SAMPLE QUESTION PAPER–6

Section-A

1. We have $R = \{(x, y) : (x - y)$ is odd natural number $x \in A, y \in B\}$. **1**

$\therefore \quad R = \{5, 4\}$

2. $$f(x) = \frac{1}{\sqrt{5-x}}.$$

It is defined when $5 - x > 0 \Rightarrow x < 5$.

$\therefore$ Domain of $f = \{x : x \in R\ ,\ x < 5\}$

Range $= (0, \infty)$. **1**

3. $$\lim_{x \to 0} \frac{\tan 8x}{\sin 3x} = \lim_{x \to 0} \left[\frac{\left(\frac{\tan 8x}{8x}\right) \times 8x}{\left(\frac{\sin 3x}{3x}\right) \times 3x} \right] = \frac{8}{3}.$$ **1**

4. $\text{cosec}\ (-1410°) = \text{cosec}\ (-360° \times 4 + 30)$

$= \text{cosec}\ 30° = 2.$ **1**

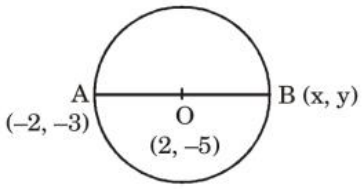
5. $$\frac{x-2}{2} = 2$$

$\Rightarrow \quad x = 4 + 2 = 6$

and $$\frac{y-3}{2} = -5$$

$\Rightarrow \quad y - 3 = -10$

$y = -10 + 3 = -7$



$\therefore$ Co-ordinates of B are $(6, -7)$. **1**

6. If two lines do not intersect in plane, then they are parallel. **1**

Section - B

7. $$\text{L.H.S.} = \frac{\cos A}{a} + \frac{\cos B}{b} + \frac{\cos C}{c}$$ **1**

$$= \frac{b^2 + c^2 - a^2}{2abc} + \frac{a^2 + c^2 - b^2}{2abc} + \frac{a^2 + b^2 - c^2}{2abc}$$ **2**

$$= \frac{b^2 + c^2 - a^2 + a^2 + c^2 - b^2 + a^2 + b^2 - c^2}{2abc}$$ **1**

$$= \frac{a^2 + b^2 + c^2}{2abc} = \text{R.H.S.}$$ **Hence proved.** **1**

OR

Given that, $\cot \alpha = \frac{1}{2}$ and $\sec \beta = -\frac{5}{3}$ **1**

$\Rightarrow \quad \tan \alpha = 2$ and $\tan \beta = \sqrt{\left(\frac{-5}{3}\right)^2 - 1}$

www.schools.aglasem.com

$$\tan\beta = \sqrt{\frac{25-9}{9}}$$

$$\tan\beta = \pm\frac{4}{3} \qquad \left[\because B \in \left(\frac{\pi}{2}, \pi\right)\right] \quad \mathbf{2}$$

$\therefore \quad \tan(\alpha+\beta) = \dfrac{\tan\alpha+\tan\beta}{1-\tan\alpha\tan\beta}$ **1**

$$= \frac{2-\frac{4}{3}}{1+2+\frac{4}{3}} = \frac{\frac{2}{3}}{\frac{11}{3}} \quad \mathbf{1}$$

$\therefore \quad \tan(\alpha+\beta) = \dfrac{2}{11}$

8. $\text{L.H.S.} = \cot 7\frac{1^\circ}{2}$

$$= \frac{\cos 7\frac{1^\circ}{2}}{\sin 7\frac{1^\circ}{2}} \quad \mathbf{1}$$

$$= \frac{2\cos 7\frac{1^\circ}{2}.\cos 7\frac{1^\circ}{2}}{2\sin 7\frac{1^\circ}{2}.\cos 7\frac{1^\circ}{2}}$$

$$= \frac{2\cos^2 7\frac{1^\circ}{2}}{\sin 15^\circ}$$

$$= \frac{1+\cos 15^\circ}{\sin 15^\circ} \quad \mathbf{1}$$

$$= \frac{1+\cos(45^\circ-30^\circ)}{\sin(45^\circ-30)^\circ}$$

$$= \frac{1+\cos 45^\circ\cos 30^\circ+\sin 45^\circ\sin 30^\circ}{\sin 45^\circ.\cos 30^\circ-\cos 45^\circ\sin 30^\circ}$$

$$= \frac{1+\left(\frac{1}{\sqrt{2}}\times\frac{\sqrt{3}}{2}+\frac{1}{\sqrt{2}}\times\frac{1}{2}\right)}{\left(\frac{1}{\sqrt{2}}\times\frac{\sqrt{3}}{2}-\frac{1}{\sqrt{2}}\times\frac{1}{2}\right)} \quad \mathbf{1}$$

$$= \frac{\left(1+\frac{(\sqrt{3}+1)}{2\sqrt{2}}\right)}{\left(\frac{\sqrt{3}-1}{2\sqrt{2}}\right)}$$

$$= \left(\frac{2\sqrt{2}+\sqrt{3}+1}{\sqrt{3}-1}\right)$$

$$= \frac{(2\sqrt{2}+\sqrt{3}+1)(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)}$$

$$= \frac{2\sqrt{6}+3+\sqrt{3}+2\sqrt{2}+\sqrt{3}+1}{(\sqrt{3})^2-1^2}$$

www.schools.aglasem.com

$$= \frac{2\sqrt{6}+2\sqrt{3}+2\sqrt{2}+4}{2}$$

$$= \sqrt{6}+\sqrt{3}+\sqrt{2}+2$$

$$= \sqrt{6}+\sqrt{3}+\sqrt{2}+\sqrt{4}$$

= R.H.S. **Hence proved.** **1**

9. We have $2kx - 5k = (x - 3).x^2$

$\Rightarrow$ $(k - 3).x^2 - 2kx + 5k = 0$

$\therefore$ $= (-2\,k)^2 - 4\,(k - 3).\,5k$ **1**

$= 4k^2 - 20k\,(k - 3)$

$= 4k\,(k - 5k + 15)$

$= 4k\,(-4k + 15)$

$= 4k\,(4k - 15)$ **1**

For real and unequal root

$\Delta > 0$ **1**

$\Rightarrow$ $-4k\,(4k - 15) > 0$

$\Rightarrow$ $4k\,(4k - 15) < 0$

$\Rightarrow$ $0 < k < \frac{15}{4}$ **1**

OR

$$\frac{(3+i\sqrt{5})(3-i\sqrt{5})}{(\sqrt{3}+i\sqrt{2})-(\sqrt{3}-i\sqrt{2})} = \frac{9+5}{2i\sqrt{2}} \times \frac{\sqrt{2}\,i}{\sqrt{2}\,i}$$ **2**

$$= \frac{7\sqrt{2}\,i}{2i^2} = -\frac{7\sqrt{2}\,i}{2}$$

$$= 0 - \frac{7}{2}\sqrt{2}\,i$$ **2**

10. Veena visits to four cities *A, B, C* and *D*.

Total arrangements in which Veena can visit = 4 ! = 24 **1**

(i) She visits *A* before *B* and *B* before *C*

$\therefore$ $X = \{ABCD, DABC, ABDC, ADBC\}$

$\therefore$ $P(X) = \frac{4}{24} = \frac{1}{6}$ **1**

(ii) Y = Order of cities *A* first and *B* last

$\therefore$ $Y = \{ACDB, ADCB\}$

$P(Y) = \frac{2}{24} = \frac{1}{12}$. **2**

11. We have a pack of 52 playing cards

Total ways of selecting 4 cards = ${}^{52}C_4 = \frac{52 \times 51 \times 50 \times 49}{4 \times 3 \times 2 \times 1}$ **1**

www.schools.aglasem.com

AglaSem Schools

A = Event of getting 1 card from each suit

$$\therefore \quad P(A) = \frac{{}^{13}C_1 \times {}^{13}C_1 \times {}^{13}C_1 \times {}^{13}C_1}{\frac{52 \times 51 \times 50 \times 49}{4 \times 3 \times 2 \times 1}} \qquad \mathbf{1}$$

$$= \frac{13 \times 13 \times 13 \times 13 \times 4 \times 3 \times 2}{52 \times 51 \times 50 \times 49}$$

$$P(A) = \frac{2197}{20825} \qquad \mathbf{2}$$

12. $P(n) : 4^n + 15n - 1$ is divisible by 9

at $n = 1$, $P(1) : 4 + 15 - 1 = 18$ is divisible by 9

So, $P(1)$ is true **1**

Let $P(k)$ is true.

i.e., $4^k + 15k - 1$ is divisible by 9

$\Rightarrow \quad 4^k + 15k - 1 = 9\lambda, \lambda \in N.$

$\Rightarrow \quad 4^k = 9\lambda - 15k + 1$ ....(i) **1**

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

i.e., $4^{k+1} + 15(k+1) - 1$ is divisible by 9.

Takeing L.H.S. $= 4^{k+1} + 15(k+1) - 1$

$= 4^k.4 + 15k + 15 - 1$

Using equation (i), we get **1**

$4(9\lambda - 15k + 1) + 15k + 14$

$= 36\lambda - 60k + 4 + 15k + 14$

$= 36\lambda - 45k + 18$

$= 9(4\lambda - 5k + 2)$

$= 9\mu, (\mu = 4\lambda - 5k + 2)$ **1**

$\Rightarrow P(k+1)$ is true, when $P(k)$ is true.

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

OR

$P(n)$ $\quad \frac{1}{3\cdot5} + \frac{1}{5\cdot7} + \frac{1}{7\cdot9} + ... + \frac{1}{(2n+1)(2n+3)}$

$= \frac{n}{3(2n+3)}$

Put $n = 1$,

$$P(1) : \frac{1}{3\cdot5} = \frac{1}{3\cdot5}$$

So, $P(1)$ is true. **1**

Let $P(k)$ is true.

$$P(k) : \frac{1}{3\cdot5} + \frac{1}{5\cdot7} + ... + \frac{1}{(2k+1)(2k+3)}$$

$$= \frac{k}{3(2k+3)} \qquad ....(i)$$

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

i.e., $\frac{1}{3\cdot5} + \frac{1}{5\cdot7} + ... + \frac{1}{(2k+1)(2k+3)} + \frac{1}{(2k+3)(2k+5)} = \frac{(k+1)}{3(2k+5)}$

www.schools.aglasem.com

Take L.H.S. $\frac{1}{3\cdot5}+\frac{1}{5\cdot7}+....+\frac{1}{(2k+1)(2k+3)}+\frac{1}{(2k+3)(2k+5)}$ **1**

Using equation (i), we get

$$= \frac{k}{3(2k+3)}+\frac{1}{(2k+3)(2k+5)}$$ **1**

$$= \frac{k(2k+5)+3}{3(2k+3)(2k+5)}$$

$$= \frac{2k^2+5k+3}{2(2k+3)(2k+5)}$$

$$= \frac{(2k+3)(k+1)}{3(2k+3)(2k+5)}$$

$$= \frac{k+1}{3(2k+5)} = \text{R.H.S.}$$ **1**

Hence, $P(k + 1)$ is true, when $P(k)$ it true.

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

13. $f(x) = \frac{x^2}{x^2+1}, x \in R$ **½**

For domain, as $x^2 \geq 0$

$\Rightarrow$ $x^2 + 1 > 0.$ **½**

$\therefore$ $f(x)$ is defined for all $x \in R$.

$\therefore$ Domain of $f = R$.

For range, let $f(x) = y$

$\Rightarrow$ $y = \frac{x^2}{x^2+1}$ **1**

$\Rightarrow$ $x^2 = \frac{y}{1-y}$ **½**

$\Rightarrow$ $x = \sqrt{\frac{y}{1-y}}$ **1**

$\Rightarrow$ $1 - y > 0 \Rightarrow y < 1$ and $y \geq 0.$

$\therefore$ Range : $0 \leq y < 1.$ **½**

14. $f(x) = \sin(5x - 8)$

$\therefore$ $f'(x) = \lim_{h\to0} \frac{f(x+h)-f(x)}{h}$

$$= \lim_{h\to0} \frac{\sin\{5(x+h)-8\}-\sin(5x-8)}{h}$$ **1**

$$= \lim_{h\to0} \frac{2}{h}\cos\left[\left(\frac{5x+5h-8+5x-8}{2}\right)\cdot\sin\left(\frac{5x+5h-8-5x+8}{2}\right)\right]$$

$$= 2\lim_{h\to0} \frac{1}{h}\left[\cos\left(5x-8+\frac{5h}{2}\right)\cdot\sin\left(\frac{5h}{2}\right)\right]$$ **1**

www.schools.aglasem.com

$$= 5\lim_{h\to 0}\cos\left((5x-8+\frac{5h}{2}\right)\frac{\sin\left(\frac{5h}{2}\right)}{\left(\frac{5h}{2}\right)}$$ **1**

$$= 5.\cos(5x-8).\lim_{h\to 0}\frac{\sin\left(\frac{5h}{2}\right)}{\left(\frac{5h}{2}\right)}$$

$$= 5\cos(5x-8), \quad \left[\because \lim_{x\to 0}\frac{\sin x}{x}=1\right]$$ **1**

15. $$f(x) = \frac{1}{\sqrt{x-[x]}}, x \in R$$

As, $0 \le (x-[x]) < 1, \ \forall\, x \in R$ **1**

But when $x \in Z$

$$x - [x] = 0$$

$\therefore$ $0 < (x-[x]) < 1, \forall\, x \in R - Z$ **1**

$\therefore$ Domain of $f = R - Z$.

For range, as $0 < x - [x] < 1, \ \forall\, x \in R - Z$

$\Rightarrow$ $0 < \sqrt{x-[x]} < 1$ **1**

$\Rightarrow$ $1 < \frac{1}{\sqrt{x-[x]}} < \infty$

$\Rightarrow$ $1 < f(x) < \infty$

$\therefore$ Range $= (1, \infty)$. **1**

16. Let two positive integers be x and y.

$\therefore$ According to question,

$$a = \frac{x+y}{2} \quad \text{....(i)}$$

and x, b, c, y are in G.P. **1**

Let r be common ratio.

$\therefore$ $b = xr, c = xr^2, y = xr^3$

$\Rightarrow$ $r = \left(\frac{y}{x}\right)^{1/3}$

$\Rightarrow$ $b = x\left(\frac{y}{x}\right)^{1/3}$

and $c = x\left(\frac{y}{x}\right)^{2/3}$ **1**

$\Rightarrow$ $b^3 = \frac{x^3y}{x}, \ c^3 = \frac{x^3y^2}{x^2}$

$\Rightarrow$ $b^3 + c^3 = \frac{x^3y}{x} + \frac{x^3y^2}{x}$

$= x^2y + xy^2$ **1**

www.schools.aglasem.com

$$b^3 + c^3 = xy\,(x + y)$$

Using (i), $x + y = 2a$

and $xy = bc$

$\therefore$ $\boxed{b^3 + c^3 = 2abc}$ **1**

17. A (1, 4, 2), B (2, – 3, 4), and C (–2, 1, 2) are co-ordinates of vertices of ΔABC, **1**

$$AB^2 = (2 - 1)^2 + (-3 - 4)^2 + (4 - 2)^2$$

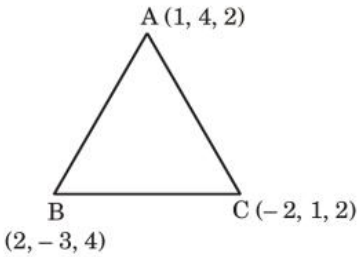
$$= 1 + 49 + 4 = 54$$ **1**

$$BC^2 = (-2 - 2)^2 + (1 + 3)^2 + (2 - 4)^2$$

$$BC^2 = 16 + 16 + 4 = 36$$

and $AC^2 = (-2 - 1)^2 + (1 - 4)^2 + (2 - 2)^2$

$$= 9 + 9 = 18$$

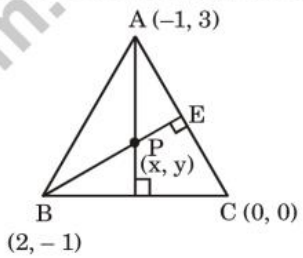


$\therefore$ $BC^2 + AC^2 = 36 + 18 = 54 = AB^2$ **2**

$\therefore \Delta ABC$ is a right triangle.

OR

A (–1, 3), B (2, – 1) and C (0, 0) are the vertices of ΔABC. P is concurrent point of altitude, so it is orthocentre.



Now, slope of $BC = \frac{1}{-2}$ **1**

$\Rightarrow$ slope of $AD = 2$

$\therefore$ Equation of AD is $y - 3 = 2\,(x + 1)$

$\Rightarrow$ $2x - y + 5 = 0$ ....(i) **1**

Now, slope of $AC = \frac{-3}{1} = -3$

$\Rightarrow$ slope of $BE = \frac{1}{-3}$

$\therefore$ Equation of BE is $y + 1 = \frac{1}{3}(x - 2)$

$3y + 3 = x - 2$

$\Rightarrow$ $x - 3y = 5$ ....(ii) **1**

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

$x = -4$, and $y = -3$.

Co-ordinates of orthocentre = P (– 4, – 3). **1**

18.

Class	f_i	x_i	$u_i = \frac{x_i - 105}{30}$	u_i^2	$f_i u_i$	$f_i u_i^2$
0 – 30	2	15	–3	9	–6	18
30 – 60	3	45	–2	4	–6	12
60 – 90	5	75	–1	1	–5	5
90 – 120	10	$105 = a$	0	0	0	0
120 – 150	3	135	1	1	3	3
150 – 180	5	165	2	4	10	20
180 – 210	2	195	3	9	6	18
Total	**30**				**2**	**76**

www.schools.aglasem.com

$\therefore$ $\text{Variance} = \sigma^2 = \dfrac{h^2}{N^2}\ [N.\Sigma f_i u_i{}^2 - (\Sigma f_i\ u_i)^2]$

Here $h = 30, N = 30.$ **2**

$\therefore$ $\sigma^2 = \dfrac{30^2}{30^2}\left[30 \times 76 - (2)^2\right]$

$= [2280 - 4]$

$\boxed{\sigma^2 = 2276}$ **2**

19. We have word DAUGHTER which consists 3 vowels and 5 consonants.

$\therefore$ Number of words consisting 2 vowels and 3 consonants

$= {}^3C_2 \times {}^5C_3 \times 5\ !$ **2**

$= \dfrac{3 \times 2}{2 \times 1} \times \dfrac{5 \times 4 \times 3}{3 \times 2 \times 1} \times 120$

$= 3600.$ **2**

Section - C

20. $\text{L.H.S.} = \dfrac{\cos 4x + \cos 2x + \cos 3x}{\sin 4x + \sin 2x + \sin 3x}$

$= \dfrac{2\cos\left(\dfrac{4x+2x}{2}\right)\cdot\cos\left(\dfrac{4x-2x}{2}\right) + \cos 3x}{2\sin\left(\dfrac{4x+2x}{2}\right)\cdot\cos\left(\dfrac{4x-2x}{2}\right) + \sin 3x}$ **2**

$= \dfrac{2\cos 3x.\cos x + \cos 3x}{2\sin 3x.\cos x + \sin 3x}$ **2**

$= \dfrac{\cos 3x\,(2\cos x + 1)}{\sin 3x\,(2\cos x + 1)}$ **2**

$= \cos 3x = \text{R.H.S.}$ **Hence proved.**

21. A = Number of people who read English news-paper **1**

B = Number of people who read Hindi news-paper **1**

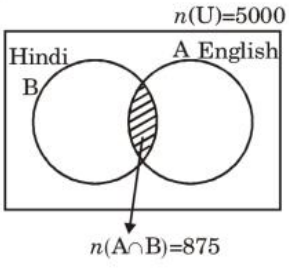
$\therefore$ According to question, **1**

$n(A) = 2250,\ n(B) = 1750$ and $n(A \cap B) = 875.$

$\therefore$ $n\ (A \cup B) = n(A) + n(B) - n\ (A \cap B)$

$= 2250 + 1750 - 875$

$= 400 - 875 = 3125$ **1**



$\therefore$ Number of people who neither read Hindi nor English

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

$= 5000 - 3125 = 1875.$ **1**

Number of people who reads only English news-paper

$= 2250 - 875$

$= 1375.$ **1**

22. Equations of two straight roads are

$2x - 3y - 4 = 0$ ...(i)

and $3x + 4y - 5 = 0$ ...(ii) **1**

www.schools.aglasem.com

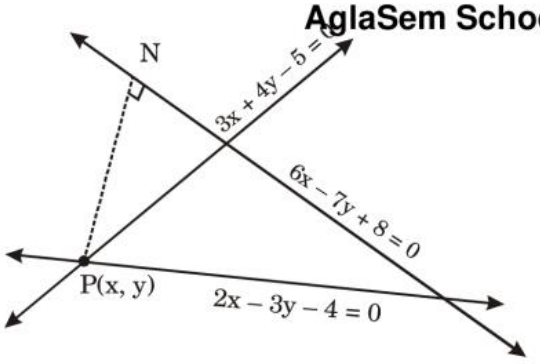
AglaSem Schools

Family is standing at the point P.

$\therefore$ On solving equations (i) and (ii), we get

$$x = \frac{31}{71},\ y = \frac{-2}{17}$$

$\therefore \quad P\left(\frac{31}{17}, \frac{-2}{17}\right)$ **1**



Because family is at $P\left(\frac{31}{17}, \frac{-2}{17}\right)$ want to reach the path

$$6x - 7y + 8 = 0 \qquad ...(iii)$$ **½**

in least time.

So they have to walk along PN.

Now, slope of path (iii) $= \frac{6}{7}$ **1**

$\therefore$ Slope of $PN = \frac{-7}{6}$

$\therefore$ Equation of $PN = y + \frac{2}{17} = \frac{-7}{6}\left(x - \frac{31}{17}\right)$

$\Rightarrow \quad \frac{17y+2}{17} = \frac{-7}{6}\left(\frac{17x-31}{17}\right)$ **1**

$\Rightarrow \quad 102y + 12 = -119x + 217$

$\Rightarrow \quad 119x + 102y = 217 - 12$ **½**

$\Rightarrow \quad 119x + 102y = 205.$

So, he should follow the path given by $119x + 102y = 205$. **1**

Because of unavailability of road transport, they have less time to reach to station, that is why they have decided to took the shortest path.

23. The expansion is $(1 + x)^n$

$\therefore \quad T_{r+1} = {}^nC_r\, x^r$

$\therefore$ Coefficients of $(r-1)^{th}$, r^{th} and $(r+1)^{th}$ terms are ${}^nC_{r-1}$, ${}^nC_r$ and ${}^nC_{r+1}$ **1**

According to question,

$${}^nC_{r-1} : {}^nC_r : {}^nC_{r+1} = 45 : 120 : 210$$

$\Rightarrow \quad \frac{{}^nC_{r-1}}{{}^nC_r} = \frac{45}{120}$ **1**

$\Rightarrow \quad \frac{(n)!}{(r-1)!(n-r+1)!} \times \frac{r!(n-r)!}{n!} = \frac{45}{120}$

$\Rightarrow \quad 3x - 11r + 3 = 0 \qquad ....(i)$ **1**

Also, $\frac{{}^nC_r}{{}^nC_{r+1}} = \frac{120}{210}$

$\Rightarrow \quad \frac{n!}{r!(n-r)!} \times \frac{(r+1)!(n-r-1)!}{n!} = \frac{4}{7}$ **1**

$\Rightarrow \quad 4n - 11r - 7 = 0 \qquad ....(ii)$ **1**

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

$$n = 10 \text{ and } r = 3$$

$\therefore \quad \boxed{n = 10}$ **1**

www.schools.aglasem.com

$(52)^4 = (50 + 2)^4$ **1**

Using Binomial theorem, we get

$= (50)^4 + {}^4C_1\, 50^3 \times 2 + {}^4C_2 \times 50^2 \times 2^2 + {}^4C_3 \times 50 \times 2^3 + {}^4C_4 \times 2^4$ **2**

$= 6250000 + 8 \times 125000 + 24 \times 2500 + 32 \times 50 + 16$ **1**

$= 6250000 + 1000000 + 60000 + 1600 + 16$ **1**

$= 73,11,616$ **2**

24. Given inequations are

$3x + 2y \leq 60$ ....(i)

$x + 3y \leq 30, x \geq 0, y \geq 0$ ....(ii)

Take $3x + 3y = 60$

$\therefore$ At $x = 0, y = 20$ **1**

and $y = 0, x = 20$

At (0, 0); $0 + 0 < 60$, (True)

i.e., (0, 0) is included. **1**

Now take $x + 3y = 30$

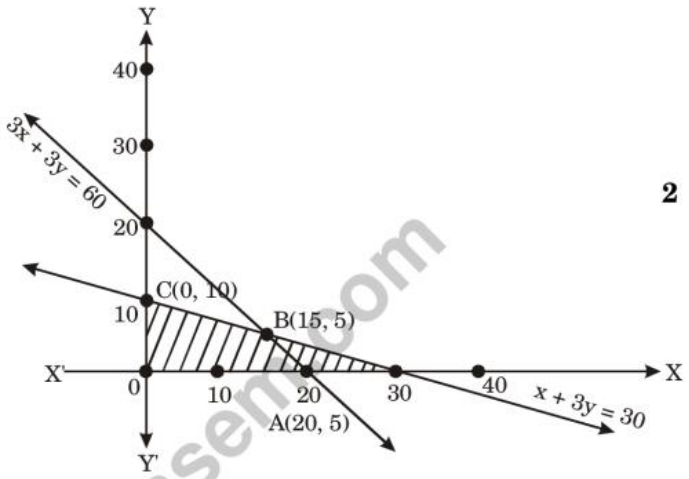
$\therefore$ At $x = 0, y = 10$

and $y = 0, x = 30$.

At (0, 0); $0 + 0 < 30$, (True)

So, origin is also included. **2**

So, shaded region *OABC* is the solution region.



2

25. $\text{L.H.S.} = \dfrac{1\cdot2^2 + 2\cdot3^2 + ... + n(n+1)^2}{1^2\cdot2 + 2^2\cdot3 + ... + n^2(n+1)}$

$= \dfrac{\Sigma[n(n+1)^2]}{\Sigma[n^2(n+1)]}$ **1**

$= \dfrac{\Sigma[n^3 + 2n^2 + n]}{\Sigma[n^3 + n^2]}$

$= \dfrac{\Sigma n^3 + 2\Sigma n^2 + \Sigma n}{\Sigma n^3 + \Sigma n^2}$ **1**

$= \dfrac{\left[\dfrac{n^2(n+1)^2}{4} + 2 \times \dfrac{n(n+1)(2n+1)}{6} + \dfrac{n(n+1)}{2}\right]}{\left[\dfrac{n^2(n+1)^2}{4} + \dfrac{n(n+1)(2n+1)}{6}\right]}$

$= \dfrac{\left(\dfrac{3n^2(n+1)^2 + 4n(n+1)(2n+1) + 6n(n+1)}{12}\right)}{\left(\dfrac{3n^2(n+1)^2 + 2n(n+1)(2n+1)}{12}\right)}$ **1**

$= \dfrac{n(n+1)(3n^2 + 3n + 8n + 4 + 6)}{n(n+1)(3n^2 + 3n + 4n + 2)}$ **1**

$= \dfrac{3n^2 + 11n + 10}{3n^2 + 7n + 6}$ **1**

www.schools.aglasem.com

$$= \frac{(3n+5)(n+2)}{(3n+1)(n+2)}$$

$$= \frac{3n+5}{3n+1} = \text{R.H.S.} \qquad \textbf{Hence proved.} \quad \textbf{1}$$

26. Given that,

$$(a + ib)\,(c + id)\,(e + if)\,(g + ih) = A + iB \qquad \textbf{1}$$

$$\therefore \quad (a - ib)\,(c - id)\,(e - if)\,(g - (ih) = A - iB \qquad \textbf{2}$$

$$\therefore \quad (A + iB)\,(A - iB) = (a + ib)\,(a - ib)\,(c + id)$$

$$(c - id)\,(e + if)\,(e - if)\,(g + ih)\,(g - ih) \quad \textbf{2}$$

$$A^2 + B^2 = (a^2 + b^2)\,(c^2 + d^2)\,(e^2 + f^2)\,(g^2 + h^2). \qquad \textbf{1}$$

OR

We have $\left|\frac{z+2-i}{z+5+4i}\right| = 5$, where z is only complex number.

$$\Rightarrow \quad \left|\frac{z+2-i}{z+5+4i}\right|^2 = 25 \qquad \textbf{1}$$

$$\left|\frac{x+iy+2-i}{x+iy+5+4i}\right|^2 = 25 \qquad \textbf{1}$$

$$\left|\frac{(x+2)+i(y-1)}{(x-5)+i(y+4)}\right|^2 = 25$$

$$\Rightarrow \text{As,} \quad |z|^2 = z\bar{z} \qquad \textbf{1}$$

$$\therefore \quad \left(\frac{(x+2)+i(y+1)}{(x+5)+i(y+4)}\right)\left(\frac{(x+2)+i(y-1)}{(x+5)+i(y+4)}\right) = 25$$

$$\Rightarrow \quad \frac{[(x+2)+i(y-1)][(x+2)-i(y+1)]}{[(x+5)+i(y+4)][(x+5)-i(y+4)]} = 25 \qquad \textbf{1}$$

$$\Rightarrow \therefore \quad (x + 2)^2 + (y - 1)^2 = 25\,[(x + 5)^2 + (y + 4)^2]$$

$$\Rightarrow \quad x^2 + 4 + 4x + y^2 + 1 - 2y = 25\,(x^2 + 25 + 10x + y^2 + 16 + 8y]$$

$$\Rightarrow \quad 25x^2 + 25y^2 + 250x + 200y + 1025 - x^2 - y^2 - 4x + 2y - 5 = 0 \qquad \textbf{1}$$

$$\Rightarrow \quad 24x^2 + 24y^2 + 246x + 202y + 1020 = 0$$

$$\Rightarrow \quad 12x^2 + 12y^2 + 123x + 101y + 510 = 0. \qquad \textbf{1}$$

❑❑

www.schools.aglasem.com