

MARKING SCHEME – SET I
SECTION – A

1. a^5b^5 . (1 Mark)
2. Ans : $\frac{5}{2}$ (1 Mark)
3. No. (1 Mark)
4. Ans: $\sqrt{a^2 + b^2}$ (1 Mark)
5. Ans: 7.2 cm (1 Mark)
6. Ans : $A + 25 + B = 90$
 $A + B = 65$ (1 mark)

SECTION – B

7. Ans:
 $11(7 \times 13 + 1)$ (1mark)
Yes, It is expressed as a product of two factors (1mark)

8. Ans:

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}; \frac{3}{2k-1} = \frac{1}{k-1} \neq \frac{1}{2k+1}$	1
$k=2$ and $k \neq -\frac{1}{2} \Rightarrow k=2$	1

- 9.

Sol:
In A.P the first term = a and common difference = d.
Given that 9th term of an A.P. is 0.
Therefore $t_9 = 0$
 $\Rightarrow a + 8d = 0 \Rightarrow a = -8d$ -----(1) 1/2 mark

We have to prove that $t_{29} = 2 t_{19}$.

$t_{19} = a + 18d = -8d + 18d = 10d$ [from (1)] 1/2 mark

$t_{29} = a + 28d = -8d + 28d = 20d$ [from (1)] 1/2 mark

$t_{29} = 2 \times 10d = 2 \times t_{19}$
 $\therefore t_{29} = 2 \times t_{19}$. 1/2 mark

10. Ans:

Let the ratio be k:1
 $3\left(\frac{4k+2}{k+1}\right) + 2\left(\frac{7k+1}{k+1}\right) = 10$ (1mark)

$26k - 10k = 10 - 8$ ($\frac{1}{2}$ mark)

Then the ratio is 1:8 ($\frac{1}{2}$ mark)

11. Ans: The possible outcomes are {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT} $\frac{1}{2}$ mark

- (i) $\frac{1}{8}$ $\frac{1}{2}$ mark
 (ii) $\frac{3}{8}$ $\frac{1}{2}$ mark
 (iii) $\frac{4}{8} = \frac{1}{2}$ $\frac{1}{2}$ mark

12. Ans: Let x be number of green balls

$$p(x) = \frac{2}{3} \quad \frac{1}{2} \text{ mark}$$

$$\frac{x}{24} = \frac{2}{3}, x = 16 \quad 1 \text{ mark}$$

So, number of blue balls = $24 - 16 = 8$. $\frac{1}{2}$ mark

SECTION -C

13.

Suppose that $\sqrt{5}$ is rational

$$\therefore \sqrt{5} = \frac{p}{q}, q \neq 0 \text{ and HCF}(p, q) = 1$$

$$5q^2 = p^2 \quad \text{--- (1)} \quad 1$$

5 is a factor of p^2 , therefore 5 is a factor of p

Now suppose $p = 5 \times m$

$$\text{From (1)} \quad 5q^2 = 25m^2 \quad 1$$

$$q^2 = 5m^2$$

\therefore 5 is a factor of q^2 and therefore 5 is a factor of q

Thus 5 is a common factor of p and q which contradicts to our assumption that HCF(p, q) = 1

Hence $\sqrt{5}$ is irrational 1

14.

$x = 2 \pm \sqrt{3}$ are the zeroes of $p(x)$, so

$x - (2 \pm \sqrt{3})$ are the factors of $p(x)$.

$$\text{Now, } \left\{ x - (2 + \sqrt{3}) \right\} \left\{ x - (2 - \sqrt{3}) \right\}$$

$$= \left\{ (x - 2) - \sqrt{3} \right\} \left\{ (x - 2) + \sqrt{3} \right\}$$

$$= (x - 2)^2 - (\sqrt{3})^2$$

$$= x^2 - 4x + 1 \quad 1 \text{ mark}$$

Dividing $p(x)$ by $x^2 - 4x + 1$

$$\begin{array}{r} x^2 - 2x - 35 \\ x^2 - 4x + 1 \overline{) x^4 - 6x^3 - 26x^2 + 138x - 35} \\ \underline{x^4 - 4x^3 + x^2} \\ -2x^3 - 27x^2 + 138x \\ \underline{-2x^3 + 8x^2 - 2x} \\ + - 136x - 35 \\ \underline{-35x^2 + 140x - 35} \\ -35x^2 + 140x - 35 \\ \underline{+ - 35} \\ 0 \end{array}$$

1 mark

$$x^2 - 2x - 35 = (x - 7)(x + 5)$$

Zeroes are 7, -5, $2 \pm \sqrt{3}$

(1 mark)

15. Ans: The line $y = 4$ ($\frac{1}{2}$ marks)
 The line $2x + y = 6$, points $(0,6)$ and $(3,0)$ (1 marks)
 The vertices are $(0,0), (3,0), (1,4)$ and $(0,4)$ ($\frac{1}{2}$ marks)
 Area = $\frac{1}{2} \times 4(1 + 7) = 16$ square units (1 mark)

16. $AB = \sqrt{34}$ units ($\frac{1}{2}$ marks)
 $BC = \sqrt{34}$ units ($\frac{1}{2}$ marks)
 $CD = \sqrt{34}$ units ($\frac{1}{2}$ marks)
 $DA = \sqrt{34}$ units ($\frac{1}{2}$ marks)
 $AC = \sqrt{68}$ units ($\frac{1}{2}$ marks)
 $BD = \sqrt{68}$ units ($\frac{1}{2}$ marks)

OR

Ans:

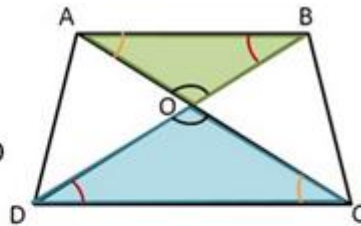
$$(x - 3)^2 + (y - 6)^2 = (x + 3)^2 + (y - 4)^2 \quad 1 \text{ mark}$$

$$x^2 - 6x + 9 + y^2 - 12y + 36 = x^2 + 6x + 9 + y^2 - 8y + 16 \quad 1 \text{ mark}$$

$$3x + y - 5 = 0 \quad 1 \text{ mark}$$

17. Ans:

Given: ABCD is a trapezium with
 $AB \parallel CD$
 and diagonals AB & CD intersecting at O



To prove: $\frac{OA}{OC} = \frac{OB}{OD}$

Proof: In $\triangle OAB$ and $\triangle OCD$

$\angle AOB = \angle DOC$ (Vertically opposite angles) 1 mark

$\angle ABO = \angle CDO$ (since $AB \parallel CD$ with BD as transversal, alternate angle are equal)

$\triangle OAB \sim \triangle OCD$ (AA Similarity) 1 mark

We know that If 2 triangles are similar ,
 their corresponding sides are in proportion

Hence

$$\frac{OA}{OC} = \frac{OB}{OD} \quad 1 \text{ mark}$$

Hence proved

OR

Ans:

In $\triangle ADB$

$$AB^2 = BD^2 + AD^2 \quad (\text{Pythagoras theorem})$$

$$\Rightarrow AD^2 = AB^2 - BD^2 \quad - \quad (1)$$

Also in $\triangle ADC$

$$AC^2 = CD^2 + AD^2 \quad (\text{Pythagoras theorem})$$

$$\Rightarrow AD^2 = AC^2 - CD^2 \quad - \quad (2)$$

From (1) and (2)

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

$$\Rightarrow AB^2 + CD^2 = BD^2 + AC^2$$

1

1

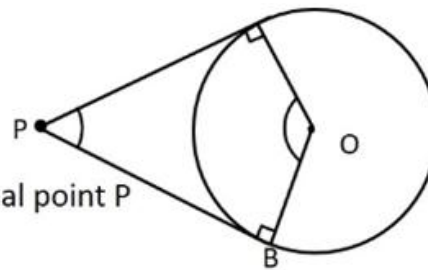
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18.

Given:

A circle with center O.

Tangents PA and PB drawn from external point P



To prove: $\angle APB + \angle AOB = 180^\circ$

Proof:

1/2 mark

Since PA is tangent,

$$OA \perp PA$$

Since PB is tangent,

$$OB \perp PB$$

(Tangent at any point of circle is perpendicular to the radius through point of contact)

$$\therefore \angle OAP = 90^\circ \quad \therefore \angle OBP = 90^\circ \quad 1 \text{ mark}$$

In quadrilateral OAPB

$$\angle OAP + \angle APB + \angle OBP + \angle AOB = 360^\circ \quad (\text{Angle sum property of quadrilateral}) \quad 1/2 \text{ mark}$$

Putting values of angles

$$90^\circ + \angle APB + 90^\circ + \angle AOB = 360^\circ$$

$$180^\circ + \angle APB + \angle AOB = 360^\circ$$

$$\angle APB + \angle AOB = 360^\circ - 180^\circ$$

$$\angle APB + \angle AOB = 180^\circ$$

1/2 mark

Hence proved

19.

$$\begin{aligned}
 m^2 - n^2 &= (m + n)(m - n) \\
 &= [(\tan\theta + \sin\theta) + \tan\theta - \sin\theta] \\
 &\quad [\tan\theta + \sin\theta - \tan\theta + \sin\theta] \\
 &= 2\tan\theta \cdot 2\sin\theta \\
 &= 4\tan\theta \sin\theta \\
 &= 4\sqrt{\tan^2\theta \sin^2\theta} \\
 &= 4\sqrt{(\sec^2\theta - 1)\sin^2\theta} \\
 &= 4\sqrt{\sec^2\theta \sin^2\theta - \sin^2\theta} \\
 &= 4\sqrt{\tan^2\theta - \sin^2\theta} \\
 &= 4\sqrt{mn} \\
 (m^2 - n^2)^2 &= 16mn
 \end{aligned}$$

1
1
1

OR

Ans:

$$\begin{aligned}
 &\frac{2 \cos(90^\circ - 68^\circ)}{\cos 22^\circ} - \frac{2 \tan(90^\circ - 15^\circ)}{5 \tan(90^\circ - 15^\circ)} \\
 &- \frac{3 \times 1 \cot(90^\circ - 20^\circ) \cot(90^\circ - 40^\circ) \tan 50^\circ \tan 70^\circ}{5 \{ \cos^2(90^\circ - 70^\circ) + \sin^2 20^\circ \}} \\
 \Rightarrow &\frac{2 \cos 22^\circ}{\cos 22^\circ} - \frac{2}{5} - \frac{3 \cot 70^\circ \cot 50^\circ \tan 50^\circ \tan 70^\circ}{5(\cos^2 20^\circ + \sin^2 20^\circ)} \\
 \Rightarrow &2 - \frac{2}{5} - \frac{3}{5} \\
 \Rightarrow &\frac{10 - 2 - 3}{5} = \frac{5}{5} = 1
 \end{aligned}$$

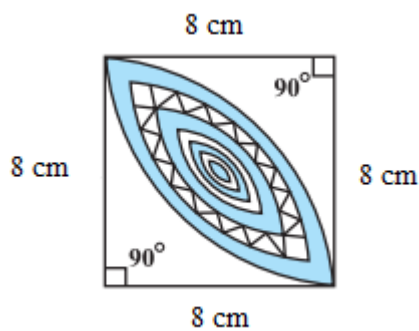
1 mark

1/2 mark

1/2 mark

1 mark

20.



Ans:

$$2(\text{sector area} - \text{triangle area})$$

1 mark

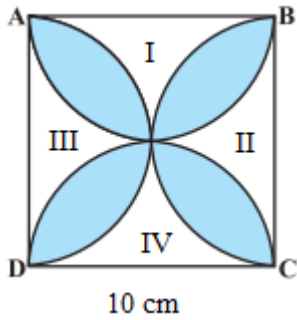
$$2\left(\frac{1}{4} \times \frac{22}{7} \times 8^2 - \frac{1}{2} \times 8 \times 8\right)$$

1 mark

$$\frac{256}{7}$$

1 mark

OR



Ans:

Let us mark the four unshaded regions as I, II, III and IV (see Fig.).

Area of I + Area of III

= Area of ABCD – Areas of two semicircles of each of radius 5 cm 1/2 mark

$$= \left(10 \times 10 - 2 \times \frac{1}{2} \times \pi \times 5^2 \right) \text{cm}^2 = (100 - 3.14 \times 25) \text{cm}^2$$

$$= (100 - 78.5) \text{cm}^2 = 21.5 \text{cm}^2 1 mark$$

Similarly, Area of II + Area of IV = 21.5 cm² 1/2 mark

So, area of the shaded design = Area of ABCD – Area of (I + II + III + IV)

$$= (100 - 2 \times 21.5) \text{cm}^2 = (100 - 43) \text{cm}^2 = 57 \text{cm}^2 1 mark$$

21. Ans:

$$\text{Volume of ice cream cone} = \frac{\text{volume of cylinder}}{\text{Number of ice cream cones}} \quad \left(\frac{1}{2} \text{ marks} \right)$$

$$\frac{1}{3} \pi r^2 h + \frac{2}{3} \pi r^3 = \frac{\pi R^2 H}{10} \quad \frac{1}{2} \text{ marks}$$

$$\frac{1}{3} \pi r^3 (4 + 2) = \frac{\pi R^2 H}{10}$$

$$r^3 = 27$$

$$r = 3 \text{ cm} \quad \left(1 \frac{1}{2} \text{ marks} \right)$$

$$\text{Diameter} = 6 \text{ cm} \quad \left(\frac{1}{2} \text{ marks} \right)$$

22. Ans :

Correct table (1 mark)

Correct graph (1 mark)

Median = 138 (1 mark)

23. Ans:

The time taken to fill a cistern by smaller pipe = x minutes

Work done by smaller pipe in 1 minute = $\frac{1}{x}$

The time taken to fill a cistern by larger pipe = x-3 minutes

Work done by larger pipe in 1 minute = $\frac{1}{x-3}$

The total time taken by both the pipes together to fill the cistern = $3\frac{1}{13} = \frac{40}{13}$ minutes

Work done by both in 1 minute = $\frac{13}{40}$

According to the problem,

$$\frac{1}{x} + \frac{1}{x-3} = \frac{13}{40}$$

1 mark

$$13x^2 - 119x + 120 = 0$$

$\frac{1}{2}$ mark

$$b^2 - 4ac = 7921$$

$$\sqrt{7921} = 89$$

$$x = \frac{-(-119) \pm 89}{26} = 8 \text{ or } \frac{30}{26}$$

1 mark

Rejecting $x = \frac{30}{26}$ (since less than 3)

$\frac{1}{2}$ mark

Hence, the larger pipe takes $8 - 3 = 5$ minutes and smaller pipe takes $x = 8$ minutes (1 mark)

OR

Let the speed of the stream be x km/hr

$$\frac{12}{11-x} + \frac{12}{11+x} = \frac{11}{4}$$

1 mark

$$x^2 - 121 + 96 = 0$$

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

$$x \neq -5, x = 5$$

1 mark

speed of stream = 5 km/h

$\frac{1}{2}$ mark

24. Ans: Number of trees planted by class I = 3

Number of trees planted by class II = $3 \times 2 = 6$

Number of trees planted by class III = $3 \times 3 = 9$

...

Number of trees planted by class XII = $12 \times 3 = 36$

(2 marks)

The number of trees form an A.P

i.e 3,6,9,12,..., 36, $n = 12$

$$S_n = \frac{12}{2}(3 + 36) = 234$$

(1mark)

Hence the total number of trees that will be planted by the students is 234.

(b) Yes. Planting more trees helps in reducing pollution and thus, make environment clean and green.

(1 mark)

25. Ans:

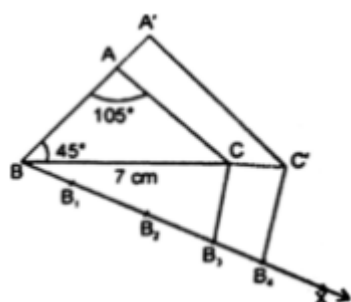
Given, To prove, Diagram, Construction

1 mark

Correct Proof

3 marks

26. Ans:



Construction of triangle ABC
Construction of similar triangle

1 mark
3 marks

27. Ans:

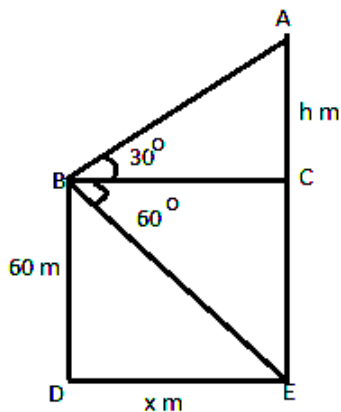
$$\begin{aligned}
 \text{L.H.S.} &= \frac{1}{(\sec \theta - \tan \theta)} - \frac{1}{\cos \theta} \\
 &= \frac{\cos \theta}{(1 - \sin \theta)} - \frac{1}{\cos \theta} \\
 &= \frac{\cos^2 \theta - (1 - \sin \theta)}{(1 - \sin \theta) \cos \theta} \\
 &= \frac{(1 - \sin^2 \theta) - (1 - \sin \theta)}{(1 - \sin \theta) \cos \theta} \\
 &= \frac{(1 - \sin \theta) [1 + \sin \theta - 1]}{(1 - \sin \theta) \cos \theta} = \frac{\sin \theta}{\cos \theta} \\
 &= \tan \theta.
 \end{aligned}$$

2 marks

$$\begin{aligned}
 \text{R.H.S.} &= \frac{1}{\cos \theta} - \frac{1}{(\sec \theta + \tan \theta)} \\
 &= \frac{1}{\cos \theta} - \frac{\cos \theta}{(1 + \sin \theta)} \\
 &= \frac{(1 + \sin \theta) - \cos^2 \theta}{\cos \theta (1 + \sin \theta)} \\
 &= \frac{(1 + \sin \theta) - (1 - \sin^2 \theta)}{\cos \theta (1 + \sin \theta)} \\
 &= \frac{(1 + \sin \theta) [1 - (1 - \sin \theta)]}{\cos \theta (1 + \sin \theta)} \\
 &= \frac{\sin \theta}{\cos \theta}
 \end{aligned}$$

2 marks

28.



Let $BD = 60$ m be the height of the building.

Let A and E be the top and bottom position of the light house.

Let h be the difference of heights of the building and the light house.

Let x be the distance between light house and the building.

Consider the triangle ABC

In $\triangle ABC$, $BC = \sqrt{3}h$ (1 Mark)

In $\triangle BCRE$, $BC = \frac{60}{\sqrt{3}}$ (1 Mark)

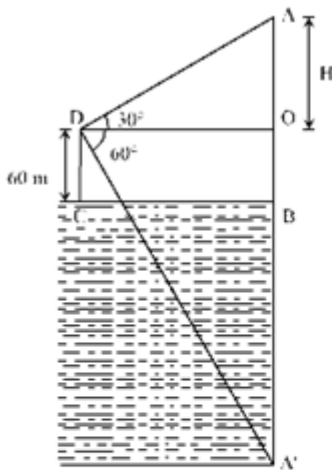
$h = 20$ m (1 Mark)

$BC = 20\sqrt{3}$ m ($\frac{1}{2}$ Marks)

Difference between the height = 20 m

distance between them = $20\sqrt{3}$ $\frac{1}{2}$ marks

OR



Let $AO = H$
 $CD = OB = 60 \text{ m}$
 $A'B = AB = 60 + H$
 In ΔAOD ,
 $\tan 30^\circ = \frac{AO}{OD} = \frac{H}{OD}$

$$H = \frac{OD}{\sqrt{3}}$$

$$OD = \sqrt{3} H \quad \text{1 mark}$$

Now, In $\Delta A'OD$,
 $\tan 60^\circ = \frac{OA'}{OD} = \frac{OB+BA'}{OD}$

$$\sqrt{3} = \frac{60+60+H}{\sqrt{3}H} = \frac{120+H}{\sqrt{3}H} \quad \text{1 mark}$$

$$\Rightarrow 120 + H = 3H$$

$$\Rightarrow 2H = 120$$

$$\Rightarrow H = 60 \text{ m}$$

1 mark

Thus, height of the cloud from the surface of the lake = $AB + A'B = 60 + 60 = 120 \text{ m}$. 1 mark

29. Ans:

$$l = 31.62 \text{ cm} \quad \text{1 mark}$$

$$S.A = 3295.6 \text{ cm}^2 \quad \text{1 mark}$$

$$\text{Volume} = 22000 \text{ cm}^3 \quad \text{1 mark}$$

$$\text{Cost of milk} = \text{Rs: } 550 \quad \text{1 mark}$$

30.

Marks	Frequency	x_i	u_i $= \frac{x_i - 67.5}{5}$	$f_i u_i$
50-55	5	52.5	-3	-15
55-60	8	57.5	-2	-16
60-65	15	62.5	-1	-15
65-70	11	67.5	0	0
70-75	7	72.5	1	7
75-80	4	77.5	2	8
	50			-31

(2 Marks)

$$\bar{u} = \frac{-31}{50}$$

$$\bar{x} = a + h\bar{u} = 64.4$$

(2 Marks)

OR

x_i	Number of Workers	$u_i = \frac{x_i - 45}{10}$	$f_i u_i$
5	5	-4	-20
15	7	-3	-21
25	f_1	-2	$-2f_1$
35	3	-1	-3
45	f_2	0	0
55	9	1	9
65	6	2	12
<i>Total</i>	$30 + f_1 + f_2$		$-23 - 2f_1$

(1 Mark)

$$f_1 + f_2 = 70$$

(1 mark)

$$f_1 = 20$$

(1 mark)

$$f_2 = 50$$

(1 mark)