SAMUTHRA INSTITUTE

Class - 10th Exam -Mathematics - Sample 01

Time : 3 Hours   **Max. Marks : 80**

General Instructions :

1. This question paper contains 38 questions.
2. This Question Paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Questions no. 1-18 are multiple choice questions (MCQs) and questions no. 19 and 20 are Assertion - Reason based questions of 1 mark each.
4. In Section B, Questions no. 21-25 are very short answer (VSA) type questions, carrying 02 marks each.
5. In Section C, Questions no. 26-31 are short answer (SA) type questions, carrying 03 marks each.
6. In Section D, Questions no. 32-35 are long answer (LA) type questions, carrying 05 marks each.
7. In Section E, Questions no. 36-38 are case study based questions carrying 4 marks each with sub parts of the values of 1, 1 and 2 marks each respectively.
8. All Questions are compulsory. However, an internal choice in 2 Question of Section B, 2 Questions of Section C and 2 Questions of Section D has been provided. An internal choice has been provided in all the 2 marks questions of Section E.
9. Draw neat and clean figures wherever required.
10. Take $\pi = \frac{22}{7}$ wherever required if not stated.
11. Use of calculators is not allowed.

Section - A

Section A consists of 20 questions of 1 mark each.

1. If $\cos A = \frac{2}{5}$, the value of $4 + 4\tan^2 A$ will be

(a) 1

(b) 2

(c) 4

(d) 25

2. a and b are two positive integers such that the least prime factor of a is 3 and the least prime factor of b is 5. Then the least prime factor of (a+b) will be

(a)   1

(b)   2

(c)   3

(d)   4

3. If HCF(336, 54) = 6, LCM(336, 54) will be

(a)   2024   (b) 3

(c)   1012   (d) 1

4. What is the ratio in which the point $P\left(\frac{3}{4}, \frac{5}{12}\right)$ divides the line segment joining the point $A\ \left(\frac{1}{2}, \frac{3}{2}\right)$ and $(2, -5)$

(a) $4 : 7$ (b) 3

(c) $1 : 5$ (d) 2

5. For what value of p will the following system of equations have no solution ?
$$(2p-1)x + (p-1)y = 2p+1;\ y + 3x - 1 = 0$$

(a) $p = 2$ (b) $p \neq 2$

(c) $p = 4$ (d) $p \neq 4$

6. A right circular cylinder of radius r and height h (where, $h > 2r$) just encloses a sphere of diameter

(a) r (b) $2r$

(c) h (d) $2h$

7. For what value of k, the system of equations $kx + 3y = 1,\ 12x + ky = 2$ has no solution.

(a) $k = -6$ (b) $k \neq -6$

(c) $k = 4$ (d) $k = -4$

8. If A and B are acute angles and $\sin A = \cos B$, then the value of $A + B$

(a) $60°$ (b) 1

(c) $90°$ (d) 1

9. $\dfrac{1}{1+\sin\theta} + \dfrac{1}{1-\sin\theta} = ?$

(a) 1 (b) $2\sec^2\theta$

(c) $2\sin^2\theta$ (d) $2\cos^2\theta$

10. If $\Delta ABC \sim \Delta PQR$, $\dfrac{AB}{PQ} = \dfrac{1}{3}$, then $\dfrac{\text{ar}\,\Delta ABC}{\text{ar}\,\Delta PQR}$ will be

1. During conversion of a solid from one shape to another, the volume of the new shape will

(a) increase   (b) decre

(c) remain unaltered   (d) e doubled

11. If $ad \neq bc$, then what do you say about the solution of the pair of linear equations $ax + by = p$ and $cx + dy = q$?

(a) no solution   (b) unique solution

(c) infinitely solution   (d) can't say anything

12. What are the values of x and y for the following pair of linear equations ?
$$3x + 2y - 7 = 0$$
$$4x + y - 6 = 0$$

(a) 1 and 2   (b) 2 and 2

(c) 1 and 1   (d) –1 and –1

13. During conversion of a solid from one shape to another, the volume of the new shape will

(a) increase   (b) decre

(c) remain unaltered   (d) e doubled

14. One equation of a pair of dependent linear equations $-5x + 7y = 2$ The second equation can be

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

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

15. If the perimeter of a circle is equal to that of a square, then the ratio of their areas is

(a) 22:7 (b) 14:11

(c) 7:22 (d) 11:14

16. If $\tan A = \cot B$, then the value is of $(A + B)$

(a) 90° (b) 120°

(c) 60° (d) 180°

17. ΔABC is an equilateral triangle of side $2a$, then length of one of its altitude is ....

(a) $a\sqrt{3}$ (b) $a2\sqrt{3}$

(c) $a3\sqrt{2}$ (d) $a\sqrt{2}$

18 If the radius of the sphere is increased by 100%, the volume of the corresponding sphere is increased by

(a) 200% (b) 500%

(c) 700% (d) 800%

19. Assertion : $x + y - 4 = 0$ and $2x + ky - 3 = 0$ has no solution if $k = 2$.

Reason : $a_1 x + b_1 y + c_1 = 0$ and $a_2 x + b_2 y + c_2 = 0$ are consistent if $\frac{a_1}{a_2} \neq \frac{k_1}{k_2}$.

20. **Assertion :** The value of y is 6, for which the distance between the points $P(2, -3)$ and $Q(10, y)$ is 10.
Reason : Distance between two given points $A(x_1, y_1)$ and $B(x_2, y_2)$ is given,

$$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

Section - B
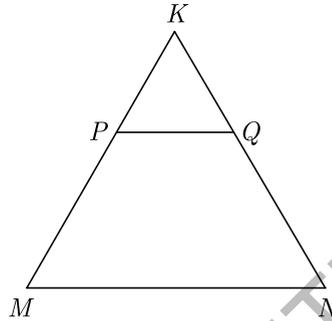
Section B consists of 5 questions of 2 marks each.

21. Prove that $3 + \sqrt{5}$ is an irrational number.

22. The ordinate of a point A on y-axis is 5 and B has co-ordinates $(-3)1$. Find the length of AB

23. Explain why $(7 \times 13 \times 11) + 11$ and $(7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1) + 3$ are composite numbers.

24. What is the distance of point $P(3, 4)$ from x-axis?

25. If triangle ABC is similar to triangle DEF such that $2AB = DE$ and $BC = 8$ cm then find EF.

OR

In the figure, PQ is parallel to MN. If $\dfrac{KP}{PM} = \dfrac{4}{13}$ and $KN = 20.4$ cm then find KQ.

Section - C

Section C consists of 6 questions of 3 marks each.

26. Show that : $\dfrac{\cos^2(45° + \theta) + \cos^2(45° - \theta)}{\tan(60° + \theta)\tan(30° - \theta)} = 1$

27. A right circular cone of radius 3 cm, has a curved surface area of 47.1 cm². Find the volume of the cone. (Use $\pi = 3.14$)

OR

The sum of the radius of base and height of a solid right circular cylinder is 37 cm. If the total surface area of the solid cylinder is 1628 sq. cm, find the volume of the cylinder. $\pi = \dfrac{22}{7}$.

28. Given that $\sqrt{5}$ is irrational, prove that $2\sqrt{5} - 3$ is an irrational number.
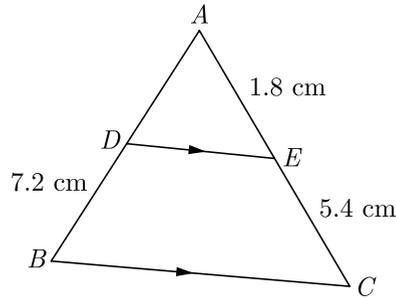
29. Prove that $(\sin\theta + \csc\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 \tan^2\theta + \cot^2\theta$

30. State Fundamental theorem of Arithmetic. Find LCM of numbers 2520 and 10530 by prime factorization.

OR

Every composite number can be expressed as the product powers of primes and this factorization is unique.

31. In Figure, $DE \parallel BC$. Find the length of side AD, given that $AE = 1.8$ cm, $BD = 7.2$ cm and $CE = 5.4$ cm.

Section - D

Section D consists of 4 questions of 5 marks each.

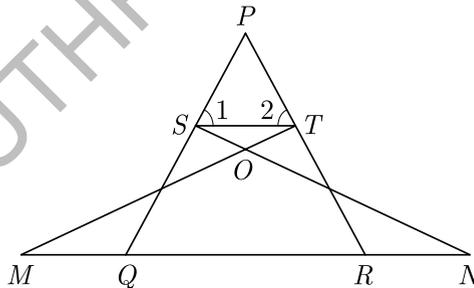**32.** Solve the following pair of linear equations graphically:

$$x - y = 1, \ 2x + y = 8$$

Also find the co-ordinates of the points where the lines represented by the above equation intersect $y-$axis.

OR

Find the value of p and q for which the system of equations represent coincident lines $2x + 3y = 7$, $(p + q + 1)x + (p + 2q + 2)y = 4(p + q) + 1$

33. In given figure $\angle 1 = \angle 2$ and $\Delta\, NSQ \sim \Delta\, MTR$, then prove that $\Delta\, PTS \sim \Delta\, PRO$.


OR

Prove that in a right triangle, the square of the hypotenuse is equal to sum of squares of other two sides. Using the above result, prove that, in rhombus $ABCD$, $4AB^2 = AC^2 + BD^2$.

34. A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toyIf a right circular cylinder circumscribes the toy, find the difference of the volume of the cylinder and toy. (Use $\pi = 3.14$)

35. Find the ratio in which the point $(-3, k)$ divides the line segment joining the points $(-5, -4)$ and $(-2, 3)$. Also find the value of k.

Section - E

**Section E consists of 3 case study based questions of 4 marks each.**

36. To conduct sports day activities, in a rectangular shaped school ground $ABCD$, lines have been drawn with chalk powder at a distance of 1 m each. 100 flower pots have been placed at a distance of 1 m from each other along AB, as shown in figure. Nishtha runs $\frac{1}{4}$th the distance AB on the 2nd line and posts a green flag. Suman runs $\frac{1}{5}$th the distance AB on the 8th line and posts a red flag.
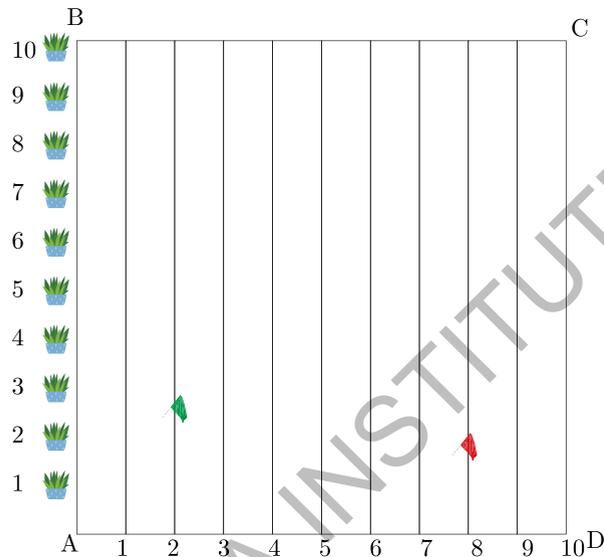
   (i)   What is the position of green flag ?
   (ii) What is the position of red flag ?
   (iii) What is the distance between both the flags ?
   (iv) What is the distance of red flag from point A ?

37. Resident Welfare Association (RWA) of a Gulmohar Society in Delhi have installed three electric poles A, B and C in a society's common park. Despite these three poles, some parts of the park are still in dark. So, RWA decides to have one more electric pole D in the park.

   The park can be modelled as a coordinate systems given below.
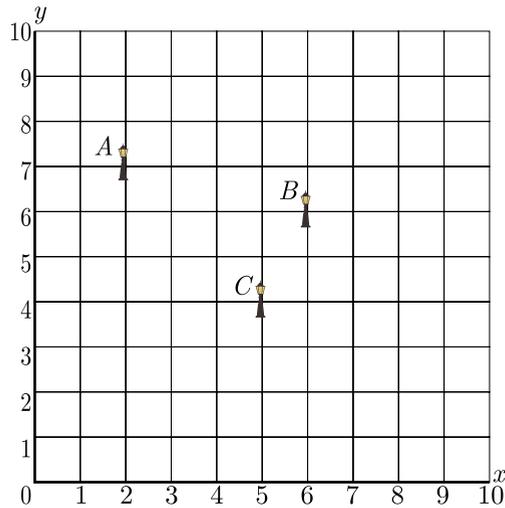
On the basis of the above information, answer any four of the following questions:

(i)   What is the position of the pole C?

(ii) What is the distance of the pole B from the corner O of the park ?

(iii) Find the position of the fourth pole D so that four points A, B, C and D form a parallelogram .

OR

What is the distance between poles A and C ?

38.   Tania is very intelligent in maths. She always try to relate the concept of maths in daily life. One day she plans to cross a river and want to know how far it is to the other side. She takes measurements on her side of the river and make the drawing as shown below.
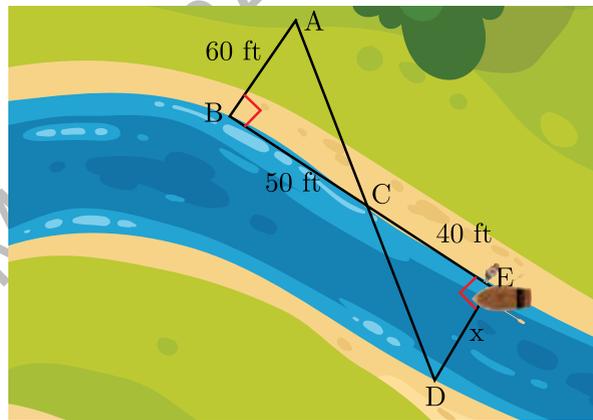
(i)   Which similarity criterion is used in solving the above problem ?

(ii) Consider the following statement :

$$S_1 : \angle ACB = \angle DCE$$

$$S_2 : \angle BAC = \angle CDE$$

Which of the above statement is/are correct.

(a) S_1 and S_2 both   (b) S_1

(c) S_2 (d) N

(iii) Consider the following statement :

$$S_3 : \frac{AB}{DE} = \frac{CA}{CD}$$

$$S_4 : \frac{BC}{CE} = \frac{AB}{DE}$$

$$S_5 \; : \; \frac{CA}{CD} = \frac{DE}{AB}$$

Which of the above statements are correct ?

(a) S_3 and S_5 (b) S_4 and S_5

(c) S_3 and S_4 (d) All three

(iv) What is the distance x across the river?

OR

What is the approximate length of AD shown in the figure?