

QUESTION PAPER CODE 430/1/3

EXPECTED ANSWER/VALUE POINTS

SECTION A

Q. Nos. 1 to 10 are multiple choice questions. Select the correct option.

1. The median and mode respectively of a frequency distribution are 26 and 29. Then its mean is

(a) 27.5 (b) 24.5 (c) 28.4 (d) 25.8

Sol. (b) 24.5 1

2. If the distance between the points A(4, p) and B(1, 0) is 5 units, then the value(s) of p is (are)

(a) 4 only (b) -4 only (c) ± 4 (d) 0

Sol. (c) ± 4 1

3. The graph of a polynomial is shown in Fig. 1, then the number of its zeroes is

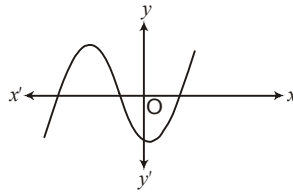


Fig. 1

(a) 3 (b) 1 (c) 2 (d) 4

Sol. (a) 3 1

4. $2.\overline{35}$ is

(a) an integer (b) a rational number
(c) an irrational number (d) a natural number

Sol. (b) rational number 1

5. HCF of 144 and 198 is

(a) 9 (b) 18 (c) 6 (d) 12

Sol. (b) 18 1

6. The probability that a number selected at random from the numbers 1, 2, 3, ..., 15 is a multiple of 4 is

(a) $\frac{4}{15}$ (b) $\frac{2}{15}$ (c) $\frac{1}{15}$ (d) $\frac{1}{5}$

Sol. (d) $\frac{1}{5}$ 1

14. If the point C(k, 4) divides the line segment joining two points A(2, 6) and B(5, 1) in ratio 2 : 3, the value of x is _____.

Sol. $\frac{16}{5}$ 1

OR

If points A(-3, 12), B(7, 6) and C(x, 9) are collinear, then the value of x is _____.

Sol. 2 1

15. If $\cot \theta = \frac{12}{5}$, then the value of $\sin \theta$ is _____.

Sol. $\frac{5}{13}$ 1

In Q. Nos. 16 to 20, answer the following.

16. The nth term of an AP is $(7 - 4n)$, then what is its common difference?

Sol. $T_1 = 3, T_2 = -1$ $\frac{1}{2}$

$d = -4$ $\frac{1}{2}$

17. If $5 \tan \theta = 3$ then what is the value of $\left(\frac{5 \sin \theta - 3 \cos \theta}{4 \sin \theta + 3 \cos \theta} \right)$?

Sol. $\frac{5 \tan \theta - 3}{4 \tan \theta + 3}$ $\frac{1}{2}$

$= 0$ $\frac{1}{2}$

18. The areas of two circles are in the ratio 9 : 4, then what is the ratio of their circumferences?

Sol. $\frac{r_1^2}{r_2^2} = \frac{9}{4} \Rightarrow \frac{r_1}{r_2} = \frac{3}{2}$ $\frac{1}{2}$

$\therefore \frac{2\pi r_1}{2\pi r_2} = \frac{3}{2}$ or 3 : 2 $\frac{1}{2}$

19. If a pair of dice is thrown once, then what is the probability of getting a sum of 8?

Sol. Favourable outcomes are

(3, 5); (4, 4); (5, 3); (2, 6); (6, 2) i.e., 5 $\frac{1}{2}$

$$P(\text{Sum } 8) = \frac{5}{36} \quad \frac{1}{2}$$

20. The areas of two similar triangles ABC and PQR are 25 cm^2 and 49 cm^2 respectively. If QR = 9.8 cm, find BC.

Sol. $\frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta PQR)} = \frac{25}{49} = \frac{BC^2}{QR^2}$ $\frac{1}{2}$

$$\frac{BC}{9.8} = \frac{5}{7} \Rightarrow BC = 7 \text{ cm} \quad \frac{1}{2}$$

SECTION B

Q. Nos, 21 to 26 carry two marks each.

21. Prove that $\sqrt{\frac{1 - \sin \theta}{1 + \sin \theta}} = \sec \theta - \tan \theta$.

Sol. L.H.S. = $\sqrt{\frac{1 - \sin \theta}{1 + \sin \theta}} \cdot \sqrt{\frac{1 - \sin \theta}{1 - \sin \theta}}$ 1

$$= \frac{1 - \sin \theta}{\cos \theta} = \sec \theta - \tan \theta \quad 1$$

OR

Prove that $\frac{\tan^2 \theta}{1 + \tan^2 \theta} + \frac{\cot^2 \theta}{1 + \cot^2 \theta} = 1$.

L.H.S. = $\frac{\tan^2 \theta}{\sec^2 \theta} + \frac{\cot^2 \theta}{\operatorname{cosec}^2 \theta}$ 1

$$= \sin^2 \theta + \cos^2 \theta$$

$$= 1 \quad 1$$

22. Two different dice are thrown together, find the probability that the sum of the numbers appeared is less than 5.

Sol. Total number of possible outcomes = 36

Favourable outcomes are = (1, 1); (1, 2); (1, 3); (2, 1); (2, 2)

(3, 1) i.e. 6 1

$$P(\text{sum of numbers less than five}) = \frac{6}{36} \text{ or } \frac{1}{6} \quad 1$$

OR

Find the probability that 5 Sundays occur in the month of November of a randomly selected year.

$$\begin{aligned} \text{Number of days of November} &= 30 \\ &= 4 \text{ weeks} + 2 \text{ days} \end{aligned} \quad 1$$

$$P(5 \text{ Sundays}) = \frac{2}{7} \quad 1$$

23. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball at random from the bag is three times that of a red ball, find the number of blue balls in the bag.

Sol. Let number of blue balls = x

$$\text{Total balls} = 5 + x \quad \frac{1}{2}$$

$$P(\text{blue ball}) = \frac{x}{5+x} \text{ and } P(\text{Red balls}) = \frac{5}{5+x} \quad 1$$

$$\therefore \frac{x}{5+x} = \frac{3(5)}{5+x}$$

$$\Rightarrow x = 15$$

$$\therefore \text{Number of blue balls} = 15 \quad \frac{1}{2}$$

24. The radii of two circles are 19 cm and 9 cm respectively. Find the radius of a circle which has circumference equal to sum of their circumferences,

$$\text{Sol. Circumference of 1st circle} = 2\pi(19) = 38\pi \text{ cm} \quad \frac{1}{2}$$

$$\text{Circumference of 2nd circle} = 2\pi(9) = 18\pi \text{ cm} \quad \frac{1}{2}$$

$$\text{Circumference of new circle} = 38\pi + 18\pi = 56\pi \text{ cm}$$

$$2\pi R = 56\pi \quad \frac{1}{2}$$

$$R = 28 \text{ cm} \quad \frac{1}{2}$$

25. Divide the polynomial $16x^2 + 24x + 15$ by $(4x + 3)$ and write the quotient and the remainder.

Sol.
$$\begin{array}{r} 4x + 3 \\ 4x + 3 \overline{) 16x^2 + 24x + 15} \\ \underline{16x^2 + 12x} \\ 12x + 15 \\ \underline{12x + 9} \\ 6 \end{array}$$

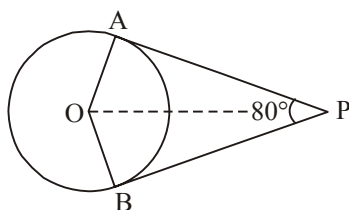
1

Quotient = $4x + 3$, Remainder = 6

$$\frac{1}{2} + \frac{1}{2}$$

26. If tangents PA and PB drawn from an external point P to a circle with centre O are inclined to each other at an angle of 80° , then find $\angle POA$.

Sol.



Joint OP

Correct figure $\frac{1}{2}$

$$\angle OPA = \frac{1}{2} \angle APB$$

$$= \frac{1}{2} (80^\circ) = 40^\circ$$

1

$$\therefore \angle POA = 90 - 40 = 50^\circ$$

$$\frac{1}{2}$$

SECTION C

Q. Nos. 27 to 34 carry 3 marks each.

27. Draw a circle of radius 4 cm. From a point 7 cm away from the centre of circle. Construct a pair of tangents to the circle.

Sol. Constructing the circle of given radius

1

Constructing the tangents

2

OR

Draw a line segment of 6 cm and divide it in the ratio 3 : 2.

Drawing line segment of length 6 cm.

1

Dividing it in the ratio 3 : 2.

2

28. Prove that $(1 + \tan A - \sec A) \times (1 + \tan A + \sec A) = 2 \tan A$

Sol. L.H.S. = $(1 + \tan A)^2 - \sec^2 A$

1

$$= 1 + \tan^2 A + 2 \tan A - \sec^2 A$$

1

$$= \sec^2 A + 2 \tan A - \sec^2 A$$

$$= 2 \tan A = \text{R.H.S.}$$

1

OR

Prove that $\frac{\operatorname{cosec} \theta}{\operatorname{cosec} \theta - 1} + \frac{\operatorname{cosec} \theta}{\operatorname{cosec} \theta + 1} = 2 \sec^2 \theta$

$$\text{L.H.S.} = \frac{\operatorname{cosec} \theta (\operatorname{cosec} \theta + 1) + \operatorname{cosec} \theta (\operatorname{cosec} \theta - 1)}{\operatorname{cosec}^2 \theta - 1}$$

1

$$= \frac{2 \operatorname{cosec}^2 \theta}{\cot^2 \theta}$$

1

$$= 2 \sec^2 \theta = \text{R.H.S.}$$

1

29. Given that $\sqrt{3}$ is an irrational number, show that $(5 + 2\sqrt{3})$ is an irrational number.

Sol. Let $(5 + 2\sqrt{3}) = x$, where x is the rational number

 $\frac{1}{2}$

$$\Rightarrow \sqrt{3} = \frac{x-5}{2}$$

1

L.H.S. is an irrational and R.H.S. is a rational number.

1

It is a contradiction

\therefore Our assumption is wrong

$\therefore 5 + 2\sqrt{3}$ is a irrational number.

 $\frac{1}{2}$

OR

An army contingent of 612 members is to march behind an army band of 48 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?

$$612 = 2^2 \times 3^2 \times 17$$

1

$$48 = 2^4 \times 3$$

1

$$\text{HCF}(612, 48) = 2^2 \times 3$$

$$= 12$$

 $\frac{1}{2}$

Number of column = 12

 $\frac{1}{2}$

Read the following passage carefully and then answer the questions given at the end.

30. To conduct Sports Day activities, in your 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 AD, as shown in Fig. 5. Niharika runs $\frac{1}{4}$ th the distance AD on the 2nd line and posts a green flag. Preet runs $\frac{1}{5}$ th the distance AD on the eighth line and posts a red flag.

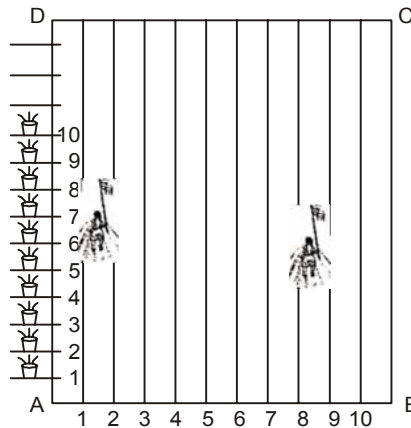


Fig. 5

- (i) What is the distance between the two flags?
 (ii) If Rashmi has to post a blue flag exactly half way between the line segment joining the two flags, where should she post the blue flag?

Sol.	Coordinate of green flag = (2, 25)	$\frac{1}{2}$
	Coordinate of Red flag = (8, 20)	$\frac{1}{2}$
	(i) Distance between the flags = $\sqrt{(-6)^2 + (5)^2}$	
	= $\sqrt{61}$ units	1
	(ii) Mid point between	1
	green and Red flag = (5, 22.5)	

31. Solve graphically: $2x + 3y = 2$, $x - 2y = 8$

Sol.	Correct graph of $2x + 3y = 2$	1
	Correct graph of $x - 2y = 8$	1

Point of intersection = (4, -2)

or $x = 4, y = -2$

1

- 32. Find the zeroes of the quadratic polynomial $6x^2 - 3 - 7x$ and verify the relationship between the zeroes and the coefficients.**

Sol. $6x^2 - 7x - 3 = (3x + 1)(2x - 3)$

Zeroes are = $-\frac{1}{3}, \frac{3}{2}$

1

Sum of zeroes = $\frac{7}{6}, \frac{-b}{a} = \frac{7}{6}$

$$\frac{1}{2} + \frac{1}{2}$$

Product of zeroes = $-\frac{1}{2}, \frac{c}{a} = \frac{-3}{6}$ or $\frac{-1}{2}$

$$\frac{1}{2} + \frac{1}{2}$$

- 33. Three horses are tied each with 7 m long rope at three corners of a triangular field having sides 20 m, 34 m and 42 m. Find the area of the plot which can be grazed by the horses.**

Sol. Sum of angle of 3 sectors

= 180°

1

Areas of three sector = $\frac{22}{7} \times 7 \times 7 \times \frac{180^\circ}{360^\circ}$

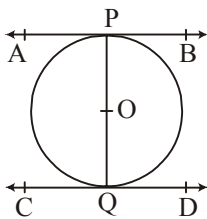
$$1\frac{1}{2}$$

= 77 cm^2

$$\frac{1}{2}$$

- 34. Prove that the tangents drawn at the end points of a diameter of a circle are parallel.**

Sol.



Correct figure

1

$\angle OPA = \angle OQD = 90^\circ$

1

But they are forming alternate interior angles

1

$\Rightarrow AB \parallel CD$

SECTION D

Q. Nos. 35 to 40 carry 4 marks each.

- 35. If 4 times the 4th term of an AP is equal to 18 times the 18th term, then find the 22nd term.**

Sol. Let first term be a and common difference = d

$\therefore 4(a + 3d) = 18(a + 17d)$

1

$\Rightarrow a = -21d$

1

$$\begin{aligned}
 22\text{nd term} &= a + 21d && 1 \\
 &= -21d + 21d \\
 &= 0 && 1
 \end{aligned}$$

OR

How many terms of the AP : 24, 21, 18, ... must be taken so that their sum is 78?

$$\text{Let the number of terms be } n, d = -3 \quad \frac{1}{2}$$

$$\therefore \frac{n}{2}[48 + (n-1)(-3)] = 78 \quad 1$$

$$\Rightarrow n^2 - 17n + 52 = 0 \quad 1$$

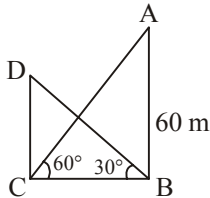
$$(n - 13)(n - 4) = 0 \quad 1$$

$$\Rightarrow n = 13 \text{ or } 4$$

$$\therefore \text{Number of terms} = 4 \text{ or } 13 \quad \frac{1}{2}$$

- 36. The angle of elevation of the top of a building from the foot of a tower is 30° . The angle of elevation of the top of the tower from the foot of the building is 60° . If the tower is 60 m high, find the height of the building.**

Sol.



$$\frac{AB}{BC} = \tan 60^\circ \quad \text{Correct figure} \quad 1$$

$$\frac{60}{BC} = \sqrt{3}$$

$$\Rightarrow BC = \frac{60}{\sqrt{3}} \text{ or } 20\sqrt{3} \text{ m} \quad 1$$

$$\text{Again, } \frac{DC}{CB} = \tan 30^\circ \quad 1$$

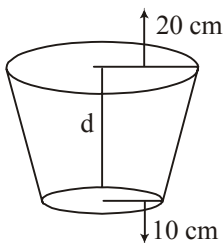
$$\frac{DC}{20\sqrt{3}} = \frac{1}{\sqrt{3}}$$

$$\Rightarrow DC = 20 \text{ m}$$

$$\text{Height of building} = 20 \text{ m} \quad 1$$

37. An open metal bucket is in the shape of a frustum of cone of height 21 cm with radii of its lower and upper ends are 10 cm and 20 cm respectively. Find the cost of milk which can completely fill the bucket at the rate of ₹ 40 per litre.

Sol.



$$\begin{aligned} \text{Volume of Bucket} &= \frac{\pi}{3} [400 + 100 + 200] \times 21 \\ &= 4900 \times \frac{22}{7} = 15400 \text{ cm}^3 \end{aligned} \quad 2$$

$$\text{Volume of milk} = \frac{15400}{1000} = 15.4 \text{ litres} \quad 1$$

$$\text{Cost of milk} = ₹ 15.4 \times 40 = ₹ 616 \quad 1$$

OR

A solid is in the shape of a cone surmounted on a hemisphere. The radius of each of them being 3.5 cm and the total height of the solid is 9.5 cm. Find the volume of the solid.

$$\begin{aligned} \text{Volume of hemisphere} &= \frac{2}{3} \pi r^3 \\ &= \frac{2}{3} \times \frac{22}{7} \times \left(\frac{7}{2}\right)^3 \\ &= \frac{539}{6} \text{ cm}^3 \end{aligned} \quad 1\frac{1}{2}$$

$$\text{Height of cone} = (9.5 - 3.5) \text{ cm} = 6 \text{ cm} \quad \frac{1}{2}$$

$$\begin{aligned} \text{Volume of cone} &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 6 = 77 \text{ cm}^3 \end{aligned} \quad 1$$

Total volume of solid

$$\begin{aligned} &= \frac{539}{6} + \frac{77}{1} \\ &= \frac{539 + 462}{6} = \frac{1001}{6} \text{ cm}^3 \text{ or } 166.83 \text{ cm}^3 \\ &= 166.83 \text{ cm}^3 \end{aligned} \quad 1$$

38. Find the mean of the following data:

Classes	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	100 – 120
Frequency	20	35	52	44	38	31

Sol.

x	f	fx
10	20	200
30	35	1050
50	52	2600
70	44	3080
90	38	3420
110	31	3410
	<u>220</u>	<u>13760</u>

Correct Table 2

$$\therefore \text{Mean} = \frac{\sum fx}{\sum f} = \frac{13760}{220} \text{ or } 62.54$$

2

39. In Fig. 6, DEFG is a square in a triangle ABC right angled at A.

Prove that

(i) $\triangle AGF \sim \triangle DBG$

(ii) $\triangle AGF \sim \triangle EFC$

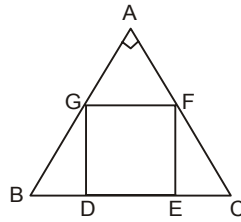
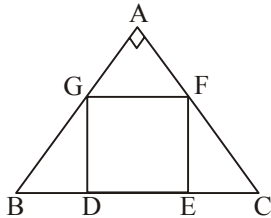


Fig.6

Sol.



$GF \parallel DE$ (DEFG is square)

$\therefore \angle AGF = \angle ABC$ (Corresponding angles)

$\frac{1}{2}$

$\therefore \angle A = \angle GDB = 90^\circ$

$\therefore \triangle AGF \sim \triangle DBG$ (By AA similarity)

$1\frac{1}{2}$

Again DEFG being a square $\angle AFG = \angle ACB$ (corresponding angles)

$\frac{1}{2}$

$$\therefore \angle A = \angle CEF \quad (\text{each } 90^\circ)$$

$$\triangle AGF \sim \triangle EFC \text{ (By AA similarity)}$$

 $1\frac{1}{2}$

OR

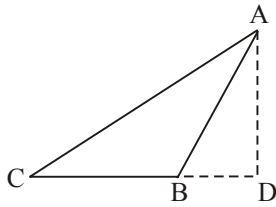
In an obtuse $\triangle ABC$ ($\angle B$ is obtuse), AD is perpendicular to CB produced. Then prove that $AC^2 = AB^2 + BC^2 + 2BC \times BD$.

Sol.

In rt $\triangle ADC$

Correct figure

1



$$AC^2 = AD^2 + CD^2$$

 $\frac{1}{2}$

$$= AD^2 + (CB + BD)^2$$

1

$$= AD^2 + BD^2 + CB^2 + 2CB \cdot BD$$

1

$$= AB^2 + CB^2 + 2CB \cdot BD$$

$\because \triangle ABD$ is rt angled

 $\frac{1}{2}$

40. A person on tour has ₹ 4200 for his expenses. If he extends his tour for 3 days, he has to cut down his daily expenses by ₹ 70. Find the original duration of the tour.

Sol. Let the number of days of tour = x

$$\text{Each day expenses} = \frac{4200}{x}$$

$$\text{Extended days tour} = x + 3$$

$$\text{Each day expenses} = \frac{4200}{x+3}$$

$$\frac{4200}{x} - \frac{4200}{x+3} = 70$$

2

$$\frac{x+3-x}{x(x+3)} = \frac{1}{60}$$

$$\Rightarrow x^2 + 3x - 180 = 0$$

1

$$(x + 15)(x - 12) = 0$$

$$\Rightarrow x = -15 \text{ (not possible)}$$

$$\text{or } x = 12$$

$$\text{Original duration of tour} = 12 \text{ days}$$

1