Sample Paper 03

Class - 10th Exam - 2024 - 25

Mathematics - Standard

**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. The maximum number of zeroes a cubic polynomial can have, is
(a) 1   (b) 4
(c) 2   (d) 3

2. If α and β are the zeroes of the polynomial $x^2 + 2x + 1$, then $\frac{1}{\alpha} + \frac{1}{\beta}$ is equal to
(a) -2 (b) 2
(c) 0   (d) 1

3. In the given figure, PA is a tangent from an external point P to a circle with centre O. If $\angle POB = 115°$, then perimeter of $\angle APO$ is
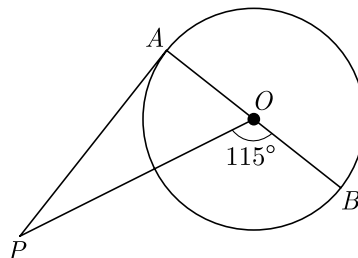
(a) 25°   (b) 20°
(c) 30°   (d) 65°

4. In an AP, if $d = -4$, $n = 7$ and $a_n = 4$, then a is equal to
(a) 6   (b) 7
(c) 20   (d) 28

5. If the probability of an event is p, then the probability of its complementary event will be

(a) $p-1$ (b) p

(c) $1-p$ (d) $1-\dfrac{1}{p}$

6. A bag contains 3 red and 2 blue marbles. If a marble is drawn at random, then the probability of drawing a blue marble is:

(a) $\dfrac{2}{5}$ (b) $\dfrac{1}{4}$

(c) $\dfrac{3}{5}$ (d) $\dfrac{2}{3}$

7. 225 can be expressed as

(a) 5×3^2 (b) $5^2 \times 3$

(c) $5^2 \times 3^2$ (d) $5^3 \times 3$

8. In Figure, $DE \,||\, BC$. Find the length of side AD, given that $AE = 1.8$ cm, $BD = 7.2$ cm and $CE = 5.4$ cm.
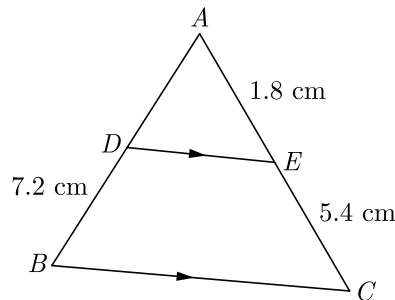
(a) 2.4 cm   (b) 2.2 cm

(c) 3.2 cm   (d) 3.4 cm

9. The roots of the quadratic equation $x^2 - 0.04 = 0$ are

(a) ± 0.2 (b) ± 0.02

(c) 0.4   (d) 2

10. Consider the following distribution :

Marks obtained	Number of students
More than or equal to 0	63
More than or equal to 10	58
More than or equal to 20	55
More than or equal to 30	51
More than or equal to 40	48
More than or equal to 50	42

the frequency of the class 30-40 is :

(a) 3   (b) 4

(c) 48   (d) 51

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

(a) 14.124 m   (b) 17.124 m

(c) 19.124 m   (d) 15.124 m

12. A circus artist is climbing a 20 m long rope, which is tightly stretched and tied from the top of a vertical pole to the ground. If the angle made by the rope with the ground level is $30°$, then what is the height of pole?

(a) 20 m

(b) 8 m

(c) 10 m

(d) 6 m

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

(a) 16 cm

(b) 14 cm

(c) 12 cm

(d) 15 cm

14. A sphere is melted and half of the melted liquid is used to form 11 identical cubes, whereas the remaining half is used to form 7 identical smaller spheres. The ratio of the side of the cube to the radius of the new small sphere is

(a) $\left(\dfrac{4}{3}\right)^{1/3}$

(b) $\left(\dfrac{8}{3}\right)^{1/3}$

(c) $(3)^{1/3}$

(d) 2

15. Ratio of volumes of two cones with same radii is

(a) $h_1 : h_2$

(b) $s_1 : s_2$

(c) $r_1 : r_2$

(d) None of these

16. If $\cos 9\alpha = \sin \alpha$ and $9\alpha < 90°$, then the value of $\tan 5\alpha$ is

(a) $\dfrac{1}{\sqrt{3}}$

(b) $\sqrt{3}$

(c) 1

(d) 0

17. In the formula $\overline{x} = a + h\left(\dfrac{\sum f_i u_i}{\sum f_i}\right)$, for finding the mean of grouped frequency distribution, u_i is equal to

(a) $\dfrac{x_i + a}{h}$

(b) $h(x_i - a)$

(c) $\dfrac{x_i - a}{h}$

(d) $\dfrac{a - x_i}{h}$

18. The distance of the point $P(-3, -4)$ from the x-axis (in units) is

(a) 3

(b) -3

(c) 4

(d) 5

19. **Assertion :** If the circumference of a circle is 176 cm, then its radius is 28 cm.

Reason : Circumference $= 2\pi \times$ radius

(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.

20. **Assertion :** Pair of linear equations : $9x + 3y + 12 = 0, 8x + 6y + 24 = 0$ have infinitely many solutions.

Reason : Pair of linear equations $a_1 x + b_1 y + c_1 = 0$ and $a_2 x + b_2 y + c_2 = 0$ have infinitely many solutions, if $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} = \dfrac{c_1}{c_2}$

(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. If $\sqrt{3}\sin\theta - \cos\theta = 0$ and $0^\circ < \theta < 90^\circ$, find the value of θ.

22. In the given figure, if $ABCD$ is a trapezium in which $AB\,||\,CD\,||\,EF$, then prove that $\frac{AE}{ED} = \frac{BF}{FC}$
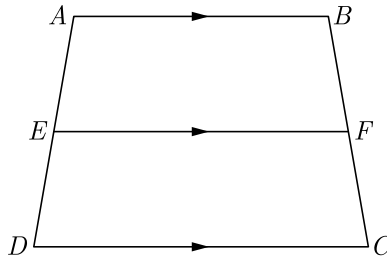

23. A box contains cards numbered 11 to 123. A card is drawn at random from the box. Find the probability that the number of the drawn card is
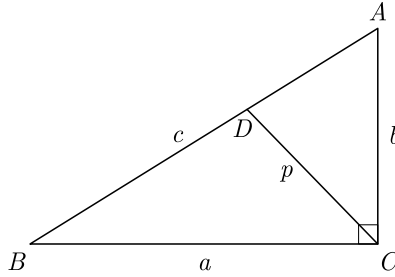
(i) A perfect square number

(ii) A multiple of 7.

OR

A letter of English alphabet is chosen at random, find the probability that the letter so chosen is :

(i) a vowel,

(ii) a consonant.

24. In Figure $\angle D = \angle E$ and $\dfrac{AD}{DB} = \dfrac{AE}{EC}$, prove that $\triangle BAC$ is an isosceles triangle.
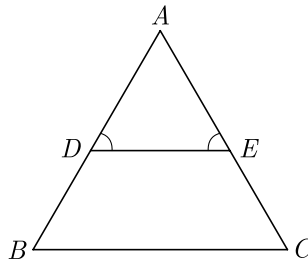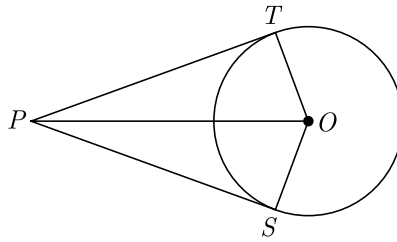

OR

ABC is a right triangle right angled at C. Let $BC = a$, $CA = b, AB = c$ $PQR, ST\,||\,QR$ and p be the length of perpendicular from C to AB. Prove that $cp = ab$.

25. In the given figure, from a point P, two tangents PT and PS are drawn to a circle with centre O such that $\angle SPT = 120°$, Prove that $OP = 2PS$.
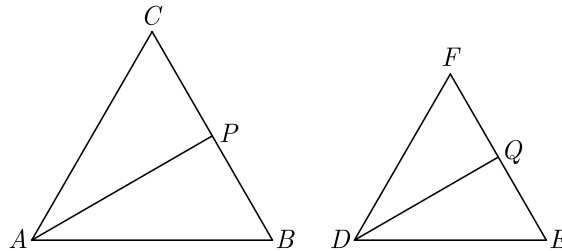

Section - C

Section C consists of 6 questions of 3 marks each.

26. Find whether the following pair of linear equations has a unique solutions. If yes, find the solution :

$7x - 4y = 49, 5x - 6y = 57$.

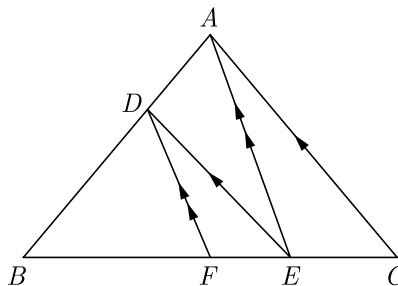**27.** In given figure $\triangle ABC \sim \triangle DEF$. AP bisects $\angle CAB$ and DQ bisects $\angle FDE$.

Prove that :

(1) $\dfrac{AP}{DQ} = \dfrac{AB}{DE}$ (2) $\triangle CAP \sim \triangle FDQ$.

OR

In the given figure, $DE \,||\, AC$ and $DF \,||\, AE$. Prove that $\dfrac{BE}{FE} = \dfrac{BE}{EC}$.

28. A conical vessel, with base radius 5 cm height 24 cm, is full of water. This water emptied into a cylindrical vessel, of base radius 10 cm. Find the height to which the water will rise in the cylindrical vessel. Use $\pi = \frac{22}{7}$

<div align="center">

OR

</div>

504 cones, each of diameter 3.5 cm and height 3 cm, are melted and recast into a metallic sphere. Find the diameter of the sphere and hence find its surface area. Use $\pi = \frac{22}{7}$

29. Quadratic polynomial $2x^2 - 3x + 1$ has zeroes as α and β. Now form a quadratic polynomial whose zeroes are 3α and 3β.

30. Three bells toll at intervals of 9, 12, 15 minutes respectively. If they start tolling together, after what time will they next toll together?

**31.** If $\cos(40^\circ + x) = \sin 30^\circ$, find the value of x.

Section - D

Section D consists of 4 questions of 5 marks each.

32. Find for x : $\dfrac{1}{x-2} + \dfrac{2}{x-1} = \dfrac{6}{x}$; $\ x \neq 0,\ 1,\ 2$

<div align="center">

OR

</div>

Find the values of k for which the equation $(3k+1)x^2 + 2(k+1)x + 1$ has equal roots. Also find the roots.

33. In figure O is the centre of a circle of radius 5 cm. T is a point such that $OT = 13$ cm and OT intersects circle at E. If AB is a tangent to the circle at E, find the length of AB, where TP and TQ are two tangents to the circle.
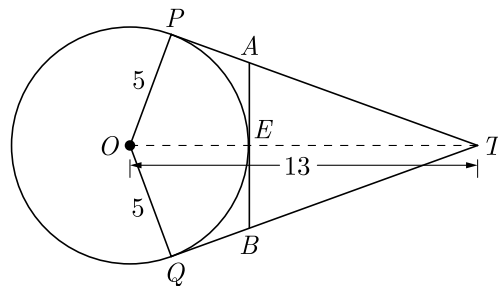
34. Find the mode of the following frequency distribution

Class Interval	25-30	30-35	35-40	40-45	45-50	50-55
Frequency	25	34	50	42	38	14

<div align="center">

OR

</div>

On the sports day of a school, 300 students participated. Their ages are given in the following distribution:

Age (in years)	5-7	7-9	9-11	11-13	13-15	15-17	17-19
Number of students	67	33	41	95	36	13	15

Find the mean and mode of the data.

35.   Find the ratio in which the line $x - 3y = 0$ divides the line segment joining the points $(-2, -5)$ and $(6, 3)$. Find the coordinates of the point of intersection.

Section - E

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

36.   Conical Tank : The advantages of cone bottom tanks are found in nearly every industry, especially where getting every last drop from the tank is important. This type of tank has excellent geometry for draining, especially with high solids content slurries as these cone tanks provide a better full-drain solution. The conical tank eliminates many of the problems that flat base tanks have as the base of the tank is sloped towards the centre giving the greatest possible full-drain system in vertical tank design.

Rajesh has been given the task of designing a conical bottom tank for his client. Height of conical part is equal to its radius. Length of cylindrical part is the 3 times of its radius. Tank is closed from top. The cross section of conical tank is given below.
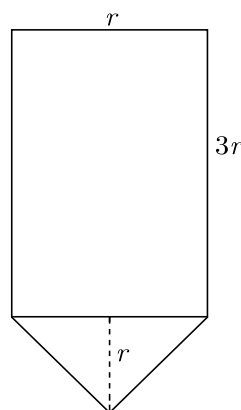
(i)   If radius of cylindrical part is taken as 3 meter, what is the volume of above conical tank ?

(ii)   What is the area of metal sheet used to make this conical tank ? Assume that tank is covered from top.

(iii)   What is the ratio of volume of cylindrical part to the volume of conical part?

(iv)   The cost of metal sheet is ₹ 2000 per square meter and fabrication cost is 1000 per square meter. What is the total cost of tank ?

37. Volume of a Bird Cage. A company makes rectangular shaped bird cages with height b inches and square bottoms. The volume of these cages is given by the function $V = b^3 - 6b^2 + 9b$.
  (i)   Find an expression for the length of each side of the square bottom.
  (ii)   Use the function to find the volume of a cage with a height of 18 inches.
  (iii)   Use the remainder theorem to find the volume of a cage with a height of 15 inches.
  (iv)   Verify the result of (iii) using function ?

38. Dipesh bought 3 notebooks and 2 pens for ₹ 80. His friend Ramesh said that price of each notebook could be ₹ 25. Then three notebooks would cost ₹ 75, the two pens would cost ₹ 5 and each pen could be for ₹ 2.50. Another friend Amar felt that ₹ 2.50 for one pen was too little. It should be at least ₹ 16. Then the price of each notebook would also be ₹ 16.

Aditya also bought the same types of notebooks and pens as Dipesh. He paid 110 for 4 notebooks and 3 pens.
  (i)   Whether the estimation of Ramesh and Amar is applicable for Aditya?
  (ii)   Let the cost of one notebook be x and that of pen be y. Which of the following set describe the given problem ?
  (iii)   What is the exact cost of the notebook?
  (iv)   What is the exact cost of the pen? What is the total cost if they purchase the same type of 15 notebooks and 12 pens.

□□□□□□