(1) $\sum_{r=1}^{n+1}(2r-1)=(n+1)^2$

$n=1$ විට LHS $=\sum_{r=1}^{2}(2r-1)$ $\qquad$ $n=1$ විට

$\qquad$ RHS $(1+1)^2$

$= 2(1)-1+2\times2-1$ $\qquad = 4$

$= 4$ $\quad \therefore n=1$ විට ප්‍රතිඵලය සත්‍යයි (5)

$n=p$, $p\in Z^+$ සඳහා ප්‍රතිඵලය සත්‍ය යැයි සිතමු

$\sum_{r=1}^{p+1}(2r-1)=(p+1)^2$ — (1) (5)

$n=p+1$ විට $\sum_{r=1}^{p+2}(2r-1)=\sum_{r=1}^{p+1}(2r-1)+2(p+2)-1=(p+1)^2+2p+3$ (5)

$= p^2+2p+1+2p+3$

$(p+2)^2$

$\sum_{r=1}^{p+2}2r-1=(\overline{p+1}+1)^2$ (5)

$\therefore n=p+1$ විටද ප්‍රතිඵලය සත්‍යවේ. ගණිත අභ්‍යාහන මූලධර්මයෙන්

$n\in Z^+$ සඳහා ප්‍රතිඵලය සත්‍යවේ (5)

25

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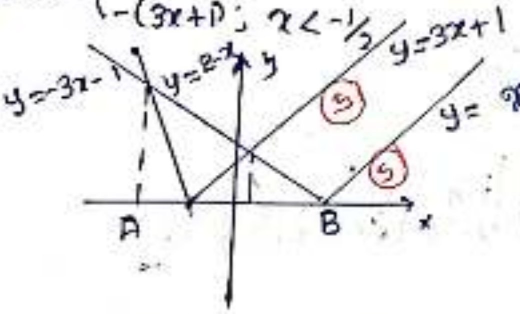
(2) $\left|\frac{3x+1}{x-2}\right|>1$ $\qquad |x-2|=\begin{cases}x-2; & x\geq 2\\ -(x-2) & x<2\end{cases}$

$3x+1=\begin{cases}3x+1; & x\geq -\frac{1}{3}\\ -(3x+1); & x<-\frac{1}{3}\end{cases}$



$\left.\begin{array}{l}y=-3x-1\\ y=2-x\end{array}\right\}x=-\frac{3}{2}$ — (A) (5)

$\left.\begin{array}{l}y=3x+1\\ y=2-x\end{array}\right\}x=\frac{1}{4}$ — (B) (5)

$\therefore$ අදාල පරාසය $x<-\frac{3}{2}$ හෝ $\frac{1}{4}<x<2$ හෝ $x>2$ (5)

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(3) $T_{r+1}={}^nC_r(px)^r$ $\qquad r=1$ විට $\qquad r=2$ විට

$={}^nC_r\,p^rx^r$ $\qquad {}^nC_1\cdot p=8$ $\qquad {}^nC_2\,p^2=24$ $\qquad n\frac{(n-1)}{2}p^2=24$ — (2)

$np=8$ — (1) (5) $\qquad \frac{n!\,p^2}{2!(n-2)!}=24$ (5)

(1) හා (2) න් $\quad n\frac{(n-1)}{2}\cdot\frac{64}{n^2}=24$ (5) $\qquad 4(n-1)=3n$ $\qquad p=5$ (5)

$n=4$ (5)

25

(4) $(2+i)^3 = 2^3 + 3\cdot 2^2 i + 3\cdot(2)i^2 + i^3$

$= 8 + 12i - 6 - i$

$= 2 + 11i$ (5)

$\therefore\ b = 11$ (5)

$(2+i)$, $z^3 + pz + q = 0$ හි මූලයක් නම්

$(2+i)^3 + p(2+i) + q = 0$ (5)

$(2+11i) + p(2+i) + q = 0$

$(2+2p+q) + (11+p)i = 0$

$Im(z_0) = 0$ $\quad$ $Re(z_0) = 0$

$11 + p = 0$ $\quad$ $2 + 2p + q = 0$

$p = -11$ (5) $\quad$ $2 + 2(-11) + q = 0$

$q = 20$ (5)

$\boxed{25}$

$$\lim_{x\to 0} \frac{(\sqrt{x+2}-\sqrt{2})(1+x\sin 3x-\cos 2x)\times(\sqrt{x+2}+\sqrt{2})}{x^2\sin x\,(\sqrt{x+2}+\sqrt{2})} \quad (5)$$

$$\lim_{x\to 0} \frac{x(1+x\sin 3x-\cos 2x)}{x^2\sin x\,(\sqrt{x+2}+\sqrt{2})} = \frac{x(x\sin 3x+2\sin^2 x)}{x^2\sin x\,(\sqrt{x+2}+\sqrt{2})}$$

$$\lim_{x\to 0}\left[\frac{\sin 3x}{\sin x} + \frac{2\sin x}{x}\right]\frac{1}{\sqrt{x+2}+\sqrt{2}}$$

$$\left[\frac{3\lim_{x\to 0}\frac{\sin 3x}{3x}}{\lim_{x\to 0}\frac{\sin x}{x}} + 2\lim_{x\to 0}\frac{\sin x}{x}\right]\lim_{x\to 0}\left[\frac{1}{\sqrt{x+2}+\sqrt{2}}\right] \quad (5)\ (5)\ (5)$$

$$\frac{3+2}{2\sqrt{2}} = \frac{5\sqrt{2}}{4} \quad (5)$$

$\boxed{25}$

06) $y = \tan^{-1}\sqrt{3x}$

$\frac{dy}{dx} = \frac{1}{1+3x^2} \times \sqrt{3} \times \frac{1}{2} x^{-1/2}$ (5)

$\frac{dy}{dx} = \frac{\sqrt{3}}{2(1+3x^2)\sqrt{x}}$ (5)

$\frac{2}{\sqrt{3}} dy = \frac{dx}{(1+3x)\sqrt{x}}$

$\frac{2}{\sqrt{3}} \int dy = \int \frac{dx}{(1+3x)\sqrt{x}}$

$\int_{1/3}^{1} \frac{dx}{(1+3x)\sqrt{x}} = \frac{2}{\sqrt{3}} [\tan^{-1}\sqrt{3x}]_{1/3}^{1}$ (5)

$\int_{1/3}^{1} \frac{dx}{(1+3x)\sqrt{x}} = \frac{2}{\sqrt{3}} [\tan^{-1}\sqrt{3} - \tan^{-1}(1)]$ (5)

$= \frac{2\sqrt{3}}{3} [\pi/3 - \pi/4]$

$= \frac{\sqrt{3}\pi}{18} \quad \therefore n = 18$ (5)

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7) $x = 2(1+\sin\theta) \quad y = 2\cos 2\theta$

$\frac{dx}{d\theta} = 2\cos\theta \quad \frac{dy}{d\theta} = -4\sin 2\theta$ (5)

$\frac{dy}{dx} = \frac{dy}{d\theta} \cdot \frac{d\theta}{dx} = \frac{-4\sin 2\theta}{2\cos\theta} = \frac{-4 \times 2\sin\theta\cos\theta}{2\cos\theta} = -4\sin\theta$ (5)

ස්පර්ශකයේ සමීකරණය

$y - 2\cos 2\theta = -4\sin\theta(x - 2(1+\sin\theta))$ (5)

$y + 4\sin\theta x - 2\cos 2\theta - 8\sin\theta(1+\sin\theta) = 0$

$y + 4\sin\theta x - 8\sin\theta - 8\sin^2\theta - 2\cos 2\theta = 0$

$y + 4\sin\theta x - 8\sin\theta - 8\sin^2\theta - 2[1 - 2\sin^2\theta] = 0$ (5)

$y + 4\sin\theta x - 8\sin\theta - 4\sin^2\theta - 2 = 0$

$y + 4\sin\theta x - 2(2\sin^2\theta + 4\sin\theta + 1) = 0$ (5)

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8) $\frac{y-2}{x-1} = 1 = t \Rightarrow \frac{y-2}{1} = \frac{x-1}{1} = t$ ලෙස ගනිමු

$x = 1+t, \quad y = 2+t$ (5)

$\left| \frac{3(1+t) + 4(2+t) - 10}{\sqrt{3^2+4^2}} \right| = 3$ (5)

$\left| \frac{7t+1}{5} \right| = 3$

$7t + 1 = \pm 15$ (5)

(+) $7t + 1 = 15$, $t = 2$

(−) $7t + 1 = -15$, $7t = -16$, $t = -16/7$

$\therefore P \equiv (3, 4)$ (5) හෝ $P = (-9/7, -2/7)$ (5)

25

09) $S=0$ හි කේන්ද්‍රය C නම්

$2g=-4,\ 2f=6$

$g=-2,\ f=3$

$C=(-g,-f)=(2,-3)$

$S=0$ හි අරය $R=\sqrt{g^2+f^2-c}$

$R=\sqrt{(-2)^2+3^2-(-12)}$

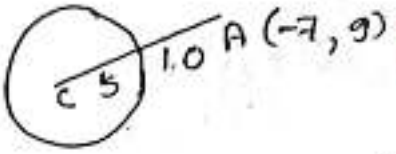
$R=5$ (5)

AC දිග $=\sqrt{(-7-2)^2+(9-3)^2}$

$=15$ (5)

AC7 වෘත්තය අරය

A ලක්ෂ්‍ය වෘත්තයෙ පිටතින් පිහිටයි



(5)

$CP:PA=5:10=1:2$ (5)

$P=\left(\dfrac{1\times(-7)+2\times 2}{1+2},\ \dfrac{1\times 9+2\times(-3)}{1+3}\right)$

$P=(-1,1)$ (5)

25

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10) $\cos 52^\circ+\cos 68^\circ+\cos 172^\circ$

$=2\cos 60^\circ\cos 8^\circ+\cos 172^\circ$ (5)

$=2\times\frac{1}{2}\cos 8^\circ+\cos 172^\circ$ (5)

$=\cos 8^\circ+\cos(180-172)$ (5)

$=\cos 8^\circ-\cos 8^\circ$ (5)

$=0$ (5)

25

B කොටස

01] a) $f(x)=x^2+kx-5=0 <^{\alpha}_{\beta}$ $k\in R$

$\alpha+\beta=-k$ (5) $\alpha\beta=-5$ (5)

$\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta$

$=(-k)^2-2(-5)$ (5)

$=k^2+10$ (5)

$\alpha^2\beta^2=(\alpha\beta)^2$

$=(-5)^2$ (5)

$=25$ (5)

$5(\alpha^2+\beta^2)=7\alpha^2\beta^2$

$5(k^2+10)=7\times 25$ (5)

$k^2+10=35$

$k^2=25$ (5)

$k=\pm 5$

$k=5$ හෝ $k=-5$
(5) (5)

$k=5$ විට $\alpha^2+\beta^2=35$ මූල ඇතිවිට $\frac{1}{\alpha^2}\times\frac{1}{\beta^2}=\frac{1}{\alpha^2\beta^2}=\frac{1}{25}$ (5) (5)

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මූල ඓක්‍යය $\frac{1}{\alpha^2}+\frac{1}{\beta^2}=\frac{\alpha^2+\beta^2}{\alpha^2\beta^2}=\frac{35}{25}=7/5$ 5

5

$1/\alpha^2$ හා $1/\beta^2$ මූල වන සමීකරණය $x^2-\left[\frac{1}{\alpha^2}+\frac{1}{\beta^2}\right]x+\frac{1}{\alpha^2}+\frac{1}{\beta^2}=0$

$x^2-(7/5)x+1/25=0$ 5

$25x^2-35x+1=0$ 5

$$y-\begin{cases}\frac{\alpha^3\beta+1}{\alpha^2}=\alpha\beta+\frac{1}{\alpha^2}=-5+x\\ \frac{\alpha\beta^3+1}{\beta^2}=\alpha\beta+\frac{1}{\beta^2}=-5+x\end{cases}$$

$y=-5+x \Rightarrow x=(y+5)$

$25(y+5)^2-35(y+5)+1=0$ 5

$25y^2+250y+625-35y-175+1=0$

$25y^2+215y+451=0$ 5

$y\rightarrow x$

$25x^2+215x+451=0$

$\boxed{90}$

b) $f(x)$ බහුපදය $(x-a)$ මගින් බෙදූවිට ශේෂය $f(a)$ වේ. 5

$f(x)=(x-a)g(x)+R$ 5

$x=a$ විට $f(a)=R$ 5

$f(x)=(3x^2+x-2)h(x)+x+2$

$f(x)=(x+1)(3x-2)h(x)+x+2$ —— ① 5

$g(x)=(x^2-1)k(x)+x$

$g(x)=(x-1)(x+1)k(x)+x$ —— ② 5

① + ② $f(x)+g(x)=(x+1)(3x-2)h(x)+x+2+(x-1)(x+1)k(x)+x$ 5

$=(x+1)\left[(3x-2)h(x)+(x-1)k(x)+2\right]$ 5

$\therefore (x+1)$ යනු $f(x)+g(x)$ හි සාධකයකි. 5

ශේෂ ප්‍රමේයය අනුව

$f(x)\cdot g(x)$ බහුපදය $(x+1)$න් බෙදූ විට ශේෂය $f(-1)\cdot g(-1)$ වේ. 5

① න් $f(-1)=1$ 5.

② න් $g(-1)=-1$ 5

ශේෂය $f(-1)\cdot g(-1)=1\times(-1)=-1$ 5

$\boxed{60}$

12) a) (i)

ගණිතඥයන් (4)	ජ්‍යොතිෂඥ (9)	සංගීතඥ (2)	ආකාර
2	8	2	${}^4C_2 \times {}^9C_8 \times {}^2C_2 =$ (5) 54 (5)
3	7	2	${}^4C_3 \times {}^9C_7 \times {}^2C_2 =$ (5) 144 (5)
4	6	2	${}^4C_4 \times {}^9C_6 \times {}^2C_2 =$ (5) 84 (5)

ආකාර $= 282$ (5)

ii) ආකාර

$3!\,[4! \times 6! \times 2!]$ (10)

$6\,(24 \times 720 \times 2)$ (5)

$207\ 360$ (5)

iii) මුළු ආකාර

$12!$ (5)

ගණිතඥ වර්ගයා එක ළඟ සිටින $9! \times 4!$ (10)

ගණිතඥ වර්ගයා එක ළඟ

නොසිටින $12! - 9! \times 4!$ (5)

75

b) $U_r = \dfrac{r \cdot 2^r}{(r+2)!}$ (5)

$U_r = \dfrac{A \cdot 2^r}{(r+1)!} + \dfrac{B \cdot 2^r}{(r+2)!}$

$\dfrac{r \cdot 2^r}{(r+2)!} = \dfrac{A \cdot 2^r}{(r+1)!} + \dfrac{B \cdot 2^r}{(r+2)!}$

$r = A(r+2) + B$ (5)

සංගුණක සමාන කිරීම

$r \rightarrow \; A = 1$ (5)

$r^0 \rightarrow \; 2A + B = 0, \; B = -2$ (5)

$U_r = \dfrac{2^r}{(r+1)!} - \dfrac{2 \cdot 2^r}{(r+2)!}$ (5)

$f(r) = \dfrac{2^r}{(r+1)!}$ (5) හා $f(r+1) = \dfrac{2^{r+1}}{(r+2)!}$ වේ.

එවිට $U_r = f(r) - f(r+1)$ වේ.

$r=1$, $U_1 = f(1) - f(2)$

$r=2$, $U_2 = f(2) - f(3)$ (15)

$r=3$, $U_3 = f(3) - f(4)$

- - - - - - - - - - -

$r=n-2$, $U_{n-2} = f(n-2) - f(n-1)$

$r=n-1$, $U_{n-1} = f(n-1) - f(n+1)$

(+)

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$r = n, \quad U_n = f(n) - f(n+1)$

$U_1 + U_2 + U_3 + \cdots + U_n = f(1) - f(n+1)$

$$\sum_{r=1}^{n} U_r = \frac{2}{2!} - \frac{2^{n+1}}{(n+2)!} \quad (10)$$

$$\sum_{r=1}^{n} U_r = 1 - \frac{2^{n+1}}{(n+2)!} \quad (5)$$

$$\sum_{r=1}^{n} W_r = 1 - \sum_{r=1}^{n-1} U_r = 1 - \left[1 - \frac{2^n}{(n+1)!}\right] \quad (10)$$

$$= \frac{2^n}{(n+1)!} \quad (5)$$

75

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3) $A = \begin{pmatrix} x & -2 \\ -4 & 1 \end{pmatrix}$ $\quad \mathrm{Det}(A) = -2$

$x - (-4)(-2) = -2$

$x - 8 = -2$

$x = 6 \quad (5)$

$A = \begin{pmatrix} 6 & -2 \\ -4 & +1 \end{pmatrix}$

$$LHS = A^2 = \begin{pmatrix} 6 & -2 \\ -4 & 1 \end{pmatrix} \begin{pmatrix} 6 & -2 \\ -4 & 1 \end{pmatrix} = \begin{pmatrix} 44 & -14 \\ -28 & 9 \end{pmatrix} \quad (5) \quad (5)$$

$$RHS = 7A + 2I = 7\begin{pmatrix} 6 & -2 \\ -4 & 1 \end{pmatrix} + 2\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 44 & -14 \\ -28 & 9 \end{pmatrix} \quad (5) \quad (05)$$

$LHS = RHS$

$A^2 = 7A + 2I$ යි

$$I = \frac{A^2 - 7A}{2} = A\left(\tfrac{1}{2}A - 7I\right) \quad (5)$$

$$A^{-1} = \tfrac{1}{2}(A - 7I) = \tfrac{1}{2}\left\{\begin{pmatrix} 6 & -2 \\ -4 & 1 \end{pmatrix} - 7\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}\right\} \quad (5)$$

$$= \tfrac{1}{2}\begin{pmatrix} -1 & -2 \\ -4 & -6 \end{pmatrix} = \begin{pmatrix} -\tfrac{1}{2} & -1 \\ -2 & -3 \end{pmatrix} \quad (5)$$

$A \cdot B^T = I + A$

$A^{-1}A \cdot B^T = A^{-1}I + A^{-1}A$

$I B^T = A^{-1} + I$

$B^T = A^{-1} + I \quad (5)$

$$B^T = \begin{bmatrix} -\tfrac{1}{2} & -1 \\ -2 & -3 \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad (5)$$

$$B^T = \begin{bmatrix} \tfrac{1}{2} & -1 \\ -2 & -2 \end{bmatrix} \quad (5)$$

$$B = \begin{bmatrix} \tfrac{1}{2} & -2 \\ -1 & -2 \end{bmatrix} \quad (5)$$

$$B^{-1}C = I + A$$

$$B \cdot B^{-1}C = BI + BA$$

$$IC = B + BA \quad (5)$$

$$C = B + BA$$

$$C = \begin{bmatrix} \frac{1}{2} & -2 \\ -1 & -2 \end{bmatrix} + \begin{bmatrix} \frac{1}{2} & -2 \\ -1 & -2 \end{bmatrix} \begin{bmatrix} 6 & -2 \\ -4 & 1 \end{bmatrix} \quad (5)$$

$$C = \begin{bmatrix} \frac{1}{2} & -2 \\ -1 & -2 \end{bmatrix} \begin{bmatrix} 11 & -3 \\ 2 & 0 \end{bmatrix} \quad (5)$$

$$C = \begin{bmatrix} \frac{23}{2} & -5 \\ 1 & -2 \end{bmatrix} \quad (5)$$

/80

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i) $Z = \cos\theta + i\sin\theta$ නම් ද මූවාවර් ප්‍රමේයය අනුව

$$Z^n = \cos n\theta + \sin(n\theta) \quad (5) \quad — ①$$

$$\frac{1}{Z^n} = \cos n\theta + i\sin(-n\theta)$$

$$\frac{1}{Z^n} = \cos n\theta - i\sin(n\theta) \quad — ② \quad (5)$$

① + ②

$$Z^n + \frac{1}{Z^n} = \cos n\theta + i\sin n\theta + \cos n\theta - i\sin n\theta \quad (5)$$

$$Z^n + \frac{1}{Z^n} = 2\cos n\theta \quad — ③$$

① − ② $$Z^n - \frac{1}{Z^n} = \cos n\theta + \sin n\theta - (\cos n\theta - i\sin n\theta)$$

$$Z^n - \frac{1}{Z^n} = 2i\sin n\theta \quad — ④ \quad (5)$$

④/③ $$\frac{Z^n - \frac{1}{Z^n}}{Z^n + \frac{1}{Z^n}} = \frac{2i\sin(n\theta)}{2\cos(n\theta)} \quad (5)$$

$$\frac{(Z^n)^2 - 1}{(Z^n)^2 + 1} = i\tan n\theta \quad (5) \Rightarrow \frac{Z^{2n} - 1}{Z^{2n} + 1} = i\tan n\theta$$

$Z_1 = \frac{\sqrt{3} + i}{2}$ ලෙස සලකමු

$$Z_1 = \frac{\sqrt{3}}{2} + \frac{1}{2}i = \cos\frac{\pi}{6} + i\sin\frac{\pi}{6} \quad (5)$$

$$Z_1^6 = \cos\pi + i\sin\pi$$

$$Z_1^6 = -1 + 0 \quad (5)$$

$$Z_1^6 = -1$$

(5)

$Z_2 = \frac{i - \sqrt{3}}{2}$ ලෙස සලකමු

$$Z_2 = -\frac{\sqrt{3}}{2} + \frac{1}{2}i$$

$$Z_2 = \cos\frac{5\pi}{6} + i\sin\frac{5\pi}{6} \quad (5)$$

$$Z_2^6 = \cos 5\pi + i\sin 5\pi \quad (5)$$

$$Z_2^6 = \cos\pi + i\sin\pi$$

$$= -1 + 0$$

$$Z_2^6 = -1 \quad (5)$$

LHS $\left(\frac{\sqrt{3}+i}{2}\right)^6 + \left(\frac{1-\sqrt{3}i}{2}\right)^6 = Z_1^6 + Z_2^6 = (-1)+(-1)$

5 $= -2 = \text{RHS}$

5 70

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14) a) $f(x) = \dfrac{x(x-2)}{(x+1)(x-3)}$

$$f'(x) = \frac{(x+1)(x-3)[x+x-2] - x(x-2)[x+1+x-3]}{(x+1)^2(x-3)^2} \quad 5$$

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

$$= \frac{2(x-1)[x^2-2x-3-x^2+2x]}{(x+1)^2(x-3)^2} \quad 5$$

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

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

$$f''(x) = \frac{(x+1)^2(x-3)^2[-6] + 6(x-1)\left[(x+1)^2 2(x-3) + (x-3)^2 2(x+1)\right]}{(x+1)^4(x-3)^4} \quad 5$$

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

$$f''(x) = \frac{+6[3x^2-6x+7]}{(x+1)^3(x-3)^3}$$

$$f''(x) = \frac{18\left[(x-1)^2 + 4/3\right]}{(x+1)^3(x-3)^3} \quad 5$$

$f''(x) \neq 0$

$\therefore$ $f(x)$ ශ්‍රිතයට නතිවර්තන ලක්ෂ්‍ය පැවතිය නොහැක

$f'(x) = 0$ දී ශ්‍රිතයට හැරුම් ලක්ෂ්‍ය පවතී

$$\frac{-6(x-1)}{(x+1)^2(x-3)^2} = 0 \qquad x = 1$$

$(1, 1/4)$ හැරුම් ලක්ෂ්‍යයකි

$-\infty < x < -1$	$x=-1$	$-1 < x < 1$	$x=1$	$1 < x < 3$	$x=3$	$3 < x < +\infty$
$f'(x) > 0$ ↗ 5		$f'(x) > 0$ ↙ 5	උපරි	$f'(x) < 0$ 5		$f'(x) < 0$ 5
	ස්පර්ශෝන්මුඛ				ස්පර්ශෝන්මුඛ	

$x \to -1^-$ විට $y \to \infty$ $\quad$ $x \to 3^-$ විට $y \to -\infty$

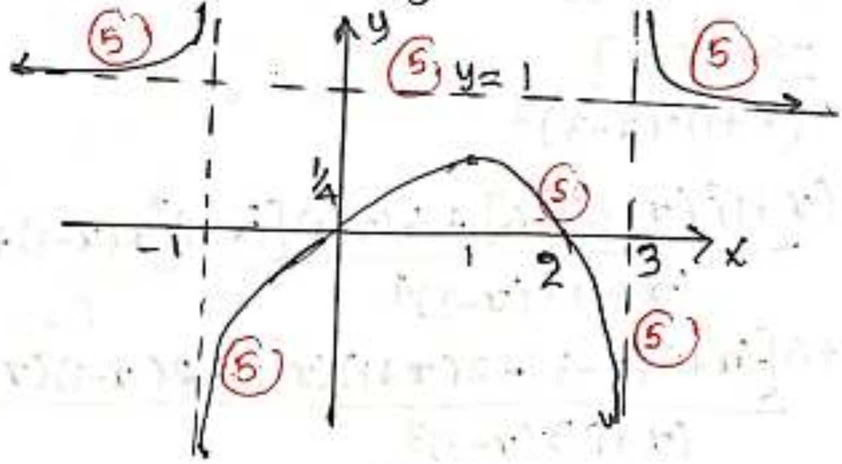
$x \to -1^+$ විට $y \to -\infty$ $\quad$ $x \to 3^+$ විට $y \to +\infty$

සිරස් ස්පර්ශෝන්මුඛ $\to$ $x = -1$ 5

$x = 3$

$$\lim_{x \to \pm\infty} \frac{x(x-2)}{(x+1)(x-3)} = \lim_{x \to \pm\infty} \frac{(1-2/x)}{(1+1/x)(1-3/x)} = 1 \quad 5$$

$\therefore$ තිරස් ස්පර්ශෝන්මුඛ $y = 1$



80

b) I) $V = \frac{2}{3}\pi r^3 + \pi r^2 h$

$= \pi r^2 \left(\frac{2r}{3} + h\right)$ 5

$S = 2\pi r h + 2\pi r^2 + \pi r^2$

$S = \pi r(2h + 3r)$ 5

II) $9\pi = \pi r^2 h$

$h = \frac{9}{r^2}$ 5

$S = \pi r(2h + 3r)$

$\pi r\left(\frac{18}{r^2} + 3r\right)$

$S = \frac{18\pi}{r} + 3\pi r^2$ 5

III) $\frac{dS}{dr} = -\frac{18\pi}{r^2} + 6\pi r$ 5

$= \frac{6\pi}{r^2}\left[r^3 - 3\right]$ 5

$\frac{dS}{dr} = 0$ වන $r = \sqrt[3]{3}$ විට දී 5

$S = \frac{18\pi}{\sqrt[3]{3}} + 3\pi (3)^{2/3}$

$S = \frac{27\pi}{\sqrt[3]{3}}\ m^2$ 5

ප්‍රතිචක්‍රීකරණ කොටසෙහි වියදම $b_1 = (2\pi rh + \pi r^2) \times 200$

ගෝලාකාර කොටසේ වියදම $b_2 = (2\pi r^2 \times 400)$

මුළු වියදම C නම්

$$C = 400\pi rh + 800\pi r^2$$

$$C = 400\pi r\left(\frac{9}{r^2}\right) + 800\pi r^2 \Rightarrow C = 400\pi\left[\frac{9}{r} + 2r^2\right] \quad 5$$

$$\frac{dC}{dr} = 400\pi\left[-\frac{9}{r^2} + 4r\right] \quad 5$$

$$\frac{dc}{dr} = \frac{400\pi}{r^2}\left[4r^3 - 9\right]$$

$\frac{dc}{dr} = 0$ වන්නේ $r = \left(\frac{3}{2}\right)^{2/3}$ විට දීය. 5

$r = \left(\frac{3}{2}\right)^{2/3}$

$\frac{dc}{dx} < 0$ | $\frac{dc}{dx} > 0$ 5

අවම

$$C \text{ අවම} = 400\pi\left[\frac{9}{\left(\frac{3}{2}\right)^{2/3}} + 2\left(\frac{3}{2}\right)^{2/3}\right] \quad 5$$

$$400\pi\left[\frac{9 + 2\times\left(\frac{9}{4}\right)^{2/3}}{\left(\frac{3}{2}\right)^{2/3}}\right]$$

70

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15) a) $\int \cos 2x \cos 4x \cos 6x \, dx$

$$I = \frac{1}{2}\int 2\cos 2x \cos 4x \cos 6x \, dx$$

$$= \frac{1}{2}\int (\cos 6x + \cos 2x)\cos 6x \, dx \quad 5$$

$$= \frac{1}{2}\int \cos^2 6x \, dx + \frac{1}{2}\int \cos 2x \cos 6x \, dx$$

$$= \frac{1}{2}\left[\int \frac{1 + \cos 12x}{2} dx\right] + \frac{1}{4}\int (\cos 8x + \cos 4x) \, dx \quad 5$$

$$= \frac{1}{2}\left[\frac{1}{2}x + \frac{1}{2}\frac{\sin 12x}{12}\right] + \frac{1}{4}\frac{\sin 8x}{8} + \frac{1}{4}\frac{\sin 4x}{4}$$

$$I = \frac{1}{4}\left[x + \frac{\sin 12x}{12}\right] + \frac{1}{4}\left[\frac{\sin 8x}{8} + \frac{\sin 4x}{4}\right] + C$$ C යනු අභිමත නියතයකි

5 5 5

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b) $\frac{x^4}{(x-1)(x^2+1)} = Ax+B+\frac{C}{(x-1)} + \frac{Dx+E}{x^2+1}$ (5)

$x^4 = (Ax+B)(x-1)(x^2+1) + C(x^2+1) + Dx+E(x-1)$

$x^4 \to 1 = A$

$x^3 \to 0 = -A+B$

$x^2 \to 0 = A-B+C+D$

$x \to 0 = B-A-D+E$

නියත $\to 0 = -B+C-E$

$A = 1$, $B = 1$, $C = \frac{1}{2}$, $E = -\frac{1}{2}$, $D = -\frac{1}{2}$ (10)

$$\int \frac{x^4}{(x-1)(x^2+1)}dx = \int (x+1)dx + \int \frac{dx}{2(x-1)} + \int \frac{-\frac{1}{2}x - \frac{1}{2}}{x^2+1}dx \quad (5)$$

$$= \frac{x^2}{2} + x + \frac{1}{2}\ln|x-1| - \frac{1}{4}\int \frac{2x}{x^2+1} - \frac{1}{2}\int \frac{dx}{x^2+1}$$

$$= \frac{x^2}{2} + x + \frac{1}{2}\ln|x-1| - \frac{1}{4}\ln|x^2+1| - \frac{1}{2}\tan^{-1}x + C$$

(5) (5) (5) (5) (5)

45

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c) $I = \int_{1/6}^{1/3} \frac{\sin^{-1}3x}{\sqrt{1-9x^2}}dx$ $\quad \sin^{-1}3x = t$ ආදේශයෙන් (5)

$\frac{3}{\sqrt{1-9x^2}} = \frac{dt}{dx}$, $\quad x = \frac{1}{6}, t = \frac{\pi}{6}$; $\quad x = \frac{1}{3}, t = \frac{\pi}{2}$ (5)

$I = \int_{\pi/6}^{\pi/2} \frac{t\,dt}{3}$ (5) $= \left[\frac{1}{6}[t^2]\right]_{\pi/6}^{\pi/2}$ (5)

$= \frac{1}{6}\left[\left(\frac{\pi}{2}\right)^2 - \left(\frac{\pi}{6}\right)^2\right]$ (5)

$= \frac{\pi^2}{6}\left[\frac{1}{4} - \frac{1}{36}\right]$

$= \frac{\pi^2}{6} \times \frac{8}{36}$

$= \frac{\pi^2}{27}$ (5)

d) $\int_0^{\pi/2} f(x)dx = \int_0^{\pi/2} f(\pi/2 - x)dx$

$\left.\begin{array}{ll} \pi/2 - x = t, & x = 0 \text{ විට } t = \pi/2 \\ -dx = dt & x = \pi/2 \text{ විට } t = 0 \end{array}\right\}$ 5

5

$\int_0^{\pi/2} f(\pi/2 - x) = \int_{\pi/2}^{0} f(t)(-dt)$

$= -\int_{\pi/2}^{0} f(t)dt$

$= \int_0^{\pi/2} f(t)dt$ 5

$= \int_0^{\pi/2} f(x)dx$ 5

20

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d) $I = \int_0^{\pi/2} \dfrac{x(\sin x + \cos x)dx}{(\cos x - \sin x)^4}$

$= \int_0^{\pi/2} \dfrac{(\pi/2 - x)[\sin(\pi/2 - x) + \cos(\pi/2 - x)]dx}{[\cos(\pi/2 - x) - \sin(\pi/2 - x)]^4}$

$= \int_0^{\pi/2} \dfrac{(\pi/2 - x)[\cos x + \sin x)dx}{(\sin x - \cos x)^4}$ 5

$= \int_0^{\pi/2} \dfrac{\pi/2[\cos x + \sin x]dx}{(\sin x - \cos x)^4} - \int_0^{\pi/2} \dfrac{x(\cos x + \sin x)}{(\sin x - \cos x)^4}dx$

$= \int_0^{\pi/2} \pi/2 \dfrac{[\cos x + \sin x]dx}{(\sin x - \cos x)^4} - I$

$I = \pi/4 \int_0^{\pi/2} \dfrac{\cos x + \sin x}{(\sin x - \cos x)^4} dx$ 5

$= \pi/4 \int_0^{\pi/2} (\cos x + \sin x)(\sin x - \cos x)^{-4} dx$

$= \pi/4 \left[\dfrac{\sin x - \cos x}{-3}\right]_0^{\pi/2}$ 5

$= -\pi/12 [3\sin\pi/2 - \cos\pi/2] - 3[\sin 0 - \cos 0]^{-3}]$ 5 5

$= -\pi/12 [1 - (-1)] = -\pi/6$ 5

30

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16) $\frac{x+2y+1}{\sqrt{5}} = \pm \frac{2x+y-4}{\sqrt{5}}$ (5), (+) $x+2y+1=2x+y-4$

$y-x+5=0$ (5)

$x+2y+1 = \pm\, 2x+y-4$ (-) $x+2y+1=-(2x+y-4)$

$y+x-1=0$ (5)

$[2(3)+5-4][2(4-2-4]$

7×2 (5)

$14>0$

∴ $(3,5)$, $(4,-2)$ ලක්ෂ $2x+y-4=0$ රේඛාව ආශ්‍රිතයෙන් එකම පැත්තේ පිහිටයි. (5)

$y-x+5=0$ සහ $2x+y-4=0$ රේඛා අතර කෝණය

$y-x+5=0 \rightarrow m_1=1$ රේඛා 2ක අතර කෝණය θ නම්

$2x+y-4=0 \rightarrow m_2=-2$ $\tan\theta = \left|\frac{m_1-m_2}{1+m_1m_2}\right| = \left|\frac{1-(-2)}{1-2}\right|$

$\tan\theta=3$ (5)

∴ $\tan\theta > 1$ (5)

$\tan\theta > \tan\pi/4$, $\theta > \pi/4$ (5)

∴ $y-x+5=0$ මහා කෝණ සමච්ඡේදකය වේ. (5)

සහ සුළු කෝණ සමච්ඡේදකය $y+x-1=0$ (5)

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අවශ්‍ය වෘත්තය $S_1 \equiv x^2+y^2+2gx+2fy+c=0$

$r = \sqrt{g^2+f^2-c}$

$\sqrt{5} = \sqrt{g^2+f^2-c}$

$g^2+f^2-c=5$ —(1) (5)

කේන්ද්‍රය $(-g,-f)$, $y+x-1=0$ මත බැවින්:

$-f-g-1=0$

$g+f+1=0$ —(3) (5)

කේන්ද්‍රයේ සිට රේඛාවට ලම්බ දුර $\sqrt{5}$ බැවින්

$\frac{2(-g)-f-4}{\sqrt{2^2+1^2}} = \sqrt{5}$ (5) $-2f-g+1=5$

$2f+g=-4$ —(4) (5)

$\frac{2(-g)-f-4}{\sqrt{5}} = \sqrt{5}$ (5), $2g+f=-9$ —(5) (5)

(5) හා (3) විසඳීමෙන් $g=-8$, $f=7$ (5)

(3) හා (4) විසඳීමෙන් $f=-3$, $g=2$ (5)

g සහ f සඳහා අගයන් දෙක ඇති නිසා අවශ්‍යතා තෘප්ත කරන වෘත්ත දෙක පවතී

$g = -8,\ f = 7$ ට

① ට $c = (-8)^2 + 7^2 - 5$

$c = 108$ (5)

$g = 2,\ f = -3$ ට

① ට $c = (-3)^2 + 2^2 - 5$

$c = 8$ (5)

∴ අවශ්‍ය වෘත්ත

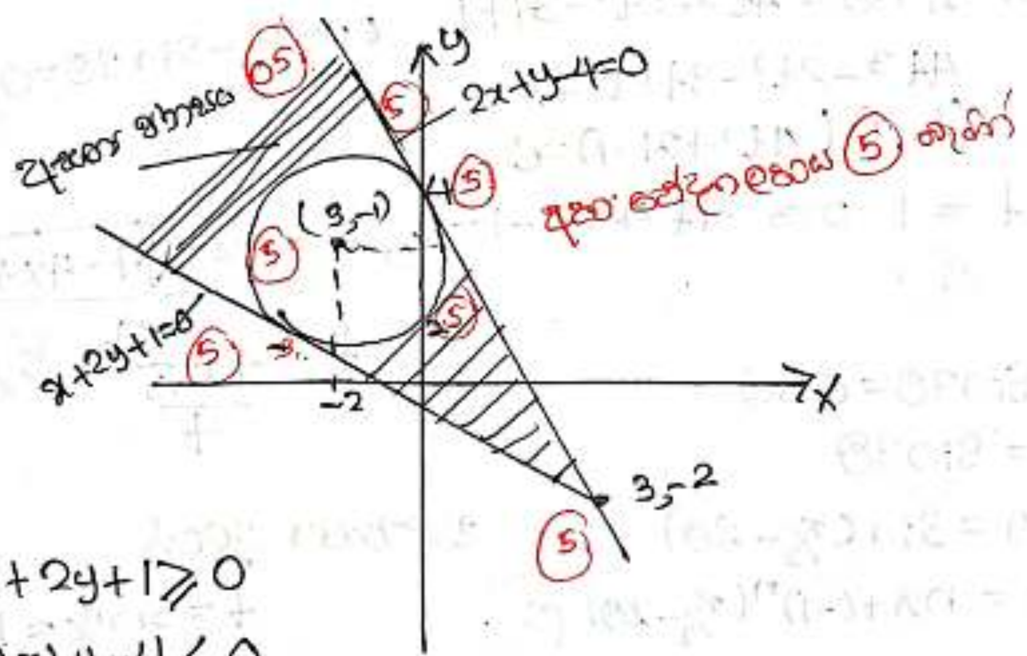
$S_1 = x^2 + y^2 + 2(-8)x + 2(7)y + 108 = 0$

$S_1 = x^2 + y^2 - 16x + 14y + 108 = 0$ (5)

$S_2 = x^2 + y^2 + 2(2x) + 2(-3)y + 8 = 0$

$S_2 = x^2 + y^2 + 4x - 6y + 8 = 0$ (5)

60



$x + 2y + 1 \geq 0$

$2x + y - 4 \leq 0$

$x^2 + y^2 + 4x - 6y + 8 \geq 0$

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150

17) $\cos 2\theta = \cos(\theta+\theta) = \cos\theta\cos\theta - \sin\theta\sin\theta$

$= \cos^2\theta - \sin^2\theta$

$= 1 - \sin^2\theta - \sin^2\theta$

$= 1 - 2\sin^2\theta$ (5)

$\sin 3\theta = \sin(2\theta+\theta) = \sin 2\theta\cos\theta + \cos 2\theta \sin\theta$

$= 2\sin\theta\cos^2\theta + (1-2\sin^2\theta)\sin\theta$

$= 2\sin\theta(1-\sin^2\theta) + \sin\theta(1-2\sin^2\theta)$

$= 3\sin\theta - 4\sin^3\theta$ (5)

$\cos 2\theta - \sin 3\theta = (1-2\sin^2\theta) - (3\sin\theta - 4\sin^3\theta)$

$= 4\sin^3\theta - 2\sin^2\theta - 3\sin\theta + 1$ (5)

$t = \sin\theta$ ලෙස

$\cos 2\theta - \sin 3\theta = 4t^3 - 2t^2 - 3t + 1$, $\cos 2\theta - \sin 3\theta = 0$

$4t^3 - 2t^2 - 3t + 1 = 0$ (5)

$(t-1)(4t^2+2t-1) = 0$

$t = 1$ හෝ $4t^2 + 2t - 1 = 0$, $t = \dfrac{-2 \pm \sqrt{4 - 4\times 4(-1)}}{2\times 4}$

(5)

$t = \dfrac{-1 \pm \sqrt{5}}{4}$ (5)

$\cos 2\theta - \sin 3\theta = 0$ විට

$\cos 2\theta = \sin 3\theta$

$\sin 3\theta = \sin(\pi/2 - 2\theta)$

$3\theta = n\pi + (-1)^n(\pi/2 - 2\theta)$ (5)

$n=1$, $\theta = \pi/2$ $\quad$ $n=4$, $\theta = \dfrac{9\pi}{10}$ $\quad$ $n=6$, $\theta = \dfrac{13\pi}{10}$

$\pi/2 \le \theta \le 3\pi/2$

$\theta = \pi/2, \dfrac{9\pi}{10}, \dfrac{13\pi}{10}$ (5)

අනුරූපව මූලයන්

$t = \sin\pi/2 = 1$

$t = \sin 9\pi/10$ (5)

$t = \sin\dfrac{13\pi}{10}$

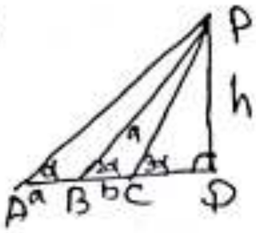
නමුත් $t = 1$ හෝ $t = \dfrac{-1 \pm \sqrt{5}}{4}$ or

$\sin\dfrac{9\pi}{10} > 0$

$\sin\dfrac{13\pi}{10} < 0$ (5)

$\therefore \sin\dfrac{9\pi}{10} = \dfrac{-1+\sqrt{5}}{4}$

50

b) 

PBC△ට sin නීතිය යෙදීමෙන්

$$\frac{\sin\alpha}{b} = \frac{\sin(\pi-3\alpha)}{a} \quad 5$$

$$\frac{\sin\alpha}{b} = \frac{\sin 3\alpha}{a}$$

$$\frac{\sin\alpha}{b} = \frac{3\sin\alpha - 4\sin^3\alpha}{a} \quad 5 \qquad \sin\alpha \neq 0 \ [0<\alpha<\tfrac{\pi}{2}]$$

$$\frac{1}{b} = \frac{3-4\sin^2\alpha}{a} \quad 5$$

$$\sin^2\alpha = \frac{3b-a}{4b} \quad 5, \quad \sin\alpha > 0 \text{ නිසා}$$

$$\sin\alpha = \sqrt{\frac{3b-a}{4b}} \quad 5$$

$$\cos\alpha = \sqrt{1-\sin^2\alpha}$$

$$= \sqrt{1-\left(\frac{3b-a}{4b}\right)} \quad 5 \quad \cos\alpha > 0$$

$$\cos\alpha = \sqrt{\frac{a+b}{4b}} \quad 5$$

PCD△ට sin නීතිය යෙදීමෙන් PBC△න්

$$\frac{\sin 3\alpha}{h} = \frac{\sin 90}{PC} \qquad \frac{\sin 2\alpha}{PC} = \frac{\sin(\pi-3\alpha)}{a}$$

$$\sin 3\alpha = h/PC \ — ① \quad 5 \qquad \sin 3\alpha = \frac{a\sin 2\alpha}{PC} \ — ② \quad 5$$

① හා ②න් $\frac{h}{PC} = \frac{a\sin 2\alpha}{PC}$ 5, $h = a\sin 2\alpha$ 5

$$h = 2a\sin\alpha\cos\alpha$$

$$h = 2a\sqrt{\frac{3b-a}{4b}} \times \sqrt{\frac{a+b}{4b}} \quad 5$$

$$h = \frac{a}{2b}\sqrt{(a+b)(3b-a)}$$

60

) $\tan^{-1}(x+1) + \cot^{-1}\left(\frac{1}{x-1}\right) = \tan^{-1}\left(\frac{8}{31}\right)$

$\alpha = \tan^{-1}(x+1)$ $\quad \beta = \cot^{-1}\left(\frac{1}{x-1}\right)$

$\tan\alpha = x+1$ 5 $\quad \cot\beta = \frac{1}{x-1}$ 5

$-\frac{\pi}{2} < \alpha < \frac{\pi}{2}$ $\quad -\frac{\pi}{2} < \beta < \frac{\pi}{2}$

$$\alpha+\beta = \tan^{-1}\left(\frac{8}{31}\right) \quad 5$$

$$\tan(\alpha+\beta) = \frac{8}{31}$$

$$\frac{\tan\alpha+\tan\beta}{} = \frac{8}{}$$

$$\frac{x+1+x-1}{1-(x+1)(x-1)}=\frac{8}{31}$$ 5

$$\frac{2x}{1-x^2+1}=\frac{8}{31}$$

$$31x=-4x^2+8$$

$$4x^2+31x-8=0$$ 5

$$(x+8)(4x-1)=0$$

$x=-8$ හෝ $x=\frac{1}{4}$ 5

$x=-8$ වූ

$\alpha,\beta<0$

$\alpha+\beta<0$

නමුත් $\alpha+\beta>0$

$\therefore\ x\neq-8$ 5

$x=\frac{1}{4}$ 5

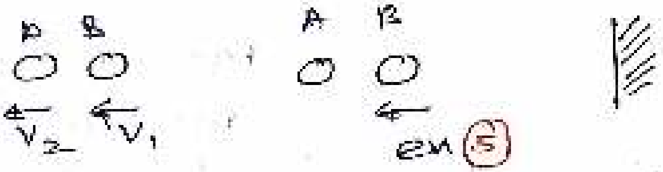
40

වයඹ පළාත් අධ්‍යාපන දෙපාර්තමේන්තුව - 13 ශ්‍රේණිය

තෙවන වාර පරීක්ෂණය - 2024

සංයුක්ත ගණිතය - II

01.



5

$I = \Delta mv$ 5

$mv_1 + mv_2 - m(eu) = 0 \Rightarrow v_1 + v_2 = eu$ — (1)

නිව්ටන්.

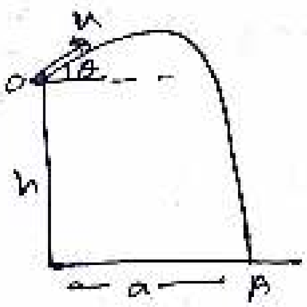
5

$v_2 - v_1 = e^2u$ — (2)

(1)+(2) $v_2 = \dfrac{e(1+e)u}{2}$ 5 $\boxed{25}$

$\text{Time} = \dfrac{a}{2u} + \dfrac{a}{eu} = \dfrac{a}{u}\left[\dfrac{1}{2} + \dfrac{1}{e}\right]$ 5

02.



$\rightarrow$ $s = ut$

$a = u\cos t \Rightarrow t = \dfrac{a}{u\cos\theta}$ 5

$\uparrow$ $s = ut + \frac{1}{2}at^2$

$-h = u\sin\theta\, t - \frac{1}{2}gt^2$ 5

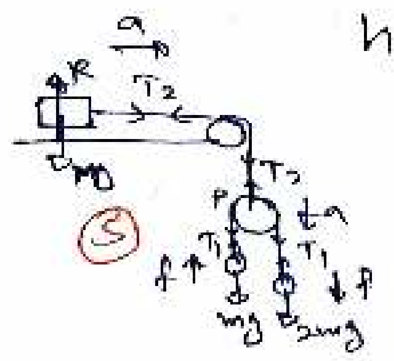
$-h = u\sin\theta \cdot \dfrac{a}{u\cos\theta} - \dfrac{1}{2}g\dfrac{a^2}{u^2\cos^2\theta}$

$-h = a\tan\theta - \dfrac{ga^2}{2ga}\left[1 + \tan^2\theta\right]$ 5

$-h = a \cdot \frac{3}{4} - \frac{a}{2}\left(1 + \frac{9}{16}\right)$ 5 $\Rightarrow \dfrac{3a}{4} - \dfrac{25a}{32} = \dfrac{-a}{32}$

$h = \frac{a}{32}$ 5 $\boxed{25}$

03.



5

(M) $\rightarrow$ $F = ma \rightarrow T_2 = Ma$ — (1) 5

(P) $\downarrow$ $F = ma \rightarrow 2T_1 - T_2 = 0$ — (2) 5

(m) $\uparrow$ $F = ma \rightarrow T_1 - mg = m(f - a)$ — (3) 5

(2m) $\downarrow$ $F = ma \rightarrow 2mg - T_1 = 2m(f + a)$ 5 — (4)

$\boxed{25}$

04.

$\rightarrow$ $F = ma$

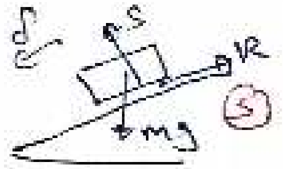
$F - R = m(0)$ (5)

$R = F$

$H = FV$

$F = \frac{H}{V}$

$R = \frac{H}{V}$ (5)



(5) $\sin\alpha = \frac{1}{L}$

$F = ma$ $\swarrow$

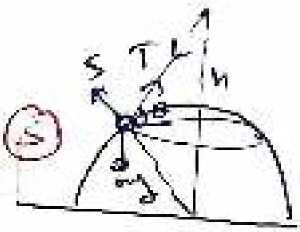
$mg\sin\alpha - R = mf$ (5)

$\frac{mg}{L} - \frac{H}{V} = mf$

$f = \frac{g}{L} - \frac{H}{mV}$ (5)

$\boxed{25}$

05.



(5)

[illegible] $a = 0$

$\rightarrow$ (F) $F = ma$

$T\cos\theta = mR\cos\theta\,\omega^2$ (5)

$\omega = \sqrt{\frac{T}{mR}}$ — (1) $\sin\theta = \frac{h}{R}$

$\uparrow$ $T\sin\theta = mg$ (5)

$T \cdot \frac{h}{R} = mg \Rightarrow T = \frac{mgR}{h}$ (5)

(1) න්

$\omega = \sqrt{\frac{mgR}{h\, mR}}$

$\omega = \sqrt{\frac{g}{h}}$ (5)

$\boxed{25}$

06. $\overline{OA} \perp \overline{OB} \Rightarrow \overline{OA} \cdot \overline{OB} = 0$ (5)

$(\underline{a} - 2\underline{b}) \cdot (3\underline{a} + \underline{b}) = 0$

$3\underline{a}\cdot\underline{a} + \underline{a}\cdot\underline{b} - 6\underline{a}\cdot\underline{b} - 2\underline{b}\cdot\underline{b} = 0$

$3|\underline{a}|^2 - 2|\underline{b}|^2 = 5\,\underline{a}\cdot\underline{b}$ (5)

$\underline{a}\cdot\underline{b} = \frac{3}{5}|\underline{a}|^2 - \frac{2}{5}|\underline{b}|^2$

$\underline{a}\cdot\underline{b} = \frac{3}{5}(1)^2 - \frac{2}{5}(2)^2 = -1$ (5)

$\underline{a}\cdot\underline{b} = |\underline{a}||\underline{b}|\cos\theta$ (5)

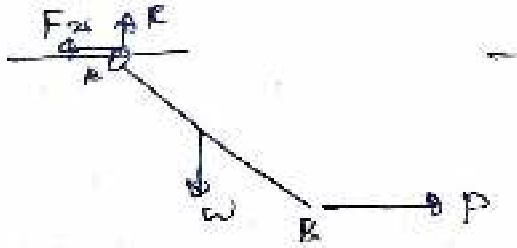
$1 \cdot 2\cos\theta = -1$

$\cos\theta = -\frac{1}{2} \Rightarrow \theta = \cos^{-1}(-\tfrac{1}{2})$

$\theta = \frac{2\pi}{3}$ (5)

$\boxed{25}$

07.



$\rightarrow$ $P = F_x$
$\uparrow$ $R = W$ 5

සමතුලිත සීමාව,

$\mu \geq \frac{|F_x|}{R}$ 5

$\mu \geq \frac{\tan\theta}{2}$

$2\mu \geq \tan\theta$

$\theta \leq \tan^{-1}(2\mu)$ 5

$\overset{\curvearrowleft}{A}$ $2a\cos\theta \cdot P - a\sin\theta W = 0$ 5

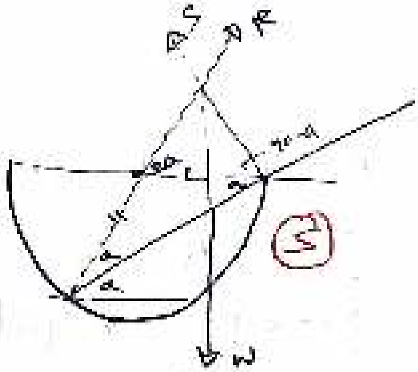
$\frac{2P}{W} = \frac{\sin\theta}{\cos\theta}$

$\tan\theta = \frac{2P}{W}$

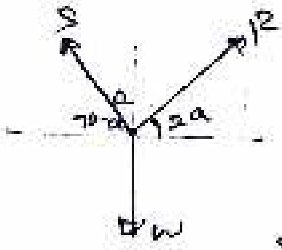
$\tan\theta = 2\frac{F_x}{R}$ 5

$\boxed{25}$

08.



5



ලාමිගේ ප්‍රමේයෙන් $\uparrow \rightarrow$

$\frac{S}{\sin(90+2a)} = \frac{R}{\sin(180-a)} = \frac{W}{\sin(90-a)}$

$\frac{S}{\cos 2a} = \frac{R}{\sin a} = \frac{W}{\cos a}$ 10

$S = W\frac{\cos 2a}{\cos a}$ 5

$R = W\frac{\sin a}{\cos a}$

$= W\tan a$ 5

$\boxed{25}$

09. $P(A) = \frac{1}{3}$ $\quad P\left(\frac{B}{A}\right) = \frac{3}{5}$

$P(A' \cap B) = \frac{2}{5}$

$P\left(\frac{B}{A}\right) = \frac{P(A\cap B)}{P(A)}$ 5

$P(A\cap B) = \frac{3}{5} \times \frac{1}{3} = \frac{1}{5}$ 5

$P(B) = P(A\cap B) + P(A'\cap B)$ 5

$= \frac{1}{5} + \frac{2}{5}$

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

$P(A\cup B) = P(A) + P(B) - P(A\cap B)$

$= \frac{1}{3} + \frac{3}{5} - \frac{1}{5}$

$= \frac{11}{15}$ 5

$\boxed{25}$

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(10) Z අගය $= \dfrac{x_i - \mu}{\sigma}$ $\qquad \mu = \dfrac{\sum_{i=1}^{n} x_i}{n}$

$1.6 = \dfrac{70 - \mu}{10}$ (5)

$\mu = 54$ (5)

$\sum_{i=1}^{n} x_i = 54 \times 100$

$= 5400$ (5)

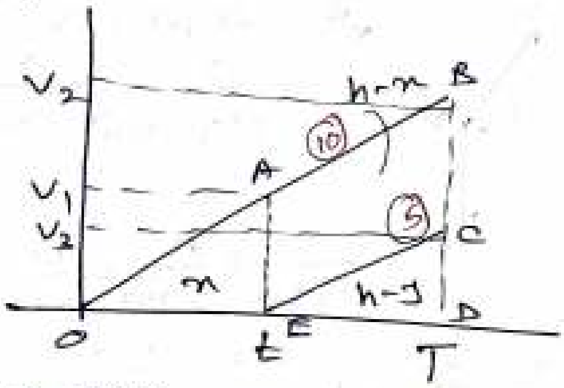
$\sum_{i=1}^{n} x_{i\,\text{නව}} = 5400 - 70 + 60 = 5390$ (5)

$\mu_{\text{නව}} = \dfrac{5390}{100} = 53.9$ (5)

$\boxed{25}$

II කොටස

(11) a.



A අංශුවට OAE Δ න්

$\frac{1}{2} \times t \times v_1 = x$ $\qquad g = \dfrac{v_1}{t}$

$\frac{1}{2} \times t \times g t = x$ (10) $\qquad v_1 = gt$

$t^2 = \dfrac{2x}{g}$

$t = \sqrt{\dfrac{2x}{g}}$ (5) —— (1)

A අංශුවට OBD Δ න්

$h = \frac{1}{2} T \cdot v_2$ $\qquad g = \dfrac{v_2}{T}$

$h = \frac{1}{2} T \cdot gT$ $\qquad v_2 = gT$

$T^2 = \dfrac{2h}{g}$

$T = \sqrt{\dfrac{2h}{g}}$ —— (2) (10)

B අංශුව CTE Δ න්

$h - y = \frac{1}{2}(T - t) v_3$ $\quad g = \dfrac{v_3}{T-t}$

$h - y = \frac{1}{2}(T-t)^2 g$ (10) $\quad v_3 = g(T-t)$

(1) හා (2) න්

$h - y = \frac{1}{2}\left(\sqrt{\dfrac{2h}{g}} - \sqrt{\dfrac{2x}{g}}\right)^2 g$ (5)

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

$h - y = h - 2\sqrt{xh} + x$

$2\sqrt{xh} = x + y$

$4xh = (x+y)^2$

$h = \dfrac{(x+y)^2}{4x}$ (15)

$\boxed{70}$

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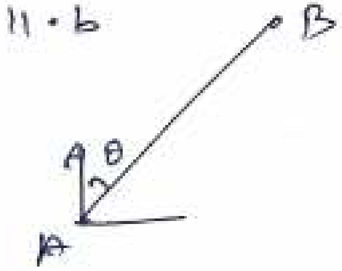
11 . b



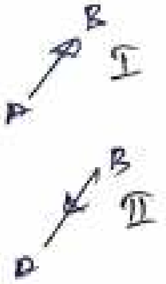
$V_{KS} = \underline{\lvert\theta\nearrow}$ (5)

$V_{SE} = \downarrow u$ (5)

$V_{KE} = V$ (5)

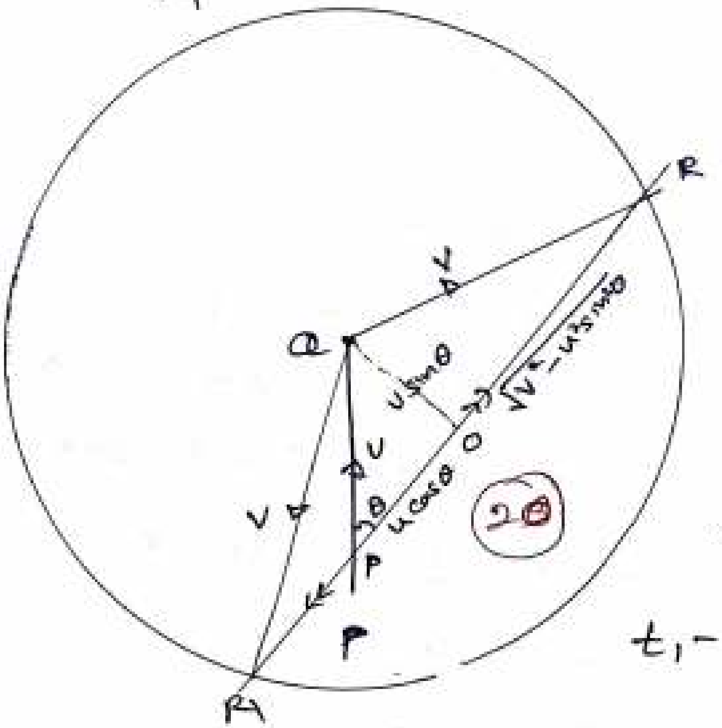
K - කුරුල්ලා
E - පොළොව
S - සුළඟ

$$V_{KS} = V_{KE} + V_{ES}$$ (10)



$\underline{\lvert\theta\nearrow}_{PR} = \underset{QR}{V} + \underset{P}{\overset{Q}{\uparrow}} u$

$\underset{R_1}{\swarrow}\theta\,P = \underset{QR_1}{V} + \underset{P}{\overset{Q}{\uparrow}} u$



$OQ = u\sin\theta$

$PO = u\cos\theta$

$OR = \sqrt{V^2 - u^2\sin^2\theta}$

$PR = \sqrt{V^2-u^2\sin^2\theta} + u\cos\theta$ (5)

$PR_1 = \sqrt{V^2-u^2\sin^2\theta} - u\cos\theta$ (5)

$$t_1 = \frac{a}{PR} \qquad t_2 = \frac{a}{PR_1}$$

$$t_1 - t_2 = \frac{a}{PR} - \frac{a}{PR_1}$$

$$= \frac{aPR_1 - aPR}{PR \cdot PR_1}$$ (10)

$$t_1 - t_2 = \frac{a\sqrt{V^2-u^2\sin^2\theta} - ua\cos\theta - a\sqrt{V^2-u^2\sin^2\theta} - u\cos\theta}{\left(\sqrt{V^2-u^2\sin^2\theta}+u\cos\theta\right)\left(\sqrt{V^2-u^2\sin^2\theta}-u\cos\theta\right)}$$

$$= \frac{-2ua\cos\theta}{V^2-u^2\sin^2\theta - u^2\cos^2\theta} = \frac{-2ua\cos\theta}{V^2-u^2(\sin^2\theta+\cos^2\theta)}$$

$$= \frac{-2ua\cos\theta}{V^2-u^2}$$

V හා u අනුපාතය නියත නිසා

$V \propto u$ (5)

$V = ku$ ලෙස ගනිමු.

$$= \frac{-2ua\cos\theta}{k^2u^2-u^2}$$

$$= -\frac{2a\cos\theta}{u(k^2-1)}$$ (10)

$\boxed{80}$

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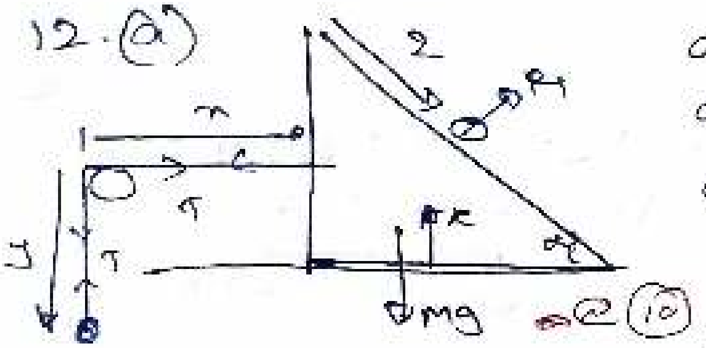
12.(a)



$a_{ME} = \ddot{x}$

$a_{mM} = \ddot{z}$ 10

$a_{m,E} = a_{m,M} + a_{ME}$

$= \ddot{z} + \ddot{x}$

$a_{\lambda m,E} = \downarrow \ddot{y}$

$\lambda m \downarrow F = ma$

$\lambda mg - T = \lambda m\ddot{y}$ — (1) 10

$x + y = l$

$\dot{x} + \dot{y} = 0$

$\ddot{x} + \ddot{y} = 0$

$\ddot{x} = -\ddot{y}$ — (4) 5

$m, M \rightarrow F = ma$

$-T = M\ddot{x} + m(\ddot{x} + \ddot{z}\cos\alpha)$ — (2) 10

$m \searrow F = ma$

$mg\sin\alpha = m(\ddot{z} + \ddot{x}\cos\alpha)$ — (3) 10

(2) − (1) $-\lambda mg = M\ddot{x} + m(\ddot{x} + \ddot{z}\cos\alpha) - \lambda m\ddot{y}$ 5

$= (M + m + \lambda m)\ddot{x} + m(g\sin\alpha - \ddot{x}\cos\alpha)\cos\alpha$

$$\ddot{x} = -\frac{mg(\lambda + \sin\alpha\cos\alpha)}{M + \lambda m + m\sin^2\alpha}$$ 5

$T = \lambda m(g + \ddot{x})$ 5

$$= \lambda m\left[g - \frac{mg(\lambda + \sin\alpha\cos\alpha)}{M + \lambda m + m\sin^2\alpha}\right]$$

$$= \lambda mg\left[\frac{M + \cancel{\lambda m} + m\sin^2\alpha - \cancel{\lambda m} - m\sin\alpha\cos\alpha}{M + \lambda m + m\sin^2\alpha}\right]$$ 5

$$= \lambda mg\left[\frac{M + m\sin\alpha[\sin\alpha - \cos\alpha]}{M + m(\lambda + \sin^2\alpha)}\right]$$ 5

$\boxed{80}$

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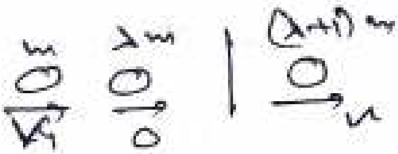
12 - b

$0 - mga\sin\alpha = \frac{1}{2}mv_1^2 - mga$ (5)

$v_1^2 = 2ga(1-\sin\alpha)$

$v_1 = \sqrt{2ga(1-\sin\alpha)}$ (5) $\boxed{10}$

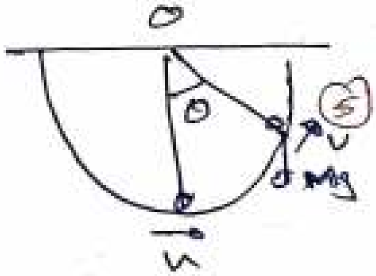
(i)



$I = \Delta mv \longrightarrow \quad mv_1 = (\lambda+1)mu$ (5)

$u = \frac{\sqrt{2ga(1-\sin\alpha)}}{\lambda+1}$ (5) $\boxed{10}$

(ii)



(5) $M = (\lambda+1)m$

(10)

$\frac{1}{2}Mu^2 - Mga = \frac{1}{2}Mv^2 - Mga\cos\theta$

$v^2 = u^2 - 2ga + 2ga\cos\theta$

$= \frac{2ga(1-\sin\alpha)}{(\lambda+1)^2} - 2ga(1-\cos\theta)$

$v^2 = \frac{2ga}{(\lambda+1)^2}\left[1-\sin\alpha - (\lambda+1)^2(1-\cos\theta)\right]$

$v = \frac{1}{(\lambda+1)}\sqrt{2ga[1-\sin\alpha-(\lambda+1)^2(1-\cos\theta)]}$ (5) $\boxed{20}$

(iii) $v = 0$ විට $\theta = \theta_1$

$\frac{1}{\lambda+1}\sqrt{2ga(1-\sin\alpha-(\lambda+1)^2(1-\cos\theta_1))} = 0$ (5)

$1-\sin\alpha-(\lambda+1)^2(1-\cos\theta_1) = 0$

$\cos\theta_1 = 1 - \frac{1-\sin\alpha}{(\lambda+1)^2} \Rightarrow \theta = \cos^{-1}\left[1-\frac{1-\sin\alpha}{(\lambda+1)^2}\right]$ (5) $\boxed{10}$

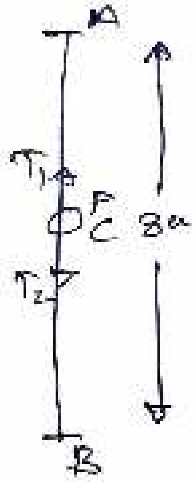
(iv) $F = ma$

$R - Mg\cos\theta = \frac{Mv^2}{a}$ (10) $\quad v = 0$ විට $R = R'$ ලෙස ගනිමු (5)

$R' = Mg\cos\theta_1 = Mg\left[1-\frac{1-\sin\alpha}{(\lambda+1)^2}\right]$

$= (\lambda+1)mg\left[1-\frac{1-\sin\alpha}{(\lambda+1)^2}\right]$ (5) $\boxed{20}$

(13)



$T_1 = \frac{mg(AC-a)}{a}$ (5) $\quad T_2 = \frac{mg(8a-AC-3a)}{3a}$

$= \frac{mg(5a-AC)}{3a}$ (5)

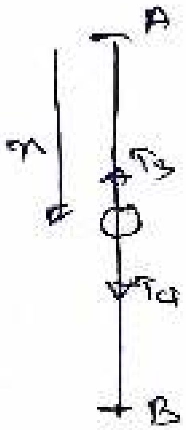
↑ $F=ma$

$T_1 - T_2 - mg = 0$ (10)

$\frac{mg(AC-a)}{a} = \frac{mg(5a-AC)}{3a} + mg$ (5)

$3(AC-a) = 5a - AC + 3a$

$AC = \frac{11a}{4}$ (5) $\quad \boxed{30}$



$T_3 = \frac{mg(x-a)}{a}$ (5) $\quad T_4 = \frac{mg(5a-x)}{3a}$ (5)

↑ $F=ma$

$T_3 - T_4 - mg = m\ddot{x}$ (10)

$\frac{mg(x-a)}{a} - mg\frac{(5a-x)}{3a} - mg = -m\ddot{x}$ (5)

$\frac{g}{3a}[3x-3a-5a+x-3a] = -\ddot{x}$

$\ddot{x} + \frac{4g}{3a}\left[x - \frac{11a}{4}\right] = 0$ (5)

$y = x - \frac{11a}{4}$

$\dot{y} = \dot{x}$ (5)

$\ddot{y} = \ddot{x}$

$\ddot{y} + \frac{4g}{3a}y = 0$ (5) —(A) $\quad \boxed{40}$

$y = A\cos\omega t + B\sin\omega t$

$\dot{y} = -A\omega\sin\omega t + B\omega\cos\omega t$ (5)

$\ddot{y} = -A\omega^2\cos\omega t - B\omega^2\sin\omega t$ (5)

$= -\omega^2(A\cos\omega t + B\sin\omega t)$

$\ddot{y} = -\omega^2 y$

$\ddot{y} + \omega^2 y = 0$ —(B) (5)

(A) in (B) [illegible]

$\omega = \sqrt{\frac{4g}{3a}}$ (5)

$x = 5a,\ t = 0$ (5)

$y = 5a - \frac{11a}{4} = \frac{9a}{4}$ (5)

$\frac{9a}{4} = A\cos 0 + B\sin 0$

$A = 9a/4$ (5)

$t=0$ so $\dot{x}=0$ also $\dot{y}=0$ (5)

$0 = -A\omega\sin\omega 0 + B\omega\cos\omega 0 \Rightarrow B = 0$ (5) $\quad \boxed{45}$

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$x = a$

$y = a - \frac{11a}{4} = \frac{-7a}{4}$ 5

$\frac{-7a}{4} = \frac{9a}{4} \cos \omega t_1$

$\cos \omega t_1 = \frac{-7}{9}$ 5

$\cos \omega t_1 = \cos(\pi - \theta)$; $\cos\theta = 7/9$ 5

$\omega t_1 = \pi - \theta$ 5 $\sin\theta = \frac{4\sqrt{2}}{9}$

$\dot{y} = \frac{-9a}{4}\sqrt{\frac{4g}{3a}} \sin(\pi - \theta)$

$= \frac{-9a}{4}\sqrt{\frac{4g}{3a}} \times \frac{4\sqrt{2}}{9}$

$= \sqrt{\frac{8ga}{3}}$ 5

$\therefore$ p.d. வேகம் $= \sqrt{\frac{8ga}{3}}$ 5

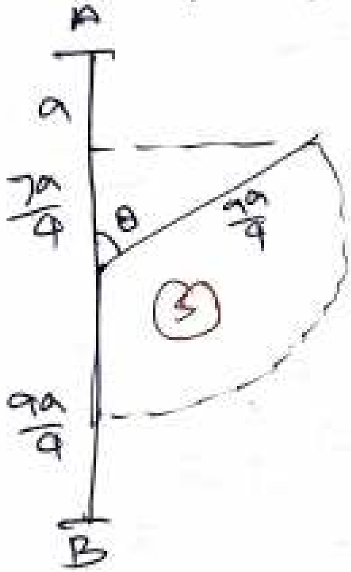
$\omega t_1 = \pi - \theta$

$t_1 = \frac{\pi - \theta}{\omega}$

$t = \sqrt{\frac{3a}{4g}}\left[\pi - \cos^{-1}\left(\frac{7}{9}\right)\right]$ 5

$\boxed{35}$

$\boxed{\text{or}}$



S.H.M is:

$x = \frac{11a}{4}$ 5 Amplitude is $5a - \frac{11a}{4} = \frac{9a}{4}$ 5

$\cos\theta = \frac{7a/4}{9a/4}$

$\theta = \cos^{-1}(7/9)$ 5

$\dot{x}^2 = \omega^2(a^2 - x^2)$

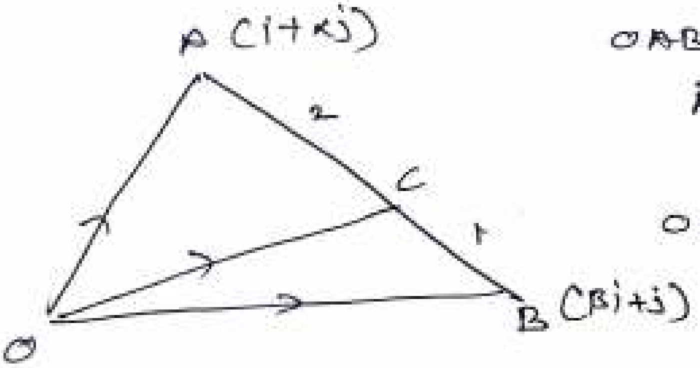
$= \frac{4g}{3a}\left[\left(\frac{9a}{4}\right)^2 - \left(-\frac{7a}{4}\right)^2\right]$ 5

$= \sqrt{\frac{8ga}{3}}$ 5

$T = \frac{\pi - \theta}{\omega} = \sqrt{\frac{3a}{4g}}\left[\pi - \cos^{-1}\left(\frac{7}{9}\right)\right]$ 5

$\boxed{35}$

14 . a Theory - 10



OAB Δ යේ

$\overline{AB} = \overline{AO} + \overline{OB}$

$= (\beta-1)\underline{i} + (1-\alpha)\underline{j}$ 5

OAC Δ යේ

$\overline{OC} = \overline{OA} + \overline{AC}$

$= OA + \frac{2}{3} AB$ 5

$= i + \alpha j + \frac{2}{3}((\beta-1)i + (1-\alpha)j)$ 5

$= \dfrac{(2\beta+1)\underline{i} + (\alpha+2)\underline{j}}{3}$ 5

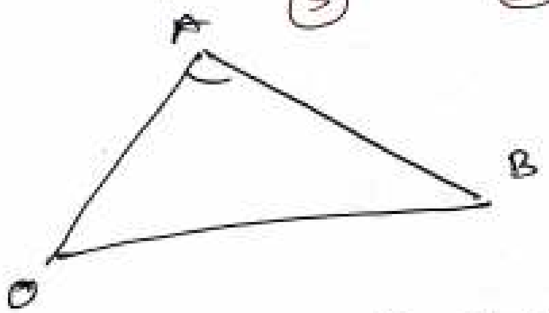
OADC සමාන්තරාස්‍රය නිසා

$\overline{OC} = \overline{AD}$

$\left(\frac{2\beta+1}{3}\right)i + \left(\frac{\alpha+2}{3}\right)j = 3i + j$ 5

$\frac{2\beta+1}{3} = 3$, $\frac{\alpha+2}{3} = 1$ 5 ; $i \neq 0$ $j \neq 0$ $\underline{i} \not\parallel \underline{j}$ 5

$\beta = 4$ 5 , $\alpha = 1$ 5



$|\overline{OA}| = |i + j| = \sqrt{2}$

$|\overline{AB}| = |3i| = 3$ 10

$|\overline{OB}| = |4i + j| = \sqrt{17}$

$\cos A = \dfrac{(OA)^2 + (AB)^2 - (OB)^2}{2(OA)(AB)}$ 5

$\cos A = -\frac{1}{\sqrt{2}}$ 5

75

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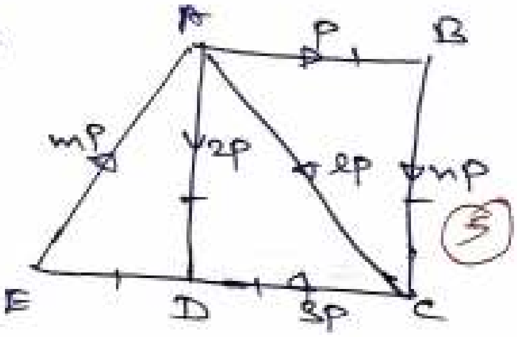
14. b



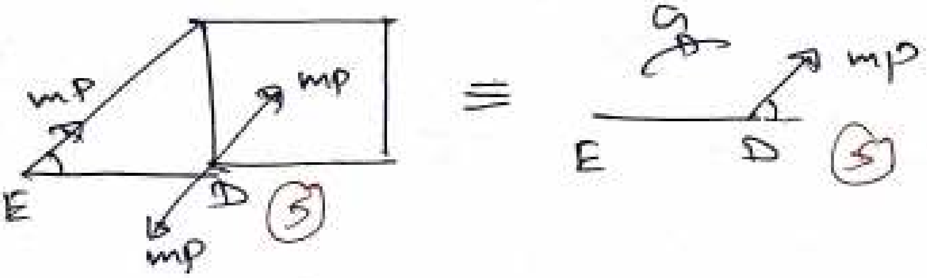
බල පද්ධතිය සමතුලිත බැවින්

$$\overset{\curvearrowright}{A} = 0 \quad nP \times a + 3P\,a = 0 \Rightarrow n = -3$$

$$\vec{X} = 0 \quad P - 3P + \frac{mP}{\sqrt{2}} + \frac{lP}{\sqrt{2}} = 0 \Rightarrow m + l = 2\sqrt{2}$$

$$\uparrow Y = 0 \quad 3P - 2P + \frac{mP}{\sqrt{2}} - \frac{lP}{\sqrt{2}} = 0 \Rightarrow l - m = \sqrt{2}$$

$$l = \frac{3\sqrt{2}}{2} \qquad m = \frac{\sqrt{2}}{2}$$



යුග්මයේ ඝූර්ණය $= \frac{mP}{\sqrt{2}} \cdot a$

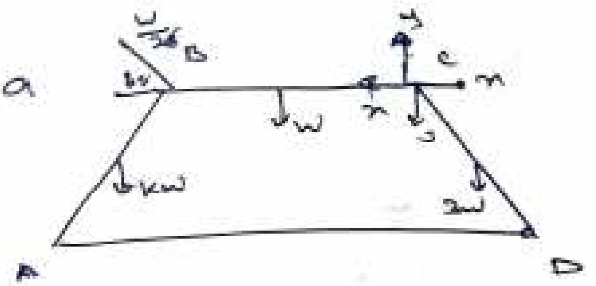
$$G = a\,\frac{\sqrt{2}}{2} \cdot \frac{P}{\sqrt{2}}$$

$$= \frac{aP}{2}$$

සමතුලිතව පවතින නිසා එකතු කළ යුතු යුග්මයේ ඝූර්ණය ADCBA දිශාවට වේ.

G

15. a



$\overset{\frown}{B}$ $\quad w \times a = y \times 2a$

$y = w/2$ $\quad$ (5)

$\overset{\frown}{D}$ $\quad 3w \times \frac{a}{2} + y \times \frac{2a}{2} = x \times 2a \frac{\sqrt{3}}{2a}$

$\frac{3w}{2} + \frac{w}{2} = \sqrt{3}x$ $\quad$ (10)

$x = \frac{2w}{\sqrt{3}}$

ABC සඳහා

$\overset{\frown}{B}$ $\quad kw\frac{a}{2} + \frac{w}{2\sqrt{3}} \times \frac{1}{2} \times \frac{\sqrt{3}}{2} \times 2a + \frac{a}{2\sqrt{3}} \times \frac{\sqrt{3}}{2} \times \frac{2a}{2} + w\left(\frac{2a}{2} + a\right)$

$= \frac{2\sqrt{3}w}{\sqrt{3}} \times 2a \times \frac{\sqrt{3}}{2} + \frac{w}{2} \times 2a$ $\quad$ (10)

$\frac{kw}{2} + \frac{w}{4} + \frac{w}{4} + 2w = 2w + \frac{3w}{2}$

$\frac{kw}{2} = \frac{3w}{2} - \frac{w}{2}$

$\frac{kw}{2} = w$

$k = 2$ $\quad$ (5)

$\overset{\frown}{A}$ $\quad 2w \cdot \frac{a}{2} + \frac{w}{2\sqrt{3}} \times \frac{1}{2} \times 2a \times \frac{\sqrt{3}}{2} + \frac{w}{2\sqrt{3}} \times \frac{\sqrt{3}}{2} \times \frac{2a}{2} + w\left(\frac{2a}{2} + a\right)$ (10)
$+ 3w\left(2a \times \frac{1}{2} + 2a + \frac{a}{2}\right) = R \times 4a$

$w + \frac{w}{4} + \frac{w}{4} + 2w + 3w \times \frac{7}{2} = 4R$

$4R = \frac{4w + w + w + 8w + 42w}{4} = 14w$

$R = \frac{14w}{4} = \frac{7w}{2}$ $\quad$ (5)

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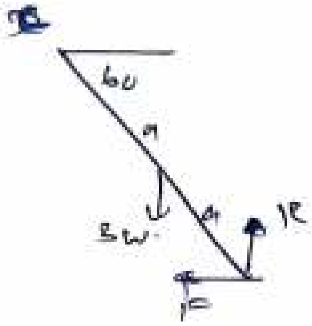

සී

$$3w \cdot \frac{a}{2} + F \times \frac{2a\sqrt{3}}{2} = R \times w \times \frac{1}{2}$$ 5 10

$$\sqrt{3}F = R - \frac{3w}{2}$$

$$F = \frac{7w}{2} - \frac{3w}{2} = 2w$$

$$F = \frac{2w}{\sqrt{3}}$$ 5

සමතුලිත විට

$$\mu \geq \frac{F}{R}$$

$$\mu \geq \frac{2w/\sqrt{3}}{\frac{7w}{2}} = \frac{4w}{7\sqrt{3}w} = \frac{4\sqrt{3}}{21}$$ 5 5

$$\mu \geq \frac{4\sqrt{3}}{21}$$

$\boxed{65}$

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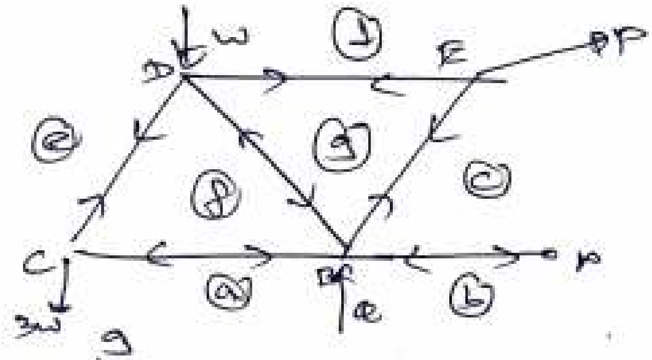
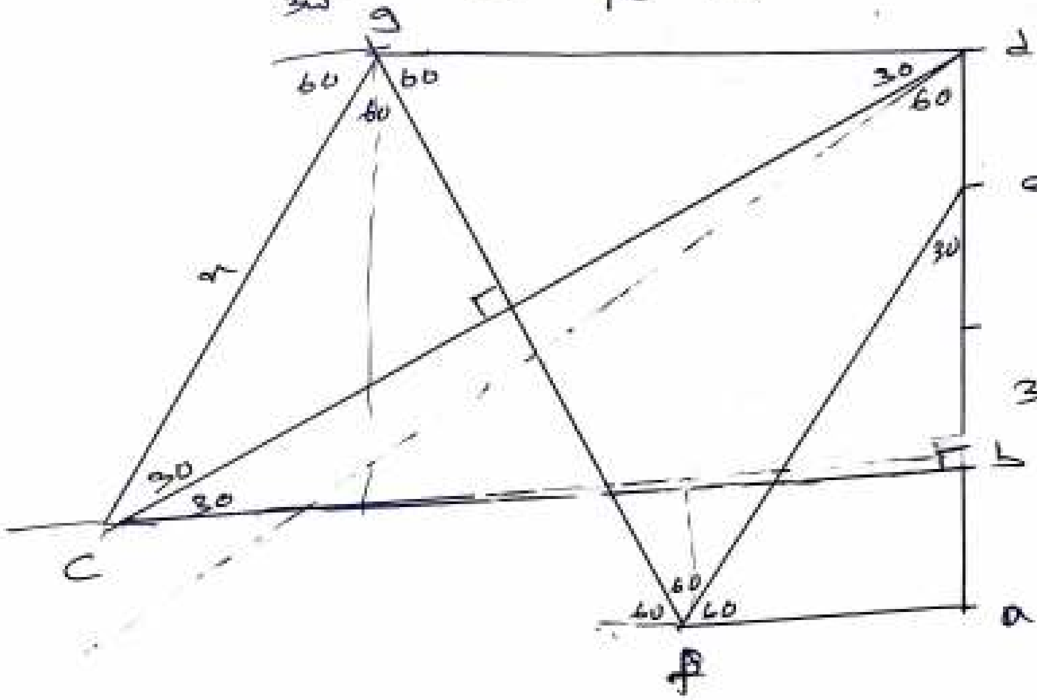
(15) b





4	30
3	20
2	15
1	10

$P \rightarrow ab \Rightarrow W$ (5)

$Q = cd \Rightarrow 6W$ (5)

$x \cos 30 = 3W$

$x\frac{\sqrt{3}}{2} = 3W$

$x = 2\sqrt{3}W$

$2x \cos 30 = CD$

$2 \cdot 2\sqrt{3}W \cdot \frac{\sqrt{3}}{2} = CD$

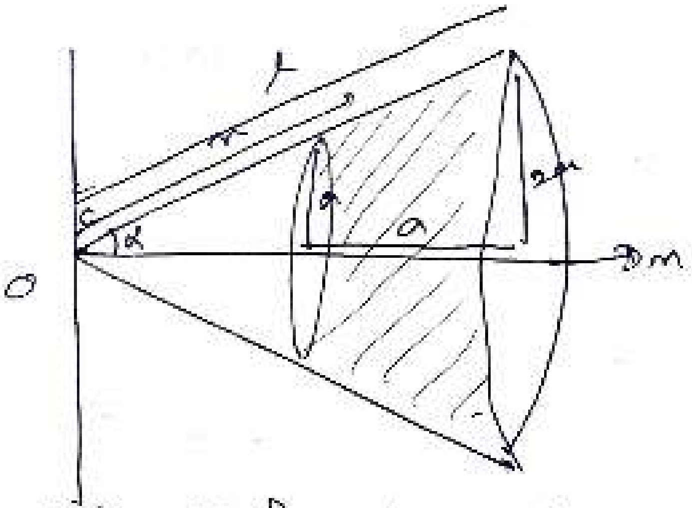
$CD = 6W$

දණ්ඩ	ආතතිය	තෙරපුම	විශාලත්වය
AB (bc)		✓	$3\sqrt{3}W$ (5)
BC (af)		✓	$\sqrt{3}W$ (5)
CD (ef)	✓		$2\sqrt{3}W$ (5)
DE (dg)	✓		$2\sqrt{3}W$ (5)
BE (cg)	✓		$2\sqrt{3}W$ (5)
BD (fg)		✓	$\frac{8W}{\sqrt{3}}$ (5)

(2) බැගින් 5 ලකුණු (15)

85

16



$\tan\alpha = \frac{2a}{2a} = 1$

$\alpha = \pi/4$

$\Delta m = \pi(x\tan\alpha)^2 \frac{\rho}{a}\Delta x$

$M = \int_a^{2a} \pi x^2 \frac{\rho}{a}\, dx$

$= \frac{\pi\rho}{a}\int_a^{2a} x^2\, dx$

$= \frac{\pi\rho}{a}\left[\frac{x^3}{3}\right]_a^{2a}$ 10

$= \frac{\pi\rho}{a}\left[\frac{8a^3 - a^3}{3}\right]$

$= \frac{7\pi a^2\rho}{3}$

සමමිතිකතාවයෙන් ස්කන්ධ කේන්ද්‍රය Ox මත x̄ දුරින් වේ නම් 5

$$\bar{x} = \frac{\int_a^{2a} x\tan^2\alpha\, x^2 \frac{\rho}{a} x\, dx}{\int_a^{2a} x\tan^2\alpha\, x^2\frac{\rho}{a}\, dx}$$ 15

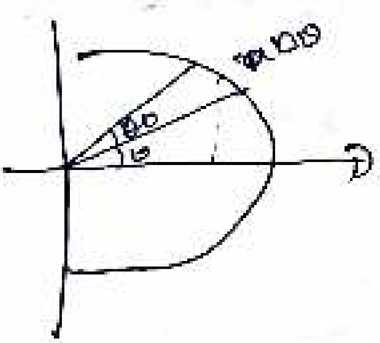
$$= \frac{\int_a^{2a} x^3\, dx}{\int_a^{2a} x^2\, dx} = \frac{\left[\frac{x^4}{4}\right]_a^{2a}}{\left[\frac{x^3}{3}\right]_a^{2a}}$$ 5

$$= \frac{\frac{16a^4 - a^4}{4}}{\frac{8a^3 - a^3}{3}} = \frac{3}{4}\times\frac{15a^4}{7a^3} = \frac{45}{28}a$$

(O සිට දුර 3b)

කුඩා තලයේ සිට දුර $3b = \frac{45}{28}a - a$

$= \frac{17}{28}a$ 5

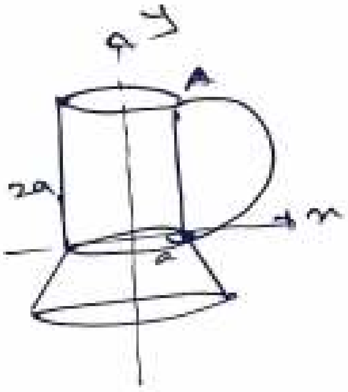


සමමිතියෙන් ස්කන්ධ කේන්ද්‍රය x අක්ෂය මත පිහිටයි. $\delta m = a\delta\theta\rho$

$$\bar{x} = \frac{\int_{-\pi/2}^{\pi/2} a\rho a\cos\theta\, d\theta}{\int_{-\pi/2}^{\pi/2} a\rho\, d\theta}$$ 10 $$= \frac{a\left[\sin\theta\right]_{-\pi/2}^{\pi/2}}{\left[\theta\right]_{-\pi/2}^{\pi/2}}$$

$$= \frac{a(1-(-1))}{\pi/2 - (-\pi/2)} = \frac{2a}{\pi}$$ 5

55



වස්තුව	ස්කන්ධය	y අක්ෂයට දුර	x අක්ෂයට දුර
	$2\pi a^3\rho$ 5	a 5	0
	$\pi a^3\sigma$ 5	a 5	$a+\frac{2a}{\pi}$ 5
	$\frac{7\pi a^3\rho}{3}$ 5	$-\frac{17}{28}a$ 5	0
සංයුක්තය	$\frac{13\pi a^3\rho}{3}+\pi\sigma a^3$ 5 $= \pi a^3\left(\frac{13}{3}\rho+\sigma\right)$	$\bar{y}$	$\bar{x}$

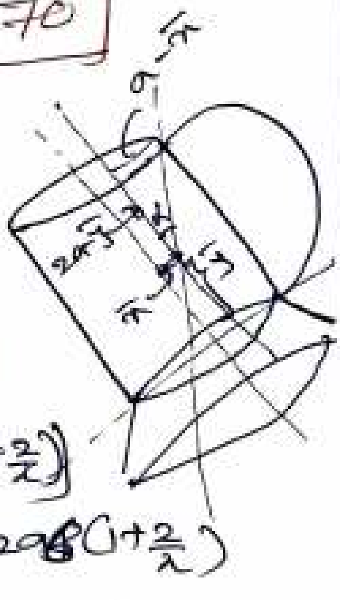
$$\bar{x} = \frac{\pi a^3\sigma\left(a+\frac{2a}{\pi}\right)}{\pi a^3\left(\frac{13}{3}\rho+\sigma\right)} \; 10 \; = \frac{a\sigma\left(1+\frac{2}{\pi}\right)}{\frac{13}{3}\rho+\sigma} \; 5$$

$$\bar{y} = \frac{2\pi a^4\rho + \pi a^4\sigma - \frac{17\pi a^4\rho}{12}}{\pi a^3\left(\frac{13}{3}\rho+\sigma\right)} \; 10$$

$$= \frac{a\left(\sigma+\frac{7}{12}\rho\right)}{\frac{13}{3}\rho+\sigma} \; 5$$

$\boxed{70}$

A ලක්ෂ්‍ය එල්ලූ විට



$$\tan\alpha = \frac{a-\left[\frac{a\sigma\left(1+\frac{2}{\pi}\right)}{\frac{13}{3}\rho+\sigma}\right]}{2a-\left[\frac{a\left(\sigma+\frac{7}{12}\rho\right)}{\frac{13}{3}\rho+\sigma}\right]} \; 5 \; 5$$

5

$$\frac{1}{2}\left[2a\left(\tfrac{13}{3}\rho+\sigma\right) - a\left(\sigma+\tfrac{7}{12}\rho\right)\right] = \left[a\left(\tfrac{13}{3}\rho+\sigma\right) - a\sigma\left(1+\tfrac{2}{\pi}\right)\right]$$

$$2a\left(\cancel{\tfrac{13}{3}\rho+\sigma}\right) - a\sigma - \frac{7a\rho}{12} = 2a\left(\cancel{\tfrac{13}{3}\rho+\sigma}\right) - 2a\sigma\left(1+\tfrac{2}{\pi}\right)$$

$$2\sigma + \frac{4\sigma}{\pi} - \sigma = \frac{7\rho}{12}$$

$$\frac{\pi\sigma+4\sigma}{\pi} = \frac{7\rho}{12}$$

$$\underline{12(\pi+4)\sigma = 7\rho\pi} \; 10$$

$\boxed{25}$

17. a

N - නිමල් බිත්තර සැපයීම $P(N) = \frac{1}{2}$

K - කමල් බිත්තර සැපයීම $P(K) = \frac{1}{3}$

S - සුනිල් බිත්තර සැපයීම $P(S) = \frac{1}{6}$

A - තෝරාගත් බිත්තරය බිඳී තිබීම

$P\left(\frac{A}{N}\right) = \frac{5}{100}$ $P\left(\frac{A}{K}\right) = \frac{6}{10}$ $P\left(\frac{A}{S}\right) = \frac{8}{100}$

තෝරාගත් බිත්තර බිඳී තිබීමේ සම්භාවිතාව $P(A)$ නම්

$$P(A) = P\left(\frac{A}{N}\right)P(N) + P\left(\frac{A}{K}\right)\cdot P(N) + P\left(\frac{A}{S}\right)P(S) \quad 10$$

$$= \frac{5}{100} \times \frac{1}{2} + \frac{6}{100} \times \frac{1}{3} + \frac{8}{100} \times \frac{1}{6}$$

5 5 5

$$= \frac{35}{600} = \frac{7}{120}$$

5

I $P\left(\frac{N}{A}\right) = \frac{P\left(\frac{A}{N}\right)\cdot P(N)}{P(A)} = \frac{\frac{5}{100}\cdot\frac{1}{2}}{\frac{7}{120}} = \frac{3}{7}$ // 10

5

II $P\left(\frac{K}{A}\right) = \frac{P\left(\frac{A}{K}\right)\cdot P(K)}{P(A)} = \frac{\frac{6}{100}\times\frac{1}{3}}{\frac{7}{120}} = \frac{12}{35}$ // 10

III $P\left(\frac{S}{A}\right) = \frac{P\left(\frac{A}{S}\right)\cdot P(S)}{P(A)} = \frac{\frac{8}{100}\cdot\frac{1}{6}}{\frac{7}{120}} = \frac{8}{35}$ // 10

65

17-b

[illegible]	[illegible] x_i	[illegible]	d	fd	x_i^2	$f_i x_i^2$
0000-2000	1000	10	-4000	-40000	1×10^6	10×10^6
2000-4000	3000	15	-2000	-30000	9×10^6	135×10^6
4000-6000	5000	40	0	0	25×10^6	1000×10^6
6000-8000	7000	20	2000	40000	49×10^6	980×10^6
8000-10000	9000	15	4000	60000	81×10^6	1215×10^6
		100		30000		3340×10^6

[illegible] 10

I. $\mu = 5000 + \frac{30000}{100} = 5300$ ([illegible]) 10

II. $Md = 4000 + \frac{2000}{40}\left(\frac{100}{2} - 25\right) = 5250$ ([illegible]) 10

III. $S = \sqrt{\frac{3340\times10^6}{100} - (5300)^2}$ 10

$= \sqrt{531} \times 10^2$

$= 23.1\times10^2$

$= 2310$ 5

IV. $\mu = 5300$ [illegible] 10

85