

SAMPLE QUESTION PAPER-7

Section-A

1. We have $A = \{1, 2, 3, 4\}$ and $B = \{1, 3, 5, 7\}$
 $\therefore R = A$ relation "is less than" from A to B 1
 $R = \{(1, 3), (1, 5), (1, 7), (2, 3), (2, 5), (2, 7), (3, 5), (3, 7), (4, 5), (4, 7)\}.$
2. $5x - 3 < 3x + 1$
 $\Rightarrow 2x < 4$
 $\Rightarrow x < 2.$
 (i) When x is an integer, then $x = \{\dots - 3, -2, -1, 0, 1\}$ $\frac{1}{2}$
 (ii) When x is real number, then $-\infty < x < 2.$ $\frac{1}{2}$
3. Equation of line is $y - 3 = \frac{1}{2}(x + 4)$
 $\Rightarrow x + 4 - 2y + 6 = 0$
 $\Rightarrow x - 2y + 10 = 0.$ 1
4. Centre of circle = $(-2, 3), r = 4$
 $\therefore$ Equation of circle is $(x + 2)^2 + (y - 3)^2 = 4^2$
 $\Rightarrow x^2 + y^2 + 4x - 6y - 6 = 0.$ 1
5.
$$\lim_{x \rightarrow 0} \frac{\sin(2+x) - \sin(2-x)}{x} = \lim_{x \rightarrow 0} \left[\frac{2 \cos\left(\frac{2+x+2-x}{2}\right) \cdot \sin\left(\frac{2+x-2+x}{2}\right)}{x} \right]$$

$$= \lim_{x \rightarrow 0} 2 \cos 2 \cdot \frac{\sin x}{x}$$

$$= 2 \cos 2 \cdot \lim_{x \rightarrow 0} \left(\frac{\sin x}{x} \right)$$

$$= 2 \cos 2.$$
 1
6. It is false that, the sum of 2 and 3 is 6. 1

Section-B

7. L.H.S. = $\cos 2A \cdot \cos \frac{A}{2} - \cos 3A \cdot \cos \frac{9A}{2}$

$$\frac{1}{2} \left[2 \cos 2A \cdot \cos \frac{A}{2} - 2 \cos 3A \cdot \cos \frac{9A}{2} \right]$$
 1

$$= \frac{1}{2} \left[\cos \left(2A + \frac{A}{2} \right) + \cos \left(2A - \frac{A}{2} \right) - \cos \left(3A + \frac{9A}{2} \right) - \cos \left(3A - \frac{9A}{2} \right) \right]$$
 1

$$= \frac{1}{2} \left(\cos \frac{5A}{2} + \cos \frac{3A}{2} - \cos \left(\frac{15A}{2} \right) - \cos \left(\frac{-3A}{2} \right) \right)$$

 But $\cos(-A) = \cos A$

$$= \frac{1}{2} \left(\cos \frac{5A}{2} - \cos \frac{15A}{2} \right)$$
 1

$$= \frac{1}{2} \times 2 \sin \frac{1}{2} \left(\frac{5A}{2} + \frac{15A}{2} \right) \cdot \sin \left(\frac{15A}{2} - \frac{5A}{2} \right)$$

$$= \sin(4A) \cdot \sin \left(\frac{5A}{2} \right) = \text{R.H.S.}$$

1

Hence proved

8. A = Number of students who takes tea

B = Number of students who takes coffee

1

According to question,

$$n(A) = 150, n(B) = 225$$

1

$$n(A \cap B) = 100$$

$\therefore$

$$n(A \cup B) = 150 + 225 - 100$$

1

$$= 375 - 100$$

$$n(A \cup B) = 275.$$

$\therefore$ Number of students who neither take tea nor coffee

$$= n(U) - n(A \cup B)$$

$$= 600 - 275$$

$$= 325.$$

1

OR

$$f(x) = \frac{(x-4)}{|x-4|}$$

For

$$\text{Domain } |x-4| \neq 0 \text{ i.e., } x \neq 4$$

$\therefore$

$$\text{Domain} = R - \{4\}$$

2

Range : When $x \geq 4$;

$$f(x) = \frac{(x-4)}{(x-4)} = 1$$

and when $x < 4$,

$$f(x) = \frac{(x-4)}{-(x-4)} = -1$$

$\therefore$

$$\text{Range of } f = \{-1, 1\}.$$

2

9. It is given that

$$a \tan \theta + b \sec \theta = c$$

$\Rightarrow$

$$(a \tan \theta - c) = -b \sec \theta$$

1

$\Rightarrow$

$$a^2 \tan^2 \theta + c^2 - 2ac \tan \theta = b^2 \sec^2 \theta$$

$\Rightarrow$

$$b^2 (1 + \tan^2 \theta) - a^2 \tan^2 \theta - c^2 + 2ac \tan \theta = 0$$

$\Rightarrow$

$$(b^2 - a^2) \tan^2 \theta + 2ac \tan \theta + b^2 - c^2 = 0.$$

1

As α and β are its solutions

$\therefore \tan \alpha$ and $\tan \beta$ are their roots.

$\therefore$

$$\tan \alpha + \tan \beta = \frac{-2ac}{b^2 - a^2}$$

and

$$\tan \alpha \tan \beta = \frac{b^2 - c^2}{b^2 - a^2}$$

1

$\therefore$

$$\tan (\alpha + \beta) = \frac{\tan \alpha + \tan \beta}{1 - \tan \alpha \tan \beta}$$

$$= \frac{\left(\frac{-2ac}{b^2 - a^2} \right)}{1 - \left(\frac{b^2 - c^2}{b^2 - a^2} \right)}$$

$$= \left[\frac{-2ac}{\frac{b^2 - a^2}{(c^2 - a^2)}} \right]$$

$$\boxed{\tan(\alpha + \beta) = \frac{2ac}{a^2 - c^2}} \quad 1$$

10. As

$$p + iq = \frac{(a+i)^2}{2a-i}$$

$$\Rightarrow p - iq = \frac{(a-i)^2}{2a+i} \quad 1$$

$$\therefore (p+iq)(p-iq) = \frac{(a+i)^2}{2a-i} \times \frac{(a-i)^2}{(2a+i)} \quad 2$$

$$p^2 + q^2 = \frac{(a^2+1)^2}{4a^2+1}, \quad \text{Hence proved. } 1$$

OR

$$\text{Put } z = 1 + i\sqrt{3} \quad (\text{given})$$

$$\text{and } 1 = r \cos \theta \quad \dots(i)$$

$$\sqrt{3} = r \sin \theta \quad \dots(ii)$$

Square and adding, we get

$$r^2 = 4 \Rightarrow r = 2 \quad 1$$

$$\text{and } \tan \theta = \sqrt{3} = \tan \frac{\pi}{3}$$

$$\Rightarrow \theta = \arg(z) = \frac{\pi}{3} \quad 2$$

$$\therefore 1 + i\sqrt{3} = 2 \left(\cos \frac{\pi}{3} + i \sin \frac{\pi}{3} \right). \quad 1$$

11. We have

$$\tan(\alpha + \beta) = n \tan(\alpha - \beta)$$

$$\Rightarrow \frac{\tan(\alpha + \beta)}{\tan(\alpha - \beta)} = \frac{n}{1}$$

Using C and D, we get

$$\frac{\tan(\alpha + \beta) + \tan(\alpha - \beta)}{\tan(\alpha + \beta) - \tan(\alpha - \beta)} = \frac{n+1}{n-1} \quad 2$$

$$\Rightarrow \frac{\left(\frac{\sin(\alpha + \beta)}{\cos(\alpha + \beta)} + \frac{\sin(\alpha - \beta)}{\cos(\alpha - \beta)} \right)}{\left(\frac{\sin(\alpha + \beta)}{\cos(\alpha + \beta)} - \frac{\sin(\alpha - \beta)}{\cos(\alpha - \beta)} \right)} = \frac{n+1}{n-1} \quad 1$$

$$\Rightarrow \frac{\sin(\alpha + \beta) \cdot \cos(\alpha - \beta) + \cos(\alpha + \beta) \cdot \sin(\alpha - \beta)}{\sin(\alpha + \beta) \cdot \cos(\alpha - \beta) - \cos(\alpha + \beta) \cdot \sin(\alpha - \beta)} = \frac{n+1}{n-1} \quad 1$$

$$\Rightarrow \frac{\sin(\alpha + \beta + \alpha - \beta)}{\sin(\alpha + \beta - \alpha + \beta)} = \frac{n+1}{n-1}$$

$$\Rightarrow \frac{\sin(2\alpha)}{\sin(2\beta)} = \frac{n+1}{n-1}$$

$$\Rightarrow (n+1) \sin 2\beta = (n-1) \sin 2\alpha.$$

Hence proved.

12. We have 6 red, 5 white and 5 blue balls, then 9 balls are to be select with 3 balls of each colour.

$$\begin{aligned} \therefore \text{Total ways} &= {}^6C_3 \times {}^5C_3 \times {}^5C_3 & 2 \\ &= \frac{6 \times 5 \times 4}{3 \times 2 \times 1} \times \frac{5 \times 4 \times 3}{3 \times 2 \times 1} \times \frac{5 \times 4 \times 3}{3 \times 2 \times 1} \\ &= 20 \times 10 \times 10 \\ &= 2000. & 2 \end{aligned}$$

OR

Let number of persons present in marriage anniversary party = n
Everybody shakes hand to each other.

$$\therefore \text{Total number of shake} = {}^nC_2 \quad 1$$

$\therefore$ According to question,

$$\begin{aligned} &{}^nC_2 = 66 \\ \Rightarrow &n(n-1) = 132 \\ \Rightarrow &n^2 - n - 132 = 0 \\ \Rightarrow &(n-12)(n+11) = 0 & 1 \\ \Rightarrow &n = 12, n = -11 \text{ (not possible)} \end{aligned}$$

$$\therefore \text{Total persons present in the room} = 12. \quad 2$$

Shaking hand is the begining of friendship, so it is healthy thinking to establish good relationship.

13. As ${}^nP_5 = 42 \cdot {}^nP_3$

$$\Rightarrow \frac{n!}{(n-5)!} = 42 \cdot \frac{n!}{(n-3)!} \quad \frac{1}{2}$$

$$\Rightarrow \frac{1}{(n-5)!} = \frac{42}{(n-3)(n-4)(n-5)!} \quad 1\frac{1}{2}$$

$$\Rightarrow (n-3)(n-4) = 42 \quad \frac{1}{2}$$

$$\Rightarrow n^2 - 7n + 12 - 42 = 0$$

$$\Rightarrow n^2 - 7n - 30 = 0 \quad \frac{1}{2}$$

$$\Rightarrow (n-10)(n+3) = 0$$

$$\Rightarrow n = 10, n = -3 \text{ (not possible)} \quad 1$$

14. Two unbiased dices are thrown.

$$\therefore S = \{(1, 1), (1, 2), (1, 3), \dots, (6, 4), (6, 5), (6, 6)\}$$

$$\text{i.e., Total sample points} = 36 \quad \frac{1}{2}$$

A = Event of getting a doublet or a total 10

$$\therefore A = \{(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6), (4, 6), (6, 4)\} \quad 1$$

$$\therefore P(A) = \frac{8}{36} = \frac{2}{9} \quad \frac{1}{2}$$

$\therefore P$ (Neither a doublet nor a total 10 will appear)

$$= 1 - \frac{2}{9} \quad \frac{1}{2}$$

$$\text{i.e., } P(\bar{A}) = \frac{7}{9} \quad \frac{1}{2}$$

15. We have 2 men and 2 woman, A = committee of 2 is selected having one man
i.e., P (selecting 1 man and 1 woman)

$$P(A) = \frac{{}^2C_1 \times {}^2C_1}{{}^4C_2} \quad 2$$

$$= \frac{2 \times 2 \times 2}{4 \times 3} = \frac{2}{3} \quad 1$$

16.

Class	Frequency (f)	x	$u_i = \frac{x_i - 65}{10}$	u_i^2	$f_i u_i$	$f_i u_i^2$
30 - 40	3	35	-3	9	-9	27
40 - 50	7	45	-2	4	-14	28
50 - 60	12	55	-1	1	-12	12
60 - 70	15	65 = a	0	0	0	0
70 - 80	8	75	1	1	8	8
80 - 90	3	85	2	4	6	12
90 - 100	2	95	3	9	6	18
Total	50				-15	105

Here,

$$a = 65, h = 10, \Sigma f = 50$$

∴

$$\text{Mean} = 65 + \frac{-15}{50} \times 10 \quad 1$$

$$= 65 - 3 = 62$$

and

$$\text{Variance} = h^2 \left[\frac{\Sigma f_i u_i^2}{N} - \left(\frac{\Sigma f_i u_i}{N} \right)^2 \right]$$

$$= 100 \left[\frac{105}{50} - \left(\frac{-15}{50} \right)^2 \right] \quad 1$$

$$= 100 \left[\frac{5250 - 225}{50 \times 50} \right]$$

$$= \frac{5025}{25} = 201 \quad 2$$

Variance = 201, and Mean = 62

17. Equation of hyperbola is $16x^2 - 9y^2 = 144$

$$\Rightarrow \frac{x^2}{9} - \frac{y^2}{16} = 1$$

∴

$$a^2 = 9 \Rightarrow a = 3 \text{ and } b = 4 \quad 1$$

Length of transversal = $2a = 6$

Length of conjugate axis = $2b = 8$

$$c^2 = a^2 + b^2 = 9 + 16 = 25$$

⇒

$$c = 5 \quad 1$$

∴

$$e = \frac{5}{3}$$

$$\text{foci} = (\pm c, 0) = (\pm 5, 0) \quad 1$$

and

$$\text{vertices} = (\pm a, 0) = (\pm 3, 0) \quad 1$$

18.

$$f(x) = \frac{2x+3}{x-2}$$

Using first principle,

$$\begin{aligned} f'(x) &= \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} \\ &= \lim_{h \rightarrow 0} \frac{1}{h} \left[\frac{2(x+h)+3}{x+h-2} - \frac{(2x+3)}{x-2} \right] \quad 1 \\ &= \lim_{h \rightarrow 0} \frac{1}{h} \left[\frac{(2x+2h+3)(x-2) - (x+h-2)(2x+3)}{(x+h-2)(x-2)} \right] \quad 1 \\ &\quad + h(2x-4-2x-3) \\ &= \lim_{h \rightarrow 0} \frac{1}{h} \left[\frac{(2x+3)(x-2) - (2x+3)(x-2)}{(x+h-2)(x-2)} \right] \\ &= \lim_{h \rightarrow 0} \left[\frac{h(2x-4-2x-3)}{h(x+h-2)(x-2)} \right] \quad 1 \\ &= \frac{-7}{(x-2)^2} \end{aligned}$$

$$\therefore \boxed{f'(x) = \frac{-7}{(x-2)^2}} \quad 1$$

19. As roots of $x^2 - 3x + p = 0$ are a and b .

$$\therefore a + b = 3 \text{ and } ab = p \quad \dots(i) \quad \frac{1}{2}$$

and $x^2 - 12x + q = 0$ have c and d roots.

$$\text{So, } c + d = 12, \text{ and } cd = q \quad \dots(ii) \quad 1$$

But a, b, c and d are in G.P.

$$\therefore \frac{b}{a} = \frac{c}{b} = \frac{d}{c} = r \text{ (common ratio)}$$

$$\Rightarrow b = ar, c = ar^2 \text{ and } d = ar^3 \quad \dots(iii) \quad 1$$

From (i), (ii) and (iii), we get

$$a \cdot ar = p \Rightarrow a^2 r = p$$

$$\text{and } ar^2 \cdot ar^3 = q = a^2 r^5 = q \quad \frac{1}{2}$$

$$\Rightarrow \frac{a^2 r^5}{a^2 r} = \frac{q}{p} \Rightarrow r^4 = \frac{q}{p} \quad \dots(iv) \quad 1$$

$$\text{Again, } a + ar = 3 \Rightarrow a(1+r) = 3$$

$$\text{and } ar^2 + ar^3 = 12 \Rightarrow ar^2(1+r) = 12$$

On dividing these, we get

$$r^2 = 4 \Rightarrow \frac{q}{p} = (4)^2 = 16 \quad (\text{from iv})$$

Applying componendo and dividendo, we get

$$\frac{q+p}{q-p} = \frac{16+1}{16-1} = \frac{17}{15} \quad \frac{1}{2}$$

Teacher can assess the ability of learning and understanding on the basis of assesment he can guide and encourage them. 1/2

Section – C

20. Take, $6^n = (1 + 5)^n$ 1

$$6^n = 1 + {}^nC_1(5) + {}^nC_2 + {}^nC_3 5^3 + \dots$$

$$\Rightarrow 6^n = 1 + 5n + 5^2 [{}^nC_2(5) + {}^nC_3 5 + \dots]$$

$$\Rightarrow 6^n - 5n - 1 = 25 [{}^nC_2 + 5 \cdot {}^nC_3 + \dots]$$

$$= 25\lambda ; \lambda = [{}^nC_2 + 5 \cdot {}^nC_3 + \dots]$$

$$\Rightarrow 6^n - 5n - 1 = 25\lambda$$

$\therefore 6^n - 5n - 1$ is divisible by 25. 1

21. Expansion $= \left(2^{1/4} + \frac{1}{3^{1/4}}\right)^n$ 1

$$= \left[2^{1/4} + 3^{-1/4}\right]^n$$

$\therefore$ 5th term from beginning $= {}^nC_4 \left(2^{1/4}\right)^{n-4} \times \left(3^{-1/4}\right)^4$

$$= {}^nC_4 2^{\frac{n-4}{4}} \times 3^{-1}$$

....(i) 1

5th term from end $= {}^nC_4 \left(3^{-1/4}\right)^{n-4} \times \left(2^{1/4}\right)^4$ 1

$$= {}^nC_4 3^{\frac{n-4}{4}} (2)^1$$

....(ii)

and

According to question,

$$\frac{{}^nC_4 2^{\frac{n-4}{4}} \times 3^{-1}}{{}^nC_4 3^{\frac{n-4}{4}} \times 2} = \frac{(6)^{1/2}}{1}$$

$$\Rightarrow 2^{\left(\frac{n-4}{4}-1\right)} \times 3^{\frac{n-4}{4}-1} = (6)^{\frac{1}{2}}$$

$$\Rightarrow (6)^{\left(\frac{n-8}{4}\right)} = 6^{\frac{1}{2}}$$

$$\Rightarrow \frac{n-8}{4} = \frac{1}{2}$$

$$\Rightarrow \boxed{n = 10}$$

OR

Expansion $= (1 + x)^n$

$\therefore$ 3 consecutive coefficients are

${}^nC_{r-1}, {}^nC_r$ and ${}^nC_{r+1}$ 1

According to question

${}^nC_{r-1} : {}^nC_r : {}^nC_{r+1} = 6 : 33 : 110$

$$\frac{n!}{(r-1)!(n-r+1)!} \times \frac{r!(n-r)!}{n!} = \frac{6}{33}$$

$$\Rightarrow \frac{r}{n-r+1} = \frac{2}{11}$$

$$\begin{aligned}
 11r &= 2n - 2r + 2 \\
 \Rightarrow 2n - 13r + 2 &= 0 && \dots(i) \quad 1 \\
 \text{and } \frac{n!}{r!(n-r)!} \times \frac{(r+1)!(n-r-1)!}{n!} &= \frac{33}{110} \\
 \Rightarrow \frac{(r+1)}{(n-r)} &= \frac{3}{10} \\
 \Rightarrow 3n - 3r &= 10r + 10 && 1 \\
 \Rightarrow 3n - 13r - 10 &= 0 && \dots(ii) \quad 1
 \end{aligned}$$

On solving equations (i) and (ii), we get

$$n = 12 \text{ and } r = 2. \quad 1$$

22. $P(x) : 10^{2n-1} + 1$ is divisible by 11.

Put $x = 1$, $P(1) = 10^{2-1} + 1 = 11$ is divisible by 11
i.e., $P(1)$ is true. 1

Let $P(k)$ is true

$$\begin{aligned}
 P(k) : 10^{2k-1} + 1 &= 11\lambda; (\lambda \in N) \\
 \Rightarrow 10^{2k} &= 10(11\lambda - 1) && \dots(i) \quad 1
 \end{aligned}$$

Now to prove $P(k+1)$ is true.

i.e. $10^{2(k+1)-1} + 1$ is divisible by 11

Take L.H.S. $= 10^{2k+2-1} + 1$ 1
 $= 10^{2k+1} + 1$

Using equation (i), we get

$$\begin{aligned}
 &10 \times 10(11\lambda - 1) + 1 && 1 \\
 \Rightarrow 1100\lambda - 100 + 1 &= 1100\lambda - 99 \\
 \Rightarrow 11(100\lambda - 9) &= 11\mu, (\because \mu = 100\lambda - 9) \\
 \text{i.e., } P(k+1) &\text{ is true.} && 2
 \end{aligned}$$

Hence, $P(n)$ is true for all $n \in N$.

23. A = number of players in Basketball team

B = number of players in Hockey team

C = number of players in Football team 1

$$\begin{aligned}
 n(A) &= 21, n(B) = 26, n(C) = 20 \\
 n(B \cap A) &= 14, n(B \cap C) = 15 && 1 \\
 n(A \cap C) &= 12, \text{ and } n(A \cap B \cap C) = 8 && 1 \\
 \therefore n(A \cup B \cup C) &= n(A) + n(B) + n(C) \\
 &- n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C) && 1 \\
 &= 21 + 26 + 20 - 14 - 15 - 12 + 8 \\
 &= 67 + 8 - 41 \\
 &= 75 - 41 \\
 n(A \cup B \cup C) &= 34 && 2
 \end{aligned}$$

So, number of all players is 34.

24. We have lines

$$y = m_1x + c_1,$$

$$y = m_2x + c_2$$

$$x = 0.$$

and

1

On drawing these equations graphically we get a ΔABC .

On solving equations, (i) and (ii), we get

$$m_1x + c_1 = m_2x + c_2$$

$\Rightarrow$

$$x = \frac{c_2 - c_1}{m_1 - m_2}$$

$\therefore$

$$y = \frac{m_1(c_2 - c_1)}{m_1 - m_2} + c_1$$

$$y = \frac{m_1c_2 - m_1c_1 + m_1c_1 - m_2c_1}{(m_1 - m_2)}$$

$$y = \frac{(m_1c_2 - m_2c_1)}{m_1 - m_2}$$

$\therefore$ Co-ordinates of A $(0, c_1)$,

$$B \left(\frac{c_2 - c_1}{m_1 - m_2}, \frac{m_1c_2 - m_2c_1}{m_1 - m_2} \right), C(0, c_2)$$

$\therefore$

$$\text{Ar}(ABC) = \frac{1}{2} \left| 0 \left(\frac{m_1c_2 - m_2c_1}{m_1 - m_2} - c_2 \right) + \frac{(c_2 - c_1)}{(m_1 - m_2)} (c_2 - c_1) + 0 \left(c_1 - \frac{m_1c_2 - m_2c_1}{m_1 - m_2} \right) \right|$$

$$= \frac{1}{2} \left| \frac{(c_2 - c_1)^2}{m_1 - m_2} \right|$$

$\therefore$

$$\boxed{\text{Ar}(ABC) = \frac{(c_2 - c_1)^2}{2|m_1 - m_2|}}$$

Hence proved. 1

OR

Equation of line is, $\frac{x}{a} \cos \theta + \frac{y}{b} \sin \theta = 1$

....(i)

$p_1 = \perp$ distance from $(\sqrt{a^2 - b^2}, 0)$ on (i)

1

$$= \frac{\left| \frac{\sqrt{a^2 - b^2}}{a} \cos \theta + 0 - 1 \right|}{\sqrt{\frac{\cos^2 \theta}{a^2} + \frac{\sin^2 \theta}{b^2}}}$$

....(ii) 1

and $p_2 = \perp$ distance of line (i) from $(-\sqrt{a^2 - b^2}, 0)$

$$= \frac{\left| \frac{-\sqrt{a^2 - b^2}}{a} \cos \theta + 0 - 1 \right|}{\sqrt{\frac{\cos^2 \theta}{a^2} + \frac{\sin^2 \theta}{b^2}}}$$

....(iii) 1

∴ Product of ⊥ distance using equations (ii) and (iii)

$$p_1 p_2 = \frac{-\left(\frac{\sqrt{a^2 - b^2}}{a} \cos \theta - 1\right) \left(\frac{+\sqrt{a^2 - b^2}}{a} \cos \theta + 1\right)}{\left(\frac{\cos^2 \theta}{a^2} + \frac{\sin^2 \theta}{b^2}\right)} \quad 1$$

$$p_1 p_2 = \frac{-\left(\frac{a^2 - b^2}{a^2} \cos^2 \theta - 1\right)}{\left(\frac{(b^2 \cos^2 \theta + a^2 \sin^2 \theta)}{a^2 b^2}\right)} \quad 1$$

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

$$p_1 p_2 = \frac{(a^2 \sin^2 \theta + b^2 \cos^2 \theta) b^2}{(b^2 \cos^2 \theta + a^2 \sin^2 \theta) a^2} = b^2.$$

∴ Product of perpendicular distances is b^2 . 1

25. Let a be first term and r be common ratio of G.P.

So first 4 terms are a, ar, ar^2, ar^3 . 1

According to question,

$$a_3 = a + 9$$

$$ar^2 = a + 9$$

$$\Rightarrow a(r^2 - 1) = 9 \quad \text{....(i)} \quad 1$$

and

$$a_2 = 94 + 18$$

$$ar = ar^3 + 18$$

$$\Rightarrow -ar(r^2 - 1) = 18 \quad \text{....(ii)} \quad 1$$

From (i) and (ii), we get

$$\frac{-ar(r^2 - 1)}{a(r^2 - 1)} = \frac{18}{9}$$

$$\Rightarrow r = -2 \quad 1$$

$$\therefore \text{From (i), } a = \frac{9}{4 - 1} = 3 \quad 1$$

∴ Four terms of G.P. = $a = 3$

$$ar = 3 \times (-2) = -6$$

$$ar^2 = 3 \times (-2)^2 = 12$$

and

$$ar^3 = 3 \times (-2)^3 = -24$$

∴ Four terms are 3, -6, 12, -24. 1

26. We have linear inequations

$$x - 2y \leq 3 \quad \text{....(i)}$$

$$3x + 4y \geq 12 \quad \text{....(ii)}$$

and $x \geq 1$ and $y \geq 1$.

Take

$$x - 2y = 3 \quad 1$$

At $x = 0$,

$$y = -3/2$$

and at $y = 0$,

$$x = 3$$

At $(0, 0)$,

$$0 - 0 < 3 \text{ (True)}$$

1

So origin is included.

Now take

$$3x + 4y = 12$$

1

At $x = 0$,

$$y = 3$$

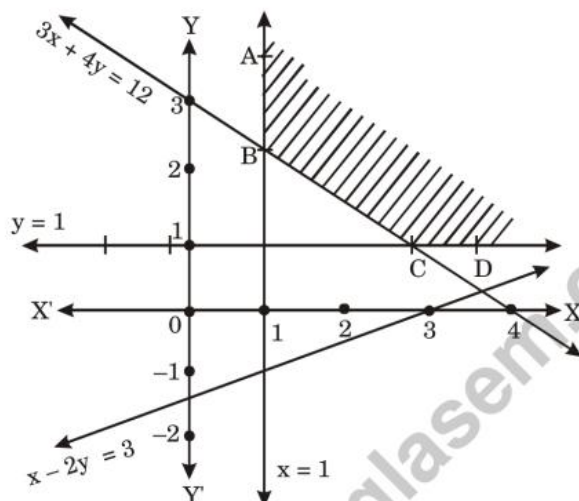
and at $y = 0$,

$$x = 4$$

At $(0, 0)$;

$$0 + 0 > 12 \text{ (False)}$$

So origin is not included.



2

$x = 1$ is a line parallel to y -axis at $(0, 0)$ is not included and $y = 1$ is a line parallel to x -axis the shaded region is the solution region.

1

