC = 15 cm and BC = 22 cm, find BD.

23. The bisector of the exterior ÐA of a triangle ABC intersects the side BC produced in D.   
Prove that :

=

24. In ABC, ray AD bisects ÐA and intersects BC in D. If BC = a, AC = b and AB = c, prove that

BD = , DC =

25. In the given figure, DEFG is a square and ÐBAC is a right angle. Prove that DE2 = BD . EC.

26. ABC is a right angled triangle at A. BL and CM are its two medians, prove that

4(BL2 + CM2) = 5BC2.

27. ABCD is a rectangle. Points M and N are on BD such that AM ^ BD and CN ^ BD. Prove that

BM2 + BN2 = DM2 + DN2.

28. A point D is on the side BC of an equilateral triangle ABC such that DC = 1/4 BC. Prove that

(AD)2 = 13(CD)2

29. Points D, E are taken in the base BC of a ABC so that BD = 1/3 BC and BE = 1/2 BC. Prove that twice the area of ABE is equal to three times the area of ABE and that ADE = 1/6 of ABC.

30. In a right angled triangle with sides a and b and hypotenuse c, the altitude drawn on the

hypotenuse is x. Prove that + = .

31. What values of x will make DE || AB in the figure?

Ss 2 10 class

Class – X**5. Quadratic Equations**

1. The sum of the reciprocals of two consecutive even numbers is 7/24. One number is 6. What is the other number?

2. If ,  are roots of the quadratic equation x2 – 6x + k = 0, find the value of k such that   
2 + 2 = 40.

3. If ,  are roots of quadratic equation 2x2 + 5x + k = 0, find the value of k if 2 + 2 +  = 21/4.

4. If ,  are roots of the quadratic equation kx2 + 4x + 4 = 0, find the values of k such that   
2 + 2 = 24.

5. Find the value of k such that the quadratic equation x2 – (k + 6)x + 2(2k – 1) = 0 has sum of the roots equal to half their products.

6. If –4 is a root of the quadratic equation x2 + px – 4 = 0 and the quadratic equation x2 + px   
+ k = 0 has equal roots, find the value of k.

7. One root of the equation 2x2 – 8x – m = 0 is 5/2. Find the other root and the value of m.

8. If one root of the quadratic equation 2x2 + ax + 3 = 0 is 1, find the other root and the value of a.

9. If  and  are the roots of x2 – 5x + 4 = 0, find the value of + – 2.

10. Rs. 250 are divided equally among a certain number of children. If there were 25 children more, each would have received 50 paise less. Find the number of children.

11. Two circle touch internally. The sum of their areas is 116  sq. cm and the distance between their centres is 6 cm. Find the radii of the circles.

12. If ,  are the roots of the quadratic equation 2x2 + 5x + 1 = 0, form an equation whose roots are

 +  and  +   +

13. Solve for x : 9x+ 2 – 6.3x + 1 + 1 = 0.

14. If ,  are the roots of the quadratic equation 3x2 – 6x + 4 = 0, find the value of (   +  ) + 3(1/   + 4

15. In a flight of 3000 km, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 100 km/hour and time increased by one hour. Find the original duration of flight.

16. Find a and b such that x + 1 and x + 2 are factors of the polynomial x3 + ax2 – bx + 10.

17. Solve for x : 6 ( x2 + 1/ x2 ) – 25 ( x – 1/x ) + 12 = 0.

18. Solve for x : ( x + 1/x )2 – 3/2x ( x – 1/x ) – 4 = 0.

19. Solve for x : x2 – 9x + 20 – x2 – 12x + 32 = 2x2 – 25x + 68.

20. Solve for x : x2 – 4x + 3 + x2 – 9 = 4x2 – 14x + 6 ; x Î R.

21. Solve for x :

( x – 1/x )2 + 8 ( x + 1/x )+ = 29,

22. Solve for x : (x2 – 5x)2 – 7(x2 – 5x) + 6 = 0; x Îe R.

23. X and Y are centres of circles of radius 9 cm and 2 cm and XY = 17 cm. Z is the centre of a circle of radius r cm, which touches the above circles externally. Given that ÐXYZ = 90°, write an equation in r and solve it for r.

24. For what value of k, (4 – k)x2 + (2k + 4)x + (8k + 1) = 0 is a perfect square?

25. Find the value of p so that the roots of the equation 2x2 + 6x + p = 0 differ by 1.

26. Write a rational expression whose numerator is a quad. polynomial with zeros 2 and –3 and whose denominator is a polynomial with zeros –2, 1 and 4.

27. Find the value of k so that one root of the equation 8x2 + kx + 1 = 0 may be double of the other.

28. The difference of mother’s age and her daughter’s age is 21 years and the twelfth part of the product of their ages is less than the mother’s age by 18 years. Find their ages.

29. If ,  are the roots of the equation 3x2 – 4x + 1 = 0, form an equation whose roots are

2 and2

30 : x2/3 + x1/3 – 2 = 0.

31. Some students planned a picnic. The budget for food was Rs. 480. But eight of these failed to go and thus the cost of food for each member increased by Rs. 10. How many students attended the picnic?

32. Solve the equation : – = 7 .

33. Solve the equation : 2(x – 3)2 + 3(x – 2)(2x – 3) = 8(x + 4)(x – 4) – 1.

34. If one root of 3x2 = 8x + (2k + 1) is seven times the other, then find the roots and value of k.

35. Solve : (x2 + 3x + 2)2 – 8(x2 + 3x) – 4 = 0.

36. Solve : (x – 1)(x – 2)(3x – 2)(3x + 1) =

37. A fox and an eagle lived at the top of a cliff of height 6 m whose base was at a distance of 10m from a point A on the ground. The fox descends the cliff and went straight to the point A. The eagle flew vertically up to a height x and then flew in a straight line to point A, the distance, travelled by each being the same. Find the value of x.

38. Solve for x : (x2 + x – 6)(x2 – 3x – 4) = 24.

39. If one root of the quadratic equation 2x2 – 3x + p = 0 is 3, find the other root of the quadratic equation.

40. If ax2 – 7x + c = 0 has 14 as the sum of the roots and also as the product of the roots, find the values of a and c.

41. Rs. 6,500 were divided equally among a certain number of persons. Had there been 15 more persons, each would have got Rs. 30 less. Find the original number of persons.

42. For what value of 'p' the equation (1 + p)x2 + 2(1 + 2p)x + (1 + p) = 0 has coincident roots ?

1 )Write the common difference of an A.P. whose nth term is 7 – 3n

2)Cards each marked with one of the numbers 4, 5, 6....20 are placed in a box. One card is drawn at random from the box. What is the probability of getting an odd prime number?

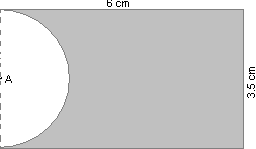
3)A game consists of tossing a one-rupee coin 3 times and noting its outcome each time. Hanif wins if all the tosses give the same result i.e. three heads or three tails, and loses otherwise. Calculate the probability that Hanif will lose the game

4)How many meters of cloth 5 m wide will be required to make a conical tent, the radius of whose base is 7 m and whose height is 24 m.

5)The height of a cone is 30 cm. A small cone is cut off at the top by a plane parallel to the base. If its volume be of the volume of the given cone, at what height above the base, the section has been made?

6)The angle of elevation of the top of a tower from a point on the ground is 30°. After walking 30 m towards the tower, the angle of elevation becomes 60°. What is the height of the tower?

7) Find the perimeter of the shaded region in the adjoining figure, if A is the centre of the circular arc.



8) A cone of radius 4 cm and height 16 cm is melted and recast in the form of a spherical ball. Find the surface area of the ball. . OR

If the mid-point of the line joining the points (3, 4) and (k, 7) is (x, y) and satisfy the equation

2x + 2y + 1 = 0, find the value of k.

9) Find the vertices of the triangle if (5,7), (2,3) & (9,4) are the mid-point of the sides of the triangle. Also show that it the right angled triangle.

10) Construct a circle of radius 3.2 cm and draw pair of tangents from both ends diameter which is at 5 cm away from centre

11) Find the point P on the x-axis which is equidistant from the points A(5, 4) and B(–2, 3). Also find the area of ΔPAB

12) The digits of a positive integer having three digits are in A.P. and their sum is 15. The number obtained by reversing the digits is 594 less than the original number. Find the number.

13) If (3, 0), (2, ) and are the vertices of a ABC whose centroid is (2, 5),

find the value of  and b

14) Solve for x 4 + 1 = 4

x+2 x+3 2x+1

**8. Mensuration**

1. Find the area of a right angled triangle if the radius of its circumcircle is 3 cm and altitude drawn to the hypotenuse is 2 cm.

2. If the diameter of a semicircular protractor is 14 cm, then find its perimeter. (Take  = 22/7)

3. The diagonals of a rhombus are 15 cm and 36 cm long. Find its perimeter.

4. The length of a rectangle is twice its breadth. Find the dimensions of the rectangle, if its area is 288 sq. cm.

5. Find the volume and the total surface area of a hemisphere of radius 2 cm.

6. A wire is looped in the form of a circle of radius 28 cm. It is reverted into a square form. Determine the side of the square. (Use  = 22/7)

7. In the given figure, OPQR is a rhombus, three of whose vetices lie on a

circle with centre O. If the area of the rhombus is 32 3 cm2, find the radius of the circle.

8. A trapezium PBCQ, with its parallel sides QC and PB in the ratio 7 : 5, is cut off from a rectangle ABCD. If the area of the trapezium is 4/7 part of the area of the rectangle, find the length of QC and PB.

9. A sector is cut off from a circle of radius 21 cm. The angle of the sector is 120°. Find the length of its arc and the area. (Take  = 22/7)

10. AB is chord of circle of radius 10 cm. The chord subtends a right angle at the centre of the circle. Find the area of the minor segment. (Take  = 3.14)

11. The difference between outside and inside surfaces of a cylindrical metallic pipe 14 cm long is 44 sq. cm. If the pipe is made of 99 cubic cm. of metal, find the outer and inner radii of the pipe. (Take  = 22/7)

12. How many metres of cloth 5 m wide will be required to make a conical tent, the radius of whose base is 7 m and whose height is 24 m. (Take  = 22/7)

13. The short and long hands of a clock are 4 cm and 6 cm long respectively. Find the sum of the distances travelled by their tips in two days. (Take  = 22/7)

14. A road which is 7 metres wide surrounds a circular park whose circumference is 352 metres. Find the area of the road. (Take  = 22/7)

15. If h, c and V respectively are the height, the curved surface and volume of a cone, prove that

3Vh3 – c2 h2 + 9V2 = 0.

16. A right circular cylinder having diameter 12 cm and height 15 cm is full of ice-cream. The ice-cream is to be filled in 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.

17. A cylindrical jar of radius 6 cm contains oil. Iron spheres each of radius 1.5 cm are immersed in the oil. How many spheres are necessary to raise the level of the oil by two centimetres?

18. A circus tent is in the form of a right circular cylinder and a right circular cone above it. The diameter and the height of the cylindrical part of the tent are 126 m and 5 m respectively. The total height of the tent is 21 m. Find the total surface area of the tent. Also find the cost of the tent if the canvas used costs Rs. 12 per square metre. (Take  = 22/7)

19. The radii of the internal and external surfaces of a hollow spherical shell are 3 cm and 5 cm respectively. If it is melted and recast into a solid cylinder of diameter 14 cm, find the height of the cylinder.

20. A solid is in the form of a right circular cone mounted on a hemisphere. The radius of the hemisphere is 2.1 cm and the height of the cone is 4 cm. The solid is placed in a cylindrical tub, full of water, in such a way that the whole solid is submerged in water. If the radius of the cylinder is 5 cm and its height is 9.8 cm, find the volume of the water left in the cylindrical tub. (Take  = 22/7)

21. The perimeter of a right triangle is 60 cm. Its hypotenuse is 25 cm. Find the area of the triangle.

22. Find the area of the shaded Region in the given figure.

23. The diameter of the driving wheel of a bus is 140 cm. How many revolutions per minute must the wheel make in order to keep a speed of 66 km/hr?

24. In the figure OE = 20 cm. In the sector OSFT, square OEFG is inscribed. Find the area of the shaded region.

25. The area of the bottom of a rectangular pit is 8.75 m2. If its depth is 1.8 m, determine its volume.

26. A well is 6 m deep. The cost of cementing its inner surface at 50 paise per dm2 is Rs. 1320. Determine the diameter of the well.

27. The total surface area of a solid right circular cylinder is 231 cm2. Its curved surface is 2/3rd of the total surface. Determine the radius of its base and height.

28. If V is the volume of cuboid of dimensions a, b, c and S is the surface area, then prove that

= + +

29. The perimeter of a triangular field is 450 mts. and its sides are in the ratio 13 : 12 : 5. Find the area of triangle.

30. The sides of a quadrangular field, taken in order are 26 m, 27 m, 7 m and 24 m respectively. The angle contained by the last two sides is a right angle. Find its area.

31. A boy is cycling such that the wheels of the cycle are making 140 revolutions per minute. If the diameter of the wheel is 60 cm, calculate the speed per hour with which the boy is cycling.

32. A chord AB of a circle of radius 15 cm makes an angle of 60° at the centre of the circle. Find the area of the major and minor segments.

33. Water in a canal 30 dm wide and 12 dm deep is flowing with a velocity of 20 km/hr. How much area will it irrigate in 30 min if 9 cm of standing water is desired?

34. A field is in the form of a rectangle of length 18 m and width 15 m. A pit 7.5 m long, 6 m broad and 0.8 deep is dug in a corner of the field and the earth taken out is spread over the remaining area of the field. Find out the extent to which the level of the field has been raised.

35. The diameter of a roller 120 cm long is 84 cm. If it takes 500 complete revolutions to level a playground, determine the cost of levelling it at the rate of 30 paise per square metre.

36. The circumference of the base of 10 m high conical tent is 44 m. Calculate the length of canvas used in making the tent if width of canvas is 2 m.

37. A heap of wheat is in the form of a cone of diameter 9 m and height 3.5 m. Find its volume. How much canvas cloth is required to just cover the heap?

38. A cylindrical tub of radius 12 cm contains water to a depth of 20 cm. A spherical ball is dropped into the tub and thus the level of water is raised by 6.75 cm. What is the radius of the ball?

39. A rectangular sheet of aluminium foil is 44 m long and 20 cm wide. A cylinder is made out of it, by rolling the foil along its length. Find the volume of the cylinder.

40. A hollow spherical shell is made of metal of density 4.9 g/km3. If the internal and external radii are 10 cm and 12 cm respectively. Find the weight of the shell.

41. The length of the sides forming right angle of a right angled triangle are 5x cm and (3x – 1) cm. If the area of the triangle is 60 cm2, find its hypotenuse.

42. Find the weight of a lead pipe 3.5 m long if the external diameter of the pipe is 2.4 cm and the thickness of thelead is 2 mm and 1 cubic cm of lead weighs 11 g.

43. An iron pillar consists of a cylindrical portion 2.8 m high and 20 cm in diameter and a cone   
42 cm high is surmounting it. Find the weight of the pillar, given that 1 cubic cm of iron weighs 7.5 g.

44. The height of a cone is 30 cm. A small cone is cut off at the top by a plane parallel to the base. If its volume be 1/27 of the volume of the given cone, at what height above the base, the section has been made?

45. A circle park is surrounded by a road 21 m wide. If the radius of the park is 105 m, find the area of the road.

46. An agricultural field is in the form of a rectangle of length 20 m and width 14 m. A pit 6 m long, 3 m wide and 2.5 m deep is dug in the corners of the field and the earth taken out of the pit is spread uniformly ever the remaining area of the field. Find the extent to which the level of the field has been raised?

**9. Trigonometry**

1. Given that : tan (1 + 2) =

2. Prove : + = 2

3. If tan  + cot  = 2, find the value of tan2 + cot2.

4. In the given figure, find the length of AE.

5. If sin  + cos  = 2 cos (90° – ), determine cot .

6. In the given figure, ABCD is a rectangle in which segments AP and AQ are drawn as shown. Find the length of (AP + AQ).

7. Show that : 1 + 1 + =

8. Show that : (sin  + cosec )2 + (cos  + sec )2 = 7 + tan2 + cot2.

9. If = m and = n, show that (m2 + n2) cos2 = n2.

10. Without using trigonometric tables, evaluate :

2 – – 2 sin 45°.

11. If x =  cos  sin , y =  cos  cos  and z =  sin , show that x2 + y2 + z2 = 2.

12. Find the value of : sin (50° + ) – cos (40° – ).

13. In the figure, ABC is a right angled triangle. D is the mid-point of BC. Show that = .

14. At a point on level ground, the angle of elevation of a vertical tower is found to be such tht its tanget is 5/12. On walking 192 metres towards the tower, the tanget of the angle is found to be   
3/4. Find the height of the tower.

15. Show that : = 1 + 2 cot2 + 2 cosec cot 

16. Solve for  : = 1 ; 0° <  < 90°.

17. A man is standing on the deck of a ship, which is 8 m above water level. He observes the angle of elevation of the top of a hill as 600 and the angle of depression of the base of the hill as 300. Calculate the distance of the hill from the ship and the height of the hill.

18. Determine the height of a mountain if the elevation of its top at an unknown distance from the base is 30° and at a distance 10 km further off from the mountain, along the same line, the angle of elevation is 15°. (Use tan 15° = 0.27)

19. From a window (h 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 the opposite side of the street are  and  respectively. Show that the height of the opposite house is h(1 + tan cot ).

20. From the top of a tower, the angles of depression of two objects on the same side of the tower are found to be  and  (>). If the distance between the objects is ‘p’ metres, show that the height ‘h’ of the tower is given by

h =

Also determine the height of the tower, if P = 50 m

 = 60°,  = 30°.

21. cot2A cosec2B – cot2B. cosec2A = cot2A – cot2B.

22. If x sin3 + y cos3 = sin  cos  and x sin  = y cos , prove x2 + y2 = 1.

23. If 7 cosec  – 3 cot  = 7, prove that 7 cot  – 3 cosec  = 3.

24. If = , find the value of .

25. tan 10°. tan 75° . tan 15° . tan 80° = 1.

26. (sin 72° + cos 18°)(sin 72° – cos 18°) = 0.

27. sin 63° . cos 27° + cos 63° . sin 27° = 1.

28. If A, B, C are the interior angles of a triangle ABC, prove that

tan = cot

29. If A and B are acute angles and tan A = 1, sin B = 1/ 2, find the value of cos (A + B).

30. If tan (A + B) = 1 and sin (2A – B) = 1, find A and B.

31. If cos  – sin  = 1, show that cos + sin = 1 or –1.

32. + = sec  . cosec  – 2 sin  cos .

33. If cot  + tan  = x and sec  – cos  = y, prove that (x2y)2/3 – (xy2)2/3 = 1.

34. If cosec  – sin  = a3, sec  – cos  = b3, prove that a2b2(a2 + b2) = 1.

35. Solve the following trigonometric equation for  : 3 tan  + cot  = 5 cosec .

36. Solve the following trigonometric equation for  : cosec2 – cot  (1 + 3) + ( 3 – 1) = 0.

37. If 5 sin  + 3 cos  = 4, find the value of 3 sin  – 5 cos .

38. Prove that : + = –

39. The shadow of a flagstaff is three times as long as the shadow of the flagstaff when the sunrays meet the ground at an angle of 60°. Find the angle between the sunrays and the ground at the time of longer shadow.

40. A fire in a building B is reported on telephone to two fire stations P and Q, 20 km apart from each other on a straight road. P observes that the fire is at the angle of 60° to the road and Q observes that it is at an angle of 45° to the road. Which station should send its team and how much will this team have to travel?

41. If the angle of elevation of a cloud from a point h metres above a lake is  and the angle of depression of its reflection in the lake is . Prove that the distance of the cloud from the point of

observation is .

42. A ladder rests against a wall at angle  to the horizontal. Its foot is pulled away from the wall through a distance ‘a’, so that it slides a distance b down the wall making an angle  with the

horizontal. Show that = .

43. From a window (P 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 the street are  and

 respectively. Show that the height of the opposite house is P .

44. The pilot of an aircraft flying horizontally at a speed of 1200 km/hr. Observes that the angle of depression of a point on the ground changes from 30° to 45° in 15 seconds. Find the height at which the aircraft is flying.

45. A flagstaff stands in the middle of a square tower. A man on the ground, opposite the middle of one face and distant 100 metre just sees the flag. On his receeding another 100 metre, the tangets of elevation of the top of the tower and top of the flagstaff are found to be 1/2 and 5/9. Find the dimensions of the tower and the height of the flagstaff, the ground being horizontal.

46. If tan A = 1/2 and tan B = 1/3, by using tan (A + B) = , prove that A + B = 45°.

47. Eleminate  from the following :

x cos  + x sin  = a; x cos  – x sin  = b.

**11. Circles and Tangent to a Circle**

1. In the given figure, O is the centre of the circle. If ÐBAC = 50°, find ÐOBC.

2. In the given figure, ABCDE is a regular pentagon. Prove that A, B, C and E are concyclic.

3. In the given figure, PT touches the circle whose centre is at O. Diameter SQ when produced meets PT at P. Given mÐSPR = xo and mÐQRP = yo. Show that xo + 2yo = 90o.

4. In the given figure, O is the centre of the circle and AB is a chord of the circle. Line QBS is a tangent to the circle at B. If ÐAOB = 110°, find ÐAPB and ÐABQ.

5. In the given figure, ABC is a triangle in which AB = AC. A circle through B touches AC at D and intersect AB at P. If D is the mid point of AC, show that 4AP = AB.

6. In the given figure, ABCD is a quadrilateral in which AD = BC and ÐADC = ÐBCD. Show that the points A, B, C and D lie on a circle.

7. In PQR, right angled at Q, a point S is taken on the side PR such that PS = SR and QR =QS. Find the measure of ÐQRS.

8. In the given figure, ABC is a right angled triangle with AB = 6 cm and AC = 8 cm. A circle with centre O has been inscribed inside the triangle. Calculate the value of r, the radius of the inscribed circle.

9. In figure, ABCD is a cyclic quadrilateral. AE is drawn parallel to CD and BA is produced. If ÐABC = 92°, ÐFAE = 20°, find ÐBCD.

10. In figure, O is the centre of the circle PQ is a tangent to the circle at A. If ÐPAB = 58°, find ÐABQ and ÐAQB.

11. Two circles intersect each other in P and Q. A is any point on the line PQ. AB and AC are tangents from A to the circles. Prove that AB = AC.

12. In the given figure, find the values of angles x and y.

13. In the given figure, P is the centre of the circle. Prove that ÐXPZ = 2(ÐXZY + ÐYXZ).

14. *l* and m are two parallel tangets at A and B. the tangent at C makes an intercept DE between the tangent *l* and m. Prove that   
ÐDFE = 90°.

15. In the given figure, AP is tangent to the circle at P. ABC is a secant such that PD is the bisector of ÐBPC. Prove that ÐBPD = ½[ÐABP – ÐAPB].

16. In the given figure, ABCD is a cyclic quadrilateral and PQ is tangent to the circle at C. If BD is a diameter and ÐDCQ = 40° and   
ÐABD = 60°, find the measure of the following angles :

(i) ÐDBC (ii) ÐBCP (iii) ÐADB.

17. The incircle of ABC touches the sides BC, CA and AB at D, E and F respectively show that :

AF + BD + CD = AE + BF + CE = 1/2 (perimeter of ABC).

18. In the given figure, AB is the chord of a circle with centre O. AB is produced to C such that   
BC = OB. CO is joined and produced to meet the circle in D. If ÐACD = y° and ÐAOD = x°, prove that x = 3y.

19. If ABC is isosceles with AB = AC, prove that the tangent at A to the circumcircle of ABC is parallel to BC.

20. In the given figure, PT is tangent and PAB is a secant to the circle. If the bisector of ÐATB intersects AB at M, prove that

(i) ÐPMT = ÐPTM (ii) PT = PM

21. The sum of either pair of opposite angles of a cyclic quadrilateral is 180° – Prove. Use this result and find out the values of x and y.

22. If figure, O is the centre of the circle and ÐAOB = 70°. Find ÐOBA and ÐOAC.

23. In the given figure, TBP and TCQ are tangents to the circle whose centre is O. Also, ÐPBA = 60° and ÐACQ = 70°. Determine ÐBAC and ÐBTC.

24. PQ and RS are two chords of a circle such that PQ = 10 cm, RS = 24 cm and AB || CD. The distance between AB and CD is 17 cm. Find the radius of the circle.

25. AB is a diameter of circle C (O, r). Chords is equal to radius OD. AC and BD produced intersect at P. Prove that ÐAPB = 60°.

26. QR is a tangent at Q. PR || AQ, where AQ is a chord through A the end point of the diameter AB. Prove that BR is tangent at B.

27. AB is a diameter and AC is a chord of circle such that ÐBAC = 30°. The tangent at C intersects AB produced in D. Prove that BC = BD.

28. Two circles touch internally at a point P and a chord AB of the circle of larger radius intersects the other circle in C and D. Prove that ÐCPA = ÐDPB.

29. In a trapezium ABCD, AB || CD and AD = BC. If P is the point of intersection of diagonals AC and BD, prove that PA . PC = PB . PD.

30. If all the sides of a parallelogram ABCD touch a circle. Show that the parallelogram is a rhombus.

31. In the given figure, determine a, b and c.

32. In the given figure AB = AD = DC = PB and ÐDBC = 20°. Determine (i) ÐABD (ii) ÐAPB. Hence or otherwise prove that AP is parallel to DB.

33. In the given figure if y = 32° and z = 40° determine x. If y + z = 90°, prove that x = 45°.

34. In the given figure, O is the centre of the circle. Prove that Ðx + Ðy = Ðz.

35. O is the centre of a circle. At any point T of the circle TP is a tangent and PBA is a secant of the circle. If ÐAPT = 90° then prove that PA2 + PB2 + 2PT2 = 4(OT)2.

36. Two circles intersect each other at A and B and a straight line PAQ cuts the circle at P and Q. If the tangents at P and Q intersect in T, prove that the points P, B, Q and T are concyclic.

37. Triangle PAB is formed by three tangents to circle O and ÐAPB = 40°; then find ÐAOB.

38. In the given figure O is the centre and AE is the diameter of the semi-circle ABCDE. If AB = BC and ÐAEC = 50°, then find

(i) ÐCBE (ii) ÐCDE (iii) ÐAOB. Also prove that BO || CE.

**12. Geometrical Constructions**

1. Construct ABC in which BC = 6 cm, ÐA = 50° and the median through A is 5.5 cm. Find the length of the altitude drawn on BC from A. Write the steps of construction.

1. Construct ABC in which BC = 6 cm, ÐA = 50° and the median through A is 5.5 cm. Find the length of the altitude drawn on BC from A. Write the steps of construction.

2. Construct a ABC, in which BC = 7.5 cm, CA = 5.2 cm and AB = 6 cm. Also draw the incircle of ABC.

3. A, B and C are three non-collinear points such that AB = 3.5 cm, BC = 4.8 cm and CA = 6 cm. Construct a circle passing through A, B and C. Find the measure of circumradius.

4. Determine the point which divides a given line-segment of 7 cm externally in the ratio

(i) 2 : 3 (ii) 1 : 2

5. Construct a triangle with perimeter 14 cm and sides in the ratio 2 : 3 : 4.

6. Draw a quadrilateral ABCD with AB = 3 cm, AD = 2.7 cm, DB = 3.6 cm, ÐB = 110° and   
BC = 4.2 cm. Construct a quadrilateral A'BC'D' similar to quadrilateral ABCD so that the diagonal D'B may be 4.8 cm.

7. Construct a quadrilateral ABCD in which AB = BC = 5 cm, CD = DA = 7.5 cm and AC = 6.2 cm. Construct the similar quadrilateral PQRS in which the side PQ = 3.6 cm and corresponds to the side AB.

8. Construct a ABC with BC = 8 cm, ÐA = 60° and median AD through A is 5 cm long. Construct a triangle A'BC' similar to ABC, with BC' = 6 cm.

9. Construct a triangle ABC in which BC = 5 cm, ÐA = 70° and median AD through A is 3.5 cm. Also determine the length of altitude drawn from A on the side BC.

10. Construct a ABC, in which AB = 5 cm, ÐB = 60° and altitude CD = 3.5 cm. Construct a AQR similar to ABC such that each of its side is 1.5 times that of the corresponding sides of ABC.

**13. Measures of Central Tendency(Statics)**

1. If the mean of the following data is 21, find the value of p :

x : 10 15 20 25 35

y : 6 10 p 10 8

2. There are 50 students in a class of which 40 are boys and the rest girls. The average weight of the class is 44 kg and the average weight of the girls is 40 kg. Find the average weight of the boys.

3. There are 120 students in a class in which 20 of them are girls and the rest boys. If the average marks in mathematics of the boys is 65% and that of girls is 80%, find the average marks of the class.

4. The median of the following of observations, arranged in ascending order is 24. Find x :

11, 12, 14, 18, x + 2, x + 4, 30, 32, 35, 41

5. If the mean of n observations x1, x2, x3, ..........., xn is x, prove that the mean of the observations x1 + a, x2 + a, x3 + a, ..........., xn + a, is x + a.

6. If the mean of the following distribution is 6, find the value of p :

x : 2 4 6 10 p + 5

y : 3 2 3 1 2

7. If x is the mean of the ten natural numbers x1, x2, .........., x10, show that

(x1 – x) + (x2 – x) + (x3 – x) + ............ (x10 – x) = 0.

8. The aggregate expenditure of a family on certain number of units of different household commodities in 1987 was Rs. 7,200 and the cost of living index number of 1996 on the basis of 1987 was Rs. 180.50. How much did the family spend in 1996 on the same units of commodities?

9. If the mean of n observations x1, x2, x3, .........., xn is x, prove that

(x1 – x) + (x2 – x) + (x3 – x) + ............ (xn – x) = 0.

10. The median of following observations, arranged in ascending order, is 25. Find x.

11, 13, 15, 19, x + 2, x + 4, 30, 35, 39, 46

11. Determine the median of 24, 23, a, a – 1, 12, 16, where a is the mean of 10, 20, 30, 40, 50.

12. The average score of boys of boys in an examination of a school is 71 and that of the girls is 73. The average score of the school examination is 71.8. Find the ratio of the number of boys to the number of girls that appeared in the examination.

13. Assuming that the consumption remains the same, find the cost of living index number (to the nearest integer) for the year 1981 (using 1975 as a base year) for the data of items used in a family which is given in the table :

***S. No. Items Consumption Rate per kg (in Rs.)***

***(in kg) 1975 1981***

1 A 30 2.50 3.50

2 B 15 10.00 11.00

3 C 7 7.00 9.00

4 D 12 3.50 4.50

5 E 5 40.00 45.00

14. Find the value of p, if the mean of the following distribution is 18 :

x : 13 15 17 19 20 + p 23

f : 8 2 3 4 5p 6

15. Calculate the arithmetic mean for the following frequency distribution :

***Class interval*** 0-80 80-160 160-240 240-320 320-400

***Frequency*** 22 35 44 25 24

16. If the arithmetic mean of 6, 8, 5, 7, x and 4 is 7, then find the value of x.

17. If the mean of the marks of five students is 33 and that of the marks of four of them is 32.5, then find the makes obtained by fifth student.

18. If the median of 6, 7, x – 2, x, 17 and 20 written in ascending order, is 16, find the value of x.

19. 20 years ago, when my parents got married, their average age was 23 years, now the average age of my family consisting of myself and my parents is 34 years. What is my present age?

20. The mean of 6, y, 7, x and 14 is 8. Express y in terms of x.

21. Find the median of the following data : 46, 64, 87, 41, 58, 77, 35, 90, 55, 33, 92.

If the observation 92 is replaced by 19 and 41 by 43, determine the new median.

22. The mean heights of 10 students was 153 cm. But later on it was discovered that 151 cm was wrongly read as 141 cm. Find the corrected mean.

23. Complete the following table and find Crude Death Rate (CDR) for the following :

***Age group Population Number of deaths***

0-10 23000 300

10-25 ....... 110

25-45 37000 100

45-70 25000 .......

above 70 15000 400

Total 125000 1230

24. The mean monthly salary of the 12 employees of a firm is Rs. 1450. If one more person joins the firm who gets Rs. 1600 per month, what will be the mean monthly salary now?

25. The average weight of A, B, C is 45 kg. If the average weight of A and B be 40 kg and that of B and C be 43 kg, find the weight of B.

26. The mean of the following frequency table is 50. But the frequencies f1 and f2 in classes 20-40 and 60-80 are missing. Find the missing frequencies.

***Class*** 0-20 20-40 40-60 60-80 80-100 Total

***Frequency*** 17 f1 32 f2 19 100

27. Find the average marks of students from the following table :

***Marks No. of Students Marks No. of Students***

Above 0 80 Above 60 23

Above 10 77 Above 70 16

Above 20 72 Above 80 10

Above 30 65 Above 90 8

Above 40 55 Above 100 0

Above 50 43

28. A candidate obtains the following percentages in an examination, English 46%, Mathematics 67%, Sanskrit 72%, Economics 58%, Political Science 53%. It is agreed to give double weights to marks in English and Mathematics as compared to other subjects. What is the weight mean?

29. The mean and median of the numbers 1, 2, 3, 4, y, 8, 9, 10, 12 and x written in increasing order, are both 7. Find the values of x and y.

30. The mean of 200 items was 50. Later on it was discovered that two items were misread as 92 and 8 instead of 192 and 88. Find the correct mean.

31. Calculate the cost of living index by aggregate expenditure method :

***Commodity Base Year Current Year***

***Quantity Price Quantity Price***

A 12 10 15 12

B 15 7 20 5

C 24 5 20 9

D 5 16 5 14

**Miscellaneous Questions**

1. Find the mode of the following 25 observations :

3, 1, 3, 5, 7, 3, 5, 4, 7, 2, 6, 3, 3, 7, 7, 8, 6, 3, 7, 7, 4, 2, 3, 7, 3.

2. Evaluate : + – 2 cos 430 cosec 470.

3. A boy is standing on the ground and flying a kite with a string of 150 m, at an angle of elevation of 300. Another boy is standing on the roof of a 25 m high building and is flying his kite at an elevation of 450. Both the boys are on opposite sides of both the kites. Find the length of the string (in metres), correct to two decimal places, that the second boy must have so that the two kites meet.

4. The G.C.D. of two polynomials (x2 + ax – 28) (x + 5) and (x2 + 8x + b)(x – 4)(x + 5). Find the values of a and b.

5. In fig., the diagonal BD of a parallelogram ABCD intersects the segment AE and F, where E is any point on the side BC. Prove that DF x EF = BF x AF.

6. Define the following terms :

(i) Crude Death Rate

(ii) Specific Death Rate

(iii) Infant Mortality Rate.

7. Express the following as a rational expression in lowest form :

+ . .

8. In a DABC, ÐBCA is a right angle. If Q is the mid point of the side BC, AC = 4 cm and AQ = 5 cm find (AB)2.

9. P and Q are respectively the points on the sides AB and AC of a ABC. If AP = 2 cm, PB = 6 cm, AQ = 3 cm and QC = 9 cm, prove that BC = 4PQ.

10. A motorboat takes 6 hours to cover 100 km downstream and 30 km upstream. If the boat goes 75 km downstream and returns back to the starting point in 8 hours, find the speed of the boat in still water and the speed of the stream.

11. In fig., DB ^ BC, DE ^ AB and AC ^ BC. Prove that DBDE and DABC are similar.

12. Solve the following system of equations :

tan (x + y) = 3 and tan (2x – y) =

13. What must be subtracted from 4x4 – 2x3 – 6x2 + x – 5 so that the result is exactly divisible by 2x2 + x – 1?

14. The bisectors of the opposite angles P and R of a cyclic quadrilateral PQRS intersect the circle at the points A and B respectively. Prove that AB is a diameter of the circle.

15. If 2 cos q – sin q = x and cos q – 3 sin q = y, prove that 2x2 + y2 – 2xy = 5.

16. Construct a triangle ABC similar to a given isosceles triangle PQR with QR = 6 cm, PR = PQ = 4 cm. Such that each of its side is 3/4th of the corresponding sides of the DPQR.

17. In the given fig. ABCD is a rectangle, also AB = 9cms., BP = 7 cms. If Q is the mid-point of AD, show that PQC is a right angle.

18. ABC is a triangle in which AC = AC and D is a point on AC such that BC2 = AC x CD. Prove that BD = BC.

19. Two circles intersect at P and Q. Through P, two straight lines APB and CQD are drawn to meet the circles at A, B, C and D. AC and DB when produced meet at O. Show that OAQB is a cyclic quadrilateral.

20. The angle of elevation of the bottom of a window 10 meter above the ground level from a point on the ground is 300. A pole projecting outwards and upwards from the bottom of the window makes an angle of 300 with the wall. If the angle of elevation of the top of the pole observed from the same point on the ground is 600 find the length of the pole.

21. Find the positive value of *k* for which the equations x2 + kx + 64 = 0 and x2 – 8x + k = 0 will have real roots.

22. The perimeter of a sector of a circle of radius 5.7m is 27.2 m, find the area of the sector.

23. Using factor theorem, factorise the polynomial x4 + 2x3 – 13x2 – 14x + 24.

24. If x = . Find the value of + .

25. The list price of an almirah is Rs. 5760. After a rebate of 5%, sales tax at the rate of 6% is charged on it. Find the total cost of the almirah to be paid by the buyer.

26. In the given figure ABCD is a ||gram an AB||PQ. Prove that MR||BC.

27. Prove that the ratio of the areas of two similar triangles is equal to the ratio of the squares of any two corresponding sides. Using this theorem find the area of ABC if AB = 10 cm and area of PQR = 12 cm2, PQ = 11 cm.

28. Two walls are at a distance of 5 m from each other. A ladder, kept resting on one wall, touches the wall at a point 6 m above the ground. When moved towards the second wall keeping the foot of the ladder fixed touches the second wall 5 m above the ground. Find the distance of the foot of the ladder from first wall.

29. In DABC, ÐC is a right angle. A semicircle is drawn on AB as diameter. P is any point on AC produced. When joined, BP meets the semicircle in point D. Prove that

AB2 = AC . AP + BD . BP.

30. If DABC is isosceles with AB = AC, prove that the tangent at A to the circumcircle of DABC is parallel to BC.

31. A ladder rests against a wall at angle a to the horizontal. Its foot is pulled away from the wall through a distance *'a'*, so that it slides a distance *b* down the wall making an angle b with the

horizontal. Show that = .

32. A tower subtends an angle a at a point A in the plane of its base and the angle of depression of the foot of the tower at a point *b* metres just above A is b. Prove that the height of tower is  *b* tan a cot b.

33. ABCD is a trapezium in which AB is parallel to DC. If AC trisects BD, then prove that   
CD = 1/2 AB.

34. State and prove Pythagoras theorem. Using the results, prove that   
AB2 – BD2 = AC2 – CD2 in given figure in which AD ^ BC.

35. The factory price of a micro-system is Rs. 18,000. At the factory price 5% excise duty is added. If 10% sales tax is charges on it, find the amount one has to pay for the micro system.

36. If PAB is a secant to a circle intersecting the circle at A and B and PT is a tangent segment then PA x PB = PT2. Prove it. Using the above result prove that P is the mid point of AB in the given figure where AB is common tangent of two circles intersecting at M and N and PMN is the comon chord.

37. The height of a cone is 30 cm. A small cone is cut off at the top by a plane parallel to the base. If its volume is 1/7th of the given cone at what height above the base is the section made?

38. Determine the values of *m* for which the equation 5x2 – 4x + 2 + *m*(4x2 – 2x – 1) = 0 will have product of roots as 2.

39. The mean of 1, 7, 5, 3 and 4 is *m.* The numbers 3, 2, 4, 3, 3 and *p* have mean *m* – 1 and median *q*. Find *p* and *q.*

40. If cosec q – sin q = *m* and sec q – cos q = *n*, prove that (m2n)2/3 + (mn2)2/3 = 1.

41. 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 cliff is 450 and the angle of depression of the base is 300, calculate the height of the cliff.

42. The H.C.F. of two expressions is 6x2 – 17x + 12 and their L.C.M. is 6x4 – 11x3 – 17x2 + 46x – 24. One of the expressions is 6x3 – 5x2 – 22x + 24. Find the other expression.

43. The equations 5x2 + (9 + 4m)x + 2m2 = 0 ans 5x + 9 = 0 are satisfied by the same value of *x*. Find the values of *m*.

44. The angle of elevation (q) of the top of a light house at a point 'A' on the ground is such that   
tan q = 5/12 when point is moved 240 m towards the light house, the angle of elevation becomes f such that tan f = 3/4. Find the height of the light house.

45. In the given figure = = and AB = 4 cm, find the value of DC.

46. In given fig., DACB DAPQ. If BC = 8 cms, PQ = 4 cms, BA = 6.5 cms, AP = 2.8 cms, find CA and AQ.

47. Simplify : + + .

48. Express the following as a rational expression :

x +

49. After covering a distance of 30 km with a uniform speed there is some defect in a railway engine and therefore its speed is reduced to (4/5)th of its original speed. Consequently the train reaches it destination late by 45 minutes. Had it happened after covering 18 km more the train would have reached 9 minute earlier. Find the speed of the train and the distance of journey.

50. A plane left 30 minutes later than the scheduled time and in order to reach the destination 1500 km away in time, it has to increase the speed by 250km/hr from the usual speed. Find its usual speed.

51. 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 600 and the angle of depression of the point 'A' from the top of the tower is 450. Find the height of the tower.

52. The taxi charges in a city comprise of a fixed charge together with the charge for the distance covered. For a journey of 10 km, the charge paid is Rs. 75 and for a journey of 15 km, the charge paid is Rs. 110. What will a person have to pay for travelling a distance of 25 km ?

53. Find the values of *a* and *b* so that the polynomials P(x) and Q(x) have (x + 1) (x + 3) as their HCF:

P(x) = (x2 + 3x + 2) (x2 + 2x + a); Q(x) = (x2 + 7x + 12)(x2 + 7x + b).

54. Solve for x : 16 x 4x + 2 – 16 x 2x + 1 + 1 = 0

55. Find the values of *a* and *b* so that the polynomials P(x) and Q(x) have (x + 1)(x – 2) as their HCF:

P(x) = (x2 + 3x + 2) (x2 + x + a); Q(x) = (x2 – 3x + 2)(x2 – 3x + b).

56. Show that : 2 sec2 q – sec4 q – 2 cosec2 q + cosec4 q = cot4 q – tan4 q.

57. If a, b are the roots of the quadratic equation 6x2 – ax + 6 = 0, find the values of 'a' such that

a2 + b2 = .

58. In fig., Ð1 = Ð2 and Ð3 = Ð4. Show that PT . QR = PR . ST.

59. Find the values of *a* and *b* so that the polynomials P(x) and Q(x) have (x – 2)(x – 3) as their HCF:

P(x) = (x2 – 6x + 8) (x2 – 2x – a)

Q(x) = (x2 + 2x + b) (x2 + 2x – 8)

60. If PAB is a secant to a circle, interesecting the circle at A and B and PT is a tangent segment, prove that PA x PB = PT2. Using the above, prove the following :

In fig., AB = AC. A circle through B touches the side AC at D intersects side AB at P. If AD = DC, prove that AB = 4 AP.

61. Find the values of *p* and *q* for which the following system of equations has infinite number of solutions :

2x + 3y = 7

(p + q)x + (2p – q)y = 21.

62. For what value of *k*, the g.c.d. of x2 + x – (2k + 2) and 2x2 + kx – 12 is x + 4 ?

63. If 3 tan q = 3 sin q, find the value of sin2 q – cos2 q.

64. If sec q = x + , prove that sec q + tan q = 2x or .

65. Solve for x : 4 – 4 + 1 = 0.

66. (x – 3) is the g.c.d. of x3 – 2x2 + px + 6 and x2 – 5x + q. Find 6p + 5q.

67. Find the values of  and  for which the following system of linear equations has infinite number of solutions : 2x + 3y = 7 and 2x + ( + )y = 28.

68. If O is the centre of the circle as shown in figure, find ÐCBD.

69. Three horses are tethered at 3 corners of a triangular plot having sides 20m, 30m, 40m with ropes of 7m length each. Find the area of this plot which can be grazed by the horses.   
(Take  = 22/7)

70. Find the values of a and b for which the following system of linear equations has infinite number of solutions : 2x – y = 5 and (a – 2b)x – (a + b)y = 15.

71. What must be added to each of the numbers 5, 6, 17 and 27 so that they become proportional?

72. If sin  = and tan  = 1, find the value of sin ( + ) where  and  are both acute angles.

73. Find the mode of the following data if k = 4 :

k – 2, + 1, 2k – 6, 3k – 10, k + 3, k – 1, 2k + 7, 3k – 2, , 2k – 5.

74. If x = tan A + sin A and y = tan A – sin A, show that x2 – y2 = 4 xy.