

2022
MATHEMATICS

Total marks : 80

Time : 3 hours

General Instructions:

- i) Approximately 15 minutes is allotted to read the question paper and revise the answers.
- ii) The question paper consists of 18 questions.
- iii) All questions are compulsory.
- iv) Internal & general choice have been provided in some questions.
- v) Marks allocated to every question are indicated against it.

N.B: Check to ensure that all pages of the question paper is complete as indicated on the top left side.

Section – A

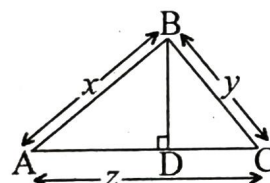
1. Choose the correct answer from the given alternatives.

- (a) If α and β are the zeroes of the polynomial $f(x) = px^2 - 2x + 3p$ and $\alpha + \beta = \alpha\beta$ then the value of p is 1
- (i) $-\frac{2}{3}$ (ii) $\frac{2}{3}$ (iii) $\frac{1}{3}$ (iv) $-\frac{1}{3}$
- (b) The pair of equations $x + y - 40 = 0$ and $x - 2y + 14 = 0$ have 1
- (i) a unique solution (ii) exactly two solutions
(iii) infinitely many solutions (iv) no solution
- (c) If $x = 1$ is a common root of $ax^2 + ax + 2 = 0$ and $x^2 + x + b = 0$, then $ab =$ 1
- (i) 1 (ii) 2 (iii) 3 (iv) 4
- (d) If sum of the first five terms of an AP is 30 and the 5th term is 10, then the sum of the first four terms of the AP is 1
- (i) 5 (ii) 10 (iii) 20 (iv) 30
- (e) If $\tan 2\theta = \cot(\theta + 15^\circ)$, where 2θ and $(\theta + 15^\circ)$ are acute, the value of θ is 1
- (i) 22° (ii) 25° (iii) 30° (iv) 35°
- (f) y -axis divides the join of $P(-4, 2)$ and $Q(8, 3)$ in the ratio 1
- (i) 3 : 1 (ii) 1 : 3 (iii) 2 : 1 (iv) 1 : 2
- (g) If tangents PA and PB from a point P to a circle with centre O are inclined to each other at angle of 80° , then $\angle POA$ is equal to 1
- (i) 50° (ii) 60° (iii) 70° (iv) 80°

- (h) An arc of a circle is of length 5π cm and the sector it bounds has an area of 20π cm². The radius of the circle is 1
 (i) 16 cm (ii) 12 cm (iii) 8 cm (iv) 4 cm
- (i) The ratio of the total surface area to the lateral surface area of a cylinder with base radius 80 cm and height 20 cm is 1
 (i) 2 : 1 (ii) 3 : 1 (iii) 4 : 1 (iv) 5 : 1
- (j) Two dice are rolled once. The probability of getting such numbers on two dice, whose product is a perfect square, is 1
 (i) 8 (ii) $\frac{1}{8}$ (iii) $\frac{9}{2}$ (iv) $\frac{2}{9}$

Section – B

2. An army contingent of 616 members is to march behind an army band of 32 members in a parade. The two groups are to march in the same number of columns. What is the maximum number of columns in which they can march? 2
3. Find the value of k for the quadratic equation $kx(x-2)+6=0$ has equal roots. 2
4. Find the values of y for which the distance between the points $P(2, -3)$ and $Q(10, y)$ is 10 units. 2
5. In the adjoining figure, $\triangle ABC$ is a right triangle in which $\angle B = 90^\circ$ and $BD \perp AC$. If $AB = x$ units, $BC = y$ units and $AC = z$ units, then find BD . 2



6. The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes. 2

Section – C

7. Answer any three from the following questions (a) to (e). 3×3 = 9
- (a) On dividing $x^3 - 3x^2 + x + 2$ by a polynomial $g(x)$, the quotient and remainder were $(x-2)$ and $(-2x+4)$ respectively. Find $g(x)$.
- (b) Meena went to a bank to withdraw ₹2000. She asked the cashier to give her ₹50 and ₹100 notes only. Meena got 25 notes in all. Find how many notes of ₹50 and ₹100 she received.
- (c) Solve the following pair of linear equations by cross-multiplication method :

$$x - 3y - 7 = 0$$

$$3x - 3y - 15 = 0$$

- (d) A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.
- (e) A sum of ₹700 is to be used to give seven cash prizes to students of a school for their overall academic performance. If each prize is ₹20 less than its preceding prize, find the value of each of the prizes.

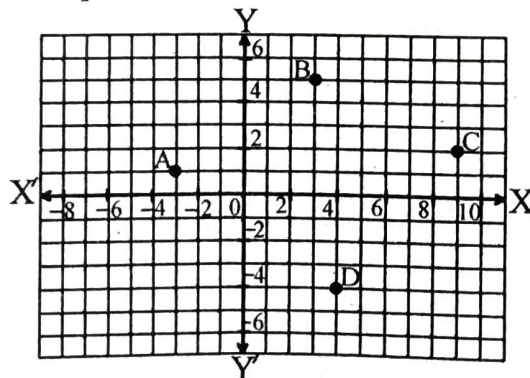
8. Answer any two from the following questions (a) to (d).

2 × 3 = 6

- (a) In triangle ABC, right angled at B, if $\tan A = \frac{1}{\sqrt{3}}$, find the value of $\cos A \cos C - \sin A \sin C$, with the help of a right triangle.
- (b) If $\sin(A - B) = \frac{1}{2}$, $\cos(A + B) = \frac{1}{2}$, $0^\circ < A + B \leq 90^\circ$, $A > B$, find A and B.
- (c) Prove that: $\frac{1 + \sec A}{\sec A} = \frac{\sin^2 A}{1 - \cos A}$, where angle A is an acute angle.
- (d) A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle 30° with it. The distance between the foot of the tree to the point where the top touches the ground is 8 m. Find the height of the tree.

9. Case Study based question:

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Four friends are seated at the points A, B, C and D on a lawn keeping social distancing, as shown in the figure above. One more friend wants to join them and sit exactly at the middle position E on a straight line between A and C. Based on the above information, answer the following questions (i) to (iii).

- (i) The distance between A and D is
 (a) $\sqrt{72}$ units (b) $\sqrt{73}$ units (c) $\sqrt{74}$ units (d) $\sqrt{75}$ units
- (ii) The coordinates of the position of E are
 (a) $\left(\frac{3}{2}, 3\right)$ (b) $\left(3, \frac{3}{2}\right)$ (c) (6, 3) (d) (3, 6)
- (iii) x-axis divides the distance/length between B and D in the ratio
 (a) 3 : 4 (b) 4 : 3 (c) 5 : 4 (d) 4 : 5

10. a. Construct an isosceles triangle whose base is 8 cm and altitude 4 cm and then another triangle whose sides are $1\frac{1}{2}$ times the corresponding sides of the isosceles triangle. (Traces of construction only is required.)

Or

3

- b. Draw a line segment AB of length 8 cm. Taking A as centre, draw a circle of radius 4 cm and taking B as centre, draw another circle of radius 3 cm. Construct tangents to each circle from the centre of the other circle. (Traces of construction only is required.)

11. a. A chord of a circle of radius 15 cm subtends an angle of 60° at the centre. Find the areas of the corresponding minor and major segments of the circle. [Use $\pi = 3.14$ and $\sqrt{3} = 1.73$]

Or

3

- b. How many silver coins, 1.75 cm in diameter and of thickness 2 mm, must be melted to form a cuboid of dimensions 5.5 cm \times 10 cm \times 3.5 cm?

12. Answer any two from the following questions (a) to (c).

$2 \times 3 = 6$

- (a) A student noted the number of cars passing through a spot on a road for 100 periods each of 3 minutes and summarised it in the table given below. Find the mode of the data:

Number of cars	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	7	14	13	12	20	11	15	8

- (b) The lengths of 40 leaves of a plant are measured correct to the nearest millimeter, and the data obtained is represented in the following table:

Length (in mm)	118-126	127-135	136-144	145-153	154-162	163-171	172-180
Number of leaves	3	5	9	12	5	4	2

Find the median length of the leaves.

- (c) 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.

Section – D

13. a. Draw the graphs of the equations $x - y + 1 = 0$ and $3x + 2y - 12 = 0$. Determine the coordinates of the vertices of the triangle formed by these lines and the x -axis and shade the triangular region.

Or

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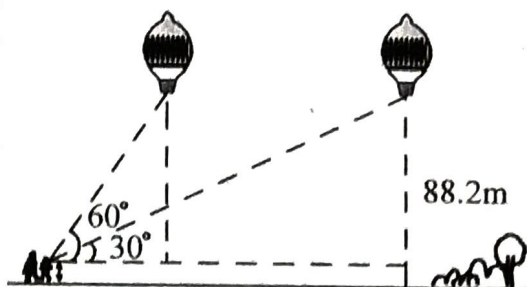
- b. Places A and B are 100 km apart on a highway. One car starts from A and another from B at the same time. If the cars travel in the same direction at different speeds, they meet in 5 hours. If they travel towards each other, they meet in 1 hour. What are the speeds of the two cars?

14. a. A statue, 1.6 m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point the angle of elevation of the top of the pedestal is 45° . Find the height of the pedestal.

Or

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- b. A 1.2 m tall girl spots a balloon 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 eyes of the girl at any instant is 60° . After sometime, the angle of elevation reduces to 30° . Find the distance travelled by the balloon during the interval.

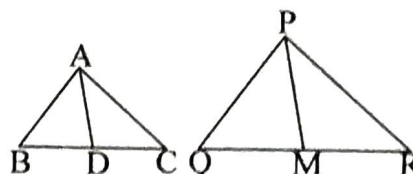


15. a. State and Prove Pythagoras Theorem.

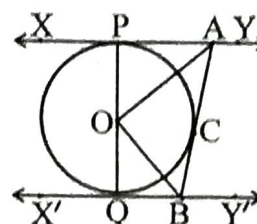
Or

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



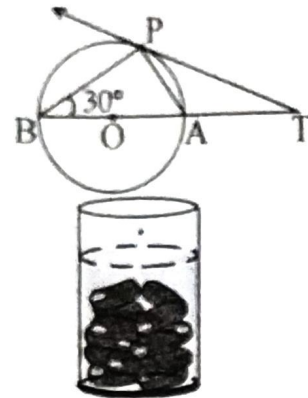
16. a. In the adjoining figure, XY and X'Y' are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting XY at A and X'Y' at B. Prove that $\angle AOB = 90^\circ$



Or

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- b. In the adjoining figure, O is the centre of the circle and TP is the tangent to the circle from an external point T. If $\angle PBT = 30^\circ$, prove that $BA : AT = 2 : 1$



17. a. A *gulab jamun*, contains sugar syrup up to about 30% of its volume. Find approximately how much syrup would be found in 45 *gulab jamuns*, each shaped like a cylinder with two hemispherical ends with length 5 cm and diameter 2.8 cm.

Or

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- b. A container, opened from the top and made up of a metal sheet, is in the form of a frustrum 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 milk which can completely fill the container @ of ₹ 20 per litre. Also find the cost of metal sheet used to make the container, if it costs ₹ 8 per 100 cm². [Take $\pi = 3.14$]

18. a. The following distribution shows the daily pocket allowance of children of a locality. Find the mean pocket allowance by step-deviation method.

Daily pocket allowance (in ₹)	More than 11	More than 13	More than 15	More than 17	More than 19	More than 21	More than 23
Number of children	64	57	51	42	29	9	4

Or

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- b. The distribution of heights (in cm) of 96 children is given below:

Height (in cm)	Number of children
124-128	5
128-132	8
132-136	17
136-140	24
140-144	16
144-148	12
148-152	6
152-156	4
156-160	3
160-164	1

Draw a less than type cumulative frequency curve for this data and use it to compute median height of the children.
