QUESTION PAPER CODE 30/3/3

EXPECTED ANSWER/VALUE POINTS

SECTION A

1. PQ = 5 cm $\frac{1}{2}$

$\tan\theta = \frac{PQ}{PR} = \frac{5}{9}$ $\frac{1}{2}$

OR

$\sec\alpha = \sqrt{1+\tan^2\alpha}$ $\frac{1}{2}$

$= \sqrt{1+\frac{25}{144}} = \frac{13}{12}$ $\frac{1}{2}$

2. Length of chord = $2\sqrt{a^2 - b^2}$ 1

3. AB = 5

$\Rightarrow \sqrt{(x-0)^2 + (-4-0)^2} = 5$ $\frac{1}{2}$

$x^2 + 16 = 25$

$x = \pm 3$ $\frac{1}{2}$

4. $\frac{27}{2^3 \cdot 5^4 \cdot 3^2} = \frac{3}{2^3 \cdot 5^4}$ $\frac{1}{2}$

It will terminate after 4 decimal places $\frac{1}{2}$

OR

$429 = 3 \times 11 \times 13$ 1

5. $(x + 5)^2 = 2(5x - 3) \Rightarrow x^2 + 31 = 10$ $\frac{1}{2}$

$D = -124$ $\frac{1}{2}$

6. $S_{10} = \frac{10}{2}[2\times 3 + 9\times 3]$ $\frac{1}{2}$

$= 5 \times 33 = 165$ $\frac{1}{2}$

SECTION B

7. HCF (65, 117) = 13 — 1

13 = 65n − 117 — $\frac{1}{2}$

Solving, we get, n = 2 — $\frac{1}{2}$

OR

Required minimum distance = LCM (30, 36, 40) — 1

$30 = 2 \times 3 \times 5$ $= 2^3 \times 3^2 \times 5$

$36 = 2^2 \times 3^2$ $= 360$ cm — 1

$40 = 2^3 \times 5$

8. Composite numbers on a die are 4 and 6

$\therefore$ P (composite number) = $\frac{2}{6}$ or $\frac{1}{3}$ — 1

Prime numbers are 2, 3 and 5

$\therefore$ P(prime number) = $\frac{3}{6}$ or $\frac{1}{2}$ — 1

9. $x^2 - 8x + 18 = 0$

$x^2 - 8x + 16 + 2 = 0$ — 1

$(x - 4)^2 = -2$ — $\frac{1}{2}$

Square of a number can't be negative

$\therefore$ The equation has no solution. — $\frac{1}{2}$

10. Total number of possible outcomes = 34 — $\frac{1}{2}$

Favourable number of outcomes is (7, 14, 21, 28 and 35) = 5 — 1

P(multiple of 7) = $\frac{5}{34}$ — $\frac{1}{2}$

11. $3x + 4y = 10 \quad \Rightarrow 3x + 4y = 10$

$2x - 2y = 2 \quad \Rightarrow 4x - 4y = 10$

On solving, $7x = 14 \quad \therefore\ x = 2$ 1

So, $y = 1$ 1

Solution is (2, 1)

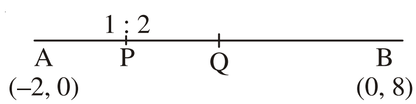
12. Diagonals of parallelogram bisect each other

$$\therefore \quad \left(\frac{3+a}{2}, \frac{1+b}{2}\right) = \left(\frac{5+4}{2}, \frac{1+3}{2}\right)$$ 1

$3 + a = 9,\ 1 + b = 4$

So $a = 6,\ b = 3$ $\frac{1}{2}+\frac{1}{2}$

OR



P divides AB in the ratio 1 : 2

$$\therefore \text{ Coordinates of P are } \left(\frac{0-4}{3}, \frac{8+0}{2}\right) = \left(\frac{-4}{3}, \frac{8}{3}\right)$$ 1

Q divides AB in the ratio 2 : 1

$$\therefore \text{ Coordinates of Q are } \left(\frac{0-2}{3}, \frac{16+0}{3}\right) = \left(\frac{-2}{3}, \frac{16}{3}\right)$$ 1

SECTION C

13.

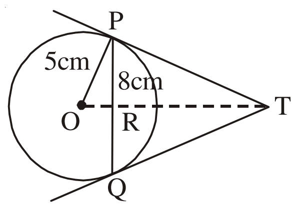
Number of days	Number of students (fi)	x_i	$f_i x_i$
0-6	10	3	30
6-12	11	9	99
12-18	7	15	105
18-24	4	21	84
24-30	4	27	108
30-36	3	33	99
36-42	1	39	39
Total	40		564

Correct Table 2

$$\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{564}{40}$$

$= 14.1$ 1

14. Let TR be x cm and TP be y cm



OT is $\perp$ bisector of PQ

So PR = 4 cm

In ΔOPR, $OP^2 = PR^2 + OR^2$

$\therefore$ OR = 3 cm 1

In ΔPRT, $y^2 = x^2 + 4^2$ ...(1) $\frac{1}{2}$

In ΔOPT, $(x + 3)^2 = 5^2 + y^2$ $\frac{1}{2}$

$\therefore$ $(x + 3)^2 = 5^2 + x^2 + 16$ [using (1)]

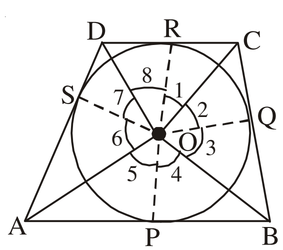
Solving we get $x = \frac{16}{3}$ cm $\frac{1}{2}$

From (1), $y^2 = \frac{256}{9} + 16 = \frac{400}{9}$

So $y = \frac{20}{3}$ cm $\frac{1}{2}$

OR

$\Delta ROC \cong \Delta QOC$ $\frac{1}{2}$



$\therefore \angle 1 = \angle 2$

Similarly $\angle 4 = \angle 3$

$\angle 5 = \angle 6$

$\angle 8 = \angle 7$ 1

$\angle ROQ + \angle QOP + \angle POS + \angle SOR = 360°$ $\frac{1}{2}$

$\therefore 2\angle 1 + 2\angle 4 + 2\angle 5 + 2\angle 8 = 360$

$\Rightarrow \angle 1 + \angle 4 + \angle 5 + \angle 8 = 180°$

So, $\angle DOC + \angle AOB = 180°$

and $\angle AOD + \angle BOC = 180°$. 1

15. A, B, C are interior angles of ΔABC

$\therefore$ $A + B + C = 180°$ $\frac{1}{2}$

(i) $\sin\left(\frac{B+C}{2}\right) = \sin\left(\frac{180° - A}{2}\right)$

$= \sin\left(90° - \frac{A}{2}\right)$

$= \cos\frac{A}{2}$ $1\frac{1}{2}$

(ii) $\tan\left(\frac{B+C}{2}\right) = \tan\left(\frac{90°}{2}\right)$ $(\because \angle A = 90°)$

$= \tan 45°$ 1

$= 1$

OR

$\tan(A + B) = 1 \therefore A + B = 45°$ 1

$\tan(A - B) = \frac{1}{\sqrt{3}} \therefore A - B = 30°$ 1

Solving, we get $\angle A = 37\frac{1°}{2}$ or $37.5°$ $\frac{1}{2}$

$\angle B = 7\frac{1°}{2}$ or $7.5°$ $\frac{1}{2}$

16. Let us assume that $\sqrt{3}$ be a rational number

$\sqrt{3} = \frac{p}{q}$ where p and q are co-primes and $q \neq 0$ $\frac{1}{2}$

$\Rightarrow$ $p^2 = 3q^2$ ...(1)

$\therefore$ 3 divides p^2

i.e., 3 divides p also ...(2)

Let p = 3m, for some integer m 1

From (1), $9m^2 = 3q^2$

$\Rightarrow$ $q^2 = 3m^2$

$\therefore$ 3 divides q^2 i.e., 3 divides q also ...(3) 1

From (2) and (3), we get that 3 divides p and q both which is a contradiction to the fact that p and q are co-primes. $\frac{1}{2}$

Hence our assumption is wrong $\therefore \sqrt{3}$ is irrational

OR

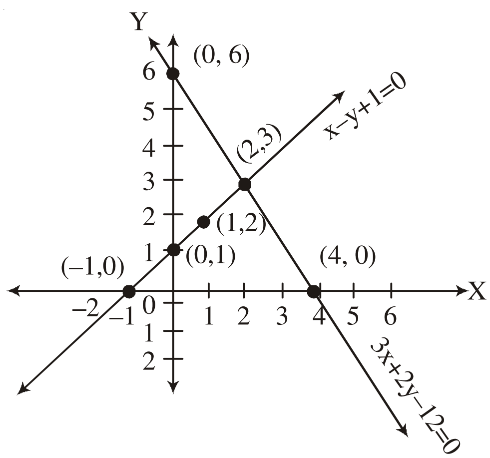
$1251 - 1 = 1250,\ 9377 - 2 = 9375,\ 15628 - 3 = 15625$ 1

Required largest number = HCF (1250, 9375, 15625)

$$\left.\begin{aligned} 1250 &= 2 \times 5^4 \\ 9375 &= 3 \times 5^4 \\ 6250 &= 2 \times 5^5 \end{aligned}\right\}$$ $1\frac{1}{2}$

$\therefore$ HCF (1250, 9375, 15625) $= 5^4 = 625$ $\frac{1}{2}$

17. Correct graph 2



Solution is

$x = 2,\ y = 3$ $\frac{1}{2} + \frac{1}{2}$

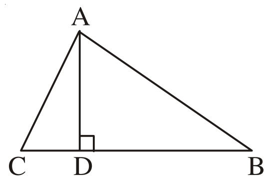
18. Volume of water flowing through canal in 30 minutes

$= 5000 \times 6 \times 1.5 = 45000\ m^3$ $1\frac{1}{2}$

$\text{Area} = 45000 \div \frac{8}{100}$

$= 562500\ m^2$ $1\frac{1}{2}$

19. $AB^2 = AD^2 + BD^2$ Correct Figure $\frac{1}{2}$



$AC^2 = AD^2 + CD^2$ 1

$AB^2 - AC^2 = BD^2 - CD^2$

$= (3CD)^2 - CD^2$

$= 8\ CD^2$ 1

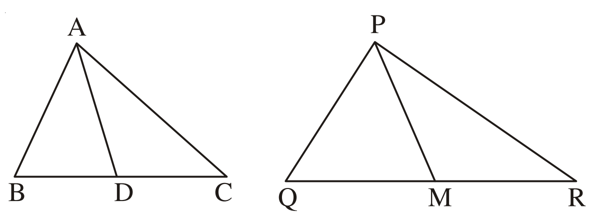
$= 8 \times \left(\frac{1}{4}BC\right)^2$

$\Rightarrow 2AB^2 - 2AC^2 = BC^2$

or $2AB^2 = 2AC^2 + BC^2$ $\frac{1}{2}$

OR

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



$\Delta ABC \sim \Delta PQR$

$\therefore \frac{AB}{PQ} = \frac{BC}{QR} = \frac{AC}{PR}$ $\frac{1}{2}$

$\frac{AB}{PQ} = \frac{2BD}{2QM}$ or $\frac{BD}{QM}$ 1

Also $\angle B = \angle Q$

$\therefore \Delta ABD \sim \Delta PQM$ $\frac{1}{2}$

So $\frac{AB}{PQ} = \frac{AD}{PM}$ $\frac{1}{2}$

20. Area of minor segment $= \frac{\pi r^2 \theta}{360°} - \frac{\sqrt{3}}{4} r^2$ 1

$= 14 \times 14 \left[\frac{22}{7} \times \frac{60°}{360°} - \frac{1.73}{4} \right] cm^2$ 1

$= \frac{14 \times 14}{84} (44 - 36.33)\ cm^2$

$= 17.90\ cm^2$ (approx.) 1

21. $\frac{1}{2}[(k+1)(-3+k) + 4(-k-1) + 7(1+3)] = 6$ 1

$\frac{1}{2}(k^2 - 6k + 21) = 6$ 1

$\Rightarrow \quad k^2 - 6k + 9 = 0$

$(k - 3)^2 = 0$

$\therefore \quad k = 3$ 1

22. $ax^2 + 7x + b$

Sum of zeroes $= \frac{-7}{a} = \frac{-7}{3}$ $1\frac{1}{2}$

$\therefore \quad a = 3$

Product of zeroes $= \frac{b}{a} = -2$

$\therefore \quad b = -6.$ $1\frac{1}{2}$

SECTION D

23.

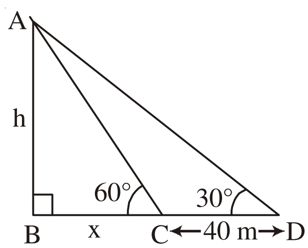
Class interval	**Cumulative Frequency**
More than or equal to 20	100
More than or equal to 30	90
More than or equal to 40	82
More than or equal to 50	70
More than or equal to 60	46
More than or equal to 70	40
More than or equal to 80	15

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

Plotting of points (20, 100), (30, 90), (40, 82), (50, 70), (60, 46), (70, 40) and (80, 15) $1\frac{1}{2}$

Joining the points to get a curve 1

24. Correct Figure 1



Let AB = h be the height of tower

In ΔABC, $\frac{h}{x} = \tan 60°$

$h = x\sqrt{3}$ 1

In ΔABD, $\frac{h}{x+40} = \tan 30°$

$\Rightarrow h\sqrt{3} = x + 40$ $\frac{1}{2}$

$3x = x + 40$

$\therefore x = 20$ $\frac{1}{2}$

So, height of tower $= h = 20\sqrt{3}$ m $\frac{1}{2}$

$= 20 \times 1.732$ m

$= 34.64$ m $\frac{1}{2}$

25. Correct figure, given, to prove and construction $\frac{1}{2}\times 4=2$

Correct proof. 2

OR

Correct figure, given, to prove and construction $\frac{1}{2}\times 4=2$

Correct proof. 2

26. $ma_m = na_n$

$\Rightarrow$ $ma + m(m-1)d = na + n(n-1)d$ 1

$\Rightarrow$ $(m-n)a + (m^2 - m - n^2 + n)d = 0$ 1

$(m-n)a + [(m-n)(m+n) - (m-n)d] = 0$ 1

Dividing by $(m-n)$

So, $a + (m+n-1)d = 0$

or $a_{m+n} = 0$ 1

OR

Let first three terms be $a - d$, a and $a + d$ $\frac{1}{2}$

$a - d + a + a + d = 18$

So $a = 6$ $\frac{1}{2}$

$(a-d)(a+d) = 5d$

$\Rightarrow$ $6^2 - d^2 = 5d$ 1

or $d^2 + 5d - 36 = 0$

$(d+9)(d-4) = 0$

so $d = -9$ or 4 1

For $d = -9$ three numbers are 15, 6 and -3 $\frac{1}{2}$

For $d = 4$ three numbers are 2, 6 and 10 $\frac{1}{2}$

27. (a) Total surface area of block

= TSA of cube + CSA of hemisphere – Base area of hemisphere 1

$= 6a^2 + 2\pi r^2 - \pi r^2$

$= 6a^2 + \pi r^2$

$= \left(6 \times 6^2 + \frac{22}{7} \times 2.1 \times 2.1\right) \text{cm}^2$ $\frac{1}{2}$

$= (216 + 13.86)\ \text{cm}^2$

$= 229.86\ \text{cm}^2$ $\frac{1}{2}$

(b) Volume of block

$$= 6^3 + \frac{2}{3} \times \frac{22}{7} \times (2.1)^3$$ 1

$= (216 + 19.40)$ cm^3

$= 235.40$ cm^3 1

OR

Volume of frustum = 12308.8 cm^3

$$\therefore \quad \frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2) = 12308.8$$

$$\Rightarrow \quad \frac{1}{3} \times 3.14 \times h(20^2 + 12^2 + 20 \times 12) = 12308.8$$ 1

$$h = \frac{12308.8 \times 3}{784 \times 3.14}$$

$h = 15$ cm 1

$$l = \sqrt{15^2 + (20-12)^2} = 17 \text{ cm.}$$ 1

Area of metal sheet used $= \pi l\,(r_1 + r_2) + \pi r_2^2$

$= 3.14[17 \times 32 + 12^2]$

$= 3.14 \times 688$ cm^2

$= 2160.32$ cm^2 1

28. Correct construction of given triangle 2

Correct construction of triangle similar to given triangle 2

29. $$\text{LHS} = \frac{\tan^3\theta}{1+\tan^2\theta} + \frac{\cot^3\theta}{1+\cot^2\theta}$$

$$= \frac{\dfrac{\sin^3\theta}{\cos^3\theta}}{1+\dfrac{\sin^2\theta}{\cos^2\theta}} + \frac{\dfrac{\cos^3\theta}{\sin^3\theta}}{1+\dfrac{\cos^2\theta}{\sin^2\theta}}$$ 1

$$= \frac{\sin^3\theta}{\cos\theta} + \frac{\cos^3\theta}{\sin\theta}$$

$$= \frac{\sin^4\theta + \cos^4\theta}{\cos\theta\sin\theta}$$ 1

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

$$= \frac{1 - 2\sin^2\theta\cos^2\theta}{\cos\theta\sin\theta} = \sec\theta\,\text{cosec}\,\theta - 2\sin\theta\cos\theta$$ 1

= R.H.S.

30. Let speed of stream be x km/hr.

Speed in downstream = (9 + x) km/hr. $\frac{1}{2}$

Speed in upstream = (9 – x) km/hr. $\frac{1}{2}$

$$\frac{15}{9+x} + \frac{15}{9-x} = 3\frac{45}{60} = 3\frac{3}{4}$$ 1

$$\frac{15(9 - x + 9 + x)}{(9+x)(9-x)} = \frac{15}{4}$$

$\Rightarrow$ $72 = 81 - x^2$ 1

$x^2 = 9$

x = 3 or –3 Rejected

$\therefore$ Speed of stream = 3 km/hr 1