QUESTION PAPER CODE 430/3/3
EXPECTED ANSWER/VALUE POINTS
SECTION A

Question numbers 1 to 10 are multiple choice questions of 1 mark each.

Select the correct choice.

1. The simplest form of $\frac{1095}{1168}$ is

(a) $\frac{17}{26}$ (b) $\frac{25}{26}$ (c) $\frac{13}{16}$ (d) $\frac{15}{16}$

Sol. (d) $\frac{15}{16}$ 1

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2. One card is drawn at random from a well – shuffled deck of 52 cards. What is the probability of getting a Jack?

(a) $\frac{3}{26}$ (b) $\frac{1}{52}$ (c) $\frac{1}{13}$ (d) $\frac{3}{52}$

Sol. (c) $\frac{1}{13}$ 1

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3. If one zero of the quadratic polynomial, $(k – 1) x^2 + kx + 1$ is –4 then the value of k is

(a) $-\frac{5}{4}$ (b) $\frac{5}{4}$ (c) $-\frac{4}{3}$ (d) $\frac{4}{3}$

Sol. (b) $\frac{5}{4}$ 1

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4. If P(–1, 1) is the midpoint of the line segment joining A(–3, b) and B(1, b + 4), then b is equal to

(a) 1 (b) –1 (c) 2 (d) 0

Sol. (b) –1 1

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5. Which of the following rational numbers is expressible as a terminating decimal?

(a) $\frac{124}{165}$ (b) $\frac{131}{30}$ (c) $\frac{2027}{625}$ (d) $\frac{1625}{462}$

Sol. (c) $\frac{2027}{625}$ 1

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6. Consider the following distribution:

Classes:	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25
Frequency:	10	15	12	20	9

The sum of lower limits of the median class and the modal class is

(a) 15 **(b) 25** **(c) 30** **(d) 35**

Sol. (b) 25 1

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7. What is the largest number that divides 245 and 1029, leaving remainder 5 in each?

(a) 15 **(b) 16** **(c) 9** **(d) 5**

Sol. (b) 16 1

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8. If PA and PB are tangents to a circle with centre O such that $\angle APB = 70°$, then $\angle AOB$ is

(a) 140° **(b) 110°** **(c) 35°** **(d) 70°**

Sol. (b) 110° 1

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9. If α and β are the zeroes of the polynomial $3x^2 + 4x - 3$, then value of $\alpha\beta$ is

(a) 1 **(b) $\frac{4}{3}$** **(c) $-\frac{4}{3}$** **(d) –1**

Sol. (d) –1 1

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10. Distance of the point $(a \cos \theta, a \sin \theta)$ from origin is:

(a) a **(b) a^2** **(c) ±a** **(d) 1**

Sol. (a) a 1

In Question numbers 11 to 15, fill in the blanks:

11. The value of $(\tan 27^o - \cot 63^o)$ is ________.

Sol. 0 1

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12. If ratio of the corresponding sides of two similar triangles is 2:3, then ratio of their perimeters is _________.

Sol. 2 : 3 1

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13. The value of k for which system of equations $x + 2y = 3$ and $5x + ky = 7$ has no solution is ________.

Sol. k = 10 1

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14. Distance between (a, –b) and (a, b) is ________.

Sol. 2b units 1

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15. The value of ($\sec^2 20° - \cot^2 70°$) is ________.

Sol. 1 — 1

Answer the following questions, Question numbers 16 to 20.

16. The perimeter of a sector of a circle of radius 14 cm is 68 cm. Find the area of the sector.

Sol. $l = 68 - 28 = 40$ cm — $\frac{1}{2}$

$A = 280 \text{ cm}^2$ — $\frac{1}{2}$

OR

The circumference of a circle is 39.6 cm. Find its area.

Sol. $r = \frac{39.6}{2\pi}$ — $\frac{1}{2}$

$A = \frac{392.04}{\pi} \text{ or } 124.74 \text{ cm}^2$ — $\frac{1}{2}$

17. If $\sec\theta = \frac{25}{7}$, then find the value of $\cot\theta$.

Sol. $\tan\theta = \frac{24}{7} \Rightarrow \cot\theta = \frac{7}{24}$ — $\frac{1}{2}+\frac{1}{2}$

OR

If $3\tan\theta = 4$, then find the value of $\left(\frac{3\sin\theta + 2\cos\theta}{3\sin\theta - 2\cos\theta}\right)$

Sol. Given expression $= \frac{3\times\frac{4}{3}+2}{3\times\frac{4}{3}-2} = 3$ — $\frac{1}{2}+\frac{1}{2}$

18. If 3y – 1, 3y + 5 and 5y + 1 are three consecutive terms of an A.P., then find the value of y.

Sol. $2(3y + 5) = 3y - 1 + 5y + 1$ — $\frac{1}{2}$

$y = 5$ — $\frac{1}{2}$

19. In Fig. 1, DE || BC, AD = 3 cm and BD = 2 cm;

Find $\frac{ar(\Delta ADE)}{ar(\Delta ABC)}$

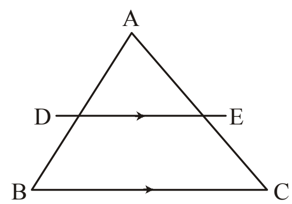

Fig. 1

Sol. AB = 3 + 2 = 5 cm $\frac{1}{2}$

$$\frac{ar(ADE)}{ar(ABC)} = \left(\frac{3}{5}\right)^2 = \frac{9}{25}$$ $\frac{1}{2}$

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20. A bag contains 4 red, 5 white and 6 green balls. A ball is drawn at random from the bag. Find the probability of getting not a red ball.

Sol. Total No. of balls = 15 $\frac{1}{2}$

P(Not a red ball) = $\frac{11}{15}$ $\frac{1}{2}$

SECTION B

Question numbers 21 to 26 carry 2 marks each.

21. Prove that: $\sqrt{\sec^2\theta + \text{cosec}^2\theta} = \tan\theta + \cot\theta$

Sol. LHS = $\sqrt{\sec^2\theta + \text{cosec}^2\theta} = \sqrt{1 + \tan^2\theta + 1 + \cot^2\theta}$ 1

$= \sqrt{\tan^2\theta + \cot^2\theta + 2}$

$= \sqrt{\tan^2\theta + \cot^2\theta + 2\tan\theta\cot\theta}$

$= \sqrt{(\tan\theta + \cot\theta)^2}$ $\frac{1}{2}$

$= \tan\theta + \cot\theta$ = RHS $\frac{1}{2}$

OR

Prove that: $\dfrac{\sin\theta}{1-\cos\theta} = (\text{cosec}\ \theta + \cot\ \theta)$

Sol. $\text{LHS} = \dfrac{\sin\theta}{1-\cos\theta} \times \dfrac{1+\cos\theta}{1+\cos\theta}$ 1

$= \dfrac{\sin\theta\,(1+\cos\theta)}{1-\cos^2\theta}$ $\frac{1}{2}$

$= \dfrac{\sin\theta\,(1+\cos\theta)}{\sin^2\theta} = \dfrac{1}{\sin\theta} + \dfrac{\cos\theta}{\sin\theta}$

$= \text{cosec}\ \theta + \cot\ \theta = \text{RHS}$ $\frac{1}{2}$

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22. A bag contains 5 red, 8 white and 7 black balls. A ball is drawn at random from the bag. Find the probability that the drawn ball is

(i) red or white

(ii) not a white ball

Sol. Total no. of balls = 20

(i) P(ball is red or white) = $\dfrac{13}{20}$ 1

(ii) P(Not a white ball) = $\dfrac{12}{20}$ or $\dfrac{3}{5}$ 1

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23. Find the values of p for which the quadratic equation $x^2 - 2px + 1 = 0$ has no real roots.

Sol. For no real roots

$D < 0$

$(-2p)^2 - 4 \times 1 \times 1 < 0$ 1

$p^2 - 1 < 0$ $\frac{1}{2}$

$-1 < p < 1$ $\frac{1}{2}$

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24. Two dice are thrown at the same time. Find the probability of getting different numbers on the two dice.

Sol. Total number of outcomes = 36 $\frac{1}{2}$

Favourable numbers of outcomes = 30 $\frac{1}{2}$

Probability = $\dfrac{30}{36}$ or $\dfrac{5}{6}$ 1

(Both numbers are different)

OR

Two dice are thrown at the same time. Find the probability that the sum of the two numbers appearing on the top of the dice is more than 9.

Sol. Favourable outcomes (5, 5), (4, 6), (6, 4), (6, 5), (5, 6), (6, 6)

Total number of outcomes = 36 $\frac{1}{2}$

Number of favourable outcomes = 6 $\frac{1}{2}$

Required probability = $\frac{6}{36}$ or $\frac{1}{6}$ 1

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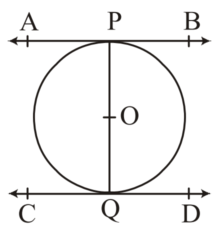
25. Prove that the tangents drawn at the ends of a diameter of a circle are parallel.

Sol.



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

$\left.\begin{array}{l}\angle OPA = 90° \\ \angle OQD = 90°\end{array}\right\}$ $\left\{\text{radius is perpendicular to tan gent}\right\}$ 1

But they are forming alternate interior angle

$\Rightarrow$ AB || CD $\frac{1}{2}$

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26. In Fig. 2, OACB is a quadrant of a circle with Centre O and radius 7 cm. If OD = 4 cm, find the area of the shaded region.

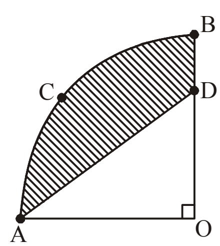

Fig. 2

Sol. Area of shaded region = $\frac{1}{4}\pi(7)^2 - \frac{1}{2}\times 7\times 4$ 1

$= \left(\frac{49}{4}\pi - 14\right)\text{cm}^2$ $\frac{1}{2}$

$= 24.5\ \text{cm}^2$ $\frac{1}{2}$

SECTION C

Question numbers 27 to 34 carry 3 marks each.

27. A number consists of two digits whose sum is 10. If 18 is subtracted from the number, its digit are reversed. Find the number.

Sol. Let two digit number = 10x + y $\frac{1}{2}$

$x + y = 10 \quad ...(i)$ $\frac{1}{2}$

$10x + y - 18 = 10y + x$

$\Rightarrow x - y = 2 \quad ...(ii)$ 1

On solving (i) & (ii) x = 6, y = 4 $\frac{1}{2}$

$\therefore$ Required number = 64 $\frac{1}{2}$

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28. If 1 and –2 are the zeroes of the polynomial $(x^3 - 4x^2 - 7x + 10)$, find its third zero.

Sol. The two factors of polynomials are (x – 1), (x + 2) $\frac{1}{2}$

$(x - 1)(x + 2) = x^2 + x - 2$ $\frac{1}{2}$

$$\frac{x^3 - 4x^2 - 7x + 10}{x^2 + x - 2} = (x - 5)$$ $1\frac{1}{2}$

Third zero = 5 $\frac{1}{2}$

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29. Draw a circle of radius 3 cm. From a point 7 cm away from its centre, construct a pair of tangents to the circle.

Sol. Drawing a circle of radius 3 cm, marking Centre 0 and taking a po int P such that OP = 7 cm 1

Constructing two tangents 2

OR

Draw a line segment of 8 cm and divide it in the ratio 3 : 4.

Drawing a line segment of 8 cm 1

Dividing it in the ratio 3 : 4 2

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30. **In Fig. 3, arrangement of desks in a classroom is shown. Ashima, Bharti and Asha are seated at A, B and C respectively. Answer the following:**

(i) Find whether the girls are sitting in a line.

(ii) If A, B and C are collinear, find the ratio in which point B divides the line segment joining A and C.

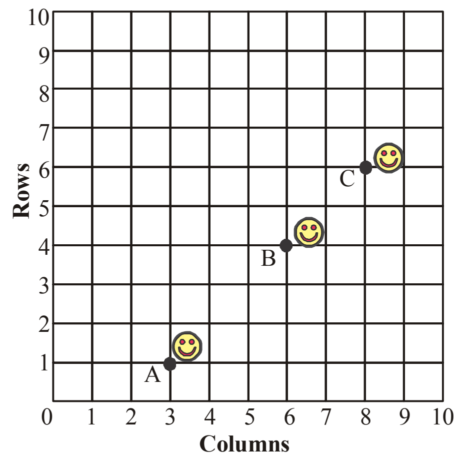

Fig. 3

Sol. Coordinates of A(3, 1)

B(6, 4)

C(8, 6) 1

(i) Area of (ΔABC) $= \frac{1}{2}[3(4-6)+6(6-1)+8(1-4)]$ $\frac{1}{2}$

$= 0$

Yes they are sitting in same line $\frac{1}{2}$

(ii) Let AB : BC = k : 1

$6 = \frac{8k+3}{k+1}$ $\frac{1}{2}$

$k = \frac{3}{2}$ or Ratio $= 3:2$ $\frac{1}{2}$

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31. **Prove that** $\frac{\cos\theta}{(1-\tan\theta)} + \frac{\sin\theta}{(1-\cot\theta)} = (\cos\theta + \sin\theta)$

Sol. LHS $= \frac{\cos\theta}{1-\tan\theta} + \frac{\sin\theta}{1-\cot\theta}$

$= \dfrac{\cos^2\theta}{\cos\theta - \sin\theta} + \dfrac{\sin^2\theta}{\sin\theta - \cos\theta}$ 1

$= \dfrac{\cos^2\theta - \sin^2\theta}{\cos\theta - \sin\theta}$ 1

$= \cos\theta + \sin\theta =$ RHS 1

OR

Prove that $(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$.

Sol. $(\sin\theta + \operatorname{cosec}\theta) + (\cos\theta + \sec\theta)^2$

$= \sin^2\theta + \operatorname{cosec}^2\theta + 2 + \cos^2\theta + \sec^2\theta + 2$ $\frac{1}{2}+\frac{1}{2}$

$= \sin^2\theta + 1 + \cot^2\theta + 2 + \cos^2\theta + 1 + \tan^2\theta + 2$ $\frac{1}{2}+\frac{1}{2}$

$= 7 + \tan^2\theta + \cot^2\theta$ 1

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32. If $\sqrt{2}$ is given as an irrational number, then prove that $(7 - 2\sqrt{2})$ is an irrational number.

Sol. Let $7 - 2\sqrt{2} = m$, where m is a rational number $\frac{1}{2}$

$\sqrt{2} = \dfrac{7 - m}{2}$ 1

Irrational = Rational 1

$\Rightarrow$ LHS $\neq$ RHS

It means out assumption is wrong.

Hence, $7 - 2\sqrt{2}$ is irrational $\frac{1}{2}$

OR

Find HCF of 44, 96 and 404 by prime factorization method. Hence find their LCM.

Sol.

$44 = 2^2 \times 11$

$96 = 2^5 \times 3$

$404 = 2^2 \times 101$ $1\frac{1}{2}$

HCF $= 2^2 = 4$ $\frac{1}{2}$

LCM $= 2^5 \times 11 \times 3 \times 101$

$= 106656$ 1

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33. A 20 m deep well with diameter 7 m is dug and the earth from digging is evenly spread out to form a platform 22 m × 14 m. Find the height of the platform.

Sol. Let height of platform be h m

$\therefore \quad \pi\left(\frac{7}{2}\right)^2 \times 20 = 22 \times 14 \times h$ 2

$\Rightarrow \quad h = \frac{35}{44}\pi$ 1

OR

h = 2.5 m

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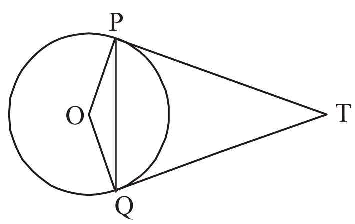
34. Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that ∠PTQ = 2 ∠OPQ.

Sol.



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

$\angle OPQ + \angle QPT = 90°$ ...(i) 1

$\angle PTQ = 180° - 2\angle QPT$ ...(ii) 1

By (i) & (ii)

$\angle PTQ = 180° - 2(90° - \angle OPQ)$

$\angle PTQ = 2\angle OPQ$ $\frac{1}{2}$

SECTION D

Question Nos. 35 to 40 carry 4 marks each.

35. In a right triangle, prove that the square of the hypotenuse is equal to sum of squares of the other two sides.

Sol. For correct given, to prove, construction and figure $4\times\frac{1}{2}=2$

For correct proof 2

OR

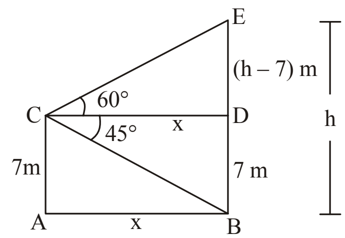
Prove that the tangents drawn from an external point to a circle are equal in length.

Sol. For correct given, to prove, construction and figure $4\times\frac{1}{2}=2$

For correct proof 2

36. **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°. Find the height of the tower. Given that $\sqrt{3}$ = 1.732.**

Sol.



Correct figure 1

$\tan 45° = \frac{7}{x}$

$\Rightarrow x = 7$ m ...(i) 1

$\tan 60° = \frac{h-7}{x}$

$x\sqrt{3} = h - 7$ ....(ii) 1

Solving (i) and (ii), $h = 7(\sqrt{3}+1)$

$= 7 \times 2.732$

$= 19.124$ m 1

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37. **The sum of first 6 terms of an A.P. is 42. The ratio of its 10th term to 30th term is 1:3. Find the first and the 13th term of the A.P.**

Sol. Here, $\frac{6}{2}(2a+5d) = 42$

$\Rightarrow 2a + 5d = 14$ ...(i) 1

Also,

$\frac{a+9d}{a+29d} = \frac{1}{3}$ ...(ii) 1

$\Rightarrow a = d$ $\frac{1}{2}$

Solving (i) and (ii), $7a = 14$ $\frac{1}{2}$

$\Rightarrow a = 2$

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

$a_{13} = a + 12d = 26$ $\frac{1}{2}$

OR

Find the sum of all odd numbers between 100 and 300.

Sol. Odd number between 100 to 300 are 1

101, 103 ... 299

299 = 101 + (n – 1)2

$\Rightarrow$ n = 100 1

$S_n = \frac{100}{2}(101+299)$ 1

= 20,000 1

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38. A hemispherical depression is cut out from one face of a cubical wooden block of edge 21 cm, such that the diameter of the hemisphere is equal to edge of the cube. Determine the volume of the remaining block.

Sol. Let r be the radius of hemisphere $\therefore\ r = \frac{21}{2}$ cm $\frac{1}{2}$

Volume of remaining block = $a^3 - \frac{2}{3}\pi r^3$

$= (21)^3 - \frac{2}{3}\pi \times \frac{21}{2} \times \frac{21}{2} \times \frac{21}{2}$ 2

$= 9261\left[1 - \frac{\pi}{12}\right]\text{cm}^3$ 1

= 6853 cm^3 (Approx.) $\frac{1}{2}$

OR

A solid metallic cylinder of diameter 12 cm and height 15 cm is melted and recast into 12 toys in the shape of a right circular cone mounted on a hemisphere of same radius. Find the radius of the hemisphere and total height of the toy, if the height of the cone is 3 times the radius.

Sol. Here, r = 6 cm

$\pi(6)^2 \times 15 = 12\left[\frac{1}{3}\pi r^2 \times 3r + \frac{2}{3}\pi r^3\right]$ 2

$36 \times 15 = \frac{12}{3}[3r^3 + 2r^3]$ $\frac{1}{2}$

$9 \times 15 = 5r^3$

r = 3 cm $\frac{1}{2}$

Total height = 12 cm 1

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39. The difference of the squares of two numbers is 180. The square of the smaller number is 8 times the larger number. Find the two numbers.

Sol. Let the numbers are x, y (x > y)

$x^2 - y^2 = 180$ 1

$y^2 = 8x$ 1

On solving $x^2 - 8x - 180 = 0$ $\frac{1}{2}$

$(x - 1)(x + 10) = 0$

$x = 18, -10$ (rejected) $\frac{1}{2}$

Numbers are 18, 12 or 18, –12 $\frac{1}{2}+\frac{1}{2}$

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40. Find the mean of the following frequency distribution :

Classes	**5 – 15**	**15 – 25**	**25 – 35**	**35 – 45**	**45 – 55**	**55 – 65**
Frequency	**6**	**11**	**21**	**23**	**14**	**5**

Sol.

CI	f_i	x_i	d_i	u_i	f_iu_i
5-15	6	10	–20	–2	–12
15-25	11	20	–10	–1	–11
25-35	21	30	0	0	0
35-45	23	40	10	1	23
45-55	14	50	20	2	28
55-65	5	60	30	3	15
Total	80				43

Correct Table 2

$$\text{Mean} = A + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$$

$$= 30 + \frac{43}{80} \times 10$$ 1

$$= 35.375$$ 1