25-07-2021-SHIFT-1_PAPER-1_MATHS_MEMORY BASED

1. If the ratio of coefficient of middle term in the expansion of $(1+x)^{20}$ and sum of coefficients of middle terms in the expansion of $(1+x)^{19}$ is λ, then λ is:

1) 2 2) 1 3) 3 4) 4

Ans. 2

Sol. $$\frac{{}^{20}C_{10}}{{}^{19}C_9+{}^{19}C_{10}}=\frac{{}^{20}C_{10}}{{}^{20}C_{10}}=1$$

2. If $f(x)=\begin{cases}\dfrac{\lambda}{\mu}\dfrac{|x^2-5x+6|}{5x-6-x^2} & ; \quad x<2\\ \mu & ; \quad x=2\\ e^{\frac{\tan(x-2)}{x-[x]}} & ; \quad x>2\end{cases}$, is continuous at x=2. Then the sum of λ and μ is:

1) $e+e^2$ 2) $e-e^2$ 3) e^2-e 4) e^2+e+1

Ans. 2

Sol. RHL= $\lim\limits_{x\to 2^+} e^{\frac{\tan(x-2)}{x-[x]}}=\lim\limits_{x\to 2^+} e^{\frac{\tan(x-2)}{(x-2)}}=e$

LHL $=\lim\limits_{x\to 2^-}\dfrac{\lambda}{\mu}\dfrac{|x^2-5x+6|}{5x-6-x^2}$

For x<2, $|x^2-5x+6|=x^2-5x+6$

$\therefore$ LHL= $\lim\limits_{x\to 2^-}\dfrac{\lambda}{\mu}\dfrac{|x^2-5x+6|}{(5x-6-x^2)}=\dfrac{-\lambda}{\mu}$

Also, $f(2)=\mu$

For f(x) to be continuous at x=2,

RHL=LHL=f(2)

$\therefore e=\dfrac{-\lambda}{\mu}=\mu$

$\Rightarrow \mu=e$ and $\lambda=-e^2$

$\therefore \lambda+\mu=e-e^2$

3. If $\sin x+\sin 2x+\sin 3x+\sin 4x=0, x\in[0,2\pi]$ then sum of values of x is

1) 7π 2) 9π 3) 11π 4) 12π

Ans. 2

Sol. $(\sin x+\sin 4x)+(\sin 2x+\sin 3x)=0$

$$\Rightarrow 2\sin\frac{5x}{2}\cos\frac{3x}{2}+2\sin\frac{5x}{2}\cos\frac{x}{2}=0$$

$$\Rightarrow 2\sin\frac{5x}{2}\left(\cos\frac{3x}{2}+\cos\frac{x}{2}\right)=0$$

$$\Rightarrow 4\sin\frac{5x}{2}\cos x\cos\frac{x}{2}=0$$

$$\Rightarrow \sin\frac{5x}{2}=0 \quad \text{or } \cos x=0 \quad \text{or } \cos\frac{x}{2}=0$$

$$\Rightarrow \frac{5x}{2}=0,\pi,2\pi,3\pi,4\pi,5\pi \quad \text{or } x=\frac{\pi}{2},\frac{3\pi}{2} \quad \text{or } \frac{x}{2}=\frac{\pi}{2}$$

$$\Rightarrow x=0,\frac{2\pi}{5},\frac{4\pi}{5},\frac{6\pi}{5},\frac{8\pi}{5},\frac{10\pi}{5} \quad \text{or } x=\frac{\pi}{2},\frac{3\pi}{2} \quad \text{or } x=\pi$$

$$\Rightarrow x=0,\frac{2\pi}{5},\frac{4\pi}{5},\frac{6\pi}{5},\frac{8\pi}{5},2\pi,\frac{\pi}{2},\frac{3\pi}{2},\pi$$

Hence sum of all solutions $=9\pi$

4. The number of real solutions of the equation $e^{6x}+e^{4x}+2e^{3x}+12e^{2x}+e^{x}-1=0$

1) 0 2) 1 3) 6 4) 8

Ans. 2

Sol. Since $f(x)=e^{6x}+e^{4x}+2e^{3x}+12e^{2x}+e^{x}-1$

$$\Rightarrow f'(x)=6e^{6x}+4e^{4x}+6e^{3x}+24e^{2x}+e^{x}>0, \forall x\in R$$

Hence f(x) is an increasing function

Now $\lim_{x\to-\infty} f(x)=-1$ and $f(0)=1+1+2+12+1-1$

$$\Rightarrow f(0)>0$$

Hence f(x)=0 has a root in $(-\infty,0)$

5. If $\frac{1}{a-b}+\frac{1}{a-2b}+....\frac{1}{a-nb}=\alpha n+\beta n^2+\gamma n^3$ where a is so large then b such that cube and higher powers of $\frac{b}{a}$ may be neglected then value of γ is:

1) $\frac{b^2}{3a^3}$ 2) $\frac{a^2-b}{3a^3}$ 3) $\frac{a-b}{3a^2}$ 4) $\frac{b^2}{2a^2}$

Ans. 1

Sol. $\frac{1}{a-b}+\frac{1}{a-2b}+\frac{1}{a-3b}+....+\frac{1}{a-nb}$

$=\frac{1}{a}\left[\left(1-\frac{b}{a}\right)^{-1}+\left(1-\frac{2b}{a}\right)^{-1}+\left(1-\frac{3b}{a}\right)^{-1}+....+\left(1-\frac{nb}{a}\right)^{-1}\right]$

$=\frac{1}{a}\left[\left\{1+\left(\frac{b}{a}\right)+\left(\frac{b}{a}\right)^2+...\right\}+\left\{1+\left(\frac{2b}{a}\right)+\left(\frac{2b}{a}\right)^2+....\right\}+\left\{1+\left(\frac{nb}{a}\right)+\left(\frac{nb}{a}\right)^2....\right\}\right]$

$=\frac{1}{a}\left[n+\frac{b}{a}(1+2+....+n)+\frac{b^2}{a^2}\left(1^2+2^2+...n^2\right)\right]$

$=\frac{1}{a}\left[n+\frac{n^2}{2}\frac{b}{a}+\frac{n}{2}\frac{b}{a}+\frac{2n^3+3n^2+n}{6}\left(\frac{b^2}{a^2}\right)\right]$

$=n\left(\frac{1}{a}+\frac{b}{2a^2}+\frac{b^2}{6a^3}\right)+\left(\frac{b}{2a^2}+\frac{b^2}{2a^3}\right)n^2+\frac{b^2}{3a^3}n^3$

By comparing this result to $\alpha n+\beta n^2+\gamma n^3$

We get $\gamma=\frac{b^2}{3a^3}$

6. In an A.P., if $S_{3n}=3S_{2n}$, then ratio $\frac{S_{4n}}{S_{2n}}$ equals:

1) 8 2) 6 3) 4 4) 2

Ans. 2

Sol $\frac{S_{3n}}{S_{2n}}=\frac{\frac{3n}{2}\left[2a+(3n-1)d\right]}{\frac{2n}{2}\left[2a+(2n-1)d\right]}=3$

$\Rightarrow 2a+(3n-1)d=2\left[2a+(2n-1)d\right]$

$\Rightarrow 2a+(n-1)d=0 \ldots(1)$

Now $\dfrac{S_{4n}}{S_{2n}}=\dfrac{\frac{4n}{2}\left[2a+(4n-1)d\right]}{\frac{2n}{2}\left[2a+(2n-1)d\right]}$

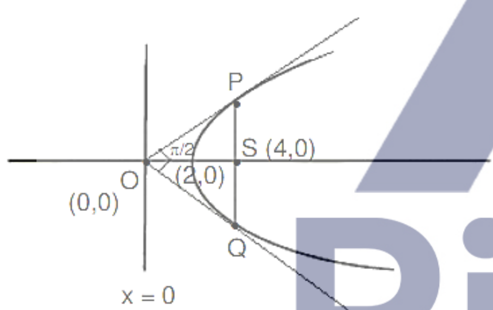
$=\dfrac{2\left[2a+(4n-1)d\right]}{\left[2a+(2n-1)d\right]}$

Put, $2a=-(n-1)d$, we have, $\dfrac{S_{4n}}{S_{2n}}=\dfrac{2[3nd]}{nd}=6$

7. A parabola whose vertex is at 2 unit distance from origin on positive x-axis and distance between focus and origin is 4 unit. The tangent drawn from the origin to the parabola meet the parabola at P and Q, then the area of ΔOPQ is

Ans. 16squnits

Sol.



Equation of parabola

$(y-0)^2=4(2)(x-2)$

Origin lie on directrix x=0

So ΔOPQ is right angle triangle.

Equation of chord of contact PQ is

T=0

X=4

It is latus rectum of parabola

So area of OPQ=$\frac{1}{2}\times 4\times 8=16$ square unit

8. The term independent of x in expansion of $\left(\dfrac{x+1}{x^{2/3}-x^{1/3}+1}-\dfrac{x-1}{x-x^{1/2}}\right)^{10}$ is:

1) 4 2) 120 3) 210 4) 310

Ans. 3

Sol. $\left(\left(x^{1/3}+1\right)-\left(\dfrac{\sqrt{x}+1}{\sqrt{x}}\right)\right)^{10}$

$\left(x^{1/3}-x^{-1/2}\right)^{10}$

$T_{r+1}={}^{10}C_r\left(x^{1/3}\right)^{10-r}\left(-x^{-1/2}\right)^r$

$\dfrac{10-r}{3}-\dfrac{r}{2}=0\Rightarrow 20-2r-3r=0$

$\Rightarrow r=4$

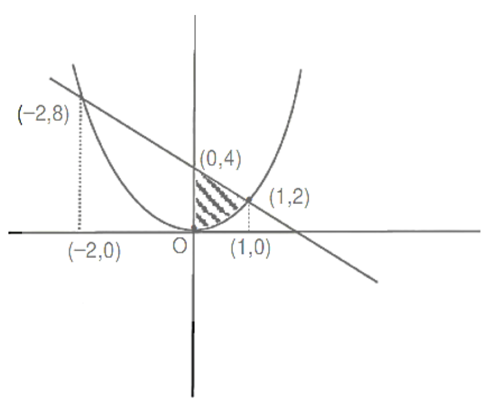
$T_5={}^{10}C_4=\dfrac{10\times 9\times 8\times 7}{4\times 3\times 2\times 1}=210$

9. The area of the region bounded by the inequalities $2x^2<y<4-2x, x>0$ is:

1) $\dfrac{11}{12}$ 2) $\dfrac{7}{3}$ 3) $\dfrac{2}{3}$ 4) $\dfrac{5}{2}$

Ans. 2

Sol.



$2x^2=4-2x$

$x^2+x-2=0$

$(x+2)(x-1)=0$

$x=-2, x=1$

Required area $=\frac{1}{2}(2+4)\times 1-\int_0^1 2x^2 dx=3-\frac{2}{3}=\frac{7}{3}$ square units

10. An ellipse with eccentricity $\frac{1}{\sqrt{3}}$ passes through the point $\left(\sqrt{\frac{3}{2}},1\right)$. A circle is drawn whose centre is the focus of ellipse and its radius is $\frac{2}{\sqrt{3}}$. If circle cuts the ellipse at two different points P and Q then the value of PQ^2 is

1) $\frac{8}{3}$ 2) $\frac{4}{3}$ 3) $\frac{16}{3}$ 4) $\frac{5}{3}$

Ans 3

Sol. Let equation of ellipse is $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1(a>b)$

It passes through $\left(\sqrt{\frac{3}{2}},1\right)\Rightarrow \frac{3}{2a^2}+\frac{1}{b^2}=1...(1)$

Given $e=\frac{1}{\sqrt{3}}\Rightarrow b^2=a^2\left(1-e^2\right)=\frac{2}{3}a^2....(2)$

Solve (1) & (2) we get $a^2=3, b^2=2$

$\therefore$ Ellipse is $\frac{x^2}{3}+\frac{y^2}{2}=1....(3)$

Focus $(\pm ae,0)\equiv\left(\pm\sqrt{3}.\frac{1}{\sqrt{3}},0\right)\equiv(\pm 1,0)$

Hence circle is $(x-1)^2+y^2=\left(\frac{2}{\sqrt{3}}\right)^2=\frac{4}{3}...(4)$

Solve (3) & (4)

$2x^3+3\left(\frac{4}{3}-(x-1)^2\right)=6$

$2x^2+4x-3\left(x^2+1-2x\right)=6$

$-x^2+6x-5=0$

x=1,5

When $x=1 \Rightarrow \frac{1}{3}+\frac{y^2}{2}=1 \Rightarrow y^2=\frac{4}{3} \Rightarrow y=\pm\frac{2}{\sqrt{3}}$

Hence $P\left(\left(1,\frac{2}{\sqrt{3}}\right), Q\left(1,-\frac{2}{\sqrt{3}}\right)\right) \Rightarrow PQ^2=\frac{16}{3}$

When $x=5 \Rightarrow \frac{y^2}{2}=1-\frac{25}{3}=-\frac{22}{3} \Rightarrow$ not possible

$PQ^2=\frac{16}{3}$

11. The statement $(p \to q)\,^\wedge\,(p \to \sim q)$ is logically equivalent to:

1) p 2) q 3) $\sim p$ 4) $\sim q$

Ans. 3

Sol. $=(p \to q) \wedge (p \to \sim q)$

$=(\sim p \vee q) \wedge (\sim p \vee \sim q)$

$=\sim p \vee (q \wedge \sim q)$

$=\sim p \vee f$

$=\sim p$

12. In class 10^{th}, 11^{th} and 12^{th} of a school there are 5,6 and 8 students respectively. The number of ways of selection of 10 students such that at least two students are selected from each of the classes and at most 5 students together can be selected from class 10^{th} & 11^{th} are $k \times 100$ then the value of k is.

Ans. 238

Sol.

Total student	(5)	(6)	(8)	
Class	10^{th}	11^{th}	12^{th}	
	2	2	6	$\to 5_{C_2} \times 6_{C_2} \times 8_{C6}$
	2	3	5	$\to 5_{C_2} \times 6_{C_3} \times 8_{C5}$
	3	2	5	$\to 5_{C_3} \times 6_{C_2} \times 8_{C5}$

Total number of ways $=5_{C_2} \times 8_{C_3}\left(6_{C_3}+6_{C_2}\right)+5_{C_2} \times 6_{C_2} \times 8_{C_6}$

$=23800$

13. If $\left(1+\frac{2}{3}+\frac{6}{3^2}+\frac{10}{3^3}+....+\infty\right)^{\log_{0.25}\left(\frac{1}{3}+\frac{1}{3^2}+\frac{1}{3^3}+....\right)}$ is ℓ then ℓ^2 is

Ans. 3

Sol. $\left(1+\frac{2}{3}+\frac{6}{3^2}+\frac{10}{3^3}+....\right)^{\log_{0.25}\left(\frac{1}{3}\left(\frac{1}{\frac{2}{3}}\right)\right)}=\ell$

$$\left(1+\frac{2}{3}+\frac{6}{3^2}+\frac{10}{3^3}+....\right)^{\log_{\frac{1}{4}}\frac{1}{2}}=\ell$$

Let $1+\frac{2}{3}+\frac{6}{3^2}+\frac{10}{3^2}+...=x$

$$(x-1)=\frac{2}{3}+\frac{6}{3^2}+\frac{10}{3^3}+...(1)$$

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

From (1)-(2), we get

$$\frac{2}{3}(x-1)=\frac{2}{3}+\frac{4}{3^2}+\frac{4}{3^3}+...$$

$$\frac{2}{3}(x-1)=\frac{2}{3}+\frac{4}{3^2}\left(\frac{1}{1-\frac{1}{3}}\right)$$

$$\frac{2}{3}(x-1)=\frac{2}{3}+\frac{4}{3^2}\frac{3}{2}.$$

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

$$x-1=2 \,\&\, x=3$$

So, $3^{\log_{\frac{1}{4}}\frac{1}{2}}=\ell$

$$3^{\frac{1}{2}}=\ell$$

$$\ell^2=3$$

14. A hyperbola with equation $\frac{(x-1)^2}{16}-\frac{(y+2)^2}{9}=1$ is given. A triangle is formed with two vertices as the focus of the hyperbola and third vertex lies on hyperbola. The locus of centroid of the triangle is:

1) $16(x-1)^2-9(y+2)^2=16$
2) $9(x-1)^2-16(y+2)^2=16$
3) $9(x-1)^2+16(y+2)^2=16$
4) $16(x-1)^2+9(y+2)^2=16$

Ans. 2

Sol. Given $\frac{(x-1)^2}{16}-\frac{(y+2)^2}{9}=1$

Let $x-1=X$

$y+2=Y$

$\frac{X^2}{16}-\frac{Y^2}{9}=1$

$a=4, b=3$

$b^2=a^2\left(e^2-1\right)\Rightarrow\frac{9}{16}=e^2-1\Rightarrow e=\frac{5}{4}$

Focus $(\pm ae,0)\Rightarrow X=\pm ae, Y=0$

$x-1=\pm 5, y+2=0$

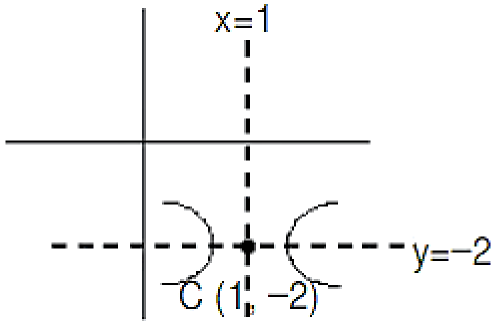
$x=6,-4, y=-2$

Hence focus $S(-4,-2), S'(6,-2)$

Let any point on hyperbola $x-1=4\sec\theta, y+2=3\tan\theta\Rightarrow P(1+4\sec\theta,-2+3\tan\theta)$

Hence centroid $\equiv\left(\frac{-4+6+1+4\sec\theta}{3},\frac{-2-2-2+3\tan\theta}{3}\right)$

$h=\frac{3+4\sec\theta}{3}\Rightarrow\sec\theta=\frac{3h-3}{4}$



$$k=\frac{-6+3\tan\theta}{3}\Rightarrow \tan\theta=k+2$$

$$\sec^2\theta-\tan^2\theta=1$$

$$\left(\frac{3h-3}{4}\right)^2-\left(k+2\right)^2=1$$

Locus is $\dfrac{9\left(x-1\right)^2}{16}-\dfrac{\left(y+2\right)^2}{1}=1$

$$\Rightarrow 9\left(x-1\right)^2-16\left(y+2\right)^2=16$$

15. Evaluate $\displaystyle\int_{\frac{\pi}{24}}^{\frac{5\pi}{24}}\frac{dx}{1+\sqrt[3]{\tan 2x}}$:

1) $\dfrac{\pi}{24}$ 2) $\dfrac{\pi}{4}$ 3) $\dfrac{\pi}{12}$ 4) $\dfrac{\pi}{6}$

Ans. 3

Sol. $\displaystyle\int_a^b f\left(x\right)dx=\int_a^b f\left(a+b-x\right)dx$

$$I=\int_{\frac{\pi}{24}}^{\frac{5\pi}{24}}\frac{dx}{1+\sqrt[3]{\tan 2x}}\dots(1)$$

By property

$$I=\int_{\frac{\pi}{24}}^{\frac{5\pi}{24}}\frac{dx}{1+\sqrt[3]{\cot 2x}}$$

$$I=\int_{\frac{\pi}{24}}^{\frac{5\pi}{24}}\frac{\sqrt[3]{\tan 2x}dx}{1+\sqrt[3]{\tan 2x}}....(2)$$

By adding (1) & (2)

$$2I=\int_{\frac{\pi}{24}}^{\frac{5\pi}{24}}\frac{\left(1+\sqrt[3]{\tan 2x}\right)dx}{1+\sqrt[3]{\tan 2x}}$$

$$2I=\int_{\frac{\pi}{24}}^{\frac{5\pi}{24}}dx=\frac{\pi}{6}$$

$$\therefore I=\frac{\pi}{12}$$

16. If a set of matrix $M=\left\{\begin{pmatrix} a & b \\ c & d \end{pmatrix}: a,b,c,d\in\{\pm1,\pm2,\pm3\}\right\}$ and $A\in M$ then the number of such matrices A whose determinant value is 15.

Ans. 16

Sol. $|A|=(ad-bc)=15$

Where $a,b,c,d\in\{\pm1,\pm2,\pm3\}$

Case-1 ad=9 & bc=-6

$ad\equiv(3,3)$ or $(-3,-3)$ $bc\equiv(2,-3),(-2,3),(-3,2),(3,-2)$

Total $=2\times4=8$ matrix

Case-II ad=6 and bc=-9

Similarly, Total $=4\times2=8$ matrix

Total such matrix $=8+8=16$ matrix

17. If $\frac{dy}{dx}=1+xe^{y-x},-\sqrt{2}<x<\sqrt{2}$ and $y(0)=0$ then minimum value of y is

1) $(1-\sqrt{3})-\ell n(\sqrt{3}-1)$ 2) $(1+\sqrt{3})-\ell n(\sqrt{3}-1)$

3) $(1-\sqrt{3})-\ell n(\sqrt{3}+1)$ 4) $(1+\sqrt{3})-\ell n(\sqrt{3}+1)$

Ans. 1

Sol. $\frac{dy}{dx}=1+xe^{y-x}....(1)$

$$e^{-y}\frac{dy}{dx}=e^{-y}+xe^{-x}$$

Put $e^{-y}=t \Rightarrow e^{-y}\frac{dy}{dx}=-\frac{dt}{dx}$

$$-\frac{dt}{dx}=t+xe^{-x}$$

$$\frac{dt}{dx}+t=-xe^{-x}..(2)$$

$$I.F.=e^{\int 1.dx}=e^{x}$$

Solution of equation (2) is

$$te^{x}=\int\left(-xe^{-x}\right).e^{x}dx+c$$

$$te^{x}=-\frac{x^2}{2}+c$$

$$e^{x-y}=-\frac{x^2}{2}+c....(3)$$

$$y(0)=0\Rightarrow 1=c\Rightarrow e^{x-y}=\left(\frac{2-x^2}{2}\right)$$

$$x-y=\ell n\left(\frac{2-x^2}{2}\right)$$

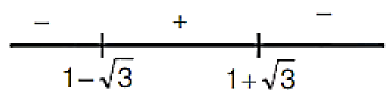
$$y=x-\ell n\left(\frac{2-x^2}{2}\right)$$

Now, $\frac{dy}{dx}=1+x\left(\frac{2}{2-x^2}\right)$

$$\Rightarrow\left(\frac{2-x^2+2x}{2-x^2}\right)=0$$

$$\Rightarrow-\left(\frac{x^2-2x-2}{2-x^2}\right)=0$$

$$x=1\pm\sqrt{3}$$



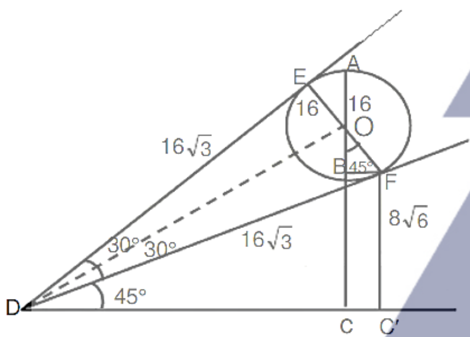
$\Rightarrow y_{\min}$ at $x = 1-\sqrt{3} \Rightarrow y_{\min} = \left(1-\sqrt{3}\right) - \ell n\left(\sqrt{3}-1\right)$

18. A balloon with radius 16 cm is at a certain height above the ground such that the angle of elevation of its centre is 75^0 from a point on the ground. If the balloon subtends an angle of 60^0 at that point, then the height of its topmost point from the ground is:

1) $8\left(\sqrt{6}-\sqrt{2}+2\right)$ 2) $8\left(\sqrt{6}-2\sqrt{2}+2\right)$ 3) $8\left(\sqrt{6}+\sqrt{2}+2\right)$ 4) $8\left(\sqrt{6}-2\sqrt{2}+2\right)$

Ans. 3

Sol. In triangle EOD



$$ED = \frac{16}{\tan 30^0} = 16\sqrt{3}$$

$$DF = 16\sqrt{3}$$

Now in $\Delta DFC'$

$$C'F = 16\sqrt{3}.\sin 45^0$$

$$= 16\sqrt{3}.\frac{1}{\sqrt{2}} = 8\sqrt{6}$$

$$CB = 8\sqrt{6}$$

In Δ^{le} OBF

$$OB = 16\sin 45^0$$

$$= \frac{16}{\sqrt{2}} = 8\sqrt{2}$$

Hence of top most point $= 8\sqrt{6} + 8\sqrt{2} + 16 = \left(8\sqrt{6} + \sqrt{2} + 2\right)$

19. If S={ $S=\{n : n\in N$ and $1\le n\le 100, \begin{bmatrix}0 & i\\ i & 0\end{bmatrix}^n\begin{bmatrix}a & b\\ c & d\end{bmatrix}=\begin{bmatrix}a & b\\ c & d\end{bmatrix}\forall a,b,c,d\in R\}$ then the number of 2 digit number in S is

1) 25 2) 22 3) 24 4) 20

Ans. 2

Sol. Let $A=\begin{bmatrix}0 & i\\ i & 0\end{bmatrix}^n$ and $B=\begin{bmatrix}a & b\\ c & d\end{bmatrix}$

$AB=IB$

$(A-I)B=0$

$A=I$

$\begin{bmatrix}0 & i\\ i & 0\end{bmatrix}^n=1$

$A^4=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

n=multiple of 4(4,8,….100)

Number of two digit numbers in S=22 (12,16,….96)

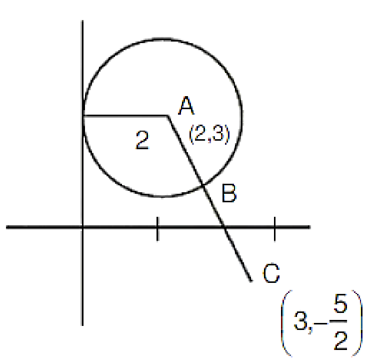
20. If $|z-(3i+2)|<2$ then the min value of $|2z-6+5i|$ is

1) $(5\sqrt{5}-2)$ 2) $(5\sqrt{5}-4)$ 3) $(5\sqrt{5}+2)$ 4) $\left(\frac{5\sqrt{5}}{2}+2\right)$

Ans. 2

Sol. $|(x-2)+(y-3)i|<2$

Point A(2,3) and radius=2



$\left|(2x-6)+(2y+5)i\right|$

$x=3$

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

Point C $\left(3,-\frac{5}{2}\right)$

$AC=\sqrt{(3-2)^2+\left(-\frac{5}{2}-3\right)^2}$

$=\sqrt{1+\frac{121}{4}}$

$=\sqrt{\frac{125}{4}}$

Min distance $2BC=2\left(\frac{5\sqrt{5}}{2}-2\right)=\left(5\sqrt{5}-4\right)$

21. Let $\vec{p}=\left(3\hat{i}+2\hat{j}+\hat{k}\right),\vec{q}=\left(2\hat{i}+\hat{j}+\hat{k}\right)$ and $\vec{r}$ is perpendicular to both $\vec{p}+\vec{q}$ and $\vec{p}-\vec{q}$ such that $|\vec{r}|=\sqrt{3}$. If $\vec{r}=\left(a\hat{i}+b\hat{j}+c\hat{k}\right)$, then the value of $|a|+|b|+|c|$ is:

1) 0 2) 1 3) 3 4) 6

Ans. 3

Sol. $(\vec{p}+\vec{q})\times(\vec{p}-\vec{q})=\begin{vmatrix}\hat{i} & \hat{j} & \hat{k}\\ 5 & 3 & 2\\ 1 & 1 & 0\end{vmatrix}=-2\hat{i}+2\hat{j}+2\hat{k}$

$\vec{r}=\pm\sqrt{3}\frac{\left((\vec{p}+\vec{q})\times(\vec{p}-\vec{q})\right)}{\left|(\vec{p}+\vec{q})\times(\vec{p}-\vec{q})\right|}$

$=\pm\left(-\hat{i}+\hat{j}+\hat{k}\right)$

So $|a|=1,|b|=1,|c|=1$

$|a|+b+|c|=3$