SCORING PACKAGE FOR 10TH STANDARD

SUBJECT: MATHEMATICS **Prepared by: T.SHIVAKUMAR,MMDRS SIRA**

Sl. No	Unit name	Marks
1	A.P	6
2	TRIANGLES	8
3	PAIR OF LINEAR Eqs.IN TWO VARIABLES	8
4	CIRCLES	4
5	AREAS RELATED TO CIRCLES	3
6	CONSTURCTIONS	5
7	COORDINATE GEOMETRY	5
8	REAL NUMBERS	4
9	POLYNOMIALS	6
10	QUADRATIC EQUATIONS	6
11	INTRODUCTION TO TRIGONOMETRY	5
12	SOME APPLICATIONS OF TRIGONOMETRY	4
13	STATISTICS	6
14	PROBABILITY	3
15	SURFACE AREAS AND VOLUMES	7
	Total = 80	

4Marks questions:

1. **Graph related problems: solve graphically**

1. x+y= -2 &2x-y= 8.
2. 3x+y= -2& x+2y= 1.
3. x-y= 1& 2x-3y= 5.
4. 3x+4y=10 & x-8y= -6.
5. x+2y=9 & 2x-y=3.
6. 2x+y=9 & 3x-2y= -4.
7. 8x+2y=-2 & 4x-6y=-22.
8. x-2y=8 & 3x-6y=9.
9. x-5y=-14 & 6x+y=9.
10. x-2y=2 & 2x+y=-8.
11. x-2y=-9 & 3x+y=1.
12. x+2y=4 & 6x+y=13.
13. X-6y=17 & 2x+3y=4.
14. 3x+2y= -5 & x-6y= -15.
15. 6x+2y=6 & 3x-6y=24.
16. X-2y=7 & 2x+3y= -14.
17. X+2y=1 & 2x-3y= -12.
18. X+2y=1 & 2x+3y= -1.
19. X-2y= 8 & 2x-3y= 14.
20. X-6y= -12 &x+y= -3.
21. X+y=1 & 2x+3y= 0.
22. X+2y = -3 & 2x-6y= 14.
23. X+y= 4 & 2x-3y= -22.
24) x+2y= 10 & 2x-4y= -4.
25) x+y= -7 & 2x-3y= 1.
26)x-2y= -7 & 3x+2y= 3.
27) 4x-2y=16 & 3x+y= 2.
28) x+4y= 2 & 3x-6y = 18.
29) x-y= 5 & 2x+y=- 11.
30) 6x+y=1 & 2x-y= 7.
31) x+y= 4 & 2x-3y= 18.
32) x+y= -2 & 2x+4y= -14.
33) 2x+3y= -5 & 4x+8y= -8.
34) x+2y=7 & 3x-4y= -9.

2. **Theorems : 4 marks compulsory**

i) **Pythagoras theorem**** – " in a right angled triangle, the square of the hypotenuse is equal to the sum of the square of the other two sides".

ii) **Basic proportionality theorem(B.P.T)**-**"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".

iii) **Areas of similar triangles**:** "The ratio of the areas of two triangles is equal to the square of the ratio of their corresponding sides".

iv) **Criteria for similarity of triangles:** "if in two triangles, corresponding angles are equal then their corresponding sides are in same proportion (ratio) and hence two triangles are similar".

v) **SSS similarity:** "In two similar triangles, sides of one triangle are proportional to the sides of the other two triangles, then their corresponding angles are equal".

vi) **Converse of Pythagoras theorem:**

Note: ** mark indicates very important.

3. ARITHMETIC : 4 MARKS PROBLES.

1. Three numbers are in arithmetic progression, and their sum is 18. Sum of their squares is 140. Find the numbers.
2. Find the three numbers in arithmetic progression, whose sum & product are 6 & 6 respectively.
3. In arithmetic progression the sum of first term, third term and fifth term is 39. The sum of second, fourth & sixth terms is 51. Find the tenth term of the sequence.
4. The sum of the first three terms of an arithmetic progression is 24. And the sum of their squares is 224. Find the first three terms of this arithmetic progression.
5. The fourth term of an arithmetic progression is 10 & eleventh term of it exceeds three times the fourth term by 1. Find the sum of first 20 terms of the this A.P.
6. The sum of third and fifth terms of an A.P is 30. And the sum of fourth and eighth term of the same A.P is 46. Find the sum of first 10 terms of this A.P.
7. In an arithmetic progression of 50 terms, the sum of first ten terms is 210. And the sum of last fifteen terms of it is 2565. Find the arithmetic progression.
8. The sum of four consecutive terms of an A.P is 32 & the ration of the product of first and last terms to the product of two middle terms is 7:15. Find the number.

9. In a certain A.P the 24^{th} term is twice the 10^{th} term. Prove that the 72^{nd} term is twice the 34^{th} term.
10. The sum of the first six terms of an A.P is zero and the fourth term is 2. Find the sum of its first 30 terms.
11. The initial term of an arithmetic progression is 1. If the sum of its first 9 terms is three times as large as the sum of its first 5 terms, what is the common difference of this progression?
12. The first row of a concert hall has 25 seats, and each row after the first has one more seat than the row before it. There are 32 rows of seats. 35 students from a class want to sit in the same row. In which row would the class sit?
13. In an AP SUM of 3 consecutive terms is 27 and their product is 504 find the terms.
14. If 6 times the sixth term of an arithmetic progression is equal to 9 times the 9th term, find the 15th term.
15. How many hours would it take for a biker to travel 54 km if the first hour he traveled 15 km and each subsequent hour he traveled 1 km less than the hour before?.
16. An A.P consists of 37 terms. The sum of the three middle most terms is 225. And the sum of the last three terms is 429. Find the A.P.
17. The sum of first 25 terms in an A.P is 525. And the sum of next 25 terms of the same A.P is 725. What is the common difference?
18. Second term in an AP is 8 & the 8^{th} term is 2 more than the thrice the second term. Find the sum of first 8 terms.
19. Find the 31^{st} term of an A.P. whose 11^{th} term is 38 and the 16^{th} term is 73.
20. The first term of an arithmetic series is 16 and the last is 60. The sum of the arithmetic series is 342. Find the common difference.
21. In an arithmetic progression the eighth term is twice the third term. The 20^{th} term is 210. Find the sum of first 100 terms.
22. An arithmetic progression consists of 21 terms, the sum of three terms in the middle is 129 & the last three 237. Find the A.P.

23. The production of a TV in a factory increases uniformly by a fixed number every year. It produced 8000 sets in 6^{th} year & 11300 sets in 9^{th} year. Find the production in the 6 years.
24. Arun repays his loan amount of ₹.1,18,000 by paying every month starting with the first installment of ₹.1000. If he increases the installment by ₹.100 every month what amount will be paid as the last installment of loan?.
25. A manufacturer of laptop produced 6000 units in 3rd year and 7000 units in 7th year. Assuming that production increases uniformly by a fixed number every year. Find the production in the fifth year.
26. The sum of the 3^{rd} and 7^{th} term of an A.P is 6 & their product is 8. Find the sum of first 15 terms of A.P.
27. Find the sum of 20 terms of an A.P in which 10^{th} term is 5 & 18^{th} term is 77.
28. Determine the A.P whose 3^{rd} term is 16 & difference of 5^{th} & 7^{th} term is 12.
29. The sum of the first 6 terms of the A.P is zero, and the fourth term is 2. Find the sum of first 30 terms.
30. An A.P consists of 60 terms, if the first & last terms be 7 & 125 respectively. Find 32^{nd} term.
31. Three numbers are in A.P, if the sum of these numbers be 27 & product is 648. Find the terms of A.P.
32. The houses of a row are numbered consecutively from 1 to 49. Show that there is 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.
33. If $1 + 4 + 7 + 10 + \cdots + x = 287$, find the value of x.
34. . In an A.P., the first term is 8, nth term is 33 and sum to first n terms is 123. Find n and d, the common difference.
35. A contract on construction job specifies a penalty for delay of completion beyond a certain date as follows: ₹. 200 for Ist day,, Rs. 250 for second day, ₹. 300 for third day and so on. If the contractor

pays ₹. 27750 as penalty, find the number of days for which the construction work is delayed.

36. Yasmeen saves ₹.32 during the first month, ₹.36 in the second month and ₹.40 in the third month. If she continues to save in this manner, in how many months she will save ₹.2000, which she has intended to give for the college fee of her maid's daughter. What value is reflected here.
37. Find the $60th$ term of the AP 8, 10, 12, ..., if it has a total of 60 terms and hence find the sum of its last 10 terms.
38. If the sum of first 7 terms of an AP is 49 and that of first 17 terms is 289, find the sum of its first n terms
39. Find the common difference of an A.P. whose first term is 5 and the sum of its first four terms is half the sum of the next four terms.
40. The sum of 4th and 8th terms of an A.P. is 24 and the sum of its 6th and 10th terms is 44. Find the sum of first ten terms of the A.P.
41. Sum of the first 14 terms of an AP is 1505 and its first term is 10. Find its 25th term.
42. The first and the last terms of an A.P. are 8 and 350 respectively. If its common difference is 9, how many terms are there and what is their sum?
43. How many multiples of 4 lie between 10 and 250? Also find their sum.
44. In an A.P., if the 6th and 13th terms are 35 and 70 respectively, find the sum of its first 20 terms.
45. Ramkali required ₹ 2500 after 12 weeks to send her daughter to school. She saved ₹ 100 in the first week and increased her weekly saving by ₹ 20 every week. Find whether she will be able to send her daughter to school after 12 weeks. What value is generated in the above situation?.
46. The sum of first six terms of an arithmetic progression is 42. The ratio of its 10th term to its 30th term is 1 : 3. Calculate the first and the thirteenth term of the $A.P$.
47. Determine the AP whose fourth term is 18 and the difference of the ninth term from the fifteenth term is 30.

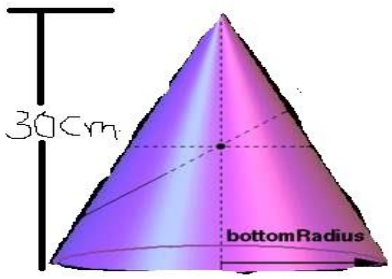
48. The 17th term of an AP is 5 more than twice its 8th term. If the 11th term of the AP is 43, then find the nth term.
49. The sum of the 2nd and the 7th terms of an AP is 30. If its 15th term is 1 less than twice its 8th term, find the AP.
50. The sum of the first seven terms of an AP is 182. If its 4th and the 17th terms are in the ratio 1: 5, find the AP.

4. SURFACE AREAS & VOLUMES : 4 MARKS PROBLES.

1. In a rain–water harvesting system, the rain–water from a roof of 22 m × 20 m drains into a cylindrical tank having diameter of base 2 m and height 3.5 m. If the tank is full, find the rainfall in cm. Write your views on water conservation.
2. The height of a cone is 10 cm. The cone is divided into two parts using a plane parallel to its base at the middle of its height. Find the ratio of the volumes of the two parts.
3. In a hospital used water is collected in a cylindrical tank of diameter 2 m and height 5 m. After recycling, this water is used to irrigate a park of hospital whose length is 25 m and breadth is 20 m. If the tank is filled completely then what will be the height of standing water used for irrigating the park. Write your views on recycling of water.
4. A well of diameter 3 m is dug 14 m deep. The soil taken out of it is spread evenly all around it to a width of 5 m to form an embankment. Find the height of the embankment
5. In a rectangular park of dimensions 50 m × 40 m, a rectangular pond is constructed so that the area of grass strip of uniform width surrounding the pond would be 1184 $m2$. Find the length and breadth of the pond.
6. 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 uniform diameter 1 16 cm, find the length of the wire.
7. A donor agency ensures milk is supplied in containers, which are in the form of a frustum of a cone to be distributed to flood victims in a camp. The height of each frustum is 30 cm and the radii of whose

lower and upper circular ends are 20 cm and 40 cm respectively. If this milk is available at the rate of Rs. 35 per litre and 880 litres of milk is needed daily for a camp. a) Find how many milk containers are needed daily for the camp. b) What daily cost will it put on the donor agency? c) What value of the donor agency is depicted in this situation?.

8. 50 circular discs, each of radius 7 cm and thickness 0.5 cm are placed one above the other. Find the total surface area of the solid so formed. Find how much space will be left in a cubical box of side 25 cm if the solid formed is placed inside it.
9. Due to heavy floods in a state, thousands were rendered homeless. 50 schools collectively offered to the state government to provide place and the canvas for 1500 tents to be fixed by the government and decided to share the whole expenditure equally. The lower part of each tent is cylindrical of base radius 2.8 m and height 3.5 m, with conical upper part of same base radius but of height 2.1 m. If the canvas used to make the tents costs ₹ 120per $sq.m$, find the amount shared by each school to set up the tents. What value is generated by the above problem? (Use $\pi = 22/7$)
10. A bucket open at the top is in the form of a frustum of a cone with a capacity of 12308.8 $cm3$. The radii of the top and bottom circular ends are 20 cm and 12 cm respectively. Find the height of the bucket and the area of metal sheet used in making the bucket. (Use $\pi = 3.14$).
11. In figure is shown a right circular cone of height 30 cm. A small cone is cut off from the top by a plane parallel to the base. If the volume of the small cone is 1 27 of the volume of given cone, find at what height above the base is the section made.



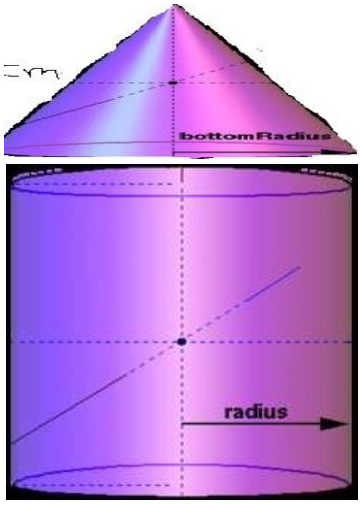
12. A right triangle having sides 15 cm and 20 cm is made to revolve about its hypotenuse. Find the Volume and Surface Area of the double cone so formed. (Use π = 3.14).
13. A well of diameter 4 m is dug 14 m deep. The earth taken out is spread evenly all around the well to form a 40 cm high embankment. Find the width of the embankment.
14. Water is flowing at the rate of 2.52 km/h through a cylindrical pipe into a cylindrical tank, the radius of whose base is 40 cm. If the increase in the level of water in the tank, in half an hour is 3.15 m, find the internal diameter of the pipe.
15. A vessel full of water is in the form of an inverted cone of height 8 cm and the radius of its top, which is open, is 5 cm. 100 spherical lead balls are dropped into the vessel. One–fourth of the water flows out of the vessel. Find the radius of a spherical ball.
16. Milk in a container, which is in the form of a frustum of a cone of height 30 cm and the radii of whose lower and upper circular ends are 20 cm and 40 cm respectively, is to be distributed in a camp for flood victims. If this milk is available at the rate of ₹ 35per litre and 880 litres of milk is needed daily for a camp, find how many such containers of milk are needed for a camp and what cost will it put on the donor agency for this. What value is indicated through this by the donor agency?.
17. 150 spherical marbles, each of diameter 1.4 cm, are dropped in a cylindrical vessel of diameter 7 cm containing some water, which are completely immersed in water. Find the rise in the level of water in the vessel.
18. A container open at the top, is in the form of a frustum of a cone of height 24 cm with radii of its lower and upper circular ends as 8 cm and 20 cm respectively. Find the cost of milk which can completely fill the container at the of ₹ 21 per litre. [Use π = 22/ 7].
19. Water is flowing through a cylindrical pipe, of internal diameter 2 cm, into a cylindrical tank of base radius 40 cm, at the rate of 0.4 m/s. Determine the rise in level of water in the tank in half an hour.

20. A bucket open at the top, and made up of a metal sheet is in the form of a frustum of a cone. The depth of the bucket is 24 cm and the diameters of its upper and lower circular ends are 30 cm and 10 cm respectively. Find the cost of metal sheet used in it at the rate of Rs. 10 per 100 $cm2$. [Use π = 3.14].
21. A solid is in the shape of a cone surmounted on a hemisphere, the radius of each of them being 3.5 cm and the total height of solid is 9.5 cm. Find the volume of the solid. [Use π = 22 7].
22. A bucket is in the form of a frustum of a cone and it can hold 28.49 litres of water. If the radii of its circular ends are 28 cm and 21 cm, find the height of the bucket. [Use π = 22 7].
23. A toy is in the shape of a cone mounted on a hemisphere of same base radius. If the volume of the toy is 231 $cm3$ and its diameter is 7 cm, then find the height of the toy.[Use π = 22/7]
24. The radii of internal and external surface of a hollow spherical shell are 3 cm and 5 cm respectively. It is melted and recast into a solid cylinder of diameter 14 cm. Find the height of the cylinder.
25. 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 16 cm and 12 cm. Find the capacity of the glass. [Use π = 22/7].
26. A hemispherical tank, full of water, is emptied by a pipe at the rate of 25 7 litres per sec. How much time will it take to empty half the tank if diameter of the base of the tank is 3m?
27. A drinking glass is in the shape of the frustum of a cone of height 14 cm. The diameters of its two circular ends are 4 cm and 2 cm. Find the capacity of the glass. [Use π = 22/7].
28. A military tent of height 8.25 m is in the form of a right circular cylinder of base diameter 30 m and height 5.5 m surmounted by a right circular cone of same base radius. Find the length of the canvas used in making the tent, if the breadth of the canvas is 1.5 $\square$.
29. From a solid cylinder whose height is 15 cm and diameter 16 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid. [Take π = 3.14].

30. Water is flowing at the rate of 6 km/h through a pipe of diameter 14 cm into a rectangular tank which is 60 m long and 22 m wide. Determine the time in which the level of the water in the tank will rise by 7 cm. [Use π = 22/7].
31. A hollow sphere of internal and external diameters 4 cm and 8 cm respectively is melted to form a cone of base diameter 8 cm. Find the height and the slant height of the cone.
32. Water is flowing at the rate of 15 $km/hour$ through a pipe of diameter 14 cm into a cuboidal pond which is 50 m long and 44 m wide. In what time will the level of water in the pond rise by 21 cm?.
33. A toy is in the form of a hemisphere surmounted by a right circular cone of the same base radius as that of the hemisphere. If the radius of base of the cone is 21 cm and its volume is 2 3 of the volume of the hemisphere, calculate the height of the cone and the surface area of the toy.[Use π = 22/7].
34. An iron solid sphere of radius 3 cm is melted and recast into small spherical balls of radius 1 cm each. Assuming that there is no wastage in the process, find the number of small spherical balls made from the given sphere.
35. A square field and an equilateral triangular park have equal perimeters. If the cost of ploughing the field at rate of Rs. $5/m^2$ is Rs. 720, find the cost of maintaining the part at the rate of Rs. $20/m^2$.
36. A solid right–circular cone of height 60 cm and radius 30 cm is dropped in a right–circular cylinder full of water of height 180 cm and radius 60 cm. Find the volume of water left in the cylinder, in cubic metres. [Use π = 22/7].
37. Water in a canal, 6 m wide and $1 \cdot 5$ m deep, is flowing at a speed of 4 km/h. How much area will it irrigate in 10 minutes, if 8 cm, of standing water is needed for irrigation?.
38. Two spheres of same metal weight 1 kg and 7 kg. The radius of the smaller sphere is 3 cm. The two spheres are melted to form a single big sphere. Find the diameter of the new sphere.
39. A cubical block of side 10 cm is surmounted by a hemisphere. What is the largest diameter that the hemisphere can have? Find the cost of

painting the total surface area of the solid so formed, at the rate of ₹ 5 *per* 100 *sq*. *cm*.

40. A hemispherical bowl of internal diameter 36 *cm* contains liquid. This liquid is filled into 72 cylindrical bottles of diameter 6 *cm*. Find the height of the each bottle, if 10% liquid is wasted in this transfer.
41. The perimeters of the ends of the frustum of a cone are 207.24 *cm* and 169.56 *cm*. If the height of the frustum be 8 *cm*, find the whole surface area of the frustum. (Use π = 3.14).
42. A hemispherical tank, of diameter 3 *m*, is full of water. It is being emptied by a pipe at the rate of 3 4 7 litre per second. How much time will it take to make the tank half empty?.
43. A well of diameter 4 *m* is dug 21 *m* deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 3 *m* to form an embankment. Find the height of the embankment.
44. A conical vessel, with base radius 5 *cm* and height 24 *cm*, is full of water. This water is emptied in to a cylindrical vessel of base radius 10 *cm*. Find the height to which the water will rise in the cylindrical vessel.
45. In figure, a tent is in the shape of a cylinder surmounted by a conical top of same diameter. If the height and diameter of cylindrical part are 2.1 *m* and 3 *m* respectively and the slant height of conical part is 2.8 *m*, find the cost of canvas needed to make the tent if the canvas is available at the rate of ₹ 500/*sq*.metre. (Use π = 22/7).



3 marks problems:

1. Statistics : 6 MARKS (3+3)

(construction of "ogive") – 3 marks.

C.I	0-3	3-6	6-9	9-12	12-15
f	9	3	5	3	1

C.I	5-10	10-15	15-20	20-25	25-30	30-35	35-40
f	2	12	2	4	3	4	3

C.I	0-10	10-20	20-30	30-40	40-50	50-60
f	7	4	5	3	2	4

C.I	20-30	30-40	40-50	50-60	60-70
f	8	7	6	4	3

C.I	0-100	100-200	200-300	300-400	400-500
f	12	8	16	21	18

C.I	0-2	2-4	4-6	6-8	8-10
f	1	2	1	5	6

C.I	100-120	120-140	140-160	160-180	180-200
f	12	14	8	6	10

C.I	1-5	5-9	9-13	13-17	17-21	21-25
f	4	5	8	10	8	7

C.I	0.2-0.4	0.4-0.6	0.6-0.8	0.8-1.0	1.0-1.2
f	7	13	4	8	9

C.I	0-6	6-12	12-18	18-24	24-30	30-36
f	23	28	16	14	9	5

C.I	0-10	10-20	20-30	30-40	40-50
f	66	54	16	14	12

C.I	0-5	5-10	10-15	15-20	20-25	25-30

f	5	7	3	4	8	9

C.I	100-150	150-200	200-250	250-300	300-350
f	44	16	18	24	35

C.I	1-3	3-5	5-7	7-9	9-11
f	8	15	12	7	6

C.I	45-55	55-65	65-75	75-85	85-95
f	3	10	11	8	3

C.I	4-14	14-24	24-34	34-44	44-54	54-64
f	10	35	52	61	38	29

C.I	0.5-1.0	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0
f	4	7	8	9	14

2. Mean or Median or Mode(there is option): 3 marks

C.I	10-25	25-40	40-55	55-70	70-85	85-100
f	2	3	7	6	6	6

C.I	15-25	25-35	35-45	45-55	55-65	65-75	75-85
f	6	11	7	4	4	2	1

C.I	0-2	2-4	4-6	6-8	8-10	10-12	12-14
f	1	2	1	5	6	2	3

C.I	100-120	120-140	140-160	160-180	180-200
f	12	14	8	6	10

C.I	11-13	13-15	15-17	17-19	19-21	21-23	23-25
f	7	6	9	13	20	5	4

C.I	65-68	68-71	71-74	74-77	77-80	80-83	83-86
f	2	4	3	8	7	4	2

C.I	50-52	53-55	56-58	59-61	62-64
f	15	110	135	115	25

C.I	100-150	150-200	200-250	250-300	300-350
f	4	5	12	2	2

C.I	45-55	55-65	65-75	75-85	85-95
f	3	10	11	8	3

C.I	1-3	3-5	5-7	7-9	9-11
f	7	8	2	2	1

C.I	5-15	15-25	25-35	35-45	45-55	55-65
f	6	11	21	23	14	5

C.I	0-3	3-6	6-9	9-12	12-15
f	3	2	4	6	5

C.I	0-10	10-20	20-30	30-40	40-50	50-60
f	12	11	8	6	7	6

C.I	0-5	5-10	10-15	15-20	20-25
f	2	1	3	1	3

C.I	2-6	6-10	10-14	14-18	18-22
f	3	2	7	1	2

C.I	0-20	20-40	40-60	60-80	80-100	100-120
f	9	7	8	15	4	5

C.I	3-13	13-23	23-33	33-43	43-53
f	3	2	1	4	3

C.I	5-10	10-15	15-20	20-25	25-30	30-35	35-40
f	3	4	6	8	4	2	3

C.I	1-3	3-5	5-7	7-9	9-11
f	10	15	12	7	6

C.I	0-2	2-4	4-6	6-8	8-10	10-12
f	1	2	1	5	6	5

C.I	45-55	55-65	65-75	75-85	85-95
f	3	10	6	8	3

C.I	20-30	30-40	40-50	50-60	60-70	70-80
f	1	4	3	5	3	4

C.I	0-5	5-10	10-15	15-20	20-25
f	9	5	8	7	1

3. Circles : 1 theorem compulsory for 3 marks

51. Prove that " The tangent at any point of a circle is perpendicular to the radius through the point of contact".

OR

52. Prove that "The lengths of tangents drawn from an external point to a circle are equal".

4. Construction: 3 marks construction problems

Constructions of triangle ---------- 3 mark question

1. Construct a triangle with sides 5cm, 6cm & 7cm and then another triangle whose sides are $\frac{7}{5}$ of the corresponding sides of the first triangle.
2. Construct a triangle with sides 4cm, 5cm & 6cm and then another triangle whose sides are $\frac{2}{3}$ of the corresponding sides of the first triangle.
3. Construct a triangle with sides 3cm, 4cm & 5cm and then another triangle whose sides are $\frac{5}{3}$ of the corresponding sides of the first triangle.
4. Construct an isosceles triangle whose base is 8cm and altitude 4cm and then another triangle whose sides are $1\frac{1}{3}$ times the corresponding sides of the isosceles triangle.
5. Construct an isosceles triangle whose base is 7cm and altitude 5cm and then another triangle whose sides are $1\frac{2}{3}$ times the corresponding sides of the isosceles triangle.
6. Construct an isosceles triangle whose base is 5cm and altitude 3cm and then another triangle whose sides are $2\frac{1}{5}$ times the corresponding sides of the isosceles triangle.

7. Construct an isosceles triangle whose base is 8cm and altitude 5cm and then another triangle whose sides are $2\frac{2}{5}$ times the corresponding sides of the isosceles triangle.
8. Draw a line segment of length 7.6cm and divide it in the ratio 5:8. Measure the two parts.
9. Draw a line segment of length 8.3cm and divide it in the ratio 2:5. Measure the two parts.
10. Draw a line segment of length 9cm and divide it in the ratio 2:3. Measure the two parts.
11. Draw a line segment of length 10cm and divide it in the ratio 8:11. Measure the two parts.
12. Draw a triangle ABC with side BC=6cm, $\angle B=60^0$, $\angle A=10^0$. Then construct a triangle a triangle whose sides are $\frac{1}{3}$ times the corresponding sides of ΔABC.
13. Draw a triangle PQR with side QR=5cm, $\angle Q=45^0$, $\angle P=105^0$. Then construct a triangle a triangle whose sides are $\frac{5}{2}$ times the corresponding sides of ΔPQR.
14. Draw a triangle XYZ with side YZ=4.5cm, $\angle Y=65^0$, $\angle P=85^0$. Then construct a triangle a triangle whose sides are $\frac{3}{5}$ times the corresponding sides of ΔPQR.
15. Draw a triangle PQR with side QR=8cm, $\angle Q=50^0$, $\angle P=120^0$. Then construct a triangle a triangle whose sides are $\frac{7}{3}$ times the corresponding sides of ΔPQR.

5. Trigonometry : 3 marks application problems

1. If A,B,C are interior angles of ΔABC, then show that $\cos(\frac{B+C}{2})=\sin\frac{A}{2}$

2. In a ΔABC, right-angled at C, if $\tan A=\frac{1}{\sqrt{3}}$, find the value of $\sin A\cos B+\cos A\sin B$.

3. If $\sec 2A=\operatorname{cosec}(A-42°)$, where $2A$ is an acute angle, find the value of A.

4. Prove the following:

$\frac{tanA}{1-cotA}+\frac{cotA}{1-\tan A}=1+\tan A+\cot A.$

5. Prove the following:
   $(\operatorname{cosec}A-\sin A)(\sec A-\cos A)=\frac{1}{tanA+cotA}$

6. If $\tan\theta+\sin\theta=m$ & $\tan\theta-\sin\theta=n$, show that $m2-n2=4\sqrt{mn}$.

7. Evaluate : $\frac{cos58^\circ}{\sin 32^\circ}+\frac{sin22^\circ}{\cos 68^\circ}-\frac{cos30^\circ cosec52^\circ}{\tan 18^\circ\tan 35^\circ\tan 60^\circ\tan 72^\circ\tan 55^\circ}$

8. Prove that
   $\sec^2\theta-\frac{sin2\theta-2sin4\theta}{2\cos 4\theta-\cos 2\theta}=1.$

9. Evaluate:
   $\frac{2}{3}\operatorname{cosec}^2 58^\circ-\frac{2}{3}\cot 58^\circ\tan 32^\circ-\frac{5}{3}\tan 13^\circ\tan 37^\circ\tan 45^\circ\tan 53^\circ\tan 77^\circ.$

10. Prove that: $(1+\cot A+\tan A)(\sin A-\cos A)=\sin A\tan A-\cot A\cos A.$

11. Evaluate : $2(\frac{cos58^\circ}{\sin 32^\circ})-\sqrt{3}(\frac{cos38^\circ cosec52^\circ}{\tan 15^\circ\tan 60^\circ\tan 75^\circ}).$

12. Prove that : $\frac{sin\theta}{\cot\theta+\operatorname{cosec}\theta}=2+\frac{sin\theta}{\cot\theta-\operatorname{cosec}\theta}.$

13. Evaluate :
    $\frac{sec29^\circ}{\operatorname{cosec}61^\circ}+2\cot 8^\circ\cot 17^\circ\cot 45^\circ\cot 73^\circ\cot 82^\circ-3(\sin^2 38^\circ+\sin^2 52^\circ).$

14. Prove that
    $\sqrt{\frac{secA-1}{\sec A+1}}+\sqrt{\frac{secA+1}{\sec A-1}}=2\operatorname{cosec}A.$

15. Prove that: $\frac{1+cosA}{\sin A}+\frac{sinA}{1+\cos A}=2\operatorname{cosec}A.$

16. Prove that : $\frac{sinA+cosA}{\sin A-\cos A}+\frac{sinA-cosA}{\sin A+\cos A}=2\sin 2A-\cos 2A$.

17. If $\cot\theta=\frac{15}{8}$, then evaluate $\frac{(2+2sin\theta)(1-sin\theta)}{(1+\cos\theta)(2-2\cos\theta)}$.

18. $(\sin\theta+\operatorname{cosec}\theta)^2+(\cos\theta+\sec\theta)^2=7+\cot^2\theta+\tan^2\theta.$
    (Dear students/teachers, use the excise problems to solve in this chapter i,e Trigonometry. Application questions may come in this chapter that's Proving or showing problems).

6. Pair of linear equations : 3 marks verbal problems

1. The sum of numerator and denominator of a fraction is 3 less than twice the denominator. If each of the numerator and denominator is decreased by 1, the fraction becomes $\frac{1}{2}$. Find the fraction.
2. A number consists of two digits. When the number is divided by the sum of its digits, the quotient is 7. If 27 is subtracted from the number, the digits interchange their places. Find the number.
3. Solve the following pair of linear equations for x and y:
   $2(ax-by)+(a+4b)=0$; $2(bx+ay)+(b-4a)=0$
4. Solve the following pair of equations:
   $\frac{4}{x}+3y=8$
   $\frac{6}{x}-4y=-5$
5. The sum of two numbers is 8. Determine the numbers if the sum of their reciprocals is 815.
6. Five years ago, Sagar was twice as old as Tiru. Ten year later Sagar's age will be ten years more than Tiru's age. Find their present ages. What was the age of Sagar when Tiru was born?
7. For what value or 'k' will the following pair of linear equations have infinitely many solutions
   $kx+3y=k-3$
   $12x+ky=k$
8. A quiz has 10 questions, worth 50 points. The test consists of MCQ worth 3 points each & FIB questions worth of 8 points each. How many MCQ's are there in the test.
9. Siddarth S Gouda has pens and pencils which together are 40 in numbers. If he has 5 more pencils and 5 less pens the number of pencils could becomes four times the number of pens. Find the original number of pens and pencils.
10. One says "give me hundred, I shall become twice as rich as you". Other one replies "if you gave me ten, I shall be six times rich as you". Tell what is the amount their respective capital?.
11. A lending library has fixed charge for the first 3 days and additional charges for each day there after. Siddarth gouda paid ₹ Rs.27

and kept a book for 7 days while his friend paid Rs.21 and kept book for 5 days. Find the fixed charge and additional charge.

12. Father is three times is old as his son. Five years ago he was four times old as his son. How old is each person now?.

13. In a class of 50 students, the number of females is two more than 5 times the number of males. How many males and females are there in the class.

14. 8 men and 12 boys can do a piece of work in 10 days, while 6 men and 8 boys can finish it in 14 days. Find the time taken by one man and one boy to finish the work.

2 marks questions:

REAL NUMBERS ---------- 2 Marks

1. **Prove that $\sqrt{2}$ is an irrational numbers.**
2. **Prove that $\sqrt{3}$ is an irrational numbers.**
3. **Prove that $2+\sqrt{5}$ is an irrational numbers.**
4. **Prove that $\sqrt{5}$ is an irrational numbers.**
5. **Prove that $\sqrt{2}+\sqrt{5}$ is an irrational numbers.**
6. **Prove that $\sqrt{5}$ is an irrational numbers.**
7. **Prove that $3-\sqrt{2}$ is an irrational numbers.**
8. **Prove that $5-\sqrt{3}$ is an irrational numbers.**
9. **Prove that $\sqrt{5}-\sqrt{3}$ is an irrational numbers.**
10. **Prove that $3\sqrt{5}$ is an irrational numbers.**
11. **Prove that $13\sqrt{7}$ is an irrational numbers.**
12. **Prove that $5\sqrt{2}$ is an irrational numbers.**

POLYNOMIALS-

2 mark questions (2 questions compulsory).

1. **Find the zeroes of the polynomial for $p(x)=x^2+4x+10$.**
2. **Find the zeroes of the polynomial for $p(x)=2x^2-8x+6$.**
3. **Find the zeroes of the polynomial for $p(x)=x^2-3x-4$.**
4. **Find the zeroes of the polynomial for $p(x)=x^2-2x-8$.**
5. **Find the zeroes of the polynomial for $p(x)=4s^2-4s+1$.**
6. **Find the zeroes of the polynomial for $p(x)=6x^2-3-7x$.**
7. **Find the zeroes of the polynomial for $p(x)=3x^2-x-4$.**

8. **Find a quadratic polynomial in which their sum and product is $\frac{2}{3}$& -1.**
9. **Find a quadratic polynomial in which their sum and product are respectively 1& -1.**
10. **Find a quadratic polynomial in which their sum and product respectively $\frac{3}{4}$&$\frac{1}{3}$.**
11. **Find a quadratic polynomial in which their sum and product are respectively 4& -3.**
12. **Find a quadratic polynomial in which their sum and product are respectively 4& 1.**
13. **Find a quadratic polynomial in which their sum and product are respectively 0&$\sqrt{5}$.**
14. **Divide $2x^2+3x+1$ by $x+2$.**
15. **Divide $5x^2-2x-3$ by $x-1$.**
16. **Divide x^2+3x-7 by x^2-1.**
17. **Divide $5x^3-4x^2+3x+3$ by x^2+1.**
18. **Divide $4x^3-3x+3$ by x^2-1.**
19. **Divide x^3+4x^2+1 by x^3-x^2+1.**
20. **Check whether $g(x)=x^2-2$ is a factor or not for $p(x)=x^3-3x^2+5x-3$.**
21. **Check whether $g(x)=x^2-2$ is a factor or not for $p(x)=5x^2-5x-3$.**

QUADRATIC EQUATIONS ---------- 2 Mark

Solving quadratic equation by Formula method – 2M

1. **Solve the equation $3x^2 -5x + 2 =0$ by using the formula.**
2. **Solve the equation $x^2-2x-8=0$ by using the formula.**
3. **Solve the equation $3x^2-x-4=0$ by using the formula.**
4. **Solve the equation $x^2+4x+10=0$ by using the formula.**
5. **Solve the equation $2x^2-8x+6=0$ by using the formula.**
6. **Solve the equation $6x^2-3-7x =0$ by using the formula.**
7. **Solve the equation $x^2+4x + 5 =0$ by using the formula.**
8. **Solve the equation $x^2+2x - 143 =0$ by using the formula.**
9. **Solve the equation $2x^2+x - 4 =0$ by using the formula.**
10. **Solve the equation $2x^2-3x + 5 =0$ by using the formula.**
11. **Solve the equation $2x^2-6x + 3 =0$ by using the formula.**
12. **Solve the equation $2x^2-7x + 3 =0$ by using the formula.**

Pair of linear equations in two variables:

1. Find the value of k for which the following pair of linear equations have infinitely many solutions:
   $2x+3y=7$; $(k-1)+(k+2)y=3k$
2. For what value of k will the following pair of linear equations have no solution?
   $2x+3y=9$;$6x+(k-2)y=(3k-2)$.

(you can use the above 4 marks questions to solve by 3 different methods such as elimination, substitution & cross multiplication)

Areas related to circles:

1. Find the perimeter of the shaded region if $ABCD$ is a square of side 21 cm and APB & CPD are semicircles.
2. In figure, $ABCD$ is a square of side 4 cm. A quadrant of a circle of radius 1 cm is drawn at each vertex of the square and a circle of diameter 2 cm is also drawn. Find the area of the shaded region. (Use π=3.14)
3. From a rectangular sheet of paper $ABCD$ with AB=40 cm and AD=28 cm, a semi-circular portion with BC as diameter is cut off. Find the area of the remaining paper.
4. Find the perimeter of the shaded region in figure, if $ABCD$ is a square of side 14 cm and APB and CPD are semicircles.
5. In figure, APB and CQD are semi-circles of diameter 7 cm each, while ARC and BSD are semi-circles of diameter 14 cm each. Find the perimeter of the shaded region.
6. Find the area of a quadrant of a circle, where the circumference of circle is 44 cm.
7. In figure, $OABC$ is a quadrant of a circle with centre O and radius 3.5 cm. If OD=2 cm, find the area of the shaded region
8. Three semicircles each of diameter 3 cm, a circle of diameter 4.5 cm and a semicircle of radius 4.5 cm are drawn in the given figure. Find the area of the shaded region.
9. In the given figure, two concentric circles with centre O have radii 21 cm and 42 cm. If $\angle AOB$=60°, find the area of the shaded region
10. In the given figure, $OACB$ is a quadrant of a circle with centre O and radius 3.5 cm. If OD=2 cm, find the area of the shaded region.
11. Find the area of the minor segment of a circle of radius 42 cm, if the length of the corresponding arc is 44 cm.

12. Find the area of shaded region in figure, where a circle of radius 6 cm has been drawn with vertex O of an equilateral triangle OAB of side 12 cm. (Use π=3.14 and $\sqrt{3}$=1.73)
13. Find the area of shaded region shown in the given figure 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.
14. Find the area of the minor segment of a circle of radius 14 cm, when its central angle is 60°. Also find the area of the corresponding major segment .

Applications of trigonometry :

1. On a straight line passing through the foot of a tower, two points C and D are at distances of 4 m and 16 m from the foot respectively. If the angles of elevation from C and D of the top of the tower are complementary, then find the height of the tower
2. A moving boat is observed from the top of a 150 m high cliff moving away from the cliff. The angle of depression of the boat changes from 60° to 45° in 2 minutes. Find the speed of the boat in m/h.
3. The shadow of a tower at a time is three times as long as its shadow when the angle of elevation of the sun is 60°. Find the angle of elevation of the sun at the time of the longer shadow
4. From the top of a lighthouse 75 m high, the angles of depression of two ships are observed to be 30° and 45° respectively. If one ship is directly behind the other on the same side of the lighthouse then find the distance between the two ships
5. A man standing on the deck of a ship, which is 10 m above water level, observes the angle of elevation of the top of a hill as 60° and the angle of depression of the base of hill as 30°. Find the distance of the hill from the ship and the height of the hill.
6. The angles of depression of the top and bottom of a 50 m high building from the top of a tower are 45° and 60° respectively. Find the height of the tower and the horizontal distance between the tower and the building. (use $\sqrt{3}$=1.73)
7. Two men on either side of a 75 m high building and in line with base of building observe the angles of elevation of the top of the building as 30° and 60°. Find the distance between the two men. (Use $\sqrt{3}$=1.73)
8. The angle of elevation of an aeroplane from a point A on the ground is 60°. After a flight of 15 seconds, the angle of elevation changes to 30°. If

the aeroplane is flying at a constant height of $1500\sqrt{3}\ m$, find the speed of the plane in km/hr.

9. At a point A,20 metres above the level of water in a lake, the angle of elevation of a cloud is 30°. The angle of depression of the reflection of the cloud in the lake, at A is 60°. Find the distance of the cloud from A.
10. The angle of elevation of the top of a building from the foot of the tower is 30° and the angle of elevation of the top of the tower from the foot of the building is 45°. If the tower is 30 m high, find the height of the building.
11. From the top of a tower of height 50 m, the angles of depression of the top and bottom of a pole are 30° and 45° respectively. Find
    I. how far the pole is from the bottom of a tower,
    II. the height of the pole. (Use $\sqrt{3}=1.732$)
12. The angle of elevation of an aeroplane from a point on the ground is 60°. After a flight of 30 seconds the angle of elevation becomes 30°. If the aeroplane is flying at a constant height of $3000\sqrt{3}\ m$, find the speed of the aeroplane.
13. From the top of a 60 m high building, the angles of depression of the top and the bottom of a tower are 45° and 60° respectively. Find the height of the tower. [Take $\sqrt{3}=1{\cdot}73$]
14. The horizontal distance between two poles is 15 m. The angle of depression of the top of first pole as seen from the top of second pole is 30°. If the height of the second pole is 24 m, find the height of the first pole. [Use $\sqrt{3}=1.732$]
15. The angles of depression of two ships from the top of a light house and on the same side of it are found to be 45° and 30°. If the ships are 200 m, apart, find the height of the light house.
16. From the top of a tower 50 m high, the angle of depression of the top of a pole is 45° and from the foot of the pole, the angle of elevation of the top of the tower is 60°. Find the height of the pole if the pole and tower stand on the same plane.
17. The angles of depression of the top and bottom of a tower as seen from the top of a $60\sqrt{3}\ m$ high cliff are 45° and 60° respectively. Find the height of the tower.
18. From the top of a vertical tower, the angles of depression of two cars, in the same straight line with the base of the tower, at an instant are found to be 45° and 60°. If the cars are 100 m apart and are on the same side of the tower, find the height of the tower. [Use $\sqrt{3}=1.73$]

19. From the top of a tower 100 m high, a man observes two cars on the opposite sides of the tower with angles of depression 30° and 45° respectively. Find the distance between the cars. [Use $\sqrt{3}=1.73$]
20. A ladder of length 6 m makes an angle of 45° with the floor while leaning against one wall of a room. If the foot of the ladder is kept fixed on the floor and it is made to lean against the opposite wall of the room, it makes an angle of 60° with the floor. Find the distance between these two walls of the room.

Coordinate geometry :

1. If two adjacent vertices of a parallelogram are $(3,2)$ and $(-1,0)$ and the diagonals intersect at $(2,-5)$, then find the coordinates of the other two vertices.
2. Find the value of p for which the points $(-1,3),(2,p)$ and $(5,-1)$ are collinear.
3. P and Q are the points with coordinates $(2,-1)$ and $(-3,4)$. Find the coordinates of the point R such that PR is $2/5$ of PQ.
4. Find the ratio in which the point $(-3,)$ divides the line-segment joining the points $(-5,-4)$ and $(-2,3)$. Also find the value of k.
5. Prove that the points $(2,-2),(-2,1)$ and $(5,2)$ are the vertices of a right angled triangle. Also find the area of this triangle
6. Find the ratio in which y-axis divides the line segment joining the points $(5,-6)$ and $B(-1,-4)$. Also find the coordinates of the point of division
7. The x-coordinates of a point P is twice its y-coordinate. If P is equidistant from $(2,-5)$ and $R(-3,6)$, find the coordinates of P.
8. Let P and Q be the points of trisection of the line segment joining the points $(2,-2)$ and $B(-7,4)$ such that P is nearer to A. Find the coordinates of P and Q.
9. Prove that the points $(3,0),(6,4)$ and $(-1,3)$ are the vertices of a right angled isosceles triangle
10. Find a relation between x & y such that the point (x,y) is equidistant from the points $A(-5,3)$ and $B(7,2)$.
11. If $(5,2),B(2,-2)$ and $C(-2,t)$ are the vertices of a right angled triangle with $\angle B=90°$, then find the value of t.
12. Find the ratio in which the point $(3/4,5/12)$ divides the line segment joining the points $A(1/2,3/2)$ and $B(2,-5)$.
13. Show that the points $(a,),(-a,-a)$ and $(-\sqrt{3}\,a,\sqrt{3}\,a)$ are the vertices of an equilateral triangle.

14. For what value of k are the points $(8,1),(3,-2k)$ and $(k,-5)$ collinear?
15. The points $(4,7),B(p,3)$ and $C(7,3)$ are the vertices of a right triangle, right–angled at B. Find the value of p.
16. Find the relation between x and y if the points $(x,y),B(-5,7)$ and $C(-4,5)$ are collinear.
17. If a point $A(0,2)$ is equidistant from the points $B(3,p)$ and $C(p,5)$, then find the value of p
18. Find the ratio in which the line segment joining the points $(1,-3)$ and $(4,5)$ is divided by x-axis.
19. Find the value of k, if the point $(2,4)$ is equidistant from the points $A(5,k)$ and $B(k,7)$.
20. Find the value(s) of x for which the distance between the points $(x,4)$ and $Q(9,10)$ is 10 units.
21. Find the relation between x and y such that point (x,y) is equidistant from the points $A(1,4)$ and $B(-1,2)$.
22. Find the value of y for which the distance between the points $A(3,-1)$ and $B(11,y)$ is 10 units
23. Show that the points $(-2,5);(3,-4)$ and $(7,10)$ are the vertices of a right angled isosceles triangle.
24. The centre of a circle is $(2\alpha-1,7)$ and it passes through the point $(-3,-1)$. If the diameter of the circle is 20 units, then find the value(s) of α.
25. If C is a point lying on the line segment AB joining $(1,1)$ and $B(2,-3)$ such that 3 AC=CB, then find the coordinates of C.
26. If the points $(4,3)$ and $B(x,5)$ are on the circle with the centre $O(2,3)$, find the value of x.
27. Find the value of k if the points $(k,3),(6,-2)$ and $(-3,4)$ are collinear.
28. The coordinates of the vertices of ΔABC are $(4,1),B(-3,2)$ and $C(0,k)$ given that the area of ABC is 12 unit2, find the value of k.
29. Find the values of x for which the distance between the point $(2,-3)$ and $Q(x,5)$ is 10 units.
30. Find a point on the y-axis which is equidistant from the points $(6,5)$ and $B(-4,3)$.
31. Find the coordinates of the points of trisection of the line segment joining the points $(3,-2)$ and $(-3,-4)$.

Surface areas & volumes :

1. A sphere of diameter 6 cm is dropped in a right circular cylindrical vessel partly filled with water. The diameter of the cylindrical vessel is 12 cm. If the sphere is completely submerged in water, by how much will the level of water rise in the cylindrical vessel?
2. Find the number of coins of 1.5 cm diameter and 0.2 cm thickness to be melted to form a right circular cylinder of height 10 cm and diameter 4.5 cm.
3. If the total surface area of a solid hemisphere is 462 $cm2$, find its volume.
4. A solid sphere of radius 10.5 cm is melted and recast into smaller solid cones, each of radius 3.5 cm and height 3 cm. Find the number of cones so formed.
5. The volume of a hemisphere is 242512 $cm3$. Find its curved surface area.
6. A solid is in the shape of cone mounted on a hemisphere of same base radius. If the curved surface areas of the hemispherical part and the conical part equal, then find the ratio of the radius and the height of the conical part.
7. Two cubes each of volume 27 $cm3$ are joined end to end to form a solid. Find the surface area of the resulting cuboid.
8. A cone of height 20 cm and radius of base 5 cm is made up of modelling clay. A child reshapes it in the form of a sphere. Find the diameter of the sphere.
9. Two cubes, each of side 4 cm are joined end to end. Find the surface area of the resulting cuboid.
10. The dimensions of a metallic cuboid are 100 cm×80 cm×64 cm. It is melted and recast into a cube. Find the surface area of the cube.
11. Water in a canal, 5.4 m wide and 1.8 m deep, is flowing with a speed of 25 $km/hour$. How much area can it irrigate in 40 minutes, if 10 cm of standing water is required for irrigation?
12. The slant height of a frustum of a cone is 4 cm and the perimeters of its circular ends are 18 cm and 6 cm. Find the curved surface area of the frustum.
13. The dimensions of a solid iron cuboid are 4.4 m×2.6 m×1.0 m. It is melted and recast into a hollow cylindrical pipe of 30 cm inner radius and thickness 5 cm. Find the length of the pipe.

14. The radius and height of a solid right circular cone are in the ratio of 5:12. If its volume is 314 $cm3$, find its total surface area.
15. A cylindrical pipe has inner diameter of 4 cm and water flows through it at the rate of 20 meter per minute. How long would it take to fill a conical tank of radius 40 cm and depth 72 cm? .