(1) a) $\dfrac{7p^2-28}{p^2+2p}$

$= \dfrac{7(p^2-4)}{p(p+2)}$

$= \dfrac{7\cancel{(p+2)}(p-2)}{p\cancel{(p+2)}}$

$= \dfrac{7p-14}{p}$ ✓

Ans (2)

b) $1-\dfrac{3f-g}{f+2g}$

$= \dfrac{(1)(f+2g)-(3f-g)}{f+2g}$

$= \dfrac{f+2g-3f+g}{f+2g}$

$= \dfrac{3g-2f}{f+2g}$ ✓

Ans (2)

c) $x^2+11x-15 = x^2+11x+\left(\frac{11}{2}\right)^2-\left(\frac{11}{2}\right)^2-15$

$= \left(x+\frac{11}{2}\right)^2-45\frac{1}{4}$

$x^2+11x-15=0$

$\left(x+\frac{11}{2}\right)^2-45\frac{1}{4}=0$

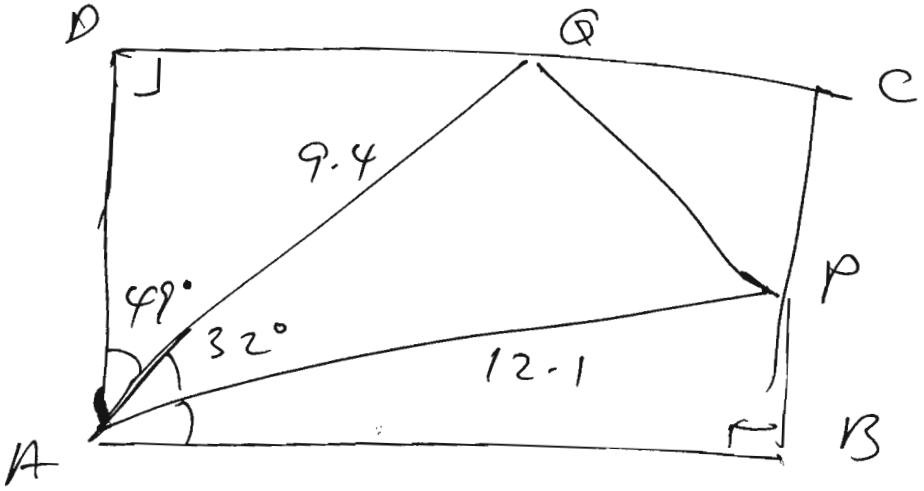
$\left(x+\frac{11}{2}\right)^2=45\frac{1}{4}$

$x+\frac{11}{2}=\pm 6.7268$

$x = 1.2268$ or -12.2268

$x = 1.23$ or -12.23 (2 decpl)

(2)



a) $\frac{AD}{9.4} = \cos 49°$

$AD = 6.16695$

$AD \approx 6.17m$ (3sf)

$\hat{PAB} = 90° - 49° - 32°$
$= 9°$

b) $\frac{PB}{12.1} = \sin 9°$

$PB = 1.8928$

$PB \approx 1.89m$ (3sf)

c) Area of $\triangle APQ = \frac{1}{2}(9.4)(12.1)\sin 32°$

$= 30.136$

$\approx 30.1 m^2$

d) $PQ^2 = 9.4^2 + 12.1^2 - 2(9.4)(12.1)\cos 32°$

$PQ = 6.4696$

$PQ \approx 6.47m$ (3sf)

a) Total cost of making 25,000 souvenirs
= 25000 × $0.90
= $22500

b) 15 parts ⟹ $0.9
1 parts ⟹ $0.06

Cost of material/souvenir = $0.06 × 5
= $0.30

Ans

Cost of wages/souvenir = $0.06 × 4
= $0.24

c) 7 × 5 = 35 hours

John's Salary per hour = $\frac{\$630}{35}$
= $18

Number of souvenirs John made per hour
= $\frac{18}{0.24}$
= 75

Ans

d) Increase of material = $0.30 × 50%
= $0.15

Increase of wage = $0.24 × 10%
= $0.024

Total Increase = $0.15 + $0.024
= $0.174

% increase = $\frac{\$0.174}{\$0.90} \times 100\%$
= 19.333%
= 19.3% (3sf)

e) 125% ⟹ $2.00
1% ⟹ $0.016
100% ⟹ $1.60

Ans: He paid $1.60

4a) $U_5 = 2^4 + 9$

$= 16 + 9$

$U_5 = 25$ (shown)

b) $U_6 = 2^5 + 11$

$= 32 + 11$

$= 43$ *

c) $U_n = 2^{n-1} + 2n - 1$

d) $U_{20} = 2^{20-1} + 2(20) - 1$

$= 524288 + 40 - 1$

Ans $= 524,327$ *

e) i) $2^{n-1} - 2^{n-2} = 2^{n-2}(2^1 - 2^0)$

$= 2^{n-2}(1)$

$= 2^{n-2}$ (shown)

$U_n - U_{n-1} = (2^{n-1} + 2n - 1) - (2^{n-2} + 2(n-1) - 1)$

$= 2^{n-1} - 2^{n-2} + 2n - 1 - 2n + 3$

Ans ii) $= 2^{n-2} + 2$

(5) a) Cost of 1 apple $= \frac{\$12}{m}$

$= \frac{1200}{m}$ cent.

b) Selling price $= \frac{1200}{m} + 2$

$= \frac{1200+2m}{m}$

No of Apples sold $= m-3$

Total sum received from sale of apples

$= \left(\frac{1200+2m}{m}\right)(m-3)$

$= \frac{2m^2 - 6m + 1200m - 3600}{m}$

$= \frac{2m^2 + 1194m - 3600}{m}$

c) $\frac{2m^2+1194m-3600}{m} - 1200 = 96$

$2m^2 + 1194m - 3600 - 1296m = 0$

$2m^2 - 102m - 3600 = 0$

$m^2 - 51m - 1800 = 0$

$(m-75)(m+24) = 0$

d) $m = 75$ or $m = -24$

e) Reject $m = -24$ coz number of apples cannot be negative. $\therefore m = 75$

Cost of each apple $= \frac{1200}{75}$

$= 16$ cents

Selling price of each apple $= 16 + 2$

$= 18$ cents

(6) $\angle LAD = \angle LCB$ ($\angle$s in the same segment)

$\angle LDA = \angle LBC$ ($\angle$ in the same segment)

$\angle ALD = \angle CLB = 90^\circ$

$\therefore \triangle LAD$ and $\triangle LCB$ are similar. (AAA)

6 i) $CNO = 90^\circ$ (perpendicular bisector of isos $\triangle$)

ii) $DCB = 58^\circ$ ($\angle$ in same segment)

$OCN = 18^\circ + 58^\circ$ (sum of angles)

$= 76^\circ$

$CON = 180^\circ - 90^\circ - 76^\circ$ ($\angle$ sum of $\triangle$)

Ans $= 14^\circ$

iii) $LDA = 180^\circ - 58^\circ - 90^\circ$ ($\angle$ sum of $\triangle$)

$= 32^\circ$

$CBA = 32^\circ$ ($\angle$ in the same segment)

iv) $ODC = 18^\circ$ (isos $\triangle$)

$ADO = 32^\circ - 18^\circ$

$= 14^\circ$

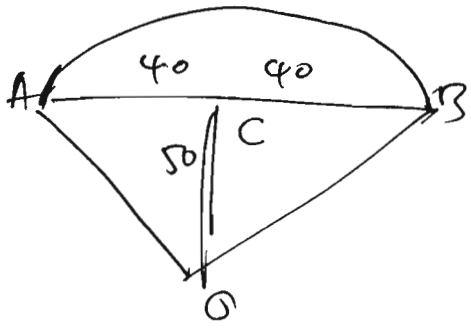
7a) $\frac{40}{50} = \tan A\hat{O}C$

$A\hat{O}C = 0.67474 \text{ rad}$

$A\hat{O}B = 0.67474 \times 2$

$= 1.34948 \text{ rad}$

Ans $= 1.35 \text{ rad. (3sf)}$



$AO^2 = 40^2 + 50^2$

$AO = \sqrt{4100}$

Area of sector $OAB = \frac{1}{2}(\sqrt{4100})^2(1.3494\text{f})$

$= 2766.434$

Area of $\triangle OAB = \frac{1}{2}(50)(80)$

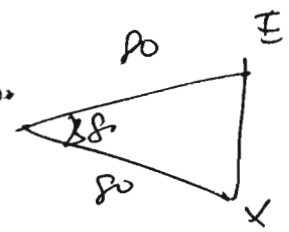
$= 2000$

Area of window $= 2766.434 - 2000$

$= 766.434$

Ans $= 766 \text{ cm}^2$

b i) $EX^2 = 80^2 + 80^2 - 2(80)(80)\cos 38°$



$EX^2 = 2713.46$

$EX = 52.09$

Ans $\approx 52.1 \text{ cm}$

b(ii)

$FY^2 = DY^2 + DF^2 - 2(DY)(DF)\cos F\hat{D}Y$

$FY^2 = EX^2$

$= 2713.46$

$DY^2 = 200^2 + 80^2$

$= 46400$

$DF^2 = DY^2$

$= 46400$

$2713.46 = 46400 + 46400 - 2(46400)\cos F\hat{D}Y$

$92800\cos F\hat{D}Y = 90026.54$

$\cos F\hat{D}Y = 0.97076$

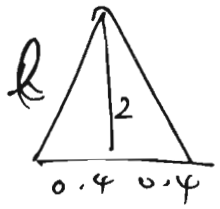
$F\hat{D}Y = 13.889°$

$F\hat{D}Y = 13.9°$

(8) $l^2 = 2^2 + 0.4^2$

$l^2 = 4.16$

$l = 2.0396$



i) Slant height of cone = 2.04 cm

ii) Total surface area $= \pi(0.4)(2.0396) + 2\pi(0.4)(16) + \pi(0.4)^2$

$= 13.77584\pi$

$= 43.278$

$= 43.3 \text{ cm}^2$

Ans

b) Volume of pencil $= \frac{1}{3}\pi r^2 h + \pi r^2 h$

$= \pi(0.4)^2(16) + \frac{1}{3}\pi(0.4)^2(2.0396)$

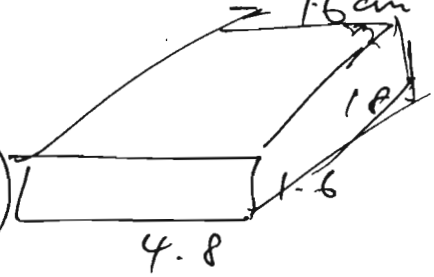
$= 8.384$ 8.377

$= 8.38 \text{ cm}^3$

Ans

c) length of box $= 6 \times 0.8$ height of box $= 2 \times 0.8$

$= 4.8 \text{ cm}$ $= 1.6 \text{ cm}$



Volume of box $= 4.8 \times 1.6 \times 18$

$= 138.24 \text{ cm}^3$ (shown)

Volume of 12 pencils $= 8.384 \times 12$ 8.377 100.524

$= 100.608$

Volume not occupied $= 138.24 - 100.608$ 100.524

$= 37.632$ 37.716

% of volume not occupied $= \frac{37.632}{138.24} \times 100\%$ 27.28%

$= 27.22\%$

$= 27.2\%$ 27.3%

9 a) $P = \frac{1}{5}(4)(12 - 4^2)$

$= -3.2$

c) $\frac{1}{5}x(12-x^2) = 1$

$y = \frac{1}{5}x(12-x^2)$ ——— (1)

$y = 1$ ——— (2)

d) From graph,

Gradient of curve at (3, 1)

$= -\frac{6}{2}$

$= -3$ //

⟹ Test $\frac{dy}{dx}$

$\frac{dy}{dx} = -3$

⇓

Adjust graph until close to this ans

e) $2x + y = 2$

$y = -2x + 2$

x	-1	3
y	4	-4

f) i) x-coordinate = 0.45

Check with

$-2x+2 = 2-4x-0.2x^3$

$0.2x^3 + 4.4x + 2 = 0$

$x =$

0.458939282

ii) $\frac{1}{5}x(12-x^2) = -2x+2$

$12x - x^3 = -10x + 10$

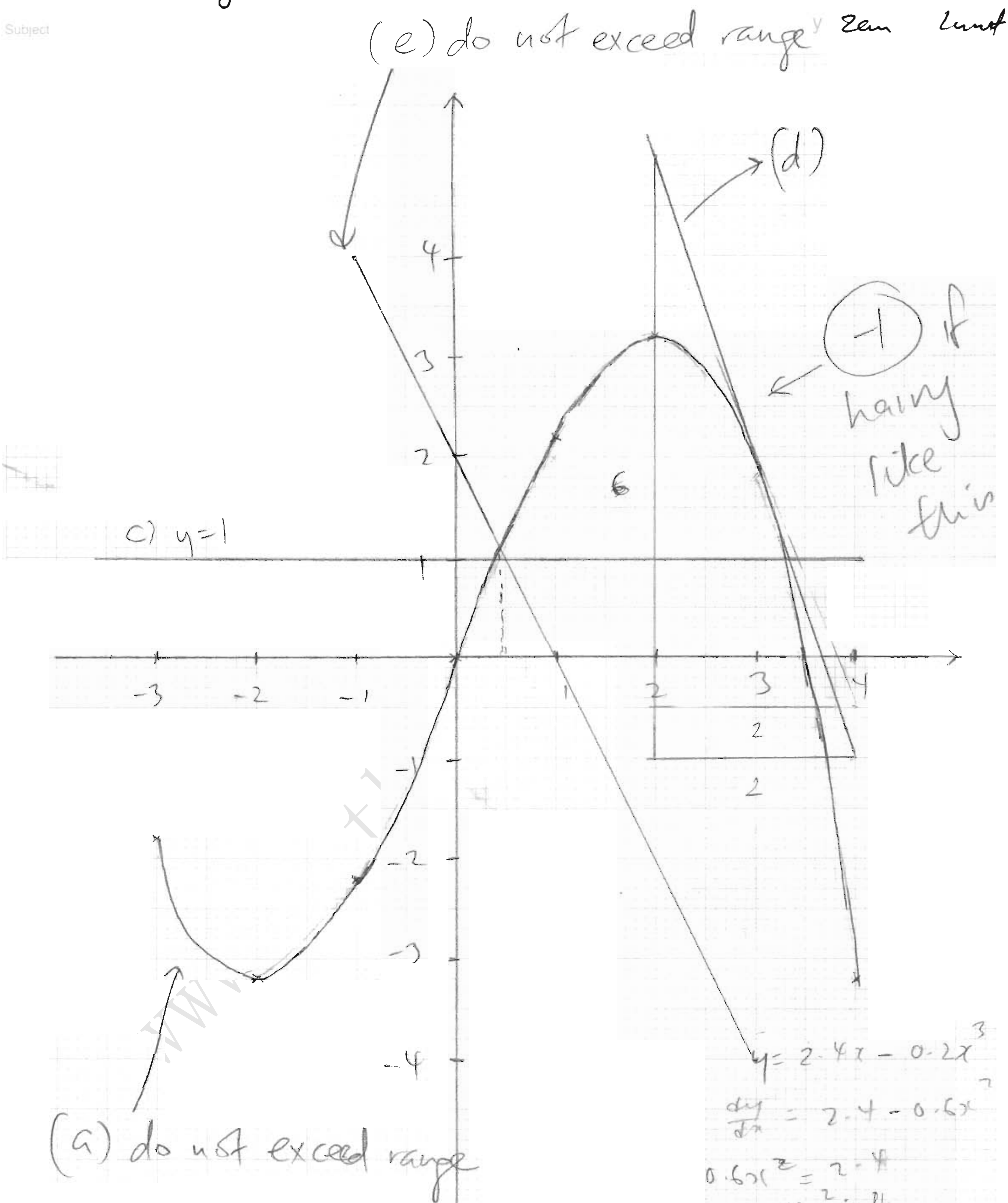
$x^3 - 22x + 10 = 0$

Ans: $A = 0$, $B = -22$, $C = 10$

Name Ah Beng

Subject

2cm 1 unit
2cm 1 unit



$y = 2.4x - 0.2x^3$

$\frac{dy}{dx} = 2.4 - 0.6x^2$

$0.6x^2 = 2.4$

$x^2 = 4$

$x = \pm 2$

Roots $\Rightarrow$ -3.464 3.464

6	10	14	18	22
$4 \le x < 8$	$8 \le x < 12$	$12 \le x < 16$	$16 \le x < 20$	$20 \le x < 24$
3	7	14	11	5

ii) Mean $= \dfrac{6(3) + 10(7) + 14(14) + 18(11) + 22(5)}{40}$

$= 14.8$

$SD = \sqrt{\dfrac{6^2(3) + 10^2(7) + 14^2(14) + 18^2(11) + 22^2(5)}{40} - 14.8^2}$

$= 4.4$

iii) More Gentle slope.

i)

	1	2	3	4	5	6
1	↳	(2,1)	(3,1)	(4,1)	(5,1)	(6,1)
2	(1,2)	↳	(3,2)	(4,2)	(5,2)	(6,2)
3	(1,3)	(2,3)	↳	(4,3)	(5,3)	(6,3)
4	(1,4)	(2,4)	(3,4)	↳	(5,4)	(6,4)
5	(1,5)	(2,5)	(3,5)	(4,5)	↳	(6,5)
6	(1,6)	(2,6)	(3,6)	(4,6)	(5,6)	↳

→ sum is 8

ii(a) Both even $= \frac{6}{30}$

$= \frac{1}{5}$ ✱

(b) Sum is 8 $= \frac{4}{30}$

$= \frac{2}{15}$

c) Product is 7 $= 0$ ✱

d) At least one number is a multiple of 3.

$= \frac{18}{30}$

$= \frac{3}{5}$ ✱