Pratap Public School, Karnal
Mid-Term Examination (2023)
Class - X
Subject - Mathematics

Time : 3 Hrs   **M.M : 80**

Name .... Roll No. .... Section ....

General Instructions:

(i) This question paper comprises four sections – A, B, C and D. This question paper carries 20 questions. All questions are compulsory.

(ii) Section A: Q. No. 1 to 20 comprises 20 questions of one mark each, **18 questions** are MCQs and **2 questions** are **Assertion and Reasoning Based**

(iii) Section B: Q. No. 21 to 25 comprises of 5 questions of two marks each.

(iv) Section C: Q. No. 26 to 31 comprises of 6 questions of three marks each.

(v) Section D: Q. No. 32 to 35 comprises of 4 questions of five marks each.

(vi) Section E: Q. No. 36 to 38 comprises of 3 questions of four marks each which are **Case Study Questions.**

(vii)   There is no overall choice in the paper. However, an internal choice has been provided in 2 questions of two marks, 2 question of three marks and 2 question of five marks. There is also a choice in the **2 mark question of Case Study.** You have to **attempt only one of the choices** in such questions.

Section - A

1. The largest number which divides 70 and 125, leaving remainders 5 and 8 respectively is
   (a) 13   (b) 65   (c) 875   (d) 1750

2. The product and the sum of the zeroes of the polynomial $2x^2 - 2\sqrt{2}x + 1$ are respectively
   (a) $\frac{1}{2}$ and $-\sqrt{2}$ (b) $-\frac{1}{2}$ and $\sqrt{2}$ (c) $\frac{1}{2}$ and $\sqrt{2}$ (d) $\sqrt{2}$ and $\frac{1}{2}$

3. The number of polynomials having zeroes −2 and 5 is
   (a) 1   (b) 2   (c) 3   (d) more than 3

4. If 2 is a zero of both the polynomials $3x^2 + ax - 14$ and $2x^3 + bx^2 + x - 2$, then the value of $a - 2b$ is
   (a) −1   (b) 5   (c) 9   (d) −9

5. The pair of equations $x + 2y + 5 = 0$ and $-3x - 6y + 1 = 0$ have
   (a) unique solution   (b) exactly two solutions
   (c) infinitely many solutions   (d) consistent with many solutions

6. If a pair of linear equations is consistent, then the lines will be
   (a) parallel   (b) always coincident   (c) always intersecting   (d) intersecting or coincident

7. If $\frac{1}{2}$ is a root of the quadratic equation $4x^2 - 4kx + k + 5 = 0$, then the value of k is
   (a) −6   (b) −3   (c) 3   (d) 6

8. The roots of the quadratic equation $x^2 - 0.04 = 0$ are
   (a) ± 0.2 (b) ± 0.02 (c) 0.4   (d) 2

9. The value(s) of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots is (are)
   (a) 0 only   (b) 4   (c) 8 only   (d) 0, 8

10. If the distance between the points $(2, -2)$ and $(-1, x)$ is 5, then one of the values of x is

(a) -2 (b) 2   (c) -1 (d) 1

11. The mid – point of the line segment joining the points $A(-2,8)$ and $B(-6,-4)$ is

(a) $(-4,-6)$ (b) $(2,6)$ (c) $(-4,2)$ (d) $(4,2)$

12. If in two triangles ABC and PQR, $\dfrac{AB}{QR} = \dfrac{BC}{PR} = \dfrac{CA}{PQ}$, then

(a) $\Delta PQR \sim \Delta CAB$ (b) $\Delta PQR \sim \Delta ABC$ (c) $\Delta PQR \sim \Delta CBA$ (d) $\Delta PQR \sim \Delta BCA$

13. $ABCD$ is a trapezium with $AD||BC$ and $AD = 4\ cm$. If the diagonals AC and BD intersect each other at O that $\dfrac{AO}{OC} = \dfrac{DO}{OB} = \dfrac{1}{2}$, then $BC =$

(a) $6\ cm$ (b) $7\ cm$ (c) $8\ cm$ (d) $9\ cm$

14. If $\sin \theta = \dfrac{a}{b}$, then $\cos \theta$ is equal to

(a) $\dfrac{b}{\sqrt{b^2-a^2}}$ (b) $\dfrac{b}{a}$ (c) $\dfrac{\sqrt{b^2-a^2}}{b}$ (d) $\dfrac{a}{\sqrt{b^2-a^2}}$

15. If $x \tan 60\,°\cos 60\,° = \sin 60\,°\cot 60\,°$, then $x =$

(a) $\cos 30°$ (b) $\tan 30°$ (c) $\sin 30°$ (d) $\cot 30°$

16. The area of sector of angle p (in degrees) of a circle with radius R is

(a) $\dfrac{p}{360} \times 2\pi R$ (b) $\dfrac{p}{180} \times \pi R^2$ (c) $\dfrac{p}{720} \times 2\pi R$ (d) $\dfrac{p}{720} \times 2\pi R^2$

17. If the sector of a circle of diameter $10\ cm$ subtends an angle of $144°$ at the centre, then the length of the arc of the sector is

(a) $2\pi\ cm$ (b) $4\pi\ cm$ (c) $5\pi\ cm$ (d) $6\pi\ cm$

18. The perimeter of a semicircular protractor of diameter $14\ cm$ is

(a) $44\ cm$ (b) $58\ cm$ (c) $62\ cm$ (d) $28\ cm$

ASSERTION and REASONING

Direction: In the question number 19 and 20, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option

(a) Both assertion and reason are true and reason is the correct explanation of assertion.
(b) Both assertion and reason are true and reason is not the correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Assertion is false but reason is true.

19. **Assertion:** If two triangles are congruent, then they are also similar

Reason: All congruent triangles are similar but similar triangles may not be congruent.

20. **Assertion:** The value of $\sin \theta = \dfrac{5}{4}$ is possible.

Reason: Hypotenuse is the largest side in any triangle.

Section - B

21. Show that $3 \times 5 \times 7 \times 11 \times 13 + 11 \times 13 \times 17$ is a composite number.

22. If one zero of the polynomial $x^2 - 3kx + 4k$ be twice the other, then find the value of k.

23. A fraction becomes $\frac{4}{5}$, if 1 is added to both numerator and denominator. If, however, 5 is subtracted from both numerator and denominator, the fraction becomes $\frac{1}{2}$. What is the fraction?

OR

Two years ago, a father was five times as old as his son. Two years later, his age will be 8 years more than three times the age of the son. Find the present ages of father and son.

24. Find two consecutive odd positive integers, such that sum of whose squares is 514.

25. Find a point on the $y - axis$ which is equidistant from the points $A(6,5)$ and $B(-4,3)$.

OR

Find the coordinates of the points of trisection of the line segment joining $(4,-1)$ and $(-2,-3)$.

Section - C

26. Show that $\sqrt{7}$ is an irrational number.

27. Draw the graphs of the equations $2x - y - 2 = 0$ and $4x - y - 4 = 0$. Determine the coordinates of the vertices of the triangle formed by these lines and the $y - axis$, and shade the triangular region.

28. The ratio of income of two persons is $9:7$ and the ratio of their expenditures is $4:3$. If each of them manages to save ₹ 2000 per month, find their monthly incomes.

29. A girl of height 90 cm is walking away from the base of a lamp $-$ post at the speed of 1.2 m/s. If the lamp is 3.6 m above the ground, find the length of her shadow after 4 seconds.

OR

Sides AB and BC and median AD of a $\triangle ABC$ are respectively proportional to sides PQ and QR and median PM of $\triangle PQR$. Show that $\triangle ABC \sim \triangle PQR$

30. The points $A(4,7), B(p, 3)$ and $C(7,3)$ are the vertices of a right triangle, right $-$ angled at B. Find the value of p.

31. If $P(9a - 2, -b)$ divides the line segment joining $A(3a + 1, -3)$ and $B(8a, 5)$ in the ratio $3:1$, find the values of a and b.

OR

In what ratio does the point $\left(\frac{24}{11}, y\right)$ divide the line segment joining the points $P(2,-2)$ and $Q(3,7)$? Also find the value of y.

Section - D

32. State and prove Basic Proportionality Theorem.

33. A pole has to be erected at a point on the boundary of a circular park of diameter 13 m in such a way that the differences of its boundaries of its distances from two diametrically opposite fixed gates A and B on the boundary is 7 m. Is it possible to do so? If yes, at what distances from the two gates should the pole be erected?

34. If $m = \cos A - \sin A$ and $n = \cos A + \sin A$, then prove the following:
$$\frac{m+1}{n-1} = \frac{1}{\cosec A - \cot A}$$

OR

Prove that $\sin A(1 + \tan A) + \cos A(1 + \cot A) = \sec A + cosec\ A$

35. In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find   [1]

    (i)   Length of the arc.   [2]

    (ii)   Area of the sector formed by the arc.

    (iii)   Area of the segment formed by the corresponding chord of the arc. $\left[\pi = \frac{22}{7}, \sqrt{3} = 1.73\right]$ [2]

OR

A brooch is made with silver wire in the form of a circle with diameter 4.2 cm. The wire is also used in making 6 diameters which divide the circle into 12 equal sectors. Find

    (i)   The total length of the wire used.

    (ii)   The area of the sector of the brooch.

Section – E

CASE STUDY BASED QUESTIONS

36. Have you ever watched how beautifully the Diwali lighting glow one after another, few very fast and other slower. On Diwali, Shreya decorated her house with three types of lights. The three lights glow after an interval of 12, 18 and 20 seconds respectively. The lights start glowing together at the same time.

    Based on the above information, answer the following questions:

    (i)   To find the time after which the lights will glow together again, we need to find LCM of numbers or HCF of numbers?

    (ii)   After how many seconds the lights will glow together again?

    (iii)   Find the HCF of 12, 18 and 20

OR

    Find HCF (12, 20). Hence, find LCM (12,20)

37. Raman is 6 $feet$ tall and is standing outside next to his younger sister Manya. He notes that he can see both of their shadows and decides to measure each shadow. His shadow is 8 $feet$ long and his sister's shadow is 5 $feet$ long.

Raman's Shadow   Manya's Shadow
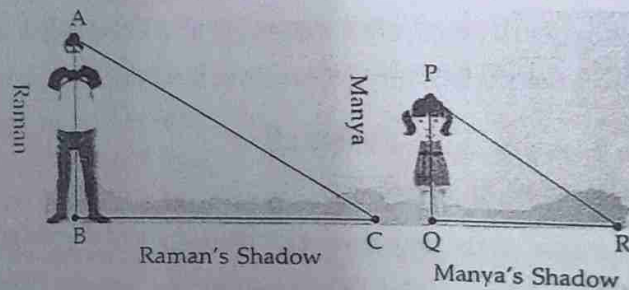
    Based on the above information, answer the following questions:

    (i)   To find the height of Raman's sister with the given information, which mathematical concept will be used?

    (ii)   Write the correct symbolic form of similarity of $\triangle ABC$ and $\triangle PQR$.

    (iii)   Write the criterion used for similarity of $\triangle ABC$ and $\triangle PQR$.

OR

    Find the height of Manya

38. In structural design, a structure is composed of triangles that are interconnecting. A truss is a series of triangle in same plane and is one of the major types of engineering structures and is especially used in the design of bridges and buildings. Trusses are designed to support loads, such as the weight of people. A truss is exclusively made of long, straight members connected by joints at the end of each member. Write the correct symbolic form of similarity of $\triangle ABC$ and $\triangle PQR$.
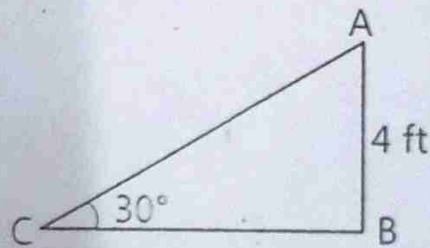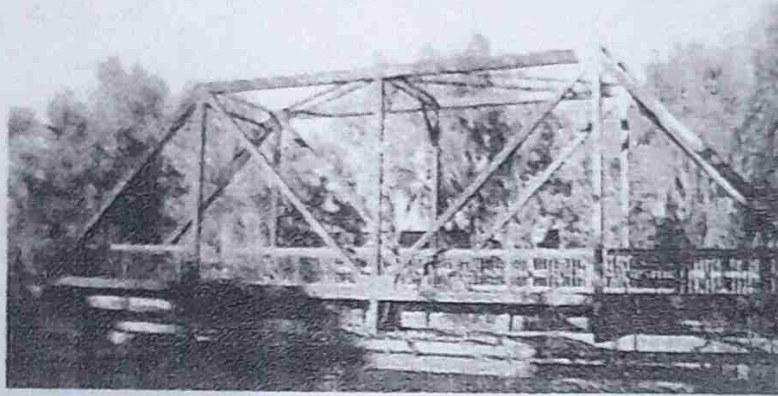
(i)   In the above triangle, what is the length of AC?

(ii)   In the above triangle, what is the length of BC?

(iii)   If $\sin A = \sin C$, what will be the length of BC?

OR

If the length of AB doubles, what will happen to the length of AC? Find it.