QUESTION PAPER CODE 30/1

EXPECTED ANSWER/VALUE POINTS

SECTION A

1. For writing $\frac{6\sqrt{5}+6\sqrt{5}}{2\sqrt{5}}$ $\frac{1}{2}$

$= 6$ which is rational $\frac{1}{2}$

2. Solving for x and y and getting $x = 3, y = 1$ $\frac{1}{2}$

$\therefore \quad a = 3, b = 1$ $\frac{1}{2}$

3. Let α and $\frac{1}{\alpha}$ be the root

$\therefore \quad \alpha \cdot \frac{1}{\alpha} = \frac{k}{5} = 1$ $\frac{1}{2}$

$\Rightarrow \quad k = 5$ $\frac{1}{2}$

4. $\frac{\text{ar}(\Delta ABC)}{\text{ar}(\Delta QRP)} = \left(\frac{BC}{RP}\right)^2$ $\frac{1}{2}$

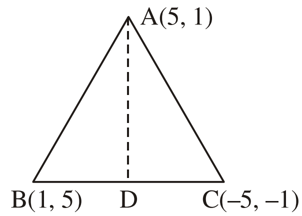
$\Rightarrow \quad \frac{9}{4} = \left(\frac{15}{PR}\right)^2 \Rightarrow PR = 10\text{ cm}$ $\frac{1}{2}$

5. $\frac{a^3}{A^3} = \frac{1}{27}$ $\frac{1}{2}$

$\Rightarrow \quad \frac{a}{A} = \frac{1}{3}$

Ratio of sufrace area $= \frac{6a^2}{6A^2} = \left(\frac{1}{3}\right)^2 = \frac{1}{9}$ $\frac{1}{2}$

6. Coordinates of D are (–1, 2) $\frac{1}{2}$



$$AD = \sqrt{(5+1)^2 + (1+2)^2}$$

$$= \sqrt{37} \text{ units}$$ $\frac{1}{2}$

SECTION B

7. Let $2+\sqrt{3}$ be a rational number.

$\Rightarrow \quad 2+\sqrt{3} = \frac{p}{q}, \quad p, q \in I, q \neq 0$ $\frac{1}{2}$

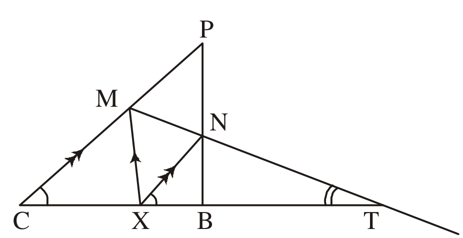
$\Rightarrow \quad \sqrt{3} = \frac{p}{q} - 2 = \frac{p-2q}{q}$ $\frac{1}{2}$

$\frac{p-2q}{q}$ is rational $\Rightarrow \sqrt{3}$ is rational number $\frac{1}{2}$

which is a contraduction

$2+\sqrt{3}$ is irrational number $\frac{1}{2}$

8. $\Delta TXN \sim \Delta TCM$ $\frac{1}{2}$



$$\Rightarrow \quad \frac{TX}{TC} = \frac{XN}{CM} = \frac{TN}{TM}$$

$$\Rightarrow \quad TX \times TM = TC \times TN \qquad ....(i)$$

Again, $\Delta TBN \sim \Delta TXM$ $\frac{1}{2}$

$$\Rightarrow \quad \frac{TB}{TX} = \frac{BN}{XM} = \frac{TN}{TM}$$

$$\Rightarrow \quad TM = \frac{TN \times TX}{TB} \qquad ...(ii)$$ $\frac{1}{2}$

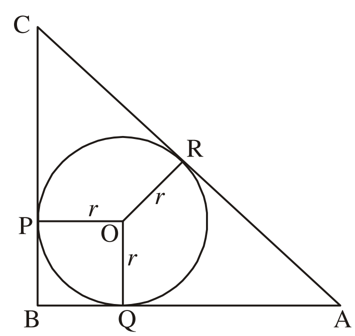
using (*ii*) in (*i*), we get

$$TX^2 \times \frac{TN}{TB} = TC \times TN$$

$$\Rightarrow \quad TX^2 = TC \times TB$$ $\frac{1}{2}$

9. $AC = \sqrt{AB^2 + BC^2}$

$$= \sqrt{14^2 + 48^2} = \sqrt{2500} = 50\,\text{cm}$$ $\frac{1}{2}$



$\angle OQB = 90° \Rightarrow$ OPBQ is a square

$$\Rightarrow \quad BQ = r,\ QA = 14 - r = AR$$ $\frac{1}{2}$

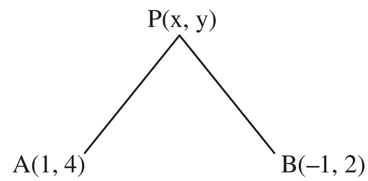
Again PB = r,

$$PC = 48 - r \Rightarrow RC = 48 - r$$ $\frac{1}{2}$

$AR + RC = AC \Rightarrow 14 - r + 48 - r = 50$

$\Rightarrow \quad r = 6 \text{ cm}$ $\frac{1}{2}$

10. $PA = PB \Rightarrow PA^2 = PB^2$



$\Rightarrow \quad (x - 1)^2 + (y - 4)^2 = (x + 1)^2 + (y - 2)^2$ 1

$\Rightarrow \quad x^2 + 1 - 2x + y + 16 - 8y = x^2 + 1 + 2x + y^2 + 4 - 4y$ $\frac{1}{2}$

$\Rightarrow \quad x + y - 3 = 0$ $\frac{1}{2}$

11. $A + B + C = 180°$

$\Rightarrow \quad \frac{A+B}{2} = 90° - \frac{C}{2}$ 1

$\Rightarrow \quad \text{cosec}\left(\frac{A+B}{2}\right) = \text{cosec}\left(90° - \frac{C}{2}\right) = \sec\frac{C}{2}$ 1

12. Let r be the radii of bases of cylinder and cone and h be the height

Slant height of cone $= \sqrt{r^2 + h^2}$ $\frac{1}{2}$

$\therefore \quad \frac{2\pi rh}{\pi r\sqrt{r^2 + h^2}} = \frac{8}{5}$ $\frac{1}{2}$

$\frac{h}{\sqrt{r^2 + h^2}} = \frac{4}{5}$

$\Rightarrow \quad \frac{h^2}{r^2 + h^2} = \frac{16}{25}$

$\Rightarrow \quad 25h^2 = 16r^2 + 16h^2$

$\Rightarrow \quad 9h^2 = 16r^2$ $\frac{1}{2}$

$\Rightarrow \quad \frac{r^2}{h^2} = \frac{9}{16} \Rightarrow \frac{r}{h} = \frac{3}{4}$ $\frac{1}{2}$

SECTION C

13. $867 = 255 \times 3 + 102$ 1

$255 = 102 \times 2 + 51$ 1

$102 = 51 \times 2 + 0$ $\frac{1}{2}$

$\Rightarrow \quad$ HCF = 51 $\frac{1}{2}$

14. Let two parts be x and 27 – x 1

$\therefore \quad \frac{1}{x} + \frac{1}{27 - x} = \frac{3}{20}$ 1

$\Rightarrow \quad x^2 - 27x + 150 = 0$ 1

$\Rightarrow \quad (x - 15)(x - 12) = 0$

$\Rightarrow \quad x = 12$ or 15 1

$\therefore$ The two parts are 12 and 15

15. Here, $S_n = 3n^2 + 5n$

$\Rightarrow \quad S_1 = 3.1^2 + 5.1 = 8 = a_1$ $\frac{1}{2}$

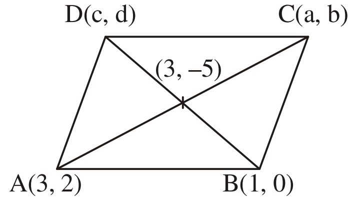
$S_2 = 3.2^2 + 5.2 = 22 = a_1 + a_2$

$a_2 = 22 - 8 = 14 \Rightarrow d = 6$ 1

$t_k = 164 \Rightarrow 8 + (k - 1)6 = 164$ $\frac{1}{2}$

$\Rightarrow \quad k = 27$ 1

16. Let the coordinates of C and D be (a, b) and (c, d)



$\therefore \quad \frac{3+a}{2} = 2 \Rightarrow a = 1$ 1

and $\frac{2+b}{2} = -5 \Rightarrow b = -12$

Also $\frac{c+1}{2} = -5 \Rightarrow c = 3$ 1

and $\frac{d+0}{2} = -5 \Rightarrow d = -10$

$\therefore$ Coordinate of C and D are (1, –12) and (3, –10) 1

OR

Ar (ΔABC) = 4

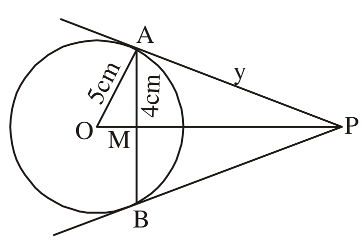
$\Rightarrow \quad \frac{1}{2}[x(4-5) + 4(5-3) + 3(3-4)] = 4$ $1\frac{1}{2}$

$\Rightarrow \quad (-x + 5) = 8$

$\Rightarrow \quad -x + 5 = 8$ 1

$\Rightarrow \quad x = -3$ $\frac{1}{2}$

17. AB = 8 cm $\Rightarrow$ AM = 4 cm



$\therefore$ OM = $\sqrt{5^2 - 4^2} = 3\,\text{cm}$

Let AP = y cm, PM = x cm

$\therefore$ ΔOPP is a right angle triangle

$\therefore$ $OP^2 = OA^2 = AP^2$

$(x + 3)^2 = y^2 + 25$

$\Rightarrow$ $x^2 + 9 + 6x = y^2 + 25$ ...(*i*) 1

Also $x^2 + 4^2 = y^2$ ...(*ii*) 1

$\Rightarrow$ $x^2 + 6x + 9 = x^2 + 16 + 25$

$\Rightarrow$ $6x = 32 \Rightarrow x = \frac{32}{6}$ i.e. $\frac{16}{3}$ cm

$\therefore$ $y^2 = x^2 + 16 = \frac{256}{9} + 16 = \frac{400}{9}$

$\Rightarrow$ $y = \frac{20}{3}$ cm or $6\frac{2}{3}$ cm 1

OR

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

Correct proof 1

18. Construction of ΔABC with sides 6 cm, 8 cm, 4 cm. 1

Construction of similar triangle 2

19. $\frac{1+\tan^2 A}{1+\cot^2 A} = \frac{1+\tan^2 A}{1+\frac{1}{\tan^2 A}} = \tan^2 A$ $1\frac{1}{2}$

$\left(\frac{1-\tan A}{1-\cot A}\right)^2 = \left(\frac{1-\tan A}{\frac{\tan A - 1}{\tan A}}\right)^2 = (-\tan A)^2 = \tan^2 A$ $1\frac{1}{2}$

Hence $\frac{1+\tan^2 A}{1+\cot^2 A} = \left(\frac{1-\tan A}{1-\cot A}\right)^2 = \tan^2 A$

OR

$$\frac{\cos 58°}{\sin 32°} + \frac{\sin 22°}{\cos 68°} - \frac{\cos 38° \text{ cosec } 52°}{\sqrt{3}(\tan 18° \tan 35° \tan 60° \tan 72° \tan 55°)}$$

$$= \left(\frac{\cos 58°}{\sin (90-58°)} + \frac{\sin 22°}{\cos (90-22°)}\right) - \frac{\cos 38° \operatorname{cosec} (90-38)°}{\sqrt{3}(\tan 18° \tan 35° \cdot \sqrt{3} \cdot \cot 18° \cot 35°)}$$ 1+1

$$= 1 + 1 - \frac{\cos 38° \sec 38°}{3.1}$$

$$= 2 - \frac{1}{3} = \frac{5}{3}$$ 1

20. Distance travelled by short hand in 48 hours $= 4 \times 2\pi \times 4$ cm $= 32\pi$ cm 1

Distance travelled by long hand in 48 hours $= 48 \times 2\pi \times 6$cm $= 576\pi$ cm 1

Total distance travelled $= (32\pi + 576\pi)$cm

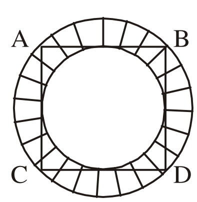
$= 608\pi$ cm 1

OR

Radius of inner circle = 5 cm $\frac{1}{2}$

Radius of outer circle = $5\sqrt{2}$ cm 1

Required area = Area of outer circle – Area of inner circle 1



$\Rightarrow \quad [(5\sqrt{2})^2 - 5^2] = 25\pi \text{ cm}^2$ $\frac{1}{2}$

21. $\sin(A+2B) = \frac{\sqrt{3}}{2} \Rightarrow A+2B = 60°$ 1

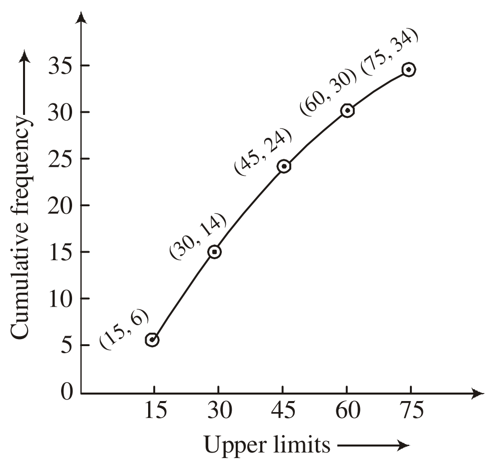
$\cos(A+4B) = \Rightarrow A+4B = 90°$ 1

Solving, we get A = 30°, B = 15° $\frac{1}{2}+\frac{1}{2}$

22.

Classes	Frequency	Classes	Cumulative frequency
0-15	6	Less than 15	6
15-30	8	Less than 30	14
30-45	10	Less than 45	24
45-60	6	Less than 60	30
60-75	4	Less than 75	34

1



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SECTION D

23. For infinitely many solutions.

$$\frac{3}{m+n} = \frac{4}{2(m-n)} = \frac{-12}{-(5m-1)}$$ 1

$$\frac{3}{m+n} = \frac{4}{2(m-n)} \Rightarrow m-5n=0 \quad ...(1)$$ 1

$$\frac{4}{2(m-n)} = \frac{12}{5m-1} \Rightarrow m-6n=-1 \quad ...(2)$$ 1

Solving (1) and (2) we get, m = 5, n = 1 1

24. $p(x) = 3x^4 - 15x^3 + 13x + 25x - 30$

$x - \sqrt{\frac{5}{3}}$ and $x + \sqrt{\frac{5}{3}}$ are factors of p(x)

$\Rightarrow$ $x^2 - \frac{5}{3}$ or $\frac{(3x^2-5)}{3}$ is a factor of p(x) 1

$p(x) = \frac{(3x^2-5)}{3}(x^2 - 5x + 6)$ 2

$= \frac{1}{3}(3x^2-5)(x-3)(x-2)$

$\therefore$ Zeroes of p(x) are $\sqrt{\frac{5}{3}}, -\sqrt{\frac{5}{3}}, 2$ and 3 1

25. Let the speed of faster train be x km/hr

$\therefore$ Speed of slower train = (x – 10) km/hr $\frac{1}{2}$

$\frac{200}{x-10} - \frac{200}{x} = 1$ $1\frac{1}{2}$

$\Rightarrow$ $x^2 - 10x - 2000 = 0$ 1

$\Rightarrow$ $(x-50)(x+40) = 0$ 1

x = 50, – 40 rejected

$\therefore$ Speed of faster train = 50 km / hr
Speed of slower train = 40 km / hr } 1

OR

$\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$

$\Rightarrow$ $\frac{1}{a+b+c} - \frac{1}{x} = \frac{1}{a} + \frac{1}{b}$

$$\frac{-(a+b)}{x(a+b+x)} = \frac{a+b}{ab}$$ 2

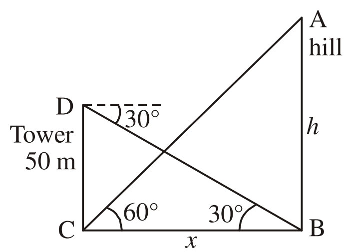
$\Rightarrow$ $x^2 + (a+b)x + ab = 0$ 1

$(x + a)(x + b) = 0 \Rightarrow x = -a, -b$ 1

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

Correct proof 2

27.



Correct figure 1

In ΔABC, $\frac{h}{x} = \tan 60°$

$\Rightarrow$ $h = x\sqrt{3}$ 1

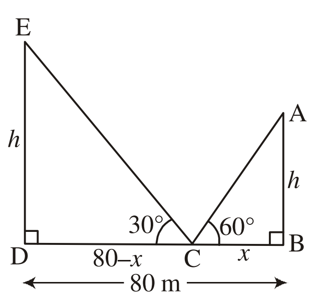
In ΔBCD, $\frac{50}{x} = \tan 30°$

$\Rightarrow$ $x = 50\sqrt{3}$ 1

$\therefore$ $h = 150$

$\therefore$ height of hill = 150 m 1

OR



Correct figure 1

In ΔABC, $\frac{h}{x} = \tan 60°$

$\Rightarrow \quad h = x\sqrt{3} \qquad \text{....(1)}$ 1

In ΔECD, $\frac{h}{80 - x} = \tan 30°$

$\Rightarrow \quad h\sqrt{3} = 80 - x$ 1

From (1), $x\sqrt{3} \times \sqrt{3} = 80 - x$

$\Rightarrow \quad x = 20$

$\therefore \quad h = 20\sqrt{3}$

$\therefore$ height of poles $= 20\sqrt{3}$m 1
Distances of poles from the point are 20 m and 60 m

28. Surface area of bucket $= \pi(r_1 + r_2)l + \pi r_1^2$

$l = \sqrt{h^2 + (r_2 - r_1)^2} = \sqrt{20^2 + (36 - 21)^2}$

$= \sqrt{625} = 25$ cm $\frac{1}{2}$

$\therefore$ Surface area of 1 bucket $= \frac{22}{7}[(36 + 21) \times 25 + 21^2]$

$= \frac{22}{7} \times 1866 \text{ cm}^2$ 1

Surface area of 10 buckets $= \frac{22}{7} \times 18660 \text{ cm}^2$ $\frac{1}{2}$

Cost of aluminium sheet $=$ ₹ $\frac{22}{7} \times \frac{18660 \times 42}{100}$ 1

$=$ ₹ 24631.20

Any relevant comment 1

29.

Classes	**Frequency**	**x_i**	**$f_i x_i$**
10-20	4	15	60
20-30	8	25	200
30-40	10	35	350
40-50	12	45	540
50-60	10	55	550
60-70	4	65	260
70-80	2	75	150
Total	50		2110

2

$$\overline{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{2110}{50} = 42.2$$ 1

40-50 is modal class

$$\text{Mode} = l + \frac{(f_1 - f_0)}{2f_1 - f_0 - f_2} \times h$$

$$= 40 + \frac{12-10}{24-10-10} \times 10 = 45$$ 1

30. (*i*) Prime numbers from 1 to 20 are 2, 3, 5, 7, 11, 13, 17, 19 i.e. 8

$$P(\text{prime number}) = \frac{8}{20} \text{ or } \frac{2}{5}$$ $1\frac{1}{2}$

(*ii*) Composite number from 1 to 20 are

4, 6, 8, 9, 10, 12, 14, 15, 16, 18, 20 i.e. 11

$$P(\text{Composite number}) = \frac{11}{20}$$ $1\frac{1}{2}$

(*iii*) Number divisible by 3 from 1 to 20 are

3, 6, 9, 12, 15, 18 i.e 6

P(number divisible by 3) = $\frac{6}{20}$ or $\frac{3}{10}$ 1

OR

Total number of cards = 52 – 3 = 49

(*i*) P(spade) = $\frac{13}{49}$ 1

(*ii*) P(black king) = $\frac{1}{49}$ 1

(*iii*) P(club) = $\frac{10}{49}$ 1

(*iv*) P(Jack) = $\frac{3}{49}$ 1