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## Question Paper Design (2016-17)

Class: X

## Mathematics(041)

Time: 3 Hours

Marks: 90

S. No.	Typology of Questions	Very Short Answer(VSA) 1 Marks	Short Answer -I (SA) 2 Marks	Short Answer -II (SA) 3 Marks	Long Answer (LA) 4 Marks	Total Marks	% Weightage
1	Remembering - (Knowledge based Simple recall questions, to know specific facts, terms, concepts, principles, or theories, identify, define, or recite, information)	1	2	2	3	23	26
2	Understanding - (Comprehension to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase, or interpret information)	1	1	1	2	14	16
3	Application (Use abstract information in concrete situation, to apply knowledge to new situations; Use given content to interpret a situation, provide an example, or solve a problem)	1	2	3	2	22	24
4	High Order Thinking Skills (Analysis & Synthesis- Classify, compare, contrast, or differentiate between different pieces of information; Organize and/or integrate unique pieces of information from a variety of sources)	1	1	4	1	19	21
5	Creating, Evaluation and Multi-Disciplinary- (Generating new ideas, product or ways of viewing things Appraise, judge, defend or justify the value or worth of a decision or, nitcome, or two or more outcomes based on values)	—	—	—	3*	12	13
<b>Total</b>		4×1=4	6×2=12	10×3=30	11×4=44	90	100

(\*): One of the LA(4 marks) will to assess the value inherent in the text.

# Course Structure (Second Term)

## Class-X

Units		Marks
II	ALGEBRA (CONTD.)	23
III	GEOMETRY (CONTD.)	17
IV	TRIGONOMETRY (CONTD)	08
V	PROBABILITY	08
VI	CO-ORDINATE GEOMETRY	11
VI	MENSURATION	23
	<b>Total</b>	<b>90</b>

### UNIT II : ALGEBRA (Contd.)

#### 3. QUADRATIC EQUATIONS (15) Periods

Standard form of quadratic equation  $ax^2 + bx + c = 0$ , ( $a \neq 0$ ). Solutions of quadratic equations (only real roots) by factorization by completing the square and by using quadratic formula. Relationship between discriminants and nature of roots.

Situational problems based on quadratic equations related to day to day activities to be incorporated.

#### 4. ARITHMETIC PROGRESSIONS (8) Periods

Motivations for studying Arithmetic Progressions Derivation of the  $n^{th}$  term and sum of the first n term of A.P. and their applications in solving daily life problems.

### **UNIT III : GEOMETRY (Contd.)**

#### **2. CIRCLES**

**(8) Periods**

Tangent to a circle at a point.

1. (Prove) The tangent at any point of a circle is perpendicular to the radius through the point of contact.
2. (Prove) The lengths of tangents drawn from an external point to circle are equal.

#### **3. CONSTRUCTIONS**

**(8) Periods**

1. Division of a line segment in agiven ratio (internally).
2. Tangent to a circle from a point outside it.
3. Construction of a triangle similar to a given triangle.

### **UNIT IV : TRIGNOMETRY**

#### **3. HEIGHTS AND DISTANCES**

**(8) Periods**

Simple problems on height and distances. Problems should not involve more than two right triangles. Angles of elevation/depression should be only  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$ .

### **UNIT V : STATISTICS AND PROBABILITY**

#### **2. PROBABILITY**

**(10) Periods**

Classical Definition of Probability. Simple problems on single events (not using set notations).

### **UNIT VI : COORDINATE GEOMETRY**

#### **1. LINES (In two-dimensions)**

**(14) Periods**

Review: Concepts of coordinates geometry, graphs of linear equations. Distance between two points. Section formula (internal division). Area of a Triangle.

## **UNIT VII : MENSURATION**

### **1. AREAS RELATED TO CIRCLES (12) Periods**

Motivate the area of a circle; area of sectors and segments of a circle. Problems based on areas and perimeter / circumference to the above said plane figures. (In calculating area of segment of a circle, problems should be restricted to central angle of  $60^\circ$ ,  $90^\circ$  and  $120^\circ$  only. Plane figures involving triangles, simple quadrilaterals and circles should be taken).

### **2. SURFACE AREAS AND VOLUMES (12) Periods**

- (i) Surface areas and volumes of combinations of any two of the following : cubes, cuboids, spheres, hemispheres, and right circular cylinders/cones. Frustum of a cone.
- (ii) Problems involving converting one type of metallic solid into another and other mixed problems. (Problems with combinations of not more than two different solids be taken).

# INDEX

## (S.A.-II)

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# Chapter-1

## QUADRATIC EQUATIONS

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### KEY POINTS

1. **Quadratic Equation:-** An equation of the form  $ax^2 + bx + c = 0$ ,  $a \neq 0$  is called a quadratic equation in one variable  $x$ , where  $a$ ,  $b$  and  $c$  are constants. For example  $2x^2 - 3x + 1 = 0$

2. **Roots of a Quadratic Equation:-**

Let  $ax^2 + bx + c = 0$ , be a quadratic equation. If  $\alpha$  is a root of this equation. It means  $x = \alpha$  satisfies this equation i.e.  $a\alpha^2 + b\alpha + c = 0$

3. **Number of Roots:-** A quadratic equation has two roots,

4. Methods For Solving Quadratic Equation

- (a) By factorization                      (b) By completing the square  
(c) By Quadratic Formula

5. **Quadratic Formula** to find roots of  $ax^2 + bx + c = 0$  is given by

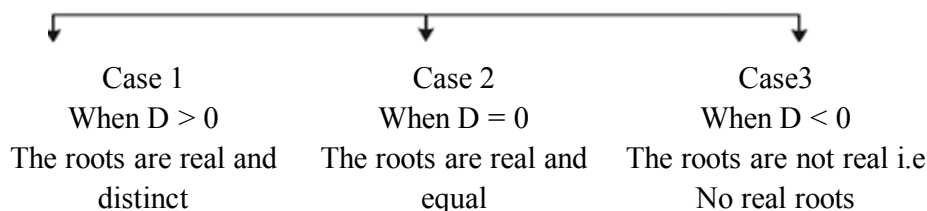
$$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}, \quad x = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

6. **Discriminant:-** For the quadratic equation  $ax^2 + bx + c = 0$  the expression  $b^2 - 4ac$  is called the discriminant and denoted by  $D$ . Then the roots of the

quadratic equation are given by  $x = \frac{-b + \sqrt{D}}{2a}, \quad x = \frac{-b - \sqrt{D}}{2a}$

7.

#### Nature of Roots



### VERY SHORT ANSWER TYPE QUESTIONS

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1. If  $\frac{-1}{2}$  is one root of quadratic equation  $2x^2 + kx + 1 = 0$ , find  $k$ .
2. Find the nature of the roots of  $3x^2 - 4\sqrt{3}x + 4 = 0$ .
3. Is  $x^3 - 4x^2 - x + 1 = (x - 2)^3$  a quadratic equation?
4. Which constant should be added and subtracted to solve the quadratic equation  $5x^2 - \sqrt{2}x + 3 = 0$  by the method of completing the square?
5. If  $px^2 + 3x + q = 0$  has two roots  $x = -1$  and  $x = -2$  find  $q - p$ .
6. If two roots of a quadratic equation are  $\sqrt{2}$  and 1 then form the quadratic equation.
7. Represent the following in the form of a quadratic equation:- "The product of two consecutive even integers is 1848".
8. Is 0.2 a root of  $x^2 - 0.4 = 0$ ?
9. If the quadratic equation  $ax^2 + bx + c = 0$  has equal roots then find  $c$  in terms of  $a$  and  $b$ .
10. If the equation  $x^2 + 6x - 91 = 0$  can be written as  $(x + p)(x + q) = 0$  then find  $p$  and  $q$ .

### SHORT ANSWER TYPE(I) QUESTIONS

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11. Solve by factorisation method:

(a)  $8x^2 - 22x - 21 = 0$

(b)  $3\sqrt{5}x^2 + 25x + 10\sqrt{5} = 0$



- (c)  $\sqrt{3}x^2 - 2\sqrt{2}x - 2\sqrt{3} = 0$
- (d)  $2x^2 + ax - a^2 = 0$
12. If roots of quadratic equation  $2x^2 - kx + k = 0$  are real and equal, then find  $k$ .
  13. Find  $k$  for which the given quadratic equation  $9x^2 + 3kx + 4 = 0$  has distinct roots.
  14. Find  $p$  for which the equation  $x^2 + 5px + 16 = 0$  has no real roots.
  15. For what value of  $c$ , roots of quadratic equation  $4x^2 - 2x + (c - 4) = 0$  are reciprocal of each other.
  16. For what value of  $p$  equation  $px^2 + 6x + 4p = 0$  has product of root equal to the sum of roots.
  17. Two squares have sides  $x$  cm and  $(x + 4)$  cm. The sum of their areas is  $656 \text{ cm}^2$ . Find the sides of the square.
  18. Find  $p$  for which the quadratic equation  $px(x - 3) + 9 = 0$  have real and equal roots.
  19. Divide 16 into two parts such that twice the square of the larger part exceeds the square of the smaller part by 164.
  20. For what value of  $k$ ,  $x^2 - 5x + 3(k - 1) = 0$  has difference of roots equal to 11.
  21. The sum of squares of two consecutive natural numbers is 313, find the numbers.

### SHORT ANSWER TYPE (II) QUESTIONS

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22. Solve the following quadratic equation:

(a)  $\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}, \quad a+b \neq 0$

(b)  $\frac{1}{2a+b+x} = \frac{1}{2a} + \frac{1}{b} + \frac{1}{2x}$

$$(c) \quad \frac{2}{x+1} + \frac{3}{2(x-2)} = \frac{23}{5x}, \quad x \neq -1, 2, 0$$

$$(d) \quad 3\left(\frac{7x+1}{5x-3}\right) - 4\left(\frac{5x-3}{7x+1}\right) = 11, \quad x \neq \frac{3}{5}, \frac{-1}{7}$$

$$(e) \quad \frac{x-1}{x+2} + \frac{x-3}{x-4} = \frac{10}{3}, \quad x \neq -2, 4$$

$$(f) \quad ax^2 + (4a^2 - 3b)x - 12ab = 0$$

$$(g) \quad 4x^2 - 4ax + (a^2 - b^2) = 0$$

$$(h) \quad \frac{4}{x} - 3 = \frac{5}{2x+3}, \quad x \neq 0, \frac{-3}{2}$$

23. Using quadratic formula, solve the following.

$$abx^2 + (b^2 - ac)x - bc = 0$$

24. If  $-5$  is a root of  $2x^2 + px - 15 = 0$  and roots of  $p(x^2 + x) + k = 0$  are equal, then find  $p$  and  $k$ .

### LONG ANSWER TYPE QUESTIONS

25. Find  $p$  for which  $(p+1)x^2 - 6(p+1)x + 3(p+q) = 0$ ,  $q \neq -1$ , has equal roots. Hence find the roots of the equation.

26. Find  $k$  for which the quadratic equation  $(2k+1)x^2 - (7k+2)x + (7k-3) = 0$  has equal roots. Also find the roots.

27. If the equation  $(1+m^2)x^2 + 2mcx + (c^2 - a^2) = 0$  has equal roots, then prove  $c^2 = a^2(1+m^2)$ .

28. For what value of  $k$ ,  $(4-k)x^2 + (2k+4)x + (8k+1) = 0$  is a perfect square.

29. Out of a group of swans,  $\frac{7}{2}$  times the square root of the number are playing on the sea shore of a tank. The two remaining ones are playing in the water. What is the total number of swans?

30. A peacock is sitting on the top of a pillar, which is 9 m high. From a point 27 m away from the bottom of the pillar, a snake is coming to its hole at the base of the pillar. Seeing the snake, the peacock pounces on it. If their speeds are equal, at what distance from the hole is the snake caught?
31. Rs 9000 were divided equally among a certain number of persons. Had there been 20 more persons, each would have got Rs 160 less. Find the original number of persons.
32. A dealer sells a toy for Rs 24 and gains as much percent as the cost price of the toy. Find the cost price of the toy.
33. A shopkeeper buys a number of books for Rs 80. If he had bought 4 more books for the same amount, each book would cost Rs 1 less. How many books did he buy?
34. Two pipes running together can fill a cistern in  $3\frac{1}{13}$  minutes. If one pipe takes 3 minutes more than the other to fill it, find the time in which each pipe would fill the cistern?
35. A chess board contains 64 equal squares and the area of each square is 6.25 cm<sup>2</sup>. A border round the board is 2 cm wide. Find the length of the side of the chess board.
36. Sum of the areas of two squares is 400 cm<sup>2</sup>. If the difference of their perimeters is 16 cm, find the sides of two squares.
37. The area of an isosceles triangle is 60 cm<sup>2</sup> and the length of each one of its equal sides is 13 cm. Find its base.
38. A girl is twice as old as her sister. Four years hence the product of their ages (in years) will be 160. Find their present age.
39. A motor boat whose speed in still water is 18 km/hr takes 1 hour more to go 24 km upstream than to return down stream to the same spot. Find the speed of the stream.

40. A fast train takes 3 hours less than a slow train for a journey of 600 km. If the speed of the slow train is 10 km/hr less than that of the fast train, find the speeds of the two trains.
41. The numerator of a fraction is 3 less than the denominator. If 2 is added to both the numerator and the denominator, then the sum of the new fraction and the original fraction is  $\frac{29}{20}$ . Find the original fraction.
42. The difference of two natural numbers is 3 and the difference of their reciprocals is  $\frac{3}{28}$ . Find the numbers.
43. Three consecutive positive integers are such that the sum of the square of the first and the product of other two is 46, find the integers.
44. A two digit number is four times the sum and three times the product of its digits. Find the numbers.
45. The hypotenuse of a grassy land in the shape of a right triangle is 1 metre more than twice the shortest side, If the third side is 7 metres more than the shortest side, find the sides of the grassy land.
46. In a class test, the sum of the marks obtained by P in Mathematics and Science is 28. Had he got 3 marks more in Mathematics and 4 marks less in Science, the product of his marks, would have been 180. Find the marks in the two subjects.
47. A piece of cloth costs Rs 200. If the piece was 5m longer and each metre of cloth costs Rs 2 less, the cost of the piece would have remained unchanged. How long is the piece and what is the original rate per metre?
48. A plane left 30 minutes later than the schedule time and in order to reach the destination 1500 km away in time it has to increase its speed by 250 km/hr from its usual speed. Find its usual speed.
49. If the sum of first  $n$  even natural numbers is 420. Find the value of  $n$ .

50. While boarding an aeroplane a passenger got hurt. The pilot showing promptness and concern, made arrangements to hospitalise the injured and so the plane started late by 30 minutes to reach the destination, 1500 km away in time, the pilot increased the speed by 100 km/hr. Find the original speed /hour of the plane. What values are depicted here?
51. A takes 10 days less than the time taken by B to finish a piece of work. If both A and B together can finish the work in 12 days, find the time taken by B to finish the work alone. What are the moral values reflected in this question which are to be adopted in our life?

# ANSWERS

1.  $k = 3$
2. The roots are equal
3. Yes
4.  $\frac{1}{50}$  or  $\frac{2}{100}$
5. 1
6.  $x^2 - (\sqrt{2} + 1)x + \sqrt{2} = 0$
7.  $x^2 + 2x - 1848 = 0$
8. No
9.  $c = \frac{b^2}{4a}$
10. 13, -7
11. (a)  $x = \frac{7}{2}, x = \frac{-3}{4}$
- (b)  $x = -\sqrt{5}, x = \frac{-2\sqrt{5}}{3}$
- (c)  $x = \sqrt{6}, x = \frac{-\sqrt{6}}{3}$
- (d)  $x = \frac{a}{2}, x = -a$
12.  $k = 0, 8$
13.  $k > 4, k < -4$
14.  $\frac{-8}{5} < p < \frac{8}{5}$
15.  $c = 8$
16.  $p = \frac{-3}{2}$
17. 16 cm, 20 cm
18.  $p \neq 0, p = 4$
19.  $x = 10, 6$
20.  $k = -7$
21. 12, 13
22. (a)  $x = -a, x = -b$
- (b)  $x = -a, x = \frac{-b}{2}$
- (c)  $x = 4, x = \frac{-23}{11}$
- (d)  $x = 0, x = 1$

- (e)  $x = \frac{1 \pm \sqrt{297}}{4}$
- (f)  $x = \frac{3b}{a}, x = -4a$
- (g)  $x = \frac{a+b}{2}, x = \frac{a-b}{2}$
- (h)  $x = -2, x = 1$
23.  $x = \frac{c}{b}, x = \frac{-b}{a}$
24.  $p = 7, k = \frac{7}{4}$
25.  $p = 3, x = 3, 3$
26.  $k = 4, \frac{-4}{7}$
28.  $k = 0, 3$
29. 16
30. 12 m
31. 25
32. Rs. 20
33. 16
34. 5 minutes, 8minutes
35. 24 cm
36. 16 cm, 12 cm
37. Base = 24cm or 10 cm
38. 6 years, 12 years
39. 6 km/hr
40. 40 km/hr, 50 km/hr
41.  $\frac{7}{10}$
42. 7, 4
43. 4, 5, 6
44. 24
45. 8m, 17m, 15m
46. Marks in Maths = 12,  
Marks in science = 16
47. length = 20 m  
rate = Rs. 10/metre
48. 750 km/hr
49.  $x = 20$
50. 500 km/hr, Humanity
51. 30 days, Unity

**Practice Test**  
**Quadratic Equations**

**Time: 50 minutes**

**M.M: 20**

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**Section-A**

1. If the discriminant of the quadratic equation  $6x^2 - bx + 2 = 0$  is 1 then find  $b$ .
2. Solve  $x^2 + 5x - 300 = 0$ .

**Section-B**

3. If  $kx^2 - 2kx + 6 = 0$  has equal root find  $k$ .
4. Find the value of  $p$  if the roots of  $x^2 + px + 12 = 0$  are in the ratio 1:3.

**Section-C**

5. Solve the quadratic equation  
 $(x - 1)^2 - 5(x - 1) - 6 = 0$
6. Find the value of  $k$ , so that the difference of roots of  
 $x^2 - 5x + 3(k - 1) = 0$  is 11

**Section-D**

7. If the roots of the equation  $(b - c)x^2 + (c - a)x + (a - b) = 0$  are equal then prove  $2b = a + c$ .
8. The sum of the squares of two natural numbers is 52. If the first number is 8 less than twice the second number, find the numbers.



# Chapter-2

## ARITHMETIC PROGRESSION

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### KEY POINTS

1. **Sequence:** A set of numbers arranged in some definite order and formed according to some rules is called a sequence.
2. **Arithmetic Progression:** A sequence in which the difference of each term from its succeeding term is constant throughout, is called an arithmetic sequence or arithmetic progression (A.P.).

In other words A.P. is sequence  $a_1, a_2, a_3, \dots, a_n$  such that

$$a_2 - a_1 = a_3 - a_2 = a_4 - a_3 = \dots a_n - a_{n-1} = d \text{ and so on.}$$

3. **General Term:** If 'a' is the first term and 'd' is common difference in an A.P., then nth term (general term) is given by  $a_n = a + (n - 1)d$ .
4. **Sum of n Terms of an A.P. :** If 'a' is the first term and 'd' is the common difference of an A.P., then sum of first n terms is given by

$$S_n = \frac{n}{2} \{2a + (n - 1)d\}$$

If 'a' is the first term & 'l' is the last/nth term of a finite A.P., then the sum is given by  $S_n = \frac{n}{2} \{a + l\}$

5.
  - (i) If  $a_n$  is given, then common difference  $d = a_n - a_{n-1}$
  - (ii) If  $S_n$  is given, then nth term is given by  $a_n = S_n - S_{n-1}$
  - (iii) If  $a, b, c$  are in A.P., then  $2b = a + c$
  - (iv) If a sequence has n terms, its rth term from the end =  $(n - r + 1)^{\text{th}}$  term from the beginning.
  - (v) Difference of mth and n<sup>th</sup> term of an A.P. =  $(m - n)d$ .

### VERY SHORT ANSWER TYPE QUESTIONS

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1. Find 5<sup>th</sup> term of an A.P. whose  $n^{\text{th}}$  term is  $3n - 5$ .
2. Find the sum of first 10 even numbers.
3. Write the  $n^{\text{th}}$  term of odd numbers.
4. Write the sum of first  $n$  natural numbers.
5. Write the sum of first  $n$  even numbers.
6. Find the  $n^{\text{th}}$  term of the A.P.  $-10, -15, -20, -25, \dots$
7. Find the common difference of A.P.  $4\frac{1}{9}, 4\frac{2}{9}, 4\frac{1}{3}, \dots$
8. Write the common difference of an A.P. whose  $n^{\text{th}}$  term is  $a_n = 3n + 7$
9. What will be the value of  $a_8 - a_4$  for the following A.P.  
 $4, 9, 14, \dots, 254$
10. What is value of  $a_{30} - a_{10}$  for the A.P.  $-10, -12, -14, -16, \dots$
11. If  $2k, 4k - 3$  and  $4k + 4$  are in A.P. find the value of  $k$ .
12. For what value of  $p$ , the following terms are three consecutive terms of an A.P.  $\frac{4}{5}, p, 2$ .

### SHORT ANSWER TYPE(I) QUESTIONS

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13. Is 144 a term of the A.P.  $3, 7, 11, \dots$ ? Justify your answer.
14. Find the 20<sup>th</sup> term from the last term of the A.P.  $3, 8, 13, \dots, 253$
15. Which term of the A.P.  $5, 15, 25, \dots$  will be 130 more than its 31<sup>st</sup> term?

16. The first term, common difference and last term of an A.P. are 12, 6 and 252 respectively, Find the sum of all terms of this A.P.
17. Find the sum of first 15 multiples of 8.
18. Is the sequence formed in the following situations an A.P.
  - (i) Number of students left in the school auditorium from the total strength of 1000 students when they leave the auditorium in batches of 25.
  - (ii) The amount of money in the account every year when Rs. 100 are deposited annually to accumulate at compound interest at 4% per annum.
19. Find the sum of even positive integers between 1 and 200.
20. If  $4m + 8$ ,  $2m^2 + 3m + 6$ ,  $3m^2 + 4m + 4$  are three consecutive terms of an A.P. find  $m$ .
21. How many terms of the A.P. 22, 20, 18, ..... should be taken so that their sum is zero.
22. If 10 times of 10th term is equal to 20 times of 20th term of an A.P. find its 30<sup>th</sup> term.
23. Find the middle term of the A.P. 6, 13, 20, ..... 216
24. Which term of the A.P.  $20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}, \dots$  is the first negative term? Find the term also.

### SHORT ANSWER TYPE(II) QUESTIONS

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25. Find the middle terms of the A.P. 7, 13, 19, ..... 241
26. Find the sum of integers between 10 and 500 which are divisible by 7.
27. The sum of 5th and 9th terms of an A.P. is 72 and the sum of 7<sup>th</sup> and 12<sup>th</sup> term is 97. Find the A.P.

28. If the  $m^{\text{th}}$  term of an A.P. be  $\frac{1}{n}$  and  $n^{\text{th}}$  term be  $\frac{1}{m}$ , show that its  $(mn)^{\text{th}}$  term is 1.
29. If the  $p^{\text{th}}$  term of an A.P. is  $q$  and the  $q^{\text{th}}$  term is  $p$ , prove that its  $n^{\text{th}}$  term is  $(p + q - n)$ .
30. If  $p$  times the  $p^{\text{th}}$  term of an A.P. is equal to  $q$  times its  $q^{\text{th}}$  term, show that the  $(p + q)^{\text{th}}$  term of the A.P. is zero.
31. For what value of  $m$  are the  $m^{\text{th}}$  terms of the following two A.P.'s the same?
- (i) 1, 3, 5, 7, .....
- (ii) 4, 8, 12, 16, .....
32. The  $24^{\text{th}}$  term of an A.P. is twice its  $10^{\text{th}}$  term. Show that  $72^{\text{nd}}$  term is 4 times its  $15^{\text{th}}$  term.
33. Find the number of natural numbers between 101 and 999 which are divisible by both 2 and 5.
34. If the seventh term of an A.P. is  $\frac{1}{9}$  and ninth term is  $\frac{1}{7}$ , find its  $63^{\text{rd}}$  term.
35. The sum of 5<sup>th</sup> and 9<sup>th</sup> terms of an A.P. is 30. If its 25<sup>th</sup> term is three times its 8<sup>th</sup> term, find the A.P.
36. If  $S_n$ , the sum of first  $n$  terms of an A.P. is given by  $S_n = 5n^2 + 3n$ , then find its  $n^{\text{th}}$  term and common difference.

### LONG ANSWER TYPE QUESTIONS

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37. The sum of third and seventh terms of an A.P. is 6 and their product is 8. Find the sum of first 16<sup>th</sup> terms of the A.P.

38. If the  $m^{\text{th}}$  term of an A.P. is  $\frac{1}{n}$  and the  $n^{\text{th}}$  term is  $\frac{1}{m}$ , show the sum of its first  $(mn)$  terms is  $\frac{1}{2}(mn+1)$ .
39. If in an A.P. the sum of first  $m$  terms is equal to  $n$  and the sum of first  $n$  terms is  $m$ , prove that the sum of first  $(m+n)$  terms is  $-(m+n)$ .
40. If  $S_n$  denote the sum of first  $n$  terms of an A.P., prove that  $S_{12} = 3(S_8 - S_4)$ .
41. If the sum of first  $k$  terms of an A.P. is  $\frac{1}{2}(3k^2 + 7k)$ , write its  $k^{\text{th}}$  term. Hence find its 20<sup>th</sup> term.
42. The sum of first 9 terms of an A.P. is 162. The ratio of its 6th term to its 13th term is 1:2. Find the first and fifteenth terms of the A.P.
43. If the 10<sup>th</sup> term of an A.P. is 21 and the sum of its first 10 terms is 120, find its  $n^{\text{th}}$  term.
44. The sum of first 7 terms of an A.P. is 63 and the sum of its next 7 term is 161. Find the 28<sup>th</sup> term of this A.P.
45. The sum of first  $q$  terms of an A.P. is  $63q - 3q^2$ . If  $p^{\text{th}}$  term is  $-60$ , find the value of  $p$ . Also find the 11th term of this A.P.
46. In an A.P. the first term is  $-2$ , the last term is  $-29$  and sum of all terms is  $-155$ . Find the 11<sup>th</sup> term of this A.P.
47. The sum of first 20 terms of an A.P. is one third of the sum of next 20 term. If first term is 1, find the sum of first 30 terms of this A.P.
48. The sum of first 10 terms of an A.P. is one third of the sum of next 10 terms. If first term is  $-5$ , find the sum of its first 30 terms.
49. The eighth term of an A.P. is half the second term and the eleventh term exceeds one -third of its fourth term by 1. Find its 15<sup>th</sup> term.

50. The digits of a three digits positive number are in A.P. and the sum of digits is 15. On subtracting 594 from the number, the digits are reversed. Find the number.
51. An old lady Krishna Devi deposited Rs. 120000 in a bank at 8% interest p.a. She uses the annual interest to give five scholarships to the students of a school for their overall performances each year. The amount of each scholarship is Rs. 300 less than the preceding scholarship. Find the amount of each scholarship. What values of lady are depicted here?
52. Ram asks the labour to dig a well upto a depth of 10 metre. Labour charges are Rs. 150 for first metre and Rs. 50 for each subsequent metre. As labour was uneducated, he claims Rs. 550 for the whole work. What should be the actual amount to be paid to the labour? What value of Ram is depicted in the question if he pays Rs. 600 to the labourer?

## ANSWERS

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- |   |   |
|---|---|
| 1. <b>10</b>  | 2. <b>110</b>                           |
| 3. <b><math>2n - 1</math></b>   | 4. <b><math>\frac{n(n+1)}{2}</math></b> |
| 5. <b><math>n(n+1)</math></b>   | 6. <b><math>-5(n+1)</math></b>          |
| 7. <b><math>\frac{1}{9}</math></b>  | 8. <b>3</b>                             |
| 9. <b>20</b>  | 10. <b><math>-40</math></b>             |
| 11. <b><math>k = 5</math></b>   | 12. <b><math>\frac{7}{5}</math></b>     |
| 13. <b>No, Because <math>a = 3</math> (odd number), <math>d = 4</math> (even number), so each term of the given A.P. will be an odd number.</b> |   |
| 14. <b>158</b>  | 15. <b><math>44^{\text{th}}</math></b>  |
| 16. <b>5412</b>   | 17. <b>540</b>                          |
| 18. <b>(i) Yes    (ii) No</b>   | 19. <b>9900</b>                         |
| 20. <b><math>m = 0, 2</math></b>  | 21. <b>23</b>                           |
| 22. <b>0</b>  | 23. <b>111</b>                          |
| 24. <b><math>28^{\text{th}}, -\frac{1}{4}</math></b>  | 25. <b>121, 127</b>                     |
| 26. <b>17885</b>  | 27. <b>6,11,16,21,26,.....</b>          |
| 31. <b>No such value m exists</b>   | 33. <b>89</b>                           |
| 34. <b>1</b>  | 35. <b>3,5,7,9,11,.....</b>             |
| 36. <b><math>a_n = 10n - 2</math>, <math>d = 10</math></b>  | 37. <b>76,20</b>                        |
| 41. <b><math>a_{20} = 62</math>, <math>a_k = 3k + 2</math></b>  | 42. <b>6,48</b>                         |

43.  $2n + 1$
44. 57
45.  $p = 21, a_{11} = 0$
46.  $-32$
47. 900
48.  $-4500$
49. 3
50. 852
51. Rs. 2520, Rs. 2220, Rs. 1920, Rs. 1620, Rs. 1320 Love charity etc
52. Rs. 600, Honesty, Sincerity



**Practice Test**  
**Arithmetic Progression**

**Time: 50 minutes**

**M.M: 20**

**Section-A**

1. Find the sum of first 10 natural numbers.
2. What is the common difference of an A.P.  $8\frac{1}{8}, 8\frac{2}{8}, 8\frac{3}{8}, \dots$

**Section-B**

3. How many 2 digit number are there in between 6 and 102 which are divisible by 6.
4.  $k + 1$ ,  $3k$  and  $4k + 2$  are three consecutive terms of an A.P. find the value of  $k$ .

**Section-C**

5. Find the five terms of an A.P. whose sum is  $12\frac{1}{2}$  and first and last term ratio is 2:3.
6. Find the middle term of an A.P. 20, 16, 12, ..., - 176.

**Section-D**

7. The digits of a three digit positive number are in A.P. and the sum of digits is 15. On subtracting 594 from the number the digits are interchanged. Find the number.
8. The sum of three numbers in A.P. is 24 and their product is 440. Find the numbers.

# Chapter-3

## CO-ORDINATE GEOMETRY

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### KEY POINTS

1. Let  $XOX'$  and  $YOY'$  are two mutually perpendicular lines. These lines are called co-ordinate axis.  $XOX'$  is called  $x$ -axis and  $YOY'$  is called  $y$ -axis.
2. Point of intersection of  $x$ -axis and  $y$ -axis i.e.  $O$  is called the origin whose coordinates are  $(0,0)$ .
3.  $x$ -coordinate of a point is called abscissa &  $y$ -coordinate is called the ordinate.
4. A plane is divided by the axis in four quadrants.
  - (i) In first quadrant, both  $x$  and  $y$  coordinates of a point are +ve.
  - (ii) In second quadrant,  $x$ -coordinate is -ve and  $y$ -coordinates is +ve.
  - (iii) In third quadrant, both  $x$  and  $y$  coordinates of a point are negative.
  - (iv) In fourth quadrant,  $x$ -coordinate is +ve and  $y$ -coordinate is -ve.

5. **Distance formula**

Distance between two points  $P(x_1, y_1)$  and  $Q(x_2, y_2)$  is

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \text{ units.}$$

6. Point  $A$ ,  $B$ , and  $C$  are collinear if they lie on the same straight line.
7. Midpoint of a line segment joining the points  $(x_1, y_1)$  and  $(x_2, y_2)$  is given by  $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ .

**8. Section formula**

The coordinates of a point which divides the line segment joining the points  $(x_1, y_1)$  and  $(x_2, y_2)$  in the ratio  $l:m$  internally are given by

$$\left( \frac{lx_2 + mx_1}{l+m}, \frac{ly_2 + my_1}{l+m} \right).$$

9. The area of the triangle with vertices  $(x_1, y_1)$ ,  $(x_2, y_2)$  and  $(x_3, y_3)$  is given by

$$\frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)] \text{ sq. units.}$$

If the area of triangle is zero then points are collinear.

10. Centroid of the triangle with vertices  $(x_1, y_1)$ ,  $(x_2, y_2)$  and  $(x_3, y_3)$  is given by

$$\left( \frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3} \right).$$

---

**SECTION-A (1 Mark Each)**

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1. What is the distance of points A(5,-7) from y-axis.
2. If the distance between the points  $(x, 2)$  and  $(3, -6)$  is 10 units, what is the positive value of  $x$ .
3. Find the co-ordinates of the midpoint of the line segment joining points (4,7) and (2,-3).
4. Find the co-ordinates of the point where the line  $\frac{x}{2} + \frac{y}{3} = 5$  intersects y-axis.
5. If A and B are respectively the points  $(-6, 7)$  and  $(-1, -5)$  then find the value of 2AB.
6. A parallel line is drawn from point P(5,3) to y-axis, what is the distance between the line and y-axis.
7. Find the distance between the lines  $3x + 6 = 0$  and  $x - 7 = 0$ .

8. The midpoint of the line segment AB is (4,0). If the co-ordinates of point A is (3,-2), then find the co-ordinates of point B.
9. What is the ordinate of any point on  $x$ -axis?
10. What is the abscissa of any point on  $y$ -axis?
11. What is the distance of point (3,2) from  $x$ -axis?
12. What is the distance of point (3,-4) from  $y$ -axis?
13. What is the distance of point (3,4) from the origin?
14. Find the value of  $y$  if the distance between the points is 10 units.
15. Find the co-ordinates of a point on  $x$ -axis which is equidistant from the points (-2,5) and (2,-3).

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### SECTION-B (2 Marks Each)

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16. For what value of  $P$ , the points (2,1), ( $p$ ,-1) and (-1,3) are collinear?
17. Find the area of  $\Delta PQR$  whose vertices are P(-5,7), Q(-4,-5) and R(4,5).
18. Find the point of trisection of the line segment joining the points (1,-2) and (-3,4).
19. The midpoints of the sides of a triangle are (3,4), (4,1) and (2,0). Find the vertices of the triangle.
20. Find the value of  $x$  if the points A (4,3) and B( $x$ ,5) lie on a circle whose centre is O(2,3).
21. Find the ratio in which  $x$ -axis divides the line segment joining the points (6,4) and (1,-7).
22. Show that the points (-2,3), (8,3) and (6,7) are the vertices of a right angle triangle.

23. Find the point on the y-axis which is equidistant from the points (5,-2) and (-3,2).
24. Find the ratio in which y-axis divides the line segment joining the points A(5,-6) and B(-1, -4).
25. Find the co-ordinates of a centroid of a triangle whose vertices are (3,-5),(-7,4) and (10,-2).

### SECTION-C (3 Marks Each)

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26. Show that the points A(2,-2), B(14,10), C(11,13) and D(-1,1) are the vertices of a rectangle.
27. Show that the points A(5,6),B(1,5),C(2,1) and D(6,2) are the vertices of a square.
28. The point R divides the line segment AB, whose A(-4,0) and B(0,6) are such that  $AR = \frac{3}{4} AB$ .
29. Three consecutive vertices of a parallelogram are (-2, -1), (1,0) and (4, 3). Find the coordinates of fourth vertex.
30. If the distance of P(x,y) from the points A(3,6) and B(-3,4) are equal, prove that  $3x + y = 5$ .
31. Two vertices of a triangle are (1,2) and (3,5). If the centroid of the triangle is at origin, find the co-ordinates of the third vertex.
32. If P(x,y) is any point on the line joining the points A(a,0) and B(0,b) then show that  $\frac{x}{a} + \frac{y}{b} = 1$ .
33. The line segment joining the points A (2,1) and B (5,-8) is trisected at the points P and Q such that P is nearer to A. If P also lies on line give by  $2x - y + k = 0$ , find the value of k.

34. If  $(3,3), (6,y), (x,7)$  and  $(5,6)$  are the vertices of a parallelogram taken in order, find the value of  $x$  and  $y$ .
35. If the vertices of a triangle are  $(1,-3), (4,p)$  and  $(-9,7)$  and its area is 15 sq units, find the value of  $p$ .

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### SECTION-D (4 Mark Each)

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36. Find the values of  $a$  and  $b$  if the points  $A(-2,1)$ ,  $B(a,b)$  and  $C(4,-1)$  are collinear and  $a - b = 1$ .
37. If a point  $A(0,2)$  is equidistant from the points  $B(3,p)$  and  $C(p,5)$  then find value of  $p$  and the length of  $AB$ .
38. To solve a riddle a girl is asked to join the three points  $A(7, 5)$ ,  $B(2, 3)$  and  $C(6, -7)$  with a sketchpen. After joining these points a triangle is obtained by her. What type of triangle is it? What values are depicted in the question?
39. The coordinates of the houses of Mona and Nishi are  $(7, 3)$  and  $(4, -3)$  respectively. The coordinates of their school are  $(2, 2)$ . If they both start for school at the same time in the morning and reaches at the same time, who walks fast? What values are depicted from the question?
40. A teacher asked three students to stand to form a triangle at the points  $P(-1, 3)$ ,  $Q(1,-1)$  and  $R(5, 1)$ . Suddenly a fourth boy came and shows his interest in participating the activity. She asked him to stand at point mid way between  $Q$  and  $R$ . What is his distance from  $P$ . What values of the teacher appears when she agreed the fourth boy to participate?

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## ANSWERS

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- |  |  |
|--|--|
| 1. 5   | 2. 9   |
| 3. (3,2)   | 4. 15  |
| 5. 26  | 6. 3   |
| 7. 9   | 8. (5,2)   |
| 9. 0   | 10. 0  |
| 11. 2 units  | 12. 3 units  |
| 13. 5 units  | 14. 3 or - 9   |
| 15. (-2,0)   | 16. 5  |
| 17. 53 sq. units   | 18. $\left(\frac{-5}{3}, 2\right), \left(\frac{-1}{3}, 0\right)$ |
| 19. (1,3),(5,5),(3,-3)   | 20. 2  |
| 21. 4:7  | 23. (0,-2)   |
| 24. 5:1  | 25. (2,-1)   |
| 26. $\left(-1, \frac{9}{2}\right)$                                       | 28. (1,2)  |
| 31. (-4,-7)  | 33. $k = -8$   |
| 34. $x = 8, y = 4$   | 35. $p = -3$   |
| 36. $a = 1, b = 0$   | 37. $P = 1, AB = \sqrt{10}$ units                                |
| 38. (a) Right Angled Triangle (b) Sports, Activeness, Critical thinking. |  |
| 39. (a) Mona, (b) Time bound, Reality                                    |  |
| 40. 5 Units, interest in Mathematics, Friendship, Cooperation            |  |

**Practice Test**  
**Coordinate Geometry**

**Time: 50 minutes**

**M.M: 20**

**Section-A**

1. Find the area of triangle whose vertices are  $(-2, 3)$ ,  $(8, 3)$  and  $(6, 7)$ .
2. Find the value of  $m$  in which the points  $(3, 5)$ ,  $(m, 6)$  and  $\left(\frac{1}{2}, \frac{15}{2}\right)$  are collinear.
3. What is the distance between the points  $A(c, 0)$  and  $B(0, -c)$
4. For what value of  $p$ , the points  $(-3, 9)$ ,  $(2, p)$  and  $(4, -5)$  are collinear.
5. If the points  $A(8, 6)$  and  $B(x, 10)$  lie on the circle whose centre is  $(4, 6)$  then find the value of  $x$ .
6. Show that the points  $A(-3, 2)$ ,  $B(-5, -5)$ ,  $C(2, -3)$  and  $D(4, 4)$  are the vertices of a rhombus.
7. Find the ratio in which the point  $(2, y)$  divides the line segment joining the points  $A(-2, 2)$  and  $B(3, 7)$ . Also find the value of  $y$ .
8. If the point  $P$  divides the line segment joining the points  $A(-2, -2)$  and  $B(2, -4)$  such that  $\frac{AP}{AB} = \frac{3}{7}$ , then find the coordinate of  $P$ .
9. If  $A(-5, 7)$ ,  $B(-4, -5)$ ,  $C(-1, -6)$  and  $D(4, 5)$  are the vertices of a parallelogram taken in order then find the area.



# Chapter-4

## SOME APPLICATIONS OF TRIGONOMETRY

### (Heights and Distances)

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#### KEY POINTS

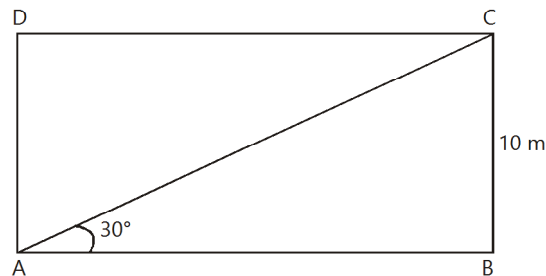
1. **Line of Sight :** The line of sight is the line drawn from the eyes of an observer to a point in the object viewed by the observer.
2. **Angle of Elevation :** The angle of elevation is the angle formed by the line of sight with the horizontal, when it is above the horizontal level i.e. the case when we raise our head to look at the object.
3. **Angle of Depression :** The angle of depression is the angle formed by the line of sight with the horizontal when it is below the horizontal i.e. case when we lower our head to look at the object.

#### VERY SHORT ANSWER TYPE QUESTIONS

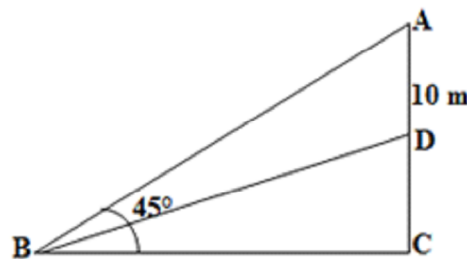
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1. A tower is 50 m high. When the sun's altitude is  $45^\circ$  then what will be the length of its shadow?
2. The length of shadow of a pole 50 m high is  $\frac{50}{\sqrt{3}}$  m. find the sun's altitude.
3. Find the angle of elevation of a point which is at a distance of 30 m from the base of a tower  $10\sqrt{3}$  m high.
4. A kite is flying at a height of  $50\sqrt{3}$  m from the horizontal. It is attached with a string and makes an angle  $60^\circ$  with the horizontal. Find the length of the string.

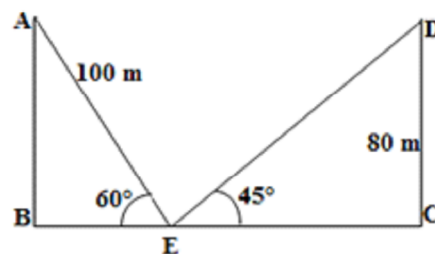
5. In the given figure find the perimeter of rectangle ABCD.



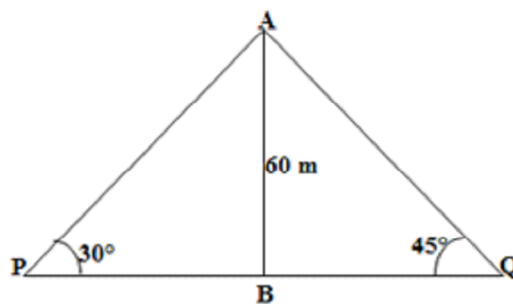
6. The length of the shadow of a pillar is  $\sqrt{3}$  times its height. Find the angle of elevation of the source of light.
7. In the figure, find the value of DC.



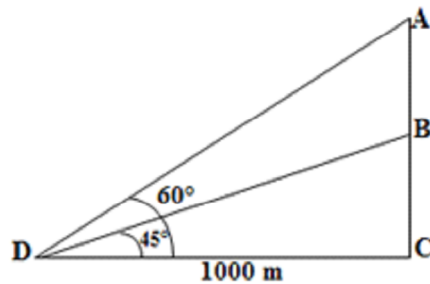
8. In the figure, find the value of BC.



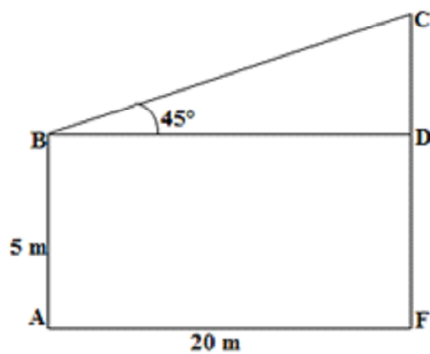
9. In the figure, two persons are standing at the opposite direction P & Q of the tower. If the height of the tower is 60 m then find the distance between the two persons.



10. In the figure, find the value of AB.



11. In the figure, find the value of CF.



12. If the horizontal distance of the boat from the bridge is 25 m and the height of the bridge is 25 m, then find the angle of depression of the boat from the bridge.

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### SHORT ANSWER TYPE QUESTIONS

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13. From the top of a hill, the angles of depression of two consecutive kilometre stones due east are found to be  $30^\circ$  and  $45^\circ$ . Find the height of the hill.
14. The string of a kite is 150 m long and it makes an angle  $60^\circ$  with the horizontal. Find the height of the kite above the ground. (Assume string to be tight)
15. The shadow of a vertical tower on level ground increases by 10 m when the altitude of the sun changes from  $45^\circ$  to  $30^\circ$ . Find the height of the tower.
16. An aeroplane at an altitude of 200 m observes angles of depression of

opposite points on the two banks of the river to be  $45^\circ$  and  $60^\circ$ , find the width of the river.

17. The angle of elevation of a tower at a point is  $45^\circ$ . After going 40 m towards the foot of the tower, the angle of elevation of the tower becomes  $60^\circ$ . Find the height of the tower.
18. The upper part of a tree broken over by the wind makes an angle of  $30^\circ$  with the ground and the distance of the root from the point where the top touches the ground is 25 m. What was the height of the tree?
19. A vertical flagstaff stands on a horizontal plane. From a point 100 m from its foot, the angle of elevation of its top is found to be  $45^\circ$ . Find the height of the flagstaff.
20. The length of a string between kite and a point on the ground is 90 m. If the string makes an angle  $\alpha$  with the level ground and  $\sin \alpha = \frac{3}{5}$ . Find the height of the kite. There is no slack in the string.
21. An aeroplane, when 3000 m high, passes vertically above another plane at an instant when the angle of elevation of two aeroplanes from the same point on the ground are  $60^\circ$  and  $45^\circ$  respectively. Find the vertical distance between the two planes.
22. The angle of elevation of a cloud from a point 60 metres above a lake is  $30^\circ$  and the angle of depression of its reflection of the cloud in the lake is  $60^\circ$ . Find the height of the cloud.
23. A man standing on the deck of a ship, 10 m above the water level observes the angle of elevation of the top of a hill as  $60^\circ$  and angle of depression the bottom of a hill as  $30^\circ$ . Find the distance of the hill from the ship and height of the hill.

24. A 7 m long flagstaff is fixed on the top of a tower on the horizontal plane. From a point on the ground, the angle of elevation of the top and the bottom of the flagstaff are  $45^\circ$  and  $30^\circ$  respectively. Find the height of the tower.
25. From a window 60 m high above the ground of a house in a street, the angle of elevation and depression of the top and the foot of another house on the opposite side of the street are  $60^\circ$  and  $45^\circ$  respectively. Show that the height of opposite house is  $60(1 + \sqrt{3})$  metres.
26. The angle of elevation of an aeroplane from a point A on the ground is  $60^\circ$ . After a flight of 30 seconds, the angle of elevation changes to  $30^\circ$ . If the plane is flying at a constant height of  $3600\sqrt{3}$  m, find the speed in km/hour of the plane.
27. A bird is sitting on the top of a tree, which is 80 m high. The angle of elevation of the bird, from a point on the ground is  $45^\circ$ . The bird flies away from the point of observation horizontally and remains at a constant height. After 2 seconds, the angle of elevation of the bird from the point of observation becomes  $30^\circ$ . Find the speed of flying of the bird.
28. From the top of a 7 m high building, the angle of elevation of the top of the tower is  $60^\circ$  and the angle of depression of the foot of the tower is  $30^\circ$ . Find the height of the tower.
29. The angles of elevation of the top of a tower from two points on the ground at distances 9 m and 4 m from the base of the tower are in the same straight line with it are complementary. Find the height of the tower.
30. A boy standing on a horizontal plane finds a bird flying at a distance of 100 m from him at an elevation of  $30^\circ$ . A girl, standing on the roof of 20 m high building, finds the angle of elevation of the same bird to be  $45^\circ$ . Both the boy and girl are on the opposite sides of the bird. Find the distance of bird from the girl.

31. As observed from the top of a light house, 100 m high above sea level, the angle of depression of a ship, sailing directly towards it, changes from  $30^\circ$  to  $60^\circ$ . Determine the distance travelled by the ship during the period of observation.
32. The angles of elevation and depression of the top and bottom of a light house from the top of a building 60 m high are  $30^\circ$  and  $60^\circ$  respectively. Find
- (i) the difference between the height of the light house and the building.
  - (ii) distance between the light house and the building.
33. Anand is watching a circus artist climbing a 20m long rope which is tightly stretched and tied from the top of vertical pole to the ground. Find the height of the pole if the angle made by the rope with the ground level is  $30^\circ$ . What value is experienced by Anand?
34. A fire in a building 'B' is reported on telephone in two fire stations P and Q, 20 km apart from each other on a straight road. P observes that the fire is at an angle of  $60^\circ$  to the road, and Q observes, that it is at an angle of  $45^\circ$  to the road. Which station should send its team and how much distance will this team has to travel? What value is depicted from the problem?
35. A 1.2m tall girl spots a balloon on the eve of Independence Day, moving with the wind in a horizontal line at a height of 88.2 m from the ground. The angle of elevation of the balloon from the girl at an instant is  $60^\circ$ . After some time, the angle of elevation reduces to  $30^\circ$ . Find the distance travelled by the balloon. What value is depicted here?

## ANSWERS

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- |  |                            |
|--|----------------------------|
| 1. 50 m  | 2. $60^\circ$              |
| 3. $30^\circ$  | 4. 100 m                   |
| 5. $20(\sqrt{3} + 1)$ m  | 6. $30^\circ$              |
| 7. 60 m  | 8. 130 m                   |
| 9. $60(\sqrt{3} + 1)$ m  | 10. $1000(\sqrt{3} - 1)$ m |
| 11. 25 m   | 12. 45                     |
| 13. 1.37 km.   | 14. $75\sqrt{3}$ m         |
| 15. 13.65 m  | 16. 315.8 m                |
| 17. 94.8 m   | 18. 43.3 m                 |
| 19. 100 m  | 20. 120 m                  |
| 21. 1268 m   | 22. 120 m                  |
| 23. 40 m, 17.32 m  | 24. 9.6 m                  |
| 26. 864 km/hour  | 27. 29.28 m                |
| 28. 28 m   | 29. 6 m                    |
| 30. $30\sqrt{2}$ m   | 31. 115.5 m                |
| 32. 20 m, 34.64 m  | 33. 10 m, happiness        |
| 34. Station P, 14.64 km, logical reasoning, Thinking, Security |                            |
| 35. $58\sqrt{3}$ m, Equality of Gender, Enjoyment              |                            |

## Practice Test

### Heights and Distances

**Time: 50 minutes**

**M.M: 20**

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#### Section-A

1. A pole which is 6 m high cast a shadow  $2\sqrt{3}$  on the ground. What is the sun's angle of elevation.
2. The height of a tower is 100 m. When the angle of elevation of sun is  $30^\circ$ , then what is the shadow of tower?

#### Section-B

3. From a point on the ground 20 m away from the foot of a tower the angle of elevation is  $60^\circ$ . What is the height of tower?
4. The ratio of height and shadow of a tower is  $1 : \frac{1}{\sqrt{3}}$ . What is the angle of elevation of the sun?

#### Section-C

5. The shadow of tower, when the angle of elevation of the sun is  $45^\circ$  is found to be 10 m longer than when it was  $60^\circ$ . Find the height of tower.
6. The angle of elevation of the top of a rock from the top and foot of a 100 m high tower are  $30^\circ$  and  $45^\circ$  respectively. Find the height of the rock.

#### Section-D

7. A man standing on the deck of a ship, 10 m above the water level observes the angle of elevation of the top of a hill as  $60^\circ$  and angle of depression of the base of the hill as  $30^\circ$ . Find the distance of the hill from the ship and height of the hill.



8. From a window 15 m high above the ground in a street, the angle of elevation and depression of the top and the foot of another house on the opposite side of the street are  $30^\circ$  and  $45^\circ$  respectively. Show that the height of opposite house is 23.66 metres.

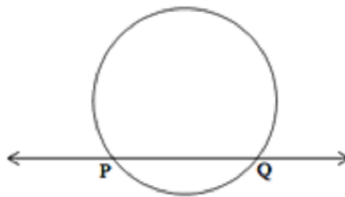
# Chapter-5

## CIRCLES

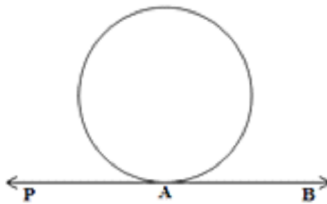
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### KEY POINTS

1. A **circle** is a collection of all those points in a plane which are at a constant distance from a fixed point. The fixed point is called the **centre** and fixed distance is called the **radius**.
2. **Secant:** A line which intersects a circle in two distinct points is called a secant of the circle.



3. **Tangent:** It is a line that intersects the circle at only one point. The point where tangent touches the circle is called the point of contact. Here A is the point of contact.

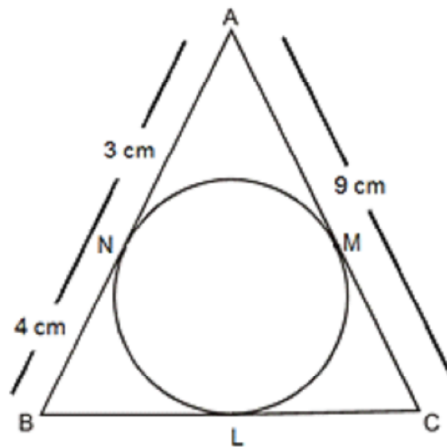


4. **Number of Tangent:** Infinitely many tangents can be drawn on a circle.
5. **Number of Secant:** There are infinitely many secants which can be drawn on a circle.
6. The proofs of the following theorems can be asked in the examination:–
  - (i) The tangent at any point of a circle is perpendicular to the radius through the point of contact.

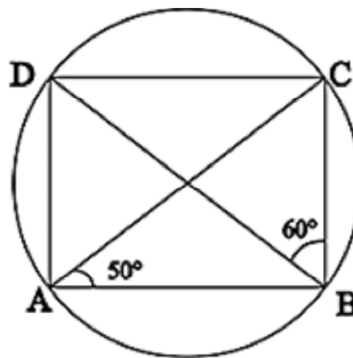
- (ii) The lengths of tangents drawn from an external point to a circle are equal.

### Very Short Answer Type Questions

1. In fig.,  $\triangle ABC$  is circumscribing a circle. Find the length of  $BC$ .

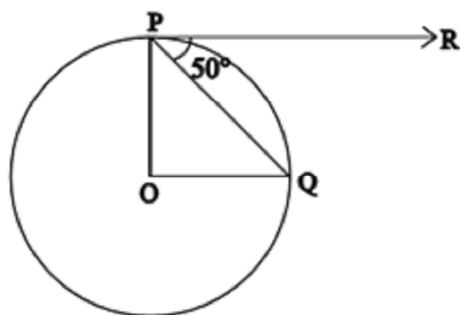


2. The length of the tangent to a circle from a point  $P$ , which is 25 cm away from the centre, is 24 cm. What is the radius of the circle.
3. In fig.,  $ABCD$  is a cyclic quadrilateral. If  $\angle BAC = 50^\circ$  and  $\angle DBC = 60^\circ$ , then find  $\angle BCD$ .

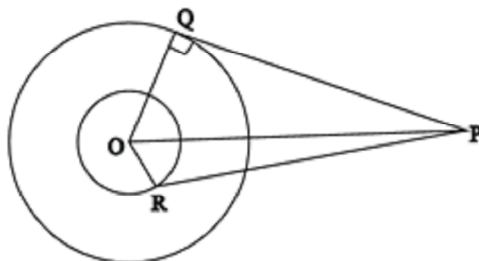


4. In figure,  $O$  is the centre of a circle,  $PQ$  is a chord and the tangent  $PR$  at  $P$

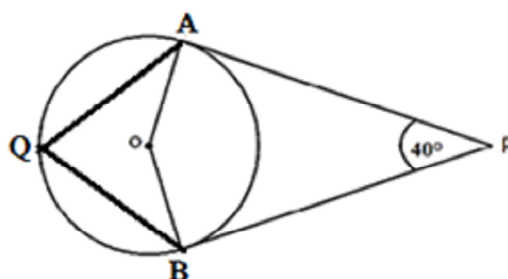
makes an angles of  $50^\circ$  with PQ. Find  $\angle POQ$ .



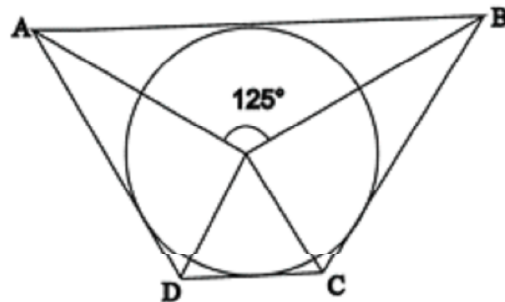
5. If two tangents inclined at an angle  $60^\circ$  are drawn to a circle of radius 3 cm, then find the length of each tangent.
6. If radii of two concentric circles are 4 cm and 5 cm, then find the length of each chord of one circle which is tangent to the other circle.
7. In the given figure, PQ is tangent to outer circle and PR is tangent to inner circle. If  $PQ = 4\text{cm}$ ,  $OQ = 3\text{ cm}$  and  $QR = 2\text{ cm}$  then find the length of PR.



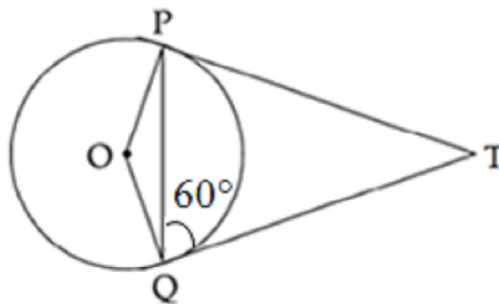
8. In the given figure, O is the centre of the circle, PA and PB are tangents to the circle then find  $\angle AQB$ .



9. In the given figure, If  $\angle AOB = 125^\circ$  then find  $\angle COD$ .



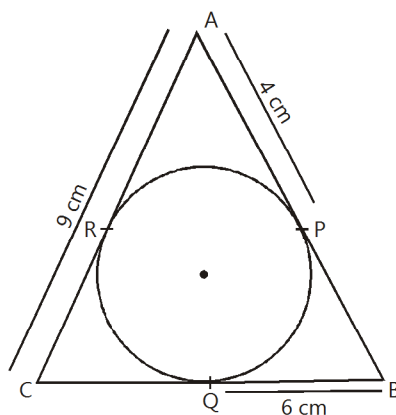
10. If two tangent TP and TQ are drawn from an external point T such that  $\angle TQP = 60^\circ$  then find  $\angle OPQ$ .



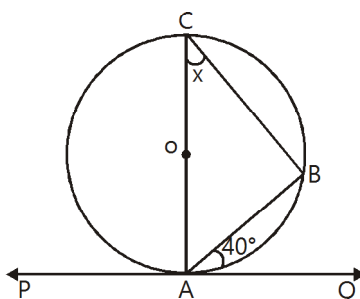
### Short Answer Type-I Questions

11. If diameters of two concentric circle are  $d_1$  and  $d_2$  ( $d_2 > d_1$ ) and C is the length of chord of bigger circle which is tangent to the smaller circle. Show that  $d_2^2 = C^2 + d_1^2$ .
12. The length of tangent to a circle of radius 2.5 cm from an external point P is 6 cm. Find the distance of P from the nearest point of the circle.
13. TP and TQ are the tangents from the external point T of a circle with centre O. If  $\angle OPQ = 30^\circ$  then find the measure of  $\angle TQP$ .

14. In the given fig.  $AP = 4$  cm,  $BQ = 6$  cm and  $AC = 9$  cm. Find the semi perimeter of  $\triangle ABC$ .

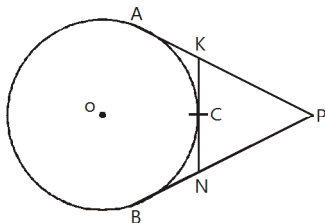


15. A circle is drawn inside a right angle triangle whose sides are  $a, b, c$  where  $c$  is the hypotenuse, which touches all the sides of the triangle. Prove  $r = \frac{a+b-c}{2}$  where  $r$  is the radius of the circle.
16. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact.
17. Prove that in two concentric circles the chord of the larger circle which is tangent to the smaller circle is bisected at the point of contact.
18. In the given Fig.,  $AC$  is diameter of the circle with centre  $O$  and  $A$  is point of contact, then find  $x$ .

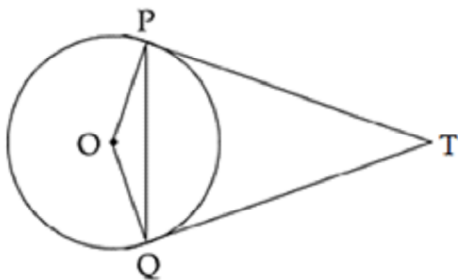


19. In the given fig. PA and PB are tangents to the circle. Prove that:

$$KN = AK + BN.$$

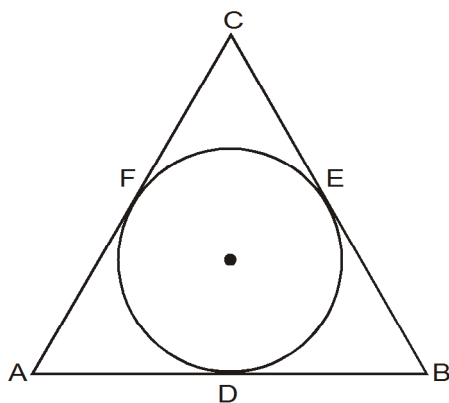


20. In the given fig. PQ is a chord of length 6 cm and the radius of the circle is 6 cm. TP and TQ are two tangents drawn from an external point T. Find  $\angle PTQ$ .



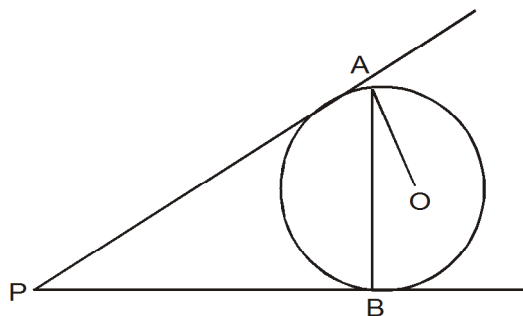
### Short Answer Type-II Questions

21. In the given figure find AD, BE, CF where  $AB = 12$  cm,  $BC = 8$  cm and  $AC = 10$  cm.

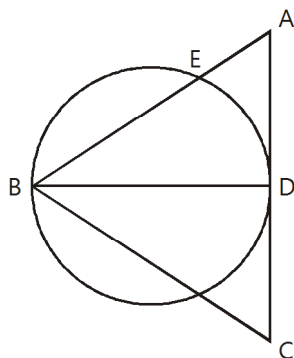


22. In a right triangle ABC a circle is drawn with AB as the diameter which intersects hypotenuse AC at point P. Prove  $PB = PC$ .

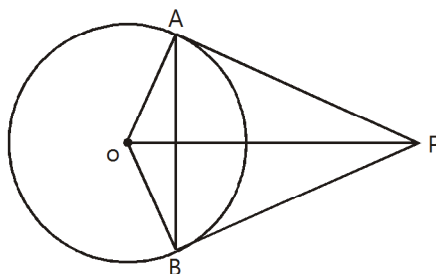
23. Two tangents PA and PB are drawn to a circle with centre O from an external point P. Prove that  $\angle APB = 2 \angle OAB$



24. If an equilateral triangle ABC with sides  $AB = AC = 6$  cm is drawn inside a circle of radius 9 cm, find area of the triangle.
25. In the given fig.  $AB = AC$ , D is the mid point of AC, BD is the diameter of the circle, then prove  $AE = \frac{1}{4} AC$

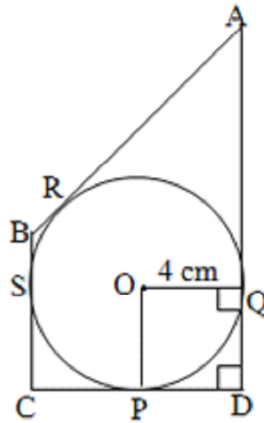


26. In the given fig. OP is equal to the diameter of the circle with centre O. Prove that  $\triangle ABP$  is an equilateral triangle.

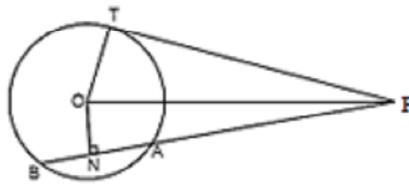




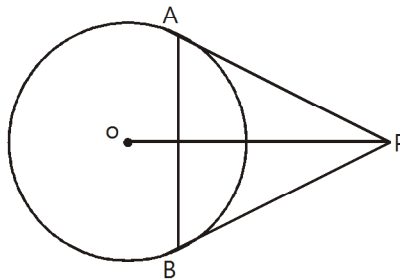
27. In the given fig., Find PC.



28. In the given fig. from an external point P, a tangent PT and a secant PAB is drawn to a circle with centre O. ON is perpendicular on the chord AB. Prove
- $PA \cdot PB = PN^2 - AN^2$
  - $PN^2 - AN^2 = OP^2 - PT^2$
  - $PA \cdot PB = PT^2$

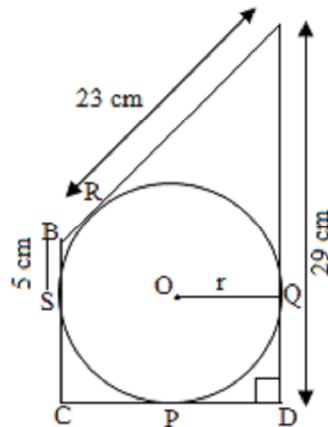


29. In a circle with centre O, AB is a diameter and AC is the chord and  $\angle BAC = 30^\circ$ . A tangent AB drawn at the point C when extended meets D. Prove  $BC = BD$ .
30. In the given fig. PA and PB are tangents to the circle with centre O. Prove that OP bisects AB and is perpendicular to it.

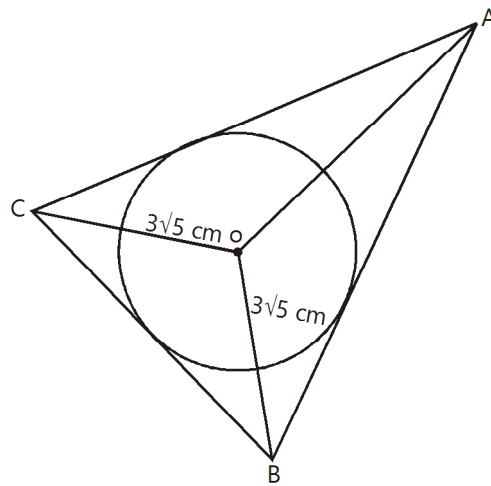


### Long Answer Type Questions

31. In the given fig. find the radius of the circle.

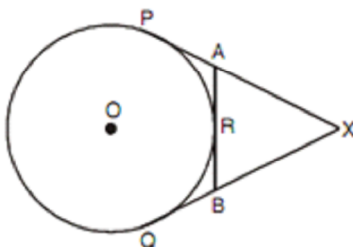


32. In the given fig. if radius of circle is 3 cm. Find the perimeter of  $\triangle ABC$ .

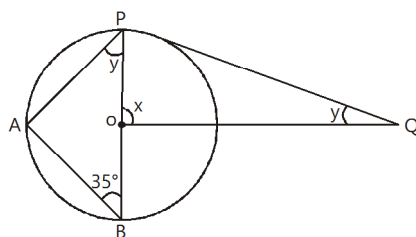


33. A circle touches the side BC of a  $\triangle ABC$  at P and AB and AC are extended respectively to points Q and R. Prove that AQ is half the perimeter of  $\triangle ABC$ .
34. In the given fig. XP and XQ are tangents from X to the circle with centre O.

R is a point on the circle. Prove that  $XA + AR = XB + BR$ .

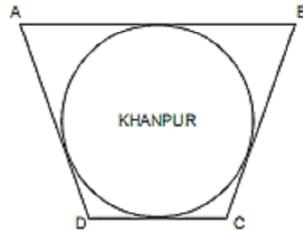


35. In the given fig. PQ is tangent and PB is diameter. Find the value of  $x$  and  $y$ .



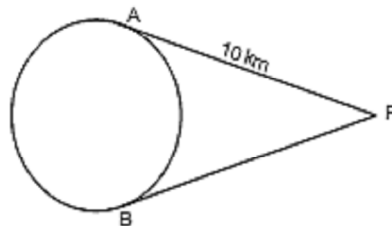
36. The distance between villages A and B is 7 km, B and C is 5 km and C and A is 8 km. The Pradhan of village wants to build a well which is equidistant from each villages.
- Find the location of well?
  - What values are depicted by this action of Pradhan?
37. The villagers wants to construct a road around a circular village. The Road cannot pass through inside the village. The villagers wants that the road should be at shortest distance from the centre of the circular village.
- Which road will be at minimum distance from the centre of the village?
  - Which values are depicted through the life of villagers?
38. In the given figure four roads touch to a circular village Khanpur of radius 1700 m. Savita got a contract for constructing road AB and CD while Vijay to construct road AD and BC.
- Prove  $AB + CD = AD + BC$

- (ii) Which value is depicted in this questions?



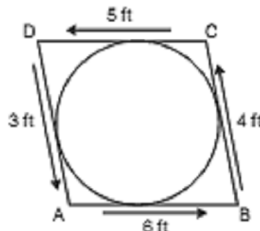
39. Two roads starting from point P touch a circular path at A and B as shown in the Figure. Sarita walks 10 km from P to A and Ramesh goes from P to B at the same time.

- (i) If Sarita wins in this race then find the distance covered by Ramesh.  
(ii) What value is depicted here.



40. One day Rahim while coming to his house found a circular pit on the road. He immediately informed Municipal corporation about the pit. Municipal corporation installed wire around the pit.

- (i) Find the total length of wire.  
(ii) Which concept of mathematics is used to find the answer?  
(iii) Which values of Rahim are depicted here?



## ANSWERS

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- |  |                |
|--|----------------|
| 1. 10 cm   | 2. 7 cm        |
| 3. $70^\circ$  | 4. $100^\circ$ |
| 5. $3\sqrt{3}$ cm  | 6. 6 cm        |
| 7. $\sqrt{21}$ cm  | 8. $70^\circ$  |
| 9. $55^\circ$  | 10. $30^\circ$ |
| 12. 4 cm   | 13. $60^\circ$ |
| 14. 15 cm  | 18. $40^\circ$ |
| 20. $120^\circ$  |                |
| 21. AD = 7 cm, BE = 5 cm, CF = 3 cm  |                |
| 24. $8\sqrt{2}$ cm <sup>2</sup>  | 27. 5 cm       |
| 31. 11 cm  | 32. 32 cm      |
| 35. $x = 35^\circ, y = 55^\circ$   |                |
| 36. (i) A, B, C, are on circumference of the circle and well at the centre.<br>(ii) Equality, Love & Care, Humanity            |                |
| 37. (i) Tangent (ii) Economic value  |                |
| 38. (ii) Gender equality   |                |
| 39. (i) 10 km (ii) Gender equality, Healthy competition  |                |
| 40. (i) 36 feet<br>(ii) tangent are equal from the external point<br>(iii) Moral and social responsibility, logical reasoning. |                |
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## Practice Test

### Circle

Time: 50 minutes

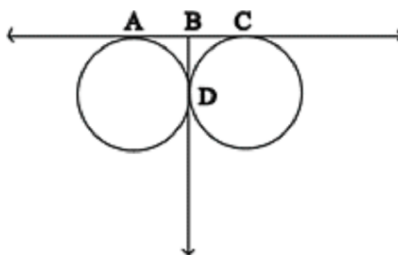
M.M: 20

#### SECTION-A

1. In the given figure find  $x$ , where ST is the tangent.

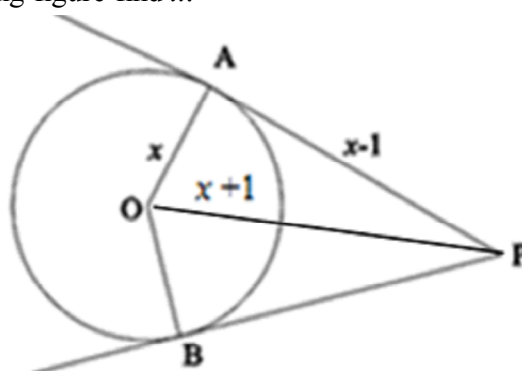


2. In the given figure if  $AC = 9$ , find  $BD$ .

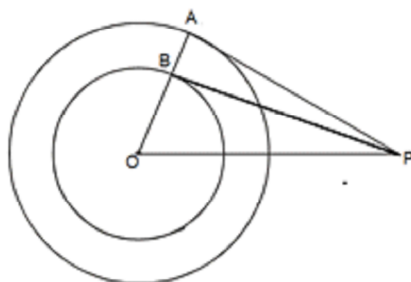


#### SECTION-B

3. In the following figure find  $x$ .

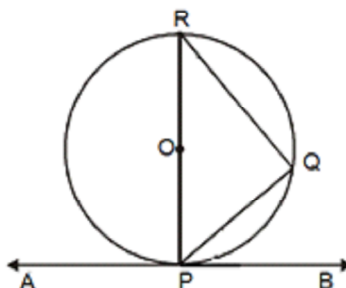


4. Two concentric circle with centre O are of radii 6 cm and 3 cm. From an external point P, tangents PA and PB are drawn to these circle as shown in the figure. If AP = 10 cm. Find BP

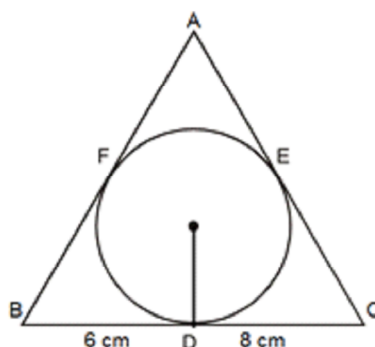


### SECTION-C

5. In the given figure, AB is a tangent to a circle with centre O. Prove  $\angle BPQ = \angle PRQ$ .

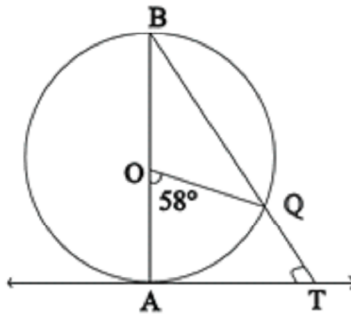


6. In the given figure  $\triangle ABC$  is drawn to circumscribe a circle of radius 3 cm, such that the segment BD and DC into which BC is divided by the point of contact D are of length 6 cm and 8 cm respectively, find side AB if the  $ar(\triangle ABC) = 63 \text{ cm}^2$

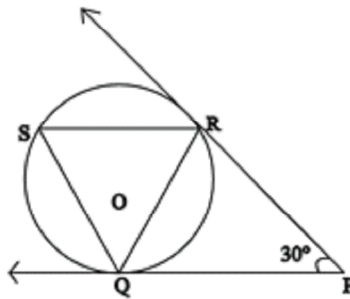


### SECTION-D

7. AB is a diameter of a circle with centre O and AT is a tangent. If  $\angle AOQ = 58^\circ$  find  $\angle ATQ$ .



8. Tangent PQ and PR are drawn from external point P to a circle with centre O, such that  $\angle RPQ = 30^\circ$ . A chord RS is drawn parallel to the tangent PQ find  $\angle RQS$ .





# Chapter-6

## CONSTRUCTIONS

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### KEY POINTS

1. Construction should be neat and clean and There should be no doubling.
2. Construction should be as per a given scale factor which may be less than 1 or greater than 1 for a triangle similar to a given triangle.
3. Step of construction should be provided only when it is mentioned in the question.
4. We makes use of compass and ruler only but in case of non-standard angles, protractor can be used.

### Very Short Answer Type Questions

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1. To construct a triangle similar to a given  $\triangle ABC$  with its sides  $\frac{5}{3}$  of the corresponding sides of  $\triangle ABC$ , a ray BX is drawn such that CBX is an acute angle and X is on the opposite side of A with respect to BC. What is the minimum no. of points to be located at equal distances on ray BX.
2. To draw a pair of tangents to a circle which are inclined to each other at an angle of  $30^\circ$ . What should be the angle between two radii?
3. To construct a triangle similar to a given  $\triangle ABC$  with its sides  $\frac{2}{5}$  of the corresponding sides of  $\triangle ABC$ , firstly a ray BX is drawn such that CBX is an acute angle and X lies on the opposite side of A with respect to BC then points  $B_1, B_2, B_3, \dots$  are located on BX at equal distances Which two points will be joined in the next step.

4. To divide a line segment AB in the ratio 3:7, What is the minimum number of points marked on a ray AX at equal distances?
5. How many tangents can be drawn from a point lying inside a circle?
6. To divide a line segment AB in the ratio 4:5, a ray AX is drawn first such that  $\angle BAX$  is an acute angle and then points  $A_1, A_2, A_3, \dots$  are located at equal distances on the ray AX which should be joined to B?
7. To divide a line segment AB in the ratio 4:5, the points  $A_1, A_2, A_3, \dots$  and  $B_1, B_2, B_3, \dots$  are located at equal distances on the ray AX and BY respectively. Which two points should be joined to divide a line segment?

### Long Answer Type Questions

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8. AB is a line segment of length 8 cm. Locate a point C on AB such that  $AC = \frac{1}{3}CB$ .
9. Construct a  $\triangle ABC$  in which  $AB = 6.5$  cm,  $\angle B = 60^\circ$  and  $BC = 5.5$  cm. Also construct a triangle  $AB'C'$  similar to  $\triangle ABC$ , whose each side is  $\frac{3}{2}$  times the corresponding sides of  $\triangle ABC$ .
10. Construct a  $\triangle ABC$  in which  $BC = 5$  cm,  $CA = 6$  cm and  $AB = 7$ . Construct a  $\triangle A'BC'$  similar to  $\triangle ABC$ , each of whose side are  $\frac{7}{5}$  times the corresponding sides of  $\triangle ABC$ .
11. Construct a triangle with side 4 cm, 5 cm, 7 cm. Then construct a triangle similar to it whose sides are  $\frac{2}{3}$  of the corresponding sides of the given triangle.
12. Construct a right triangle in which sides (other than hypotenuse) are of

lengths 8 cm and 6 cm. Then construct another triangle similar to this triangle whose sides are  $\frac{3}{4}$  times the corresponding sides of the first triangle.

13. Construct a  $\triangle ABC$  in which  $BC = 8$  cm,  $\angle B = 45^\circ$  and  $\angle C = 30^\circ$ . Construct another triangle similar to  $\triangle ABC$  such that each side are  $\frac{3}{4}$  of the corresponding sides of  $\triangle ABC$
14. A triangle  $ABC$  is given such that  $AB = 15$  cm,  $BC = 27$  cm and  $\angle BAC = 50^\circ$ . Draw another triangle  $A'BC'$  similar to  $\triangle ABC$  with sides  $BA'$  and  $BC'$  equal to 25 cm and 45 cm respectively. Find the scale factor.
15. Draw a pair of tangents to a circle of radius 6 cm which are inclined to each other at an angle of  $60^\circ$ . Also justify the construction.
16. Construct a triangle  $ABC$  in which  $AB = 5$  cm,  $\angle B = 60^\circ$  and altitude  $CD = 3$  cm. Construct a  $\triangle AQR \sim \triangle ABC$  such that each sides is 1.5 times that of the corresponding sides of  $\triangle ABC$ .
17. Draw an isosceles  $\triangle ABC$  with  $AB=AC$  and base  $BC=7$ cm, vertical angle is  $120^\circ$ . Construct  $\triangle AB'C' \sim \triangle ABC$  with its sides  $1\frac{1}{3}$  times of the corresponding sides of  $\triangle ABC$ .
18. Draw a circle of radius 3 cm. From a point 5 cm from the centre of the circle, draw two tangents to the circle. Measure the length of each tangent.
19. Draw a circle of radius 4 cm with centre O. Draw a diameter POQ. Through P or Q draw a tangent to the circle.
20. Draw two circle of radius 5 cm and 3 cm with their centres 9 cm apart. From the centre of each circle, draw tangents to other circles.
21. Draw two circles of radii 6 cm and 4 cm. From a point on the outer circle, draw a tangent to the inner circle and measure its length.

22. Draw a circle of radius 3 cm. Take two points P and Q on one of its extended diameter each at a distance of 7 cm from its centre. Draw tangents to the circle from these two points.
23. Draw a line segment PQ = 10 cm. Take a points A on PQ such that  $\frac{PA}{PQ} = \frac{2}{5}$ . Measure the length of PA and AQ
24. Draw an equilateral triangle  $\Delta PQR$  with side 5cm. Now construct  $\Delta PQ'R'$  such that  $\frac{PQ'}{PQ} = \frac{1}{2}$ .
25. Draw a line segment of length 8 cm and divided it in the ratio 5:8. Meeasure the two parts.
26. Students of a school staged a rally for cleanliness campaign. They walked through the lanes AB, BC and CA which form a triangle. Construct a triangle ABC with sides AB = 7 cm, BC = 7.5 cm abd CA = 6.5 cm. Construct a  $\Delta$  similar to  $\Delta ABC$  whose sides are  $\frac{3}{2}$  of the corresponding sides of  $\Delta ABC$ . What value represents here?
27. Amit has a triangu;ar piece of land ABC with base BC = 4.2 m,  $\angle A = 45^\circ$  and altitude through A is 2.5 cm. He wants to purchase another piece of land similar to the earlier triangle with scale factor  $\frac{1}{2}$  and donate this to vridhashram. Construct triangle using above dimensions. What value represents here? What qualities of Gandhiji would you like to construct within you?
28. Draw a line segment of length 8 cm divided it in the ratio 3:4. Dividing joint families into nuclear families is good or bad. Give reson in support of your answer.

29. Draw a circle of radius 5 cm. Draw tangents from the end points of its diameter. What do you observe?

If each tangent represents the quality of a human being, Find out the qualities that should be adopted for a better human being.

## ANSWERS

---

- |    |               |    |       |
|----|---------------|----|-------|
| 1. | 5             | 2. | 150   |
| 3. | $B_5$ to C    | 4. | 10    |
| 5. | 0             | 6. | $A_9$ |
| 7. | $A_4$ & $B_5$ |    |       |

## Practice Test

### Constructions

**Time: 50 minutes**

**M.M: 20**

---

#### SECTION-A

1. Draw a perpendicular bisector of line segment  $AB = 8\text{cm}$
2. Draw a line parallel to a given line.

#### SECTION-B

3. Draw an angle bisector of  $75^\circ$ .
4. Draw a line segment of  $5.6\text{cm}$ . Divide it in the ratio  $2:3$ .

#### SECTION-C

5. Draw two tangents to a circle of radius  $3.5\text{cm}$  from a point  $P$  at a distance of  $5.5\text{cm}$  from its centre. Measure its length.
6. Draw a circle of radius  $3.5\text{cm}$ . Draw two tangents to the circle such that they include an angle of  $120^\circ$ .

#### SECTION-D

7. Construct a  $\triangle ABC$  of sides  $AB = 4\text{cm}$ ,  $BC = 5\text{cm}$  and  $AC = 7\text{cm}$ . Construct another triangle similar to  $\triangle ABC$  such that each of its sides is  $\frac{5}{7}$  of the corresponding sides of  $\triangle ABC$ .
8. Draw a right triangle  $ABC$  in which  $AB = 6\text{cm}$ ,  $BC = 8\text{cm}$  and  $\angle B = 90^\circ$ . Draw  $BD \perp AC$  and draw a circle passing through the points  $B$ ,  $C$  and  $D$ . Construct tangents from  $A$  to this circle.

# Chapter-7

## AREAS RELATED TO CIRCLES

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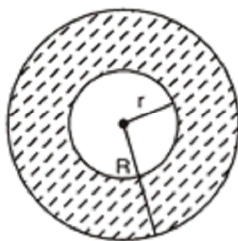
### KEY POINTS

1. **Circle:** A circle is the locus of a point which moves in a plane in such a way that its distance from a fixed point always remains the same. The fixed point is called the centre and the given constant distance is known as the radius of the circle.

If  $r$  is radius of a circle, then

- (i) Circumference =  $2\pi r$  or  $\pi d$  where  $d = 2r$  is the diameter of the circle
- (ii) Area =  $\pi r^2$  or  $\frac{\pi d^2}{4}$
- (iii) Area of semi circle =  $\frac{\pi r^2}{2}$
- (iv) Area of quadrant of a circle =  $\frac{\pi r^2}{4}$

**Area enclosed by two concentric circles:** If  $R$  and  $r$  are radii of two concentric circles, then area enclosed by the two circles =  $\pi R^2 - \pi r^2$



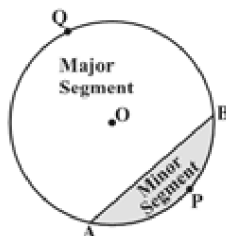
$$\begin{aligned}
 &= \pi(R^2 - r^2) \\
 &= \pi(R + r)(R - r)
 \end{aligned}$$

- (i) If two circles touch internally, then the distance between their centres is equal to the difference of their radii.
- (ii) If two circles touch externally, then distance between their centres is equal to the sum of their radii.



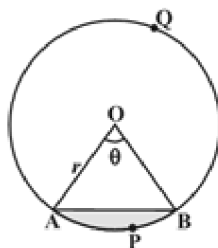
- (iii) Distance moved by rotating wheel in one revolution is equal to the circumference of the wheel.
- (iv) The number of revolutions completed by a rotating wheel in one minute =  $\frac{\text{Distance moved in one minute}}{\text{Circumference of the wheel}}$

**Segment of a Circle:** The portion (or part) of a circular region enclosed between a chord and the corresponding arc is called a segment of the circle. In fig. adjacent APB is minor segment and AQB is major segment.



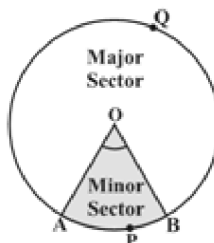
Area of segment APB = Area of the sector OAPB – Area of  $\triangle OAB$

$$= \frac{\theta}{360^\circ} \times \pi r^2 - \frac{1}{2} r^2 \sin \theta$$



**Sector of a circle:** The portion (or part) of the circular region enclosed by the two radii and the corresponding arc is called a sector of the circle.

In figure adjacent OAPB is minor sector and OAQB is the major sector.



$$\begin{aligned}\text{Area of the sector of angle } \theta &= \frac{\theta}{360^\circ} \times \pi r^2 \\ &= \frac{1}{2} \times \text{length of arc} \times \text{radius} = \frac{1}{2} lr\end{aligned}$$

$$\text{Length of an arc of a sector of angle } \theta = \frac{\theta}{360} \times 2\pi r$$

- (i) The sum of the arcs of major and minor sectors of a circle is equal to the circumference of the circle.
- (ii) The sum of the areas of major and minor sectors of a circle is equal to the area of the circle.

- (a) Angle described by minute hand in 60 minutes =  $360^\circ$   
 Angle described by minute hand in one minute =  $\frac{360^\circ}{60} = 6^\circ$

Thus minute hand rotates through an angle of  $6^\circ$  in one minute

- (b) Angle described by hour hand in 12 hours =  $360^\circ$   
 Angle described by hour hand in one hour =  $\frac{360^\circ}{12} = 30^\circ$   
 Angle described by hour hand in one minute =  $\frac{30^\circ}{60} = \frac{1^\circ}{2}$

Thus, hour hand rotates through an angle of  $\frac{1^\circ}{2}$  in one minute.

### VERY SHORT ANSWER QUESTIONS

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1. If the diameter of a semi circular protactor is 14 cm, then find its perimeter.
2. If circumference and the area of a circle are numerically equal, find the diameter of the circle.
3. Find the area of the circle 'inscribed' in a square of side  $a$  cm.
4. Find the area of a sector of a circle whose radius is  $r$  and length of the arc is  $l$ .
5. The radius of a wheel is 0.25 m. Find the number of revolutions it will make to travel a distance of 11 kms.

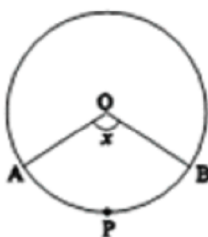
6. If the area of circle is  $616 \text{ cm}^2$ , then what is its circumference?
7. What is the area of the circle that can be inscribed in a square of side 6 cm?
8. What is the diameter of a circle whose area is equal to the sum of the areas of two circles of radii 24 cm and 7 cm?
9. A wire can be bent in the form of a circle of radius 35 cm. If it is bent in the form of a square, then what will be its area?
10. What is the angle subtended at the centre of a circle of radius 6 cm by an arc of length  $3\pi \text{ cm}$ ?
11. Write the formula for the area of sector of angle  $\theta$  (in degrees) of a circle of radius  $r$ .
12. If the circumference of two circles are in the ratio 2:3, what is the ratio of their areas?
13. If the difference between the circumference and radius of a circle is 37 cm, then find the circumference of the circle. ( Use  $\pi = \frac{22}{7}$  )
14. If diameter of a circle is increased by 40%, find by how much percentage its area increases?
15. The hour hand of a clock is 6 cm long. Find the area swept by it between 11:20 am and 11:55 am.

### SHORT ANSWER TYPE I QUESTIONS

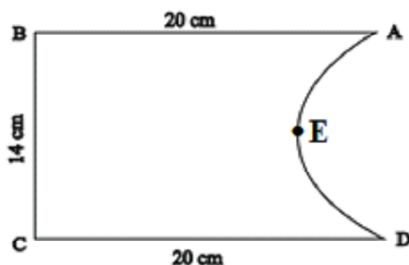
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16. Find the area of a quadrant of a circle whose circumference is 22 cm.
17. What is the angle subtended at the centre of a circle of radius 10 cm by an arc of length  $5\pi \text{ cm}$ ?
18. If a square is inscribed in a circle, what is the ratio of the area of the circle and the square?
19. Find the radius of semicircle if its perimeter is 18 cm.

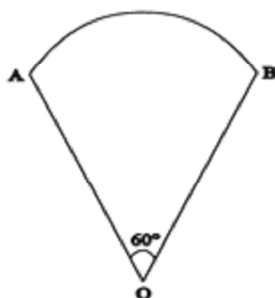
20. If the perimeter of a circle is equal to that of square, then find the ratio of their areas.
21. What is the ratio of the areas of a circle and an equilateral triangle whose diameter and a side are respectively equal?
22. In fig., O is the centre of a circle. The area of sector OAPB is  $\frac{5}{18}$  of the area of the circle. Find  $x$ .



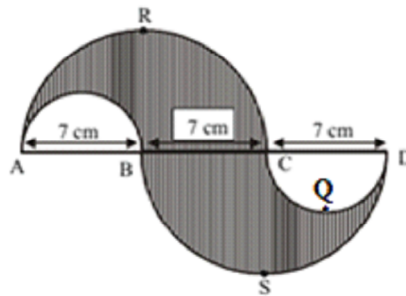
23. Find the perimeter of a given fig, where AED is a semicircle and ABCD is a rectangle.



24. In fig, is a sector of a circle of radius 10.5 cm. Find the perimeter of the sector.

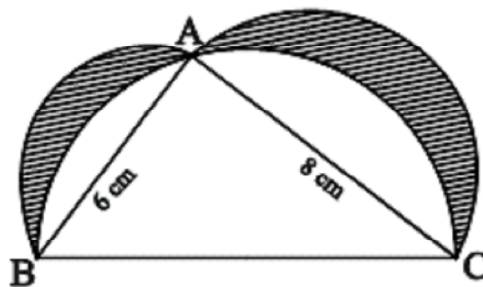


25. In the given fig, APB and CQD are semi circles of diameter 7 cm each, while ARC and BSD are semicircles of diameter 14 cm each. Find the perimeter of the shaded region. (Use  $\pi = \frac{22}{7}$ )



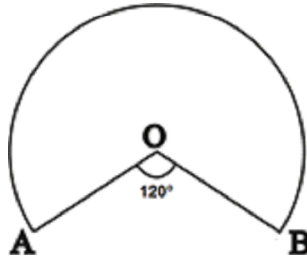
### SHORT ANSWER TYPE II QUESTIONS

26. Area of a sector of a circle of radius 36 cm is  $54\pi$  cm<sup>2</sup>. Find the length of the corresponding arc of the sector.
27. The length of the minute hand of a clock is 5 cm. Find the area swept by the minute hand during the time period 6:05 am to 6:40 am.
28. In fig, ABC is a triangle right angled at A. Semi circles are drawn on AB, AC and BC as diameters. Find the area of the shaded region.

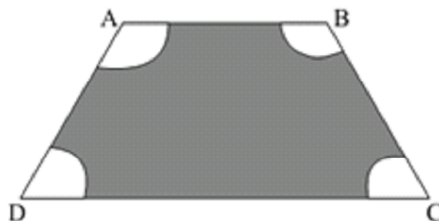


29. In fig, OAPB is a sector of a circle of radius 3.5 cm with the centre at O and

$\angle AOB = 120^\circ$ . Find the length of OAPBO.

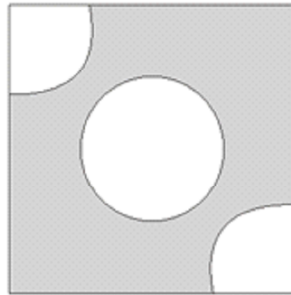


30. Circular footpath of width 2 m is constructed at the rate of Rs 20 per square meter, around a circular park of radius 1500 m. Find the total cost of construction of the foot path. (Take  $\pi = 3.14$ )
31. A boy is cycling such that the wheels of the cycle are making 140 revolutions per minute. If the diameter of the wheel is 60 cm. Calculate the speed of cycle.
32. In a circle with centre O and radius 5 cm, AB is a chord of length  $5\sqrt{3}$  cm. Find the area of sector AOB.
33. The area of an equilateral triangle is  $49\sqrt{3}$  cm<sup>2</sup>. Taking each angular point as centre, a circle is described with radius equal to half the length of the side of the triangle. Find the area of the triangle not included in the circle.
34. ABCD is a trapezium with  $AB \parallel DC$ ,  $AB = 18$  cm,  $DC = 32$  cm and the distance between AB and DC is 14 cm. Circles of equal radii 7 cm with centres A, B, C and D have been drawn, Then, find the area of the shaded region of the figure. ( $\pi = \frac{22}{7}$ )

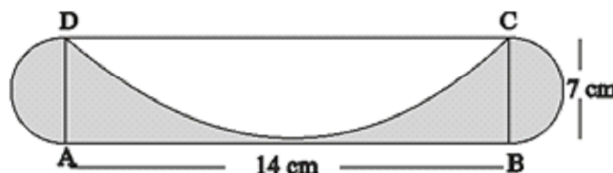


35. From each of the two opposite corners of a square of side 8 cm, a quadrant of a circle of radius 1.4 cm is cut. Another circle of radius 4.2 cm is also cut from the centre as shown in fig. Find the area of the shaded portion.

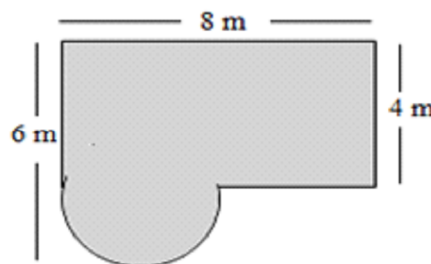
(Use  $\pi = \frac{22}{7}$ )



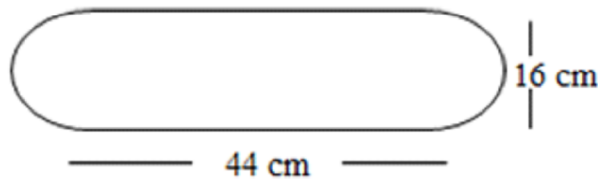
36. A sector of  $100^\circ$  cut off from a circle contains  $70.65 \text{ cm}^2$ . Find the radius of the circle. ( $\pi = 3.14$ )
37. In fig. ABCD is a rectangle with  $AB = 14 \text{ cm}$  and  $BC = 7 \text{ cm}$ . Taking DC, BC and AD as diameter, three semicircles are drawn. Find the area of the shaded portion.



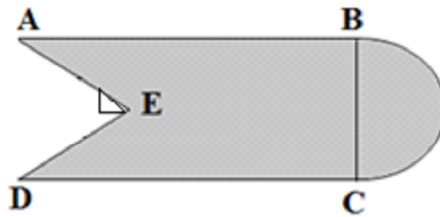
38. A square water tank has its each side equal to 40 m. There are four semi circular grassy plots all around it. Find the cost of turfing the plot at Rs 1.25 per sq. m. (Use  $\pi = 3.14$ )
39. Find the area of the shaded region shown in the fig.



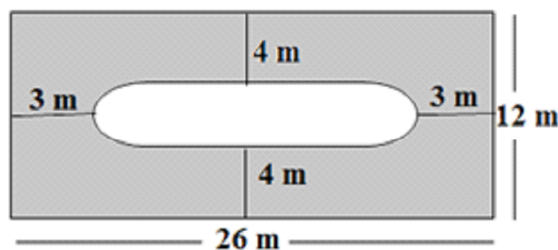
40. Find the area of the minor segment of a circle of radius 28 cm, when the angle of the corresponding sector is  $45^\circ$ .
41. A piece of wire 11 cm long is bent into the form of an arc of a circle subtending an angle of  $45^\circ$  at its centre. Find the radius of the circle.
42. Find the area of the flower bed (with semicircular ends).



43. In fig. from a rectangular region ABCD with AB = 20 cm, a right triangle AED with AE = 9 cm and DE = 12 cm, is cut off. On the other end, taking BC as diameter, a semi circle is added on outside the region. Find the area of the shaded region.



44. The circumference of a circle exceeds the diameter by 16.8 cm. Find the radius of the circle.
45. Find the area of the shaded region.

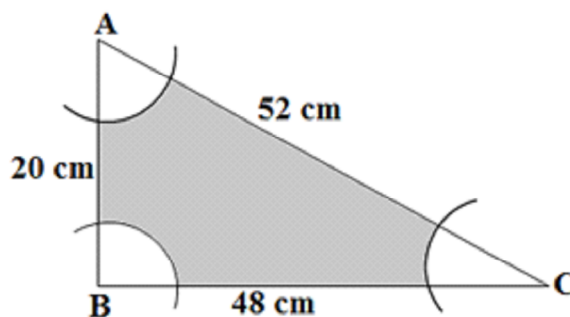


### LONG ANSWER TYPE QUESTIONS

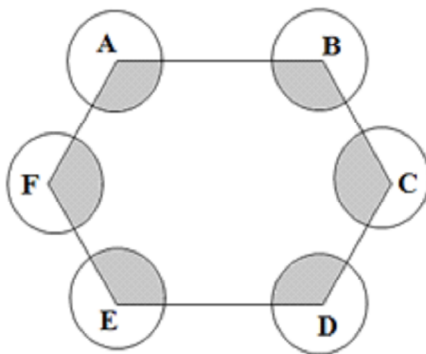
46. Two circles touch externally. The sum of their areas is  $130\pi$  sq. cm and the distance between their centres is 14 cm. Find the radii of the circles.



47. Three circles each of radius 7 cm are drawn in such a way that each of them touches the other two. Find the area enclosed between the circles.
48. Find the number of revolutions made by a circular wheel of area  $6.16 \text{ m}^2$  in rolling a distance of 572 m.
49. All the vertices of a rhombus lie on a circle. Find the area of the rhombus, if area of the circle is  $2464 \text{ cm}^2$ .
50. With vertices A, B and C of a triangle ABC as centres, arcs are drawn with radii 6 cm each in fig. If  $AB = 20 \text{ cm}$ ,  $BC = 48 \text{ cm}$  and  $CA = 52 \text{ cm}$ , then find the area of the shaded region. (Use  $\pi = 3.14$ )

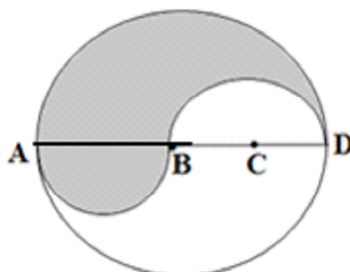


51. ABCDEF is a regular hexagon. With vertices A, B, C, D, E and F as the centres, circles of same radius ' $r$ ' are drawn. Find the area of the shaded portion shown in the given figure.

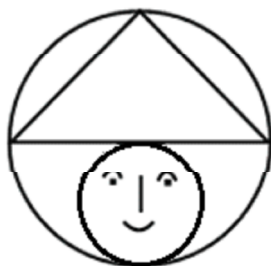


52. ABCD is a diameter of a circle of radius 6 cm. The lengths AB, BC and CD

are equal. Semicircles are drawn on AB and BD as diameter as shown in the fig. Find the perimeter and area of the shaded region.

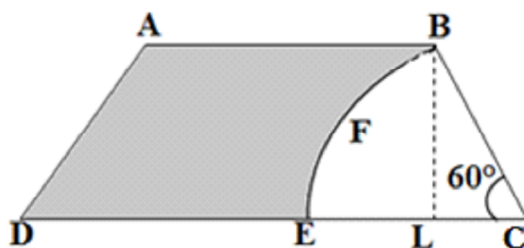


53. A poor artist on the street makes funny cartoons for children and earns his living. Once he made a comic face by drawing a circle within a circle, the radius of the bigger circle being 30 cm and that of smaller being 20 cm as shown in the figure. What is the area of the cap given in this figure? What qualities of this artist are being reflected here?

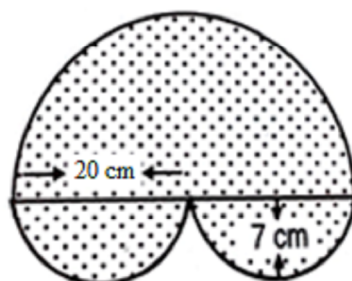


54. In the given fig., ABCD is a trapezium with  $AB \parallel CD$  and  $\angle BCD = 60^\circ$ . If BFEC is a sector of a circle with centre C and  $AB = BC = 7$  cm and  $DE = 4$  cm, then find the area of the shaded region.

(Use  $\pi = \frac{22}{7}$ ,  $\sqrt{3} = 1.732$ )



55. Find the area of the shaded region in the given figure.



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## ANSWERS

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- |                                     |  |
|-------------------------------------|--|
| 1. 36 cm                            | 2. 4 units                             |
| 3. $\frac{\pi a^2}{4} \text{ cm}^2$ | 4. $\frac{1}{2}lr \text{ sq. units}$   |
| 5. 7000                             | 6. 88 cm                               |
| 7. $9\pi \text{ cm}^2$              | 8. 50 cm                               |
| 9. 3025 cm <sup>2</sup>             | 10. 90°                                |
| 11. $\frac{8}{360} \times \pi r^2$  | 12. 4:9                                |
| 13. 44 cm                           | 14. 96%                                |
| 15. 5.5 cm <sup>2</sup>             | 16. 9.625 cm <sup>2</sup>              |
| 17. 90°                             | 18. $\pi : 2$ or $11 : 7$              |
| 19. 3.5 cm                          | 20. 4: $\pi$                           |
| 21. $\pi : \sqrt{3}$                | 22. 100                                |
| 23. 76 cm                           | 24. 32 cm                              |
| 25. 66 cm                           | 26. $3\pi \text{ cm}$                  |
| 27. $45\frac{5}{6} \text{ cm}^2$    | 28. 24 cm <sup>2</sup>                 |
| 29. 21.67 cm                        | 30. Rs. 377051.2                       |
| 31. 15.84 km/h                      | 32. $\frac{25}{3}\pi \text{ cm}^2$     |
| 33. 7.77 cm <sup>2</sup>            | 34. 196 cm <sup>2</sup>                |
| 35. 5.48 cm <sup>2</sup>            | 36. 9 cm                               |
| 37. 59.5 cm <sup>2</sup>            | 38. Rs. 5140                           |
| 39. $(32 + 2\pi) \text{ cm}^2$      | 40. $(308 - 196\sqrt{2}) \text{ cm}^2$ |

- |     |   |     |   |
|-----|---|-----|---|
| 41. | 14 cm                                   | 42. | $(704 + 64\pi) \text{ cm}^2$            |
| 43. | 334.31 $\text{cm}^2$                    | 44. | 3.92 cm                                 |
| 45. | $(248 - 4\pi) \text{ cm}^2$             | 46. | 11 cm and 3 cm                          |
| 47. | 7.87 $\text{cm}^2$                      | 48. | 65                                      |
| 49. | 1568 $\text{cm}^2$                      | 50. | 423.48 $\text{cm}^2$                    |
| 51. | $2\pi r^2$                              | 52. | P = 37.71 cm<br>A = 37.71 $\text{cm}^2$ |
| 53. | $400\sqrt{2}$ , Kind hearted, sensitive | 54. | 28.89 $\text{cm}^2$                     |
| 55. | 462 $\text{cm}^2$                       |     |   |

## Practice Test

### Areas Related to Circles

Time: 50 minutes

M.M: 20

#### SECTION-A

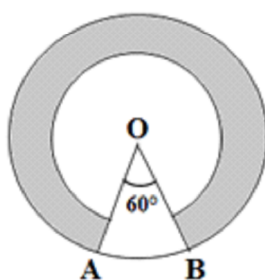
1. If the circumference of two circles are equal, then what is the ratio between their areas?
2. If the diameter of a protactor is 21 cm, then find its perimeter.

#### SECTION-B

3. Find the area of a circle whose circumference is 22 cm.
4. Find the area of a quadrant of a circle whose circumference is 44 cm.

#### SECTION-C

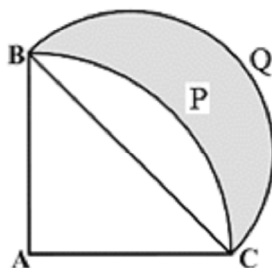
5. A horse is tied to a pole with 28 cm long string. Find the area where the horse can graze.
6. In fig. two concentric circles with centre O, have radii 21 cm and 42 cm. If  $\angle AOB = 60^\circ$ , find the area of the shaded region. (Use  $\pi = \frac{22}{7}$ )



#### SECTION-D

7. A chord AB of a circle of radius 10 cm makes a right angle at the centre of the circle. Find the area of the minor and major segments.

8. In the fig., ABCP is a quadrant of a circle of radius 20 cm. With AC as diameter, a semi circle is drawn. Find the area of the shaded portion.



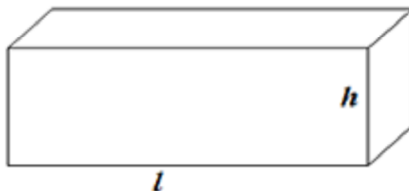
# Chapter-8

## SURFACE AREAS AND VOLUMES

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### KEY POINTS

1. **Cuboid:** 3-D shapes like a book, a match box, an almirah, a room etc. are called Cuboid.



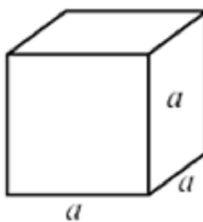
For cuboid  $l$  = length,  $b$  = breadth,  $h$  = height

$$\text{Volume} = l \times b \times h$$

$$\text{Lateral surface area} = 2h(l + b)$$

$$\text{Total surface area} = 2(lb + bh + hl)$$

2. **Cube:** 3-D shapes like ice-cubes, dice etc. are called cube.



$$\text{In cube, length} = \text{breadth} = \text{height} = a$$

$$\text{Volume} = a^3$$

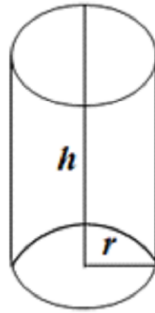
$$\text{Lateral surface area} = 4a^2$$

$$\text{Total surface area} = 6a^2$$

3. **Cylinder:** 3-D shapes like jars, circular pillars, circular pipes, road rollers etc.



are called cylinder.



- (a) For right circular cylinder solid, base radius =  $r$ , height =  $h$

$$\text{Volume} = \pi r^2 h$$

$$\text{Lateral surface area} = 2\pi r h$$

$$\text{Total surface area} = 2\pi r (r + h)$$

- (b) For right circular cylinder (Hollow)

$$\text{external radius} = R$$

$$\text{internal radius} = r$$

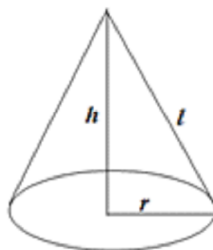
$$\text{height} = h$$

$$\text{Volume} = \pi(R^2 - r^2)h$$

$$\text{Curved surface area} = 2\pi(R + r)h$$

$$\text{Total surface area} = 2\pi(R + r)h + 2\pi(R^2 - r^2)$$

4. **Cone:** 3-D shapes like conical tents, ice-cream cone are called Cone.



For right circular cone,

base radius =  $r$

height =  $h$

slant height =  $l$

$$l = \sqrt{h^2 + r^2}$$

$$\text{Volume} = \frac{1}{3}\pi r^2 h$$

Curved surface area =  $\pi r l$

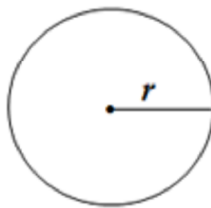
Total surface area =  $\pi r (r + l)$

It may be noted that

$3 \times$  volume of a cone = volume of right circular cylinder

$\left[ \begin{array}{l} \text{radius of cone and cylinder should be same} \\ \text{height of cone and cylinder should be same} \end{array} \right]$

5. **Sphere:** 3-D shapes like cricket balls, footballs etc. are called sphere.

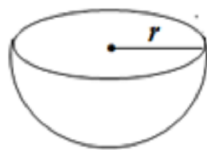


- (a) For sphere : Radius =  $r$

$$\text{Volume} = \frac{4}{3}\pi r^3$$

$$\text{surface area} = 4\pi r^2$$

- (b) For Hemisphere (solid): Radius =  $r$

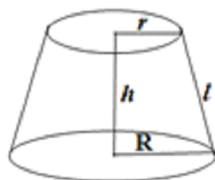


$$\text{Volume} = \frac{2}{3}\pi r^3$$

$$\text{curved surface} = 2\pi r^2$$

$$\text{Total surface area} = 3\pi r^2$$

6. **Frustum**: When a cone is cut by a plane parallel to the base of the cone, then the portion between the plane and the base is called the frustum of the cone.



Example = Turkish Cap

For a frustum of cone:

Base radius = R

Top radius = r

Height = h

slant height = l

$$l = \sqrt{h^2 + (R - r)^2}$$

$$\text{volume} = \frac{1}{3}\pi h(r^2 + R^2 + Rr)$$

Curved surface area (solid frustum) =  $\pi l(R + r)$

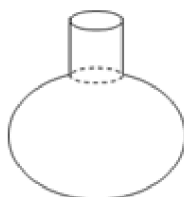
Total surface area (solid frustum) =  $\pi l(R + r) + \pi(R^2 + r^2)$

### Very Short Answer Type Questions

- 
1. What geometrical shapes is a "FUNNEL" combination of?
-



2. What geometrical shapes is a "SURAHI" combination of?



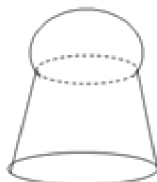
3. What geometrical shapes is a cylindrical "PENCIL" sharpened at one edge combination of?



4. What geometrical shapes is a "GLASS (tumbler)"?



5. What geometrical shapes is a "SHUTTLE COCK" combination of?



6. What geometrical shapes is a "GILLI" in gilli-danda game combination of?



7. What geometrical shapes is a "PLUMBLINE" (SAHUL) use by masons combination of?



8. A solid shape is converted from one form to another. What is the change in its volume?
9. What cross-section is made by a cone when it is cut parallel to its base?  
[Hint : Cross sectional area of top of frustum]
10. Find total surface area of a solid hemi-sphere of radius 7cm.
11. Volume of two spheres is in the ratio 64 : 125. Find the ratio of their surface areas.
12. A right circular cylinder of radius  $r$  cm and height  $h$  cm ( $h > 2r$ ) just encloses a sphere. Find diameter of the sphere.
13. A cylinder and a cone are of same base radius and of same height. Find the ratio of the volumes of cylinder to that of the cone.
14. A solid sphere of radius  $r$  is melted and recast into the shape of a solid cone of height  $r$ . Find radius of the base of the cone.
15. Find the total surface area of a solid hemi-sphere of radius  $r$ .
16. If the volume and the surface area of a sphere are numerically equal, then find the radius of the sphere.
17. A cylinder, a cone and a hemisphere are of same base and have the same height. What is the ratio of their volumes?

18. If two solid hemi-spheres of same base radius  $r$  are joined together along their base, then find the total surface area of this new solid.
19. If the volume of a cube is  $1331 \text{ cm}^3$ , then find the length of its edge.
20. What does the "CAPACITY" for a hollow cylinder means?

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### Short Answer Type Question (Type-I)

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21. How many cubes of side 2 cm can be cut from a cuboid measuring  $(16\text{cm} \times 12\text{cm} \times 10\text{cm})$ .
22. Find the height of largest right circular cone that can be cut out of a cube whose volume is  $729 \text{ cm}^3$ .
23. Two identical cubes each of volume  $64 \text{ cm}^3$  are joined together end to end. What is the surface area of the resulting cuboid?
24. Twelve solid spheres of the same sizes are made by melting a solid metallic cylinder of base diameter 2 cm and height 16cm. Find the radius of each sphere.
25. The diameters of the two circular ends of the bucket are 44 cm and 24 cm. The height of the bucket is 35cm. Find the volume of the bucket.

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### Short Answer Type Question (Type-II)

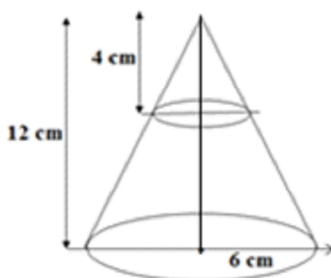
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26. Find the length of the longest rod that can be put in a room of  $10\text{m} \times 10\text{m} \times 5\text{m}$  dimensions.
27. Find surface area of a cube whose volume is  $1000 \text{ cm}^3$ .
28. The volume of two hemi-sphere are in the ratio 8:27. Find the ratio of their radii.
29. Find the curved surface area and the total surface area of a solid cone whose height is 28 cm and radius is 21 cm.

30. A bucket is in the form of a frustum of a cone and holds 28.490 litres of water. The radii of the top and bottom are 28 cm and 21 cm respectively. Find the height of the bucket.
31. Three cubes of a metal whose edges are in the ratio 3:4:5 are melted and converted into a single cube whose diagonal is  $12\sqrt{3}$  cm. Find the edge of three cubes.
32. Find the depth of a cylindrical tank of radius 10.5 cm, if its capacity is equal to that of a rectangular tank of size 15 cm  $\times$  11 cm  $\times$  10.5 cm.
33. A cone of radius 8 cm and height 12 cm is divided into two parts by a plane through the mid-point of its axis parallel to its base. Find the ratio of the volumes of the two parts.
34. A petrol tank is a cylinder of base diameter 28 cm and length 24 cm filled with conical ends each of axis length 9 cm. Determine the capacity of the tank.

### Long Answer Type Questions

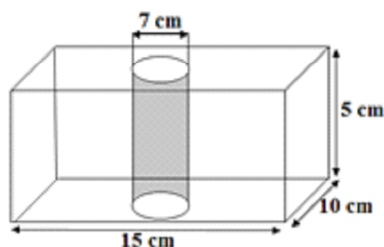
35. In the given figure, from the top of a solid cone of height 12 cm and base radius 6 cm, a cone of height 4 cm is removed by a plane parallel to the base. Find the total surface area of the remaining solid.  
(Use  $\pi = \frac{22}{7}$  and  $\sqrt{5} = 2.236$ )



36. A solid wooden toy is in the form of a hemi-sphere surmounted by a cone of same radius. The radius of hemi-sphere is 3.5 cm and the total wood used in

the making of toy is  $166\frac{5}{6} \text{ cm}^3$ . Find the height of the toy. Also, find the cost of painting the hemi-spherical part of the toy at the rate of Rs. 10 per  $\text{cm}^2$ . (use  $\pi = \frac{22}{7}$ ).

37. In the given figure, from a cuboidal solid metallic block of dimensions  $15 \text{ cm} \times 10 \text{ cm} \times 5 \text{ cm}$  a cylindrical hole of diameter 7cm is drilled out. Find the surface area of the remaining block. (Use  $\pi = \frac{22}{7}$ ).



38. Water is flowing at the rate of 2.52 km/hr. 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 3.15m, find internal diameter of the pipe.



## ANSWERS

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- |  |                                  |
|--|----------------------------------|
| 1. Cylinder, Frustum   | 2. Cylinder, Sphere              |
| 3. Cylinder, Cone  | 4. Frustum                       |
| 5. Hemi-sphere, Frustum  |                                  |
| 6. Cylinder with Conical ends                                  |                                  |
| 7. Hemi-sphere, Cone   | 8. Remains Uncharged             |
| 9. Circle  | 10. $462 \text{ cm}^2$           |
| 11. 16:25  | 12. $2r$                         |
| 13. 3:1  | 14. $2r$                         |
| 15. $3\pi r^2$   | 16. 3 units                      |
| 17. 3:1:2  | 18. $4\pi r^2$                   |
| 19. $11 \text{ cm}^2$  | 20. Volume                       |
| 21. 240  | 22. 9 cm                         |
| 23. $160 \text{ cm}^2$   | 24. 1 cm                         |
| 25. $32706.6 \text{ cm}^3$                                     | 26. 15 m                         |
| 27. $600 \text{ cm}^2$   | 28. 2:3                          |
| 29. C.S.A = $2310 \text{ cm}^2$<br>T.S.A = $3696 \text{ cm}^2$ | 30. 15 cm                        |
| 31. 6 cm, 8 cm, 10 cm  | 32. 5 cm                         |
| 33. 1:7 or 7:1   | 34. $18480 \text{ cm}^3$         |
| 35. $350.592 \text{ cm}^2$                                     | 36. $h = 6 \text{ cm}$ , Rs. 770 |
| 37. $583 \text{ cm}^2$   | 38. 4 cm                         |

**Practice Test**  
**Surface Areas and Volumes**

**Time: 50 minutes**

**M.M: 20**

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**SECTION-A**





1. What is the formula for total surface area of a solid hemi-sphere?
2. What geometrical shapes is a "FUNNEL" combination of?
3. A cylindrical boiler is 2 m high and has 3.5m radius. Find its volume.
4. What is the formula for total surface area of a bucket?  
[Hint: bucket is in shape of frustum]
5. What will be the volume of the largest right circular cone that can be cut from a cube of edge 4.2 cm.
6. Find the volume of a frustum of a cone whose height is 4 m and radii of the ends are 7 m and 4 m.
7. Show that the ratio of the volumes of a cylinder, a cone and a hemi-sphere of same base and same height is 3:1:2.
8. Two solid metallic cubes of sides 40cm and 30cm are melted together recast into 5824 equal solid cubical dice. Determine the side of the cubical dice.

# Chapter-9

## PROBABILITY

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### KEY POINTS

1. The Theoretical probability of an event E written as  $P(E)$ , is defined as.  
$$P(E) = \frac{\text{Number of outcomes favourable to E}}{\text{Number of all possible outcomes of the experiment}}$$
  
Where the outcomes of the experiment are equally likely.
2. The sum of the probability of all the elementary events of an experiment is 1.
3. The probability of a sure event is 1 and probability of an impossible event is 0
4.  $P(E) + P(\bar{E}) = 1$
5. The probability of an event E is a number  $P(E)$  such that  $0 \leq P(E) \leq 1$ .
6. A pack of cards consists of 52 cards which are divided into 4 suits of 13 cards each spades , hearts , diamonds  and clubs . Clubs and spades are of black colour, while hearts and diamonds are of red colour.
7. The cards in each suit are ace, king, queen, jack, 10, 9, 8, 7, 6, 5, 4, 3 and 2.
8. Kings, queens and jacks are called face cards. Thus there are 12 face cards in a deck of cards.

### VERY SHORT ANSWER QUESTIONS

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1. Find the probability of getting one head if a coin is thrown twice.
2. One card is drawn at random from a pack of cards. Find the probability of getting jack.

3. One card is drawn at random from a pack of cards. Find the probability of getting a diamond card.
4. A die is thrown once. What is the probability of getting an even prime number?
5. A die is thrown twice. What is the probability that the same number will come up either time.
6. In a leap year what is the probability of 53 Sundays.
7. One card is drawn from the well shuffled pack of 52 cards. Find the probability of getting a black face card.
8. If  $P(E) = 27\%$  then what is the probability of not occurrence of even P?
9. Usha and Aastha are two friends. What is the probability that their birthday falls on the same day 14 November 2015?
10. One alphabet is chosen out of the alphabets of the word "BHARTIYA". What will be the probability of getting a vowel?
11. Two friends were born in the year 2000. What is the probability that they both have the same birthday.
12. A die is thrown once. What is the probability of getting a prime number?
13. A bag contains 6 red and 5 blue balls. One ball is drawn at random from the bag. Find the probability that the ball drawn is blue.
14. A pair of dice is thrown once. What is the probability of getting the sum on both the die as 11.
15. In a non - leap year, what is the probability of 53 Mondays?

### VERY SHORT ANSWER QUESTIONS

---

16. A card is drawn at random from a pack of 52 playing cards. Find the probability that the card drawn is neither an ace nor a king.
17. Out of 250 bulbs in a box, 35 bulbs are defective. One bulb is taken out at random from the box. Find the probability that the drawn bulb is not defective.
18. Non Occurance of any event is 3:4. What is the probability of Occurance of this event?
19. If 29 is removed from (1, 4, 9, 16, 25, 29) then find the probability of getting a prime number.
20. A card is drawn at random from a deck of playing cards. Find the probability of getting a face card.
21. In 1000 lottery tickets there are 5 prize winning tickets. Find the probability of winning a prize if a person buys one ticket.
22. One card is drawn at random from a pack of cards. Find the probability that it is a black card.
23. A die is thrown once. Find the probability of getting a perfect square.
24. Two dice are rolled simultaneously. Find the probability that the sum of the two numbers appearing on the top is more than and equal to 10.
25. Find the probability of multiples of 7 in 1, 2, 3, .....,33, 34, 35.

### Long Answer Type Questions

---

26. Cards marked with numbers 3, 4, 5, .....,50 are placed in a box and mixed thoroughly. One card is drawn at random from the box, find the probability that the number on the drawn card is
  - (i) divisible by 7
  - (ii) a number, which is a perfect square

27. A bag contains 5 white balls, 7 red balls, 4 black balls and 2 blue balls. One ball is drawn at random from the bag. Find the probability that the balls drawn is
- (i) White or blue                      (ii) red or black  
 (iii) not white                      (iv) neither white nor black
28. The king, queen and jack of diamonds are removed from a pack of 52 playing cards and the pack is well shuffled. A card is drawn from the remaining cards. Find the probability of getting a card of
- (i) diamond                      (ii) a jack
29. The probability of winning a game is  $\frac{x}{12}$ . The probability of losing it is  $\frac{1}{3}$ . Find the value of  $x$ .
30. In a lottery, there are 10 prizes and 25 are empty. Find the probability of getting a prize. Also verify that  $P(E) + P(\bar{E}) = 1$  for this event.
31. The probability of a defective egg in a lot of 400 eggs is 0.035. Calculate the number of defective eggs in the lot. Also calculate the probability of taking out a non defective egg from the lot.
32. In a fair at a game stall, slips marked with numbers 3,3,5,7,7,7,9,9,9,11 are placed in a box. A person wins if the mean of numbers are written on the slip. What is the probability of his losing the game?
33. A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears
- (i) a two digit number                      (ii) a perfect square number  
 (iii) a number divisible by 5.
34. A card is drawn at random from a well shuffled deck of playing cards. Find the probability that the card drawn is
- (i) a card of spade or an ace                      (ii) a red king  
 (iii) neither a king nor a queen                      (iv) either a king or a queen

35. A card is drawn from a well shuffled deck of playing cards. Find the probability that the card drawn is
- (i) a face card
  - (ii) red colour face card
  - (iii) black colour face card
36. In a class discussion, Himanshu says that probability of an event cannot be 1.3. which value is depicted here?
37.  $P(E) + P(\bar{E}) = 1$  which value is depicted by this statement?
38. Ramesh got Rs. 24000 as Bonus. He donated Rs. 5000 to temple. He gave Rs. 12000 to his wife, Rs. 2000 to his servant and gave rest of the amount to his daughter. Calculate the probability of
- (i) wife's share
  - (ii) Servant's Share
  - (iii) daughter's share.
  - (iv) Which values are depicted by Ramesh?
39. 240 students reside in a hostel. Out of which 50% go for the yoga classes early in the morning, 25% go for the Gym club and 15% of them go for the morning walk. Rest of the students have joined the laughing club. What is the probability of students who have joined laughing club? Which value is depicted by the students?

## ANSWERS

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1.  $\frac{1}{2}$

3.  $\frac{1}{4}$

5.  $\frac{1}{6}$

7.  $\frac{3}{26}$

9.  $\frac{1}{365}$

11.  $\frac{1}{366}$

13.  $\frac{5}{11}$

15.  $\frac{1}{7}$

17.  $\frac{43}{50}$

19. **0**

21. **0.005**

23.  $\frac{1}{3}$

25.  $\frac{1}{7}$

27.  $\frac{7}{18}, \frac{11}{18}, \frac{13}{18}, \frac{1}{2}$

29. **8**

31. **14, 0.965**

2.  $\frac{1}{13}$

4.  $\frac{1}{6}$

6.  $\frac{2}{7}$

8.  $\frac{73}{100}$

10.  $\frac{3}{8}$

12.  $\frac{1}{2}$

14.  $\frac{1}{18}$

16.  $\frac{11}{13}$

18.  $\frac{4}{7}$

20.  $\frac{3}{13}$

22.  $\frac{1}{2}$

24.  $\frac{1}{6}$

26.  $\frac{7}{16}, \frac{1}{4}$

28.  $\frac{10}{49}, \frac{3}{49}$

30.  $\frac{2}{7}$

32.  $\frac{7}{10}$



33.  $\frac{1}{5}, \frac{1}{10}, \frac{9}{10}$

34. (i)  $\frac{4}{13}$  (ii)  $\frac{1}{26}$  (iii)  $\frac{11}{13}$  (iv)  $\frac{2}{13}$

35. (i)  $\frac{3}{13}$  (ii)  $\frac{3}{26}$  (iii)  $\frac{3}{26}$

36. **Logical value**

37. **Understanding, logical reasoning**

38. (i)  $\frac{1}{2}$  (ii)  $\frac{1}{12}$  (iii)  $\frac{5}{24}$  **Social value, Religious value**

39.  $\frac{1}{10}$ , **Physical fitness**

## Practice Test

### Probability

**Time: 50 minutes**

**M.M: 20**

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#### SECTION-A

1. A die is thrown once. find the probability of getting an odd number.
2. A bag contains 4 red and 6 black balls. one ball is drawn from the bag at random. Find the probability of getting a black ball.

#### SECTION-B

3. Find the probability of having 53 friday in a year.
4. One card is drawn at random from the well shuffled pack of 52 cards. Find the probability of getting a black face card or a red face card.

#### SECTION-C

5. A box contains 5 Red, 4 green and 7 white marbles. One marbles is drawn at random from the box. What is the probability that marble is
  - (i) not white
  - (ii) neither red nor white
6. A die is thrown once. find the probability that the number.
  - (i) is an even prime number
  - (ii) is a perfect square

#### SECTION-D

7. A box contains cards numbered 1,3,5,.....,35. Find the probability that tha card drawn is
  - (i) a prime number less than 15
  - (ii) divisible by both 3 and 15
8. From a deck of 52 playing cadrs, king, queen and jack of a club are removed and a card is drawn from the remaining cards. Find the probabiliy that the card drawn is
  - (i) a spade
  - (ii) a queen
  - (iii) a club

## **General Values For Value Based Questions**

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1. Honesty
2. Punctuality, Discipline
3. Humanity
4. Gender Equality
5. Eco friendly / Environment loving
6. Hard work
7. Logical Reasoning
8. Knowledge
9. Love and Care
10. Sportsmanship
11. Healthy Competition / Team Spirit
12. Ambition
13. Courage
14. Equality
15. Economic Value / Habit of Saving
16. Social Value
17. Religious Value
18. Co-operation
19. Unity
20. Health Awareness

# SAMPLE QUESTION PAPER - I

## Mathematics

### S.A.(II)

**Time allowed :3 hours**

**Maximum Marks : 90**

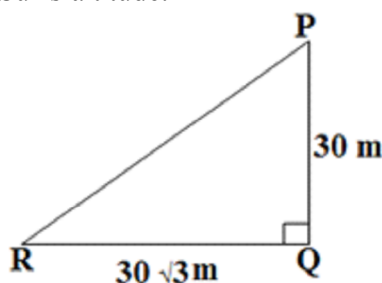
#### *General Instructions*

1. All questions are compulsory.
2. The question paper consists of 31 questions divided into four sections A, B, C and D. Section A comprises of 4 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 10 questions of 3 marks each and Section D comprises of 11 questions of 4 marks each.
3. There is no overall choice.
4. Use of calculator is not permitted.

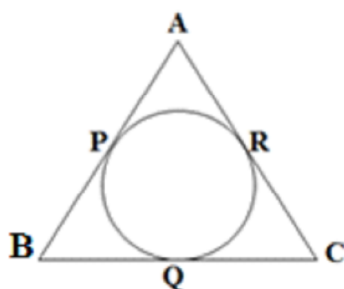
#### SECTION-A

*Question numbers 1 to 4 carry 1 mark each.*

1. If the quadratic equation  $px^2 - 2\sqrt{5}px + 15 = 0$  has two equal roots, find the value of  $p$ .
2. For what value of  $k$ ;  $2k-7$ ,  $k+5$  and  $3k+2$  are consecutive terms of an A.P.
3. In the figure, a tower PQ is 30 m high and the length of its shadow QR is  $30\sqrt{3}$  m. Find the Sun's altitude.



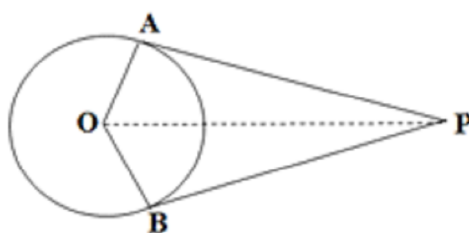
4. In the figure, the sides AB, BC and CA of a triangle ABC touches the circle at points P, Q and R respectively. If PA=4 cm, BP=3 cm and AC= 11 cm, find the value of BC.



### SECTION-B

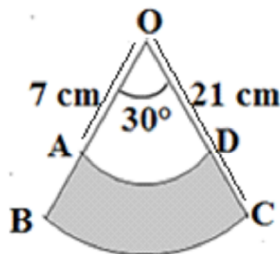
*Question numbers 5 to 10 carry 2 marks each.*

5. Out of first 50 natural numbers, a number is selected at random, find the probability that a number selected is a multiple of 3 and 4.
6. Find the ratio in which y-axis divides the line segment joining the points A(5,−6) and B(−1,−4). Also find the coordinates of the point of division.
7. The volume of a hemisphere is  $2425\frac{1}{2}$  cubic cm. Find its curved surface area.
8. In the figure, if  $\angle APO = 40^\circ$ , find  $\angle AOB$ .



9. The sum of n numbers of A.P is  $n^2 + 3n$ . Find its 20th term.
10. The shaded portion in the figure represents the area swept by a wiper of a car.

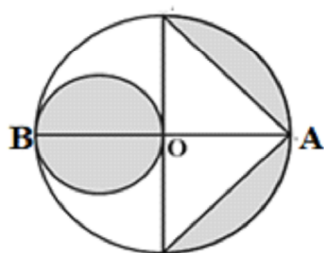
Calculate the area swept by the wiper, if  $OA=7$  cm and  $OC=21$  cm.



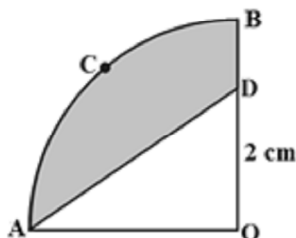
### SECTION-C

*Question numbers 11 to 20 carry 3 marks each*

11. In the adjoining figure,  $AB$  is a diameter of the circle with centre  $O$  and  $OA=7$  cm. Find the area of the shaded region.



12. A hemispherical bowl of internal radius 9 cm is full of water. This water is to be filled within cylindrical bottles of diameter 3 cm and height 4 cm. Find the number of bottles needed to empty the bowl.
13. If a point  $A(0, 2)$  is equidistant from the points  $B(3, p)$  and  $C(p, 5)$  then find the value of  $p$ .
14. In the adjoining figure,  $OACB$  represents a quadrant of a circle of radius 3.5 cm with centre  $O$ .



- (i) Calculate the area of quadrant OACB.
- (ii) Given OD= 2 cm, calculate the area of the shaded region.
15. If the 8th term of an A.P. is 37 and the 15th term is 15 more than the 12th term, find the A.P. Hence, find the sum of the first 15 terms of the A.P.
16. Solve for  $x$ :
- $$\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x} \quad a \neq 0, b \neq 0, c \neq 0$$
17. A toy is in the form of a cone mounted on a hemisphere of radius 3.5 cm. If the total height of the toy is 15.5 cm, find its total surface area.
18. A solid right circular cone of diameter 14 cm and height 8 cm is melted to form a hollow sphere. If the external diameter of the sphere is 10 cm, find the internal diameter of the sphere.
19. A flagstaff stands on the top of a 5 m high tower. From a point on the ground, the angle of elevation of the top of the flagstaff is  $60^\circ$  and from the same point, the angle of elevation of top of a tower is  $45^\circ$ . Find the height of the flagstaff.
20. One card is drawn from a well shuffled deck of 52 playing cards. Find the probability of getting
- (i) a non face card
- (ii) a black king or a red queen.

#### SECTION-D

***Question number 21 to 31 carry 4 marks each.***

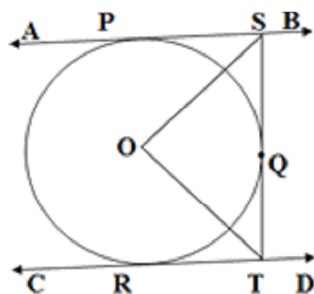
21. While boarding an aeroplane, a passenger got hurt. The pilot, showing promptness and concern, made arrangements to hospitalise the injured and so the plane started late by 30 minutes. To reach the destination, 1500 km away,

in time, the pilot increased the speed by 100 km/hr. Find the original speed per hour of the plane. Do you appreciate the values shown by the pilot, namely promptness in providing help to the injured and his efforts to reach in time?

22. Prove that the lengths of the tangents drawn from an external point to a circle are equal.
23. Construct a  $\triangle ABC$  in which  $BC=8$  cm,  $\angle B = 45^\circ$  and  $\angle C = 30^\circ$ , Construct another triangle, similar to  $\triangle ABC$  such that its sides are  $\frac{3}{4}$  of the corresponding sides of  $\triangle ABC$ .
24. If all the sides of a parallelogram touch a circle, show that the parallelogram is a rhombus.
25. Solve for  $x$ :  $\left(\frac{2x+3}{x+3}\right) + 5\left(\frac{x+3}{2x+3}\right) = 6 \quad x \neq -3, \frac{-3}{2}$
26. From a window, 15 m high above the ground, the angles of elevation and depression of the top and foot of a house on the opposite side of the street are  $30^\circ$  and  $45^\circ$  respectively. Show that the height of the opposite house is 23.66 m.
27. Rs 9000 were divided equally among a certain number of persons. Had there been 20 more persons, each would have got Rs 160 less. Find the original number of persons.
28. Point P divides the line segment joining the points A(2,1) and B(5,-8) such that  $\frac{AP}{AB} = \frac{1}{3}$ . If P lies on the line  $2x-y+k=0$ , find the value of  $k$ .
29. A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears
  - (i) a two digit number
  - (ii) a perfect square number
  - (iii) a number divisible by 5



30. A bucket made up of a metal sheet is in the form of a frustum of a cone of height 16 cm with radii of its lower and upper ends as 8 cm and 20 cm respectively. Find the cost of the bucket if the cost of metal sheet used is Rs 15 per  $100 \text{ cm}^2$ . (Use  $\pi = 3.14$ )
31. In the adjoining figure, AB and CD are two parallel tangents to a circle with centre O. ST is the tangent segment between two parallel tangents touching the circle at Q. Show that  $\angle SOT = 90^\circ$ .



# **SAMPLE QUESTION PAPER - II**

## **Mathematics**

### **S.A.(II)**

**Time allowed :3 hours**

**Maximum Marks : 90**

***General Instructions:***

1. All questions are compulsory.
2. The question paper consists of 31 questions divided into four sections A, B, C and D. Section A comprises of 4 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 10 questions of 3 marks each and Section D comprises of 11 questions of 4 marks each.
3. There is no overall choice.
4. Use of calculator is not permitted.

#### **SECTION-A**

1. Find the sum of first  $n$  natural numbers.
2. The tops of two poles of heights 18 m and 12 m are connected by a wire. If the wire makes an angle of  $30^\circ$  with the horizontal, find the length of the wire.
3. A pair of dice is thrown once. Find the probability of getting an even number on the first die.
4. Determine the distance between  $(7, 4)$  and  $(-1, 8)$ .

#### **SECTION-B**

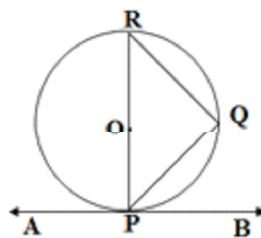
5. The sum of 5th and 7th terms of an A.P. is 52 and its 10th term is 46. Find the common difference.

6. Find the value of  $k$  for which the quadratic equation  $2x^2 + 5x + k = 0$  has no real roots.
7. Two concentric circles with centre O are of radii 5 cm and 3 cm. From an external point P, two tangents PA and PB are drawn to these circles respectively. If PA=12 cm, then find length of PB.
8. Draw a line segment of length 10 cm. Find a point  $p$  on it which divides it internally in the ratio 2:3.
9. Draw a circle of radius 4 cm with centre O. Draw a diameter POQ. Through P, construct a tangent to the circle.
10. Three metallic solid cubes whose edges are 3 cm, 4 cm and 5 cm are melted to form a single cube. Find the edge of the cube so formed.

### SECTION-C

11. Find how many terms of the A.P. 54, 51, 48... must be taken so that their sum is 513. Explain the double answer.
12. Solve the quadratic equation:  

$$(x-1)^2 - 5(x-1) - 6 = 0$$
13. In the given figure, AB is a tangent to a circle with centre O. Prove that  $\angle BPQ = \angle PRQ$ . If  $\angle BPQ = 60^\circ$ , find  $\angle RPQ$ .



14. The height of a light house is  $h$  metres. From this light house, the angles of depression of two ships on opposite sides of it are observed to be  $30^\circ$  and  $45^\circ$ . Find the distance between the two ships.

15. Two dice are thrown simultaneously. Find the probability of getting the sum of the two numbers on the dice as greater than 6 but less than 9.
16. The coordinates of the vertices of  $\triangle ABC$  are A(7,2), B(9,10), C(1,4). If E and F are the mid points of AB and AC respectively, then using these coordinates prove that  $EF = \frac{1}{2}BC$
17. Show that the points A(4,7), B(0,6), C(4,5) and D(8,6) are the vertices of a rhombus.
18. The side of a solid metallic cube is 60 cm. The cube is melted and recast into 8000 equal solid cubical dice. Find the side of each die.
19. Cost of fencing a circular park at the rate of Rs 70 per metre is Rs 11,000. Find the area of the park. (Use  $\pi = \frac{22}{7}$ )
20. Find the area of the segment of a circle of radius 14 cm, when the angle of the corresponding sector is  $30^\circ$ . (Use  $\pi = \frac{22}{7}$ )

#### SECTION-D

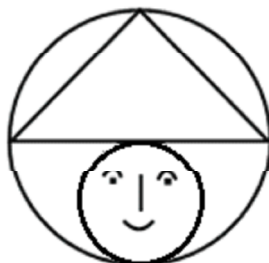
21. Show that the sum of  $(p+q)^{\text{th}}$  and  $(p-q)^{\text{th}}$  terms of an AP is equal to twice its  $p^{\text{th}}$  term.
22. Solve for x:  

$$\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x} \quad a \neq 0, b \neq 0, x \neq 0$$
23. If the equation  $(1+m^2)x^2 + 2mcx + (c^2 - a^2) = 0$  has equal roots prove  $c^2 = a^2(1+m^2)$ .
24. If all the sides of a parallelogram touch a circle, show that the parallelogram is a rhombus.
25. Draw a pair of tangents to the circle of radius 4 cm, which are inclined to each other at an angle of  $45^\circ$ . Measure their lengths.

26. A person standing between two poles, finds that the angle subtended at his eyes by the tops of the poles is a right angle. If the heights of the two poles are two times and four times the height of the person and the distance between the two poles is equal to the height of the higher pole, find the ratio of the distances of the persons from the smaller to the bigger poles.
27. Out of a deck of 52 playing cards, two black kings and 4 red cards (not king) are removed. A card is drawn at random. Find the probability that the card drawn is:
- |                  |                   |
|------------------|-------------------|
| (a) a black jack | (b) a black queen |
| (c) a balck card | (d) a king        |
28. Find the area of a quadrilateral ABCD whose vertices are A(1,0), B(5,3), C(2,7) and D(-2,4). Also, find the lengths of the diagonals AC and BD.
29. Find how many cubic centimetres of metal are there in an open metallic box whose external dimensions are 36 cm, 25 cm and 16 cm, the metal being 2 cm thick throughout. If 1 cubic cm of metal weights 15 g, find the weight of the open box.
30. A tool is prepared out of a square metallic sheet of side 24 cm by taking out two semi-circular parts of radius 7 cm each from the two sides as shown in the figure. Find the area of the metal used in making 50 such tools. (Use  $\pi = \frac{22}{7}$ )



31. A poor artist on the street makes funny cartoons for children and earns his living. Once he made a comic face by drawing a circle within a circle, the radius of bigger circle being 30 cm and that of smaller being 20 cm as shown in the figure. What is the area of the cap? What qualities of this artist are being reflected here?



## ANSWERS

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- |   |                            |
|---|----------------------------|
| 1. $\frac{n(n+1)}{2}$   | 2. 12 m                    |
| 3. $\frac{1}{2}$  | 4. $4\sqrt{5}$ units       |
| 5. $D = 5$  | 6. $K > \frac{25}{8}$      |
| 7. $4\sqrt{10}$ cm  | 8. Construction            |
| 9. Construction   | 10. 6 cm                   |
| 11. $n = 18$ or $n = 19$ , Double answer because 19th term = 0  |                            |
| 12. $x = 0$ when $y = -1$<br>$x = 7$ when $y = 6$   |                            |
| 13. $\angle RPQ = 30^\circ$   | 14. $h(1 + \sqrt{3})$ m    |
| 15. $\frac{11}{36}$   |                            |
| 16. Coordinates of E(8,6)<br>Coordinates of F(4,3)<br>Length of EF = 5 units<br>Length of BC = 10 units |                            |
| 17. Each side = $\sqrt{17}$ units<br>Ist diagonal = 2 units<br>IInd diagonal = 8 units                  |                            |
| 18. 3 cm  | 19. 1964.28 m <sup>2</sup> |
| 20. 2.33 cm <sup>2</sup>  | 21. Prove it               |

22.  $x = -a, y = -b$
23. Prove it
24. Prove it
25. Construction
26.  $1 : 3$
27. (a)  $\frac{1}{23}$  (b)  $\frac{1}{23}$  (c)  $\frac{12}{23}$  (d)  $\frac{1}{23}$
28. Area = 25 units<sup>2</sup>  
 $AC = 5\sqrt{2}$  units  
 $BD = 5\sqrt{2}$  units
29. Volume of material used = 4.992 cm<sup>3</sup>  
 Weight of metal = 74.88 kg
30. 21100 cm<sup>2</sup>
31. Area of cap = 400 cm<sup>2</sup>  
 Value = Hard Working, Kind hearted, Sensitive, Honest