SECTION- A

1. (b)
2. (b)
3. (c)
4. (d)
5. (a)
6. (c)
7. (a)
8. (a)
9. (a)
10. (b)
11. (c)
12. (c)
13. (a)
14. (d)
15. (b)
16. (a)
17. (c)
18. (a)

Assertion-Reason

19. (b)
20. (d)

SECTION- B

21. **(a)** Correct graph of both the equations.
Solution of equation is $x = 3, y = -4$

OR

(b) Correct graph of y = – 7 and x = 0
As y = – 7 is intersecting x = 0 at (0, – 7)
So, system of equations is consistent

22. As $XZ \| BC$ Therefore $\frac{AX}{XB} = \frac{3}{2} = \frac{AZ}{ZC}$ - (i)

$\Delta AXY \sim \Delta ABM$

$\Rightarrow \frac{AX}{AB} = \frac{XY}{BM}$ or $\frac{3}{5} = \frac{XY}{3}$

$\Rightarrow XY = \frac{9}{5}$ or 1.8 cm

23. **(a)** $\sin\theta + \cos\theta = \sqrt{3}$
squaring both sides
$\sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = 3$
$\Rightarrow 1 + 2\sin\theta\cos\theta = 3$
$\Rightarrow \sin\theta\cos\theta = 1$

OR

(b) $\operatorname{cosec}\alpha = \frac{1}{\sin\alpha} = \sqrt{2}$
$\operatorname{cosec}\beta = \sqrt{1 + \cot^2\beta} = \sqrt{1+3} = 2$
$\therefore \operatorname{cosec}\alpha + \operatorname{cosec}\beta = \sqrt{2} + 2$ or $\sqrt{2}(\sqrt{2}+1)$

24. We have to find HCF of $85 - 1 = 84$ and $72 - 2 = 70$. HCF of 84 and $70 = 14$

25. Total No of Balls $= 9$

(i) P(drawn ball is red) $= \frac{4}{9}$

(ii) P(drawn ball is yellow) $= \frac{2}{9}$

SECTION- C

26. Let the numbers be x and $y, x > y$

Therefore $\frac{1}{2}(x - y) = 2$ ....(i)

and $2y + x = 13$ .... (ii)

Solving equations (i) and (ii)

$x = 7, y = 3$

27. Let $\sqrt{5}$ be a rational number.

$\sqrt{5} = \frac{p}{q}$, where $q \neq 0$ and let p&q be co-primes.

$5q^2 = p^2 \Rightarrow p^2$ is divisible by $5 \Rightarrow p$ is divisible by 5

$\Rightarrow p = 5a$, where ' a ' is some integer .... (i)

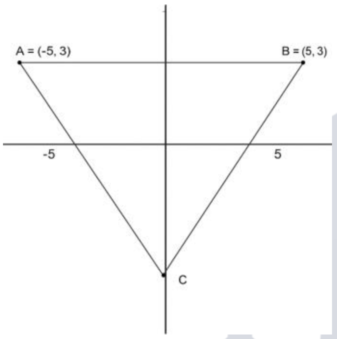
$25a^2 = 5q^2 \Rightarrow q^2 = 5a^2 \Rightarrow q^2$ is divisible by $5 \Rightarrow q$ is divisible by 5

$\Rightarrow q = 5b$, where ' b ' is some integer .... (ii)

(i) and (ii) leads to contradiction as ' p ' and ' q ' are co-primes.

$\sqrt{5}$ is an irrational number.

28.



Let the third vertex be (x, y)

$A(-5,3)\ B(5,3)\ C(x, y)$

$AB = 10 = AC$

$AC^2 = 100$

$(-5 - x)^2 + (3 - y)^2 = (5 - x)^2 + (3 - y)^2$

$20x = 0$

$x = 0$

$(3 - y)^2 = 75$

$3 - y = \pm 5\sqrt{3}$

$y = 3 - 5\sqrt{3}$

$y = -5.5$

The coordinates of the third vertex are (0, -5.5)

29. (a) TP = TQ

$\Rightarrow \angle TPQ = \angle TQP$

Let $\angle PTQ$ be θ

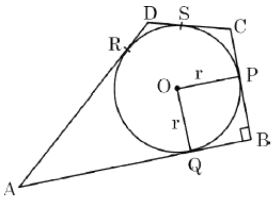
$$\Rightarrow \angle TPQ = \angle TQP = \frac{180^\circ - \theta}{2} = 90^\circ - \frac{\theta}{2}$$

Now $\angle OPT = 90^\circ$

$$\Rightarrow \angle OPQ = 90^\circ - \left(90^\circ - \frac{\theta}{2}\right) = \frac{\theta}{2}$$

$\angle PTQ = 2\angle OPQ$

OR



(b)
DR = DS = 3 cm
AR = AD − DR = 17 − 3 = 14 cm
⇒ AQ = AR = 14 cm
QB = AB − AQ = 20 − 14 = 6 cm
Since QB = OP = r ∴ radius = 6 cm

30. LHS $= \frac{(\tan\theta+\sec\theta)-(\sec\theta-\tan^2\theta)}{\tan\theta-\sec\theta+1}$

$= \frac{(\tan\theta+\sec\theta)(1-\sec\theta+\tan\theta)}{\tan\theta-\sec\theta+1}$

$= \tan\theta+\sec\theta$

$= \frac{1+\sin\theta}{\cos\theta} =$ RHS

31. (a) Let h be height of cylindrical part and r be radius of hemisphere

Volume of room $= 2\pi r^3 + \frac{2}{3}\pi r^3 = \frac{1408}{21}$

$\Rightarrow_{r=2}$

Therefore, h = 4

Height of the room is = 6 m

OR

(b) Volume of the cone $== \frac{1}{3} \times \pi \times 9 \times 12 = 36\pi\ \text{cm}^3$

Volume of ice-cream in the cone $= \frac{5}{6} \times 36 \times \pi = 30\pi\ \text{cm}^3$

Volume of ice-cream on top $= \frac{2}{3} \times 27 \times \pi = 18\pi\ \text{cm}^3$

Total volume of the ice-cream $= (30\pi + 18\pi) = 48\pi\ \text{cm}^3$

$= 48 \times 3.14 = 150.72\ \text{cm}^3$

SECTION-D

32. Given:

Triangle $\triangle ABC$, and a line DE is drawn parallel to BC such that it intersects AB at D and AC at E.

To prove:

$\frac{AD}{DB} = \frac{AE}{EC}$.

Proof:

1.Draw the triangle and parallel line

Let $DE \| BC$, intersecting AB at D and AC at E.

So, $DE \| BC$.

2.Triangles formed

Since $DE \| BC$, triangles $\triangle ADE$ and $\triangle ABC$ are similar by A A similarity:

$\angle ADE = \angle ABC$ (corresponding angles)

$\angle AED = \angle ACB$ (corresponding angles)

Therefore:

$\triangle ADE \sim \triangle ABC$

3.Corresponding sides of similar triangles are proportional

From similarity:

$\frac{AD}{AB} = \frac{AE}{AC}$ and $\frac{DE}{BC} = \frac{AD}{AB} = \frac{AE}{AC}$.

4.Express the remaining segments

On $AB, AB = AD + DB$, so:

$\frac{AD}{AB} = \frac{AD}{AD + DB}$

On $AC, AC = AE + EC$, so:

$$\frac{AE}{AC} = \frac{AE}{AE + EC}$$

Since $\frac{AD}{AB} = \frac{AE}{AC}$:

$$\frac{AD}{AD + DB} = \frac{AE}{AE + EC}.$$

5.Cross-multiply

$$AD(AE + EC) = AE(AD + DB)$$

Expanding:

$$AD \cdot AE + AD \cdot EC = AE \cdot AD + AE \cdot DB$$

Subtract $AD \cdot AE$ from both sides:

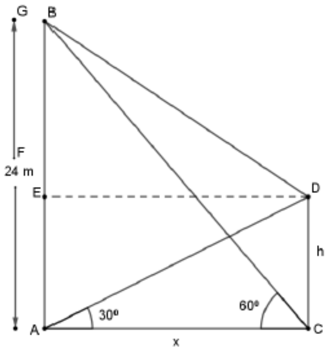
$$AD \cdot E \downarrow= AE \cdot DB$$

6.Divide both sides by $DB \cdot EC$

$$\frac{AD}{DB} = \frac{AE}{EC}.$$

This proves that the line parallel to one side divides the other two sides in the same ratio.

33. (a)



Let AB and CD be the given towers.

$\tan 30^\circ = \frac{1}{\sqrt{3}} = \frac{h}{x} \Rightarrow x = h\sqrt{3}$ .... (i)

$\tan 60^\circ = \sqrt{3} = \frac{24}{x} \Rightarrow x = \frac{24}{\sqrt{3}}$ or $8\sqrt{3}$ .... (ii)

using (i) and (ii)

$x = 8\sqrt{3}$ and $h = 8$

length of wire $= \sqrt{BE^2 + x^2} = \sqrt{256 + 192} = \sqrt{448}$ m $= 8\sqrt{7}$ m

OR

(b) Let Point B represents observer.

$\angle QBP = 60^\circ; \angle ABO = 45^\circ$

Using geometry $\angle PBO = \frac{1}{2} \times 60^\circ = 30^\circ$

Now, $\frac{r}{OB} = \sin 30^\circ = \frac{1}{2} \Rightarrow OB = 2r$ ...... (i)

Also $\frac{OA}{OB} = \sin 45^\circ = \frac{1}{\sqrt{2}} \Rightarrow OB = OA\sqrt{2}$ ..... (ii)

Using (i) and (ii) $OA = \sqrt{2}r$

or height of center of balloon $= \sqrt{2}r$ units

34. Area of minor segment $= \frac{22}{7} \times 14 \times 14 \times \frac{60}{360} - \frac{1}{2} \times 14 \times 14 \times \frac{\sqrt{3}}{2}$

$= \left(\frac{308}{3} - 49\sqrt{3}\right)$ cm^2 or 17.9 cm^2

Area of major segment $= \frac{22}{7} \times 14 \times 14 - \left(\frac{308}{3} - 49\sqrt{3}\right)$

$= 616 - \frac{308}{3} + 49\sqrt{3}$

$= \left(\frac{1540}{3} + 49\sqrt{3}\right)$ cm^2 or 598.1 cm^2

35. (a) Given $\frac{a+10d}{a+16d} = \frac{3}{4}$

$\Rightarrow 4a + 40d = 3a + 48d$
$\Rightarrow a = 8d$
therefore $\frac{a_5}{a_{21}} = \frac{a+4d}{a+20d} = \frac{3}{7}$
using(i)
$a_5 : a_{21} = 3:7$

$$\frac{S_5}{S_{21}} = \frac{\frac{5}{2}(2a+4d)}{\frac{21}{2}(2a+20d)} = \frac{5 \times 20d}{21 \times 36d} = \frac{25}{189}$$

Therefore, $S_5 : S_{21} = 25:189$

OR

(b) Let the number of rows be n.
A.P. formed is 22,21,20,19, ...

Here $a = 22, d = -1 Sn = 250$
$\therefore 250 = \frac{n}{2}[44 + (n-1)(-1)]$
$\Rightarrow n^2 - 45n + 500 = 0$
$\Rightarrow (n-25)(n-20) = 0$
$n \neq 25 \therefore n = 20$
logs in top row $= a_{20} = 22 + 19(-1) = 3$

SECTION- E

36. (i) $(18 + x)(12 + x) = 2(18 \times 12)$
(ii) $x^2 + 30x - 216 = 0$
(iii) Solving : $x^2 + 30x - 216 = 0$
$\Rightarrow (x + 36)(x - 6) = 0$
$x \neq -36 \therefore \Rightarrow x = 6.$
new dimensions are 24 cm × 18 cm

OR

(iii) If $(18 + x)(12 + x) = 220$
then $x^2 + 30x - 4 = 0$
Here $D = 900 + 16 = 916$ which is not a perfect square.
Thus we can't have any such rational value of x.

37. (i) Modal Class is $600 - 800$
(ii) $\frac{N}{2} = 12$, median class is $600 - 800$

Rainfall	x_i	f_i	cf.
200-400	300	2	2
400-600	500	4	6
600-800	700	7	13
800-1000	900	4	17
1000-1200	1100	2	19
1200-1400	1300	3	22
1400-1600	1500	1	23
1600-1800	1700	1	24
		24	

Median $= 600 + \frac{200}{7}(12 - 6)$

$= \frac{5400}{7}$ or $771 \cdot 4$

OR

(ii)

Rainfall	x_i	f_i	$f_i x_i$
200 – 400	300	2	600
400 – 600	500	4	2000
600-800	700	7	4900
800-1000	900	4	3600
1000-1200	1100	2	2200
1200-1400	1300	3	3900
1400-1600	1500	1	1500
1600-1800	1700	1	1700
		24	20400

Mean $= \frac{20400}{24} = 850$

(iii) Sub-divisions having good rainfall $= 2 + 3 + 1 + 1 = 7$.

38. **(i)** $\tan 30^\circ = \frac{1}{\sqrt{3}} = \frac{75}{AB}$

$\Rightarrow AB = 75\sqrt{3}$ cm

(ii) $\sin 30^\circ = \frac{1}{2} = \frac{75}{OB}$

$\Rightarrow OB = 150$ cm

(iii) $QB = 150 - 75 = 75$ cm

$\Rightarrow Q$ is mid point. of OB

Since $PQ11AO$ therefore P is mid point of AB

Hence $AP = \frac{75\sqrt{3}}{2}$ cm.

OR

(iii) $QB = 150 - 75 = 75$ cm

Now, $\triangle BQP \sim \triangle BOA$

$\Rightarrow \frac{QB}{OB} = \frac{PQ}{OA}$

$\Rightarrow \frac{1}{2} = \frac{PQ}{75}$

$\Rightarrow PQ = \frac{75}{2}$ cm