MATHEMATICS BASIC 2021 (COMPARTMENT)

PART- A

SECTION - I

16 Marks

(This Section consists of 16 Questions of 1 mark each.)

1. Find the distance between the points $A\left(-\frac{7}{3}, 5\right)$ and $B\left(\frac{2}{3}, 5\right)$. 1

2. Express 288 as product of its prime factors. 1

3. Write the common difference of the A.P. :

$\frac{1}{5}, \frac{4}{5}, \frac{7}{5}, \frac{10}{5}, \ldots$

OR

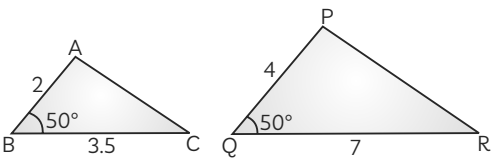
Find the 8^{th} term of the A.P. whose first term is –2 and common difference is 3. 1

4. Find the sum and product of zeroes of the polynomial, $p(x) = x^2 + 5x + 6$. 1

5. Check whether 13 cm, 12 cm, 5 cm can be the sides of a right triangle.** 1

6. If $2 \cos \theta = \sqrt{3}$, then find the value of θ. 1

7.

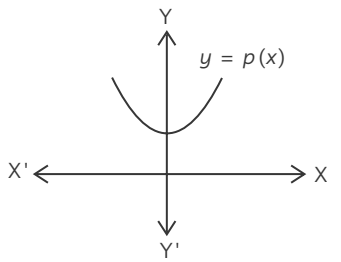


In the given figure $\triangle ABC \sim \triangle PQR$. Write similarity criterion by which $\triangle ABC$ and $\triangle PQR$ are similar.

OR

Corresponding sides of two similar triangles are in the ratio 3 : 5. What is the ratio of their areas?** 1

8. The graph of $y = p(x)$ is shown in figure for some polynomial $p(x)$. Find the number of zeroes of $p(x)$.



1

9. Find the discriminant of the quadratic equation $2x^2 - 5x - 6 = 0$. 1

10. A card is drawn at random from a well-shuffled pack of 52 playing cards. Find the probability of getting a red face card. 1

11. Show that the tangents drawn at the ends of a diameter of a circle are parallel. 1

12. If PL and PM are two tangents to a circle with centre O from an external point P and PL = 4 cm, find the length of OP, where radius of the circle is 3 cm.

OR

Find the distance between two parallel tangents of a circle of radius 2·5 cm. 1

13. Two different coins are tossed simultaneously. Write all the possible outcomes.

OR

A die is thrown once. Write the probability of getting a number less than 7. 1

14. Write the expression for the volume of a cone of radius '*r*' and height three times the radius '*r*'.

OR

Write the expression for the total surface area of a solid hemisphere of radius '*r*'. 1

15. A vertical pole is 100 metres high. Find the angle subtended by the pole at a point on the ground $100\sqrt{3}$ meters from the base of the pole. 1

16. In $\triangle ABC$, right-angled at A, if AB = 7 cm and AC = 24 cm, then find sin B and tan C. 1

SECTION - II

16 Marks

(Case study based questions (Q. No. 17-20) are compulsory.

Attempt any 4 sub-parts from each question. Each sub-part carries 1 mark.)

17. *During the lockdown period, many families got bored of watching TV all the time. Out of these families, one family of 6 members decided to play a card game. 17 cards numbered 1, 2, 3, 4, ..., 17 are put in a box and mixed thoroughly. One card is drawn by one member at random and other family members bet for the chances of drawing the number either prime, odd or even etc.*

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	

Based on the above information, answer the following questions:

(A) The first member of the family draws a card at random and another member bets that it is an even prime number. What is the probability of his winning the bet?

(a) $\frac{2}{17}$ **(b)** $\frac{3}{17}$

(c) $\frac{1}{17}$ **(d)** $\frac{4}{17}$ 1

(B) The second member of the family draws a card at random and some other member bets that it is an even number. What is the probability of his winning the bet?

(a) $\frac{7}{17}$ **(b)** $\frac{8}{17}$

(c) $\frac{9}{17}$ **(d)** $\frac{5}{17}$ 1

(C) What is the probability that the number on the card drawn at random is divisible by 5?

(a) $\frac{5}{17}$ **(b)** $\frac{4}{17}$

(c) $\frac{3}{17}$ **(d)** $\frac{2}{17}$ 1

(D) What is the probability that the number on the card drawn at random is a multiple of 3?

(a) $\frac{5}{17}$ **(b)** $\frac{6}{17}$

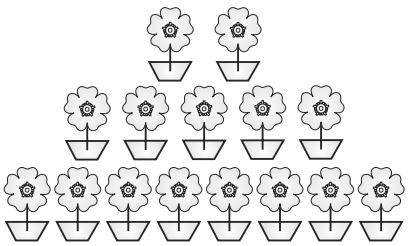
(c) $\frac{7}{17}$ **(d)** $\frac{8}{17}$ 1

(E) What is the probability that the number on the card is a factor of 9?

(a) $\frac{9}{17}$ **(b)** $\frac{3}{17}$

(c) $\frac{8}{17}$ **(d)** $\frac{1}{17}$ 1

18. *Roshni being a plant lover decides to start a nursery. She bought few plants with pots. She placed the pots in such a way that the number of pots in the first row is 2, in the second is 5, in the third row is 8 and so on.*



Based on the above, answer the following questions:

(A) How many pots were placed in the 7^{th} row?

(a) 20 **(b) 23**

(c) 77 **(d) 29** 1

(B) If Roshni wants to place 100 pots in total, then total number of rows formed in the arrangement will be:

(a) 8 **(b) 9**

(c) 10 **(d) 12** 1

(C) How many pots are placed in the last row?

(a) 20 **(b) 23**

(c) 26 **(d) 29** 1

(D) If Roshni has sufficient space for 12 rows, then how many total number of pots are placed by her with the same arrangement?

(a) 222 **(b) 155**

(c) 187 **(d) 313** 1

(E) The difference in number of pots placed in the 4^{th} row and the 2^{nd} row, is:

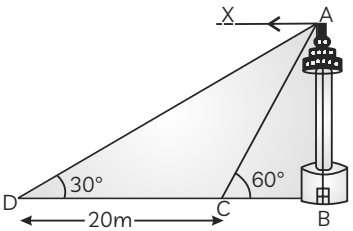
(a) 3 **(b) 4**

(c) 6 **(d) 8** 1

19. *To explain how trigonometry can be used to measure the height of an inaccessible object, a teacher gave the following example to students:*

A TV tower stands vertically on the bank of a canal. From a point on the other bank directly opposite the tower, the angle of the elevation of the top of the tower is 60°. From another point 20 m away from this point on the line joining this point to the

foot of the tower, the angle of elevation of the top of the tower is 30° (as shown in figure).



Based on the above information, answer the following questions:

(A) The width of the canal is:

(a) $10\sqrt{3}$ **m** **(b)** $20\sqrt{3}$ **m**

(c) 10 m **(d) 20 m** 1

(B) Height of the tower is:

(a) $10\sqrt{3}$ **m** **(b) 10 m**

(c) $20\sqrt{3}$ **m** **(d) 20 m** 1

(C) Distance of the foot of the tower from the point D is:

(a) 20 m **(b) 30 m**

(c) 10 m **(d)** $20\sqrt{3}$ **m** 1

(D) The angle formed by the line of sight with the horizontal when it is above the horizontal line is known as:

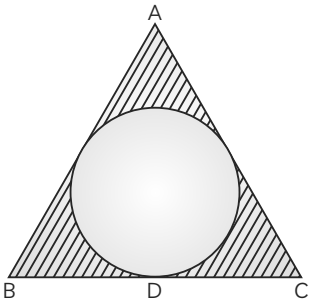
(a) angle of depression
(b) line of sight
(c) angle of elevation
(d) obtuse angle 1

(E) In figure, measure of angle XAC is:

(a) 30° **(b) 60°**

(c) 90° **(d) 45°** 1

20. *A children's park is in the triangular shape as shown in Figure below. In the middle of the park, there is a circular region for younger children to play. It is fenced with three layers of wire. The radius of the circular region is 3 m.*



Based on the above information, answer the following questions:

(A) The perimeter (or circumference) of the circular region is:

(a) 3□ m **(b) 18□ m**

(c) 6□ m **(d) 9□ m** 1

(B) The total length of wire used is:

(a) 9□ m **(b) 18□ m**

(c) 54□ m **(d) 27□ m** 1

(C) The area of the circular region is:

(a) 54□ m^2 **(b) 3□** m^2

(c) 18□ m^2 **(d) 9□** m^2 1

(D) If BD = 6 m, DC = 9 m and ar (ABC) = 54 m^2**, then the length of sides AB and AC, respectively, are:**

(a) 9 m, 12 m
(b) 12 m, 9 m
(c) 10 m, 12 m
(d) 12 m, 10 m 1

(E) The perimeter of □ABC is:

(a) 28 m **(b) 37 m**

(c) 36 m **(d) 38 m** 1

PART- B

SECTION - III

12 Marks

(This section consists of 6 questions of 2 marks each.)

21. Find the LCM and HCF of two numbers 26 and 91 by the method of prime factorisation. 2

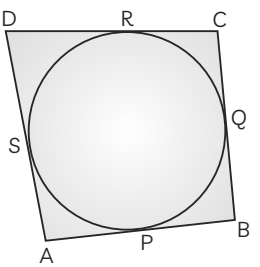
22. If $\sin(A + B) = \frac{\sqrt{3}}{2}$, $\sin(A - B) = \frac{1}{2}$, **where** $0° < A + B < 90°$; $A > B$, **then find the values of A and B.**

OR

Simplify:

$$\frac{\sin 30° + \tan 45° - \operatorname{cosec} 60°}{\sec 30° + \cos 60° + \cot 45°}$$ 2

23. A quadrilateral ABCD is drawn to circumscribe a circle (see Figure). Prove that AB + CD = AD + BC.



2

24. The greater of two supplementary angles exceeds the smaller by 18°. Find the two angles. 2

25. Find the coordinates of the point which divides the line segment joining the points A(7, –1) and B(–3, –4) in the ratio 2 : 3. 2

26. Find whether the following pair of linear equations are consistent or inconsistent.

$5x - 3y = 11, -10x + 6y = 22$

OR

Solve for x and y:

$x + y = 6, 2x - 3y = 4$ 2

SECTION - IV

21 Marks

(This section consists of 7 questions of 3 marks each.)

27. Draw a pair of tangents to a circle of radius 4 cm which are inclined to each other at an angle of 45°.** 3

28. Prove that $7\sqrt{2}$ is an irrational number, given that $\sqrt{2}$ is an irrational number. 3

29. Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre. 3

30. D and E are points on the sides CA and CB respectively of a triangle ABC, right-angled at C.**

Prove that:

$AE^2 + BD^2 = AB^2 + DE^2$.

OR

Diagonals of a trapezium ABCD with AB || DC intersect each other at the point O. If AB = 2 CD, find the ratio of the areas of triangles AOB and COD.** 3

31. Prove that

$\sec\theta(1-\sin\theta)(\sec\theta + \tan\theta) = 1$

OR

Prove that

$$\frac{1+\sec A}{\sec A} = \frac{\sin^2 A}{1-\cos A}$$

3

32. Show that the points A(1, 7), B(4, 2), C(–1, 1) and D(–4, 4) are the vertices of a square ABCD. 3

33. If α, β are zeroes of the quadratic polynomial $x^2 + 9x + 20$, form a quadratic polynomial whose zeroes are $(\alpha + 1)$ and $(\beta + 1)$. 3

SECTION - V

15 Marks

(This section consists of 3 questions of 5 marks each.)

34. A cone of height 36 cm and radius of base 9 cm is made up of moulding clay. A child reshapes it in the form of a sphere. Find the diameter of the sphere. 5

35. The table shows the daily expenditure on food of 25 households in a locality:

Daily Expenditure (₹)	Number of Households
100-150	4
150-200	5
200-250	12
250-300	2
300-350	2

Find the mean daily expenditure on food. Also, find the modal expenditure. 5

36. The diagonal of a rectangular field is 60 metres longer than the shorter side. If the longer side is 30 metres more than the shorter side, find the sides of the field.

OR

The sum of the ages of a father and his son is 45 years. Five years ago, the product of their ages (in years) was 124. Determine their present ages. 5