DATE:

1. $2x^2+6x-3=0$

$x^2+3x-\frac{3}{2}=0$

$\alpha+\beta=-3 \quad \alpha\beta=-\frac{3}{2}$

a) S.O.R:

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

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

$=12$

α^2 P.O.R:

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

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

$=\frac{9}{4}$

Equation:

$x^2-12x+\frac{9}{4}=0$

$4x^2-48x+9=0$

3

b) $2x^2+6x-3=p$

$2x^2+6x-(3+p)=0$

No real roots: $b^2-4ac<0$

$(6)^2-4(2)(-3-p)<0$

$36+24+8p<0$

$8p<-60$

$p<-\frac{60}{8}$

$p<-\frac{15}{2}$

2. a) $A=13.567567567\ldots$

Method 1:

Let $A=13+N$

$N=0.567567567\ldots$

$1000N=567.567567\ldots$

$999N=567$

$N=\frac{567}{999}$

then $A=13+\frac{567}{999}$

$=13\frac{21}{37}$ or $\frac{502}{37}$

Method 2:

$13.567567567\ldots$

$=13+0.567+0.000567+\ldots$

$\cancel{=13+\left[\frac{0.567}{1-}\right]}$

$0.567+0.000567+\ldots$ G.P

$a=0.567$, $r=\frac{0.000567}{0.567}$

$r=0.001$

$S_\infty=\frac{0.567}{1-0.001}=\frac{567}{999}$

Hence, $13.567567567\ldots$

$=13+\frac{567}{999}$

$=13\frac{21}{37}$ or $\frac{502}{37}$

3 b) Area of $\Delta=\frac{1}{2}\times$ base $\times$ height

Height $=\frac{2\times \text{Area of } \Delta}{\text{base}}$

$=\frac{2(20\sqrt{3}-4)}{4+4\sqrt{3}}$

$=\frac{4(10\sqrt{3}-2)}{4(1+\sqrt{3})}$

$=\frac{(10\sqrt{3}-2)(1-\sqrt{3})}{(1+\sqrt{3})(1-\sqrt{3})}$

$=\frac{12\sqrt{3}-32}{-2}$

$=16-6\sqrt{3}$

NO:

DATE:

3a) MATHEMATICS

MMAATT HEICS.

Case 1 : No double letters.

MATHEICS → 8 letters

$^8P_4 = 1680$

or Case 2 : 1 set of double letters.

M or A or T

_ _ _ _

$\frac{^4P_2}{2!}$ ← choose where to place / ← same letter

M or A or T

$\frac{^4P_2}{2!} \times 3 \times {^7P_2}$ ← 2 more places

$= 756$

or Case 3 : 2 sets of double letters.

A and M OR A and T OR M and T

$\frac{^4P_2}{2!} \times 3 = 18$ ✓

Total $= 1680 + 756 + 18$ ✓

$= 2454$ ✓

(5)

b) i) 9 Male, 6 Female, Choose 7

Choose 5 Males + 2 Female = 7.

$^9C_5 \times {^6C_2}$ ✓

$126 \times 15 = 1890$ ✓

ii) not more than 3 females.

Case 1 : 3 females + 4 males.

Case 2 : 2 females + 5 males

Case 3 : 1 female + 6 males

Case 4 : no females + 7 males.

Total :

$(^6C_3 \times {^9C_4}) + (^6C_2 \times {^9C_5}) +$ Any ✓

$(^6C_1 \times {^9C_6}) + (^6C_0 \times {^9C_7})$

$= 2520 + 1890 + 504 + 36$

$= 4950$ ✓

(4)

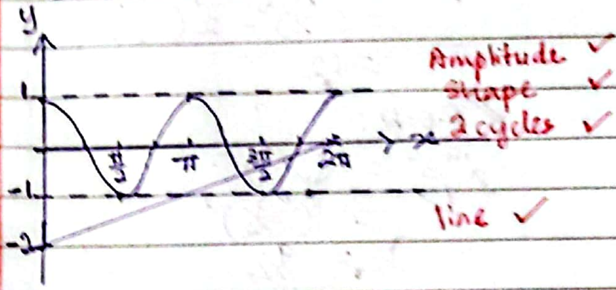
4a) $\cos 2x = \cos(x + x)$ ✓

$= \cos x \cos x - \sin x \sin x$ ✓

$= \cos^2 x - \sin^2 x$.

(2)

b) $y = \cos 2x$ for $0 \le x \le 2\pi$.



$\cos^2 x - \sin^2 x = \frac{x}{\pi} - 2$

$\cos 2x = \frac{x}{\pi} - 2$

$y = \frac{x}{\pi} - 2$

x	0	2π
y	-2	0

Number of solutions = 2 ✓

(5)

5.

$FD = BC = 25$

Total sides: $6x + 2y + 2(25) = 130$

$2y = 80 - 6x$

$y = 40 - \frac{5}{2}x$ ✓

From $\triangle ABC$:

$x^2 + y^2 = 25^2$ ✓ or

$x^2 + (40 - \frac{5}{2}x)^2 = 25^2$ ✓

$x^2 + 1600 - 200x + \frac{25}{4}x^2 = 625$

$29x^2 - 800x + 3900 = 0$

Using formula:

$x = \frac{800 \pm \sqrt{(-800)^2 - 4(29)(3900)}}{2(29)}$ ✓

$x = \frac{800 \pm \sqrt{187600}}{58}$

$x = 21.26$ or 6.325 ✓

$y = -13.15$ (rejected) or 24.19 ✓

$x = \cancel{21.26}\ 6.33$ and $y = 24.19$

Volume of prism.

$\cancel{= \frac{1}{3} \times (6.325)^2 \times 24.19}$

$= \frac{1}{2} \times (6.325)^2 \times 24.19$

$= 483.87\ cm^3$ ✓

Hence, a piece of dodol of volume $600\ cm^3$ cannot be packed into the container because the volume of container is less than $600 cm^3$. ✓

(8)

6(a) Let gradient of $L_1 = m_1$ and $L_2 = m_2$

$m_1 = \tan\theta_1$ and $m_2 = \tan\theta_2$.

From $\triangle ABC$:

$\tan\theta_1 = \frac{AC}{BC}$ ✓

or $\tan\theta_2 = \tan(90 + \theta_1)$

$\theta_2 = 90° + \theta_1$ (exterior angle of $\triangle$)

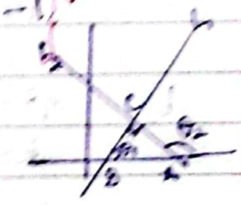
θ_2 is in quadrant II ($>90°$).

$\therefore \tan\theta_2 = -\frac{BC}{AC}$

$= -\frac{1}{\tan\theta_1}$

$\tan\theta_1 \times \tan\theta_2 = -1$ ✓

Hence, $m_1 m_2 = -1$



(3)

b) i) $AC = BC$ ✓

$\sqrt{(x+3)^2 + (y-2)^2} = \sqrt{(x-5)^2 + (y+2)^2}$ ✓

$x^2 + 6x + 9 + y^2 - 4y + 4 = x^2 - 10x + 25 + y^2 + 4y + 4$

$16x - 8y - 16 = 0$

$8y = 16x - 16$

$y = 2x - 2$ ✓

Equation of CD: $y = 2x - 2$

ii) $y = 2x - 2$ —— ①

$y = -3x + 8$ —— ②

$2x - 2 = -3x + 8$ ✓

$5x = 10$

$x = 2$ ✓

$y = 2(2) - 2 = 2$

Coordinates of lamppost $= (2, 2)$ ✓

(6)

Alternative:

$m_{AB} = -\frac{1}{2}$

$m_{CD} = 2$ ✓

or

Midpoint, $M\left(\frac{-3+5}{2}, \frac{2+(-2)}{2}\right)$

$M(1, 0)$ ✓

Equation

$y - 0 = 2(x - 1)$ ✓

$y = 2x - 2$. ✓

NO: DATE:

7a) $2y - 8x + 3 = 0$

$2y = 8x - 3$

$y = 4x - \frac{3}{2}$

gradient, $m_1 = 4$

tangent to curve ; $m_2 = 4$.

$\frac{dy}{dx} = 2x$

$2x = 4$ ✓

$x = 2$

$y = 2^2 = 4$

$\therefore P(2,4)$ ✓

(2)

b) $4^2 = k(2)$ ✓

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

$y^2 = 8x$

$y = (8x)^{\frac{1}{2}}$

Area $= \int_0^2 (8x)^{\frac{1}{2}} dx - \int_0^2 x^2 dx$ ✓

$= \left[\frac{8^{\frac{1}{2}} \cdot x^{\frac{3}{2}}}{\frac{3}{2}}\right]_0^2 - \left[\frac{x^3}{3}\right]_0^2$

$= \left[\frac{16}{3} - 0\right] - \left[\frac{8}{3} - 0\right]$

* $= \frac{8}{3}$ ✓

(3)

c) $V = \int_a^b \pi x^2 dy$.

$V = \int_0^4 \pi y \, dy - \int_0^4 \pi \left(\frac{y^2}{8}\right)^2 dy$

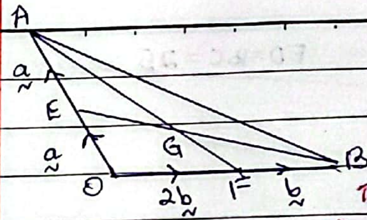
$= \pi\left[\frac{y^2}{2}\right]_0^4$ ✓1 or $- \frac{\pi}{64}\left[\frac{y^5}{5}\right]_0^4$ ✓1

$= 8\pi - \frac{16}{5}\pi$ ✓

$= \frac{24}{5}\pi$ or 4.8π unit^3 ✓

(3)

8



$\vec{AG} = h\vec{AF}$

$\vec{BG} = k\vec{BE}$

Triangle Law

a) i) $\vec{OG} = \vec{OA} + \vec{AG}$ or ✓1

$= \vec{OA} + h\vec{AF}$

$= \vec{OA} + h(\vec{AO} + \vec{OF})$ ✓

$= 2\underset{\sim}{a} + h(-2\underset{\sim}{a} + 2\underset{\sim}{b})$

$= (2 - 2h)\underset{\sim}{a} + 2h\underset{\sim}{b}$ ✓

ii) $\vec{OG} = \vec{OB} + \vec{BG}$ ✓1 *

$= \vec{OB} + k\vec{BE}$

$= \vec{OB} + k(\vec{BO} + \vec{OE})$ ✓

$= 3\underset{\sim}{b} + k(-3\underset{\sim}{b} + \underset{\sim}{a})$

$= (3 - 3k)\underset{\sim}{b} + k\underset{\sim}{a}$ ✓

(5)

b) $(2-2h)\underset{\sim}{a} + 2h\underset{\sim}{b} = k\underset{\sim}{a} + (3-3k)\underset{\sim}{b}$

$k = 2 - 2h$ — (1) ✓1

$2h = 3 - 3k$ ✓1 OR $2 - k = 3 - 3k$ ✓1

$= 3 - 3(2 - 2h)$

$= 3 - 6 + 6h$

$4h = 3$

$h = \frac{3}{4}$ ✓

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

(3)

c) $\vec{OG} = \frac{1}{2}\underset{\sim}{a} + \frac{3}{2}\underset{\sim}{b}$

$= \frac{1}{2}(2\underset{\sim}{i} + \underset{\sim}{j}) + \frac{3}{2}(3\underset{\sim}{i})$ ✓

$= \frac{11}{2}\underset{\sim}{i} + \frac{1}{2}\underset{\sim}{j}$

$|\vec{OG}| = \sqrt{\left(\frac{11}{2}\right)^2 + \left(\frac{1}{2}\right)^2}$

$= \frac{\sqrt{122}}{2}$ ✓

$= 5.523$ units

(2)

9 a) $n = 8 \quad p = 0.4$

i) mean $= np$

$= 8(0.4)$

$= 3.2$ ✓

$\sigma = \sqrt{npq}$

$= \sqrt{3.2(0.6)}$ ✓

$= 1.386$ ✓

ii) $P(X \leq 2) = P(X=0) + P(X=1) + P(X=2)$

$= {}^8C_0 (0.4)^0 (0.6)^8 +$ or

${}^8C_1 (0.4)^1 (0.6)^7 +$ or

${}^8C_2 (0.4)^2 (0.6)^6$ ✓

$= 0.3154$ ✓

b) $\mu = 200 \quad \sigma^2 = 25 \rightarrow \sigma = 5$

i) $P(X < 190)$

$P\left(Z < \frac{190-200}{5}\right)$ ✓

$P(Z < -2) = 0.0228$ ✓

ii) $P(X > m) = 0.20$

$P\left(Z > \frac{m-200}{5}\right) = 0.20$ ✓

$\frac{m-200}{5} = 0.842$ ~~2.054~~ ✓

$m = 5(0.842) + 200$

$= 204.21$ ✓

10 a)

$x-1$	1	2	3	4	5	6
$\log_{10} y$	0.40	0.59	0.76	0.93	1.11	1.29
	0.4031	0.5855	0.7566	0.9345	1.1139	1.290

✓ ✓

[scale on y-axis is 2 cm ≡ 0.2, so number of decimal places to take is 2.]

c) $y = pq^{(x-1)}$

$\log_{10} y = \log_{10} p + (x-1)\log_{10} q$

✓ $\underset{Y}{\log_{10} y} = \underbrace{\log_{10} q}_{m} \underset{X}{(x-1)} + \underbrace{\log_{10} p}_{c}$

From graph Y-intercept $= 0.22 (\pm 0.02)$

(i) ✓ $\log_{10} p = 0.22$

$p = 1.6596$

✓ $= 1.660$ (4 s.f.)

(ii) *Gradient $= \frac{1.3 - 0.4}{5 - 1} = 0.18$ ~~0.175~~ (± 0.01)

✓ $\log_{10} q = 0.18$

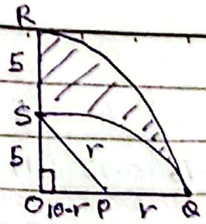
✓ $q = 1.514$

b) Plot all points correctly - 1

Axes - 1

Line of best fit - 1

11.



Let PQ = r, then OP = 10 − r

a) $5^2 + (10-r)^2 = r^2$

$25 + 100 - 20r + r^2 = r^2$ ✓

$20r = 125$

$r = 6.25$ cm ✓

$\therefore PQ = 6.25$ cm

b) $\sin \angle OPS = \frac{5}{6.25}$ ✓

$\angle OPS = 0.9274$ rad / $53.13°$

$\angle QPS = 3.142 - 0.9274$

$= 2.215$ rad ✓

c) Perimeter = $\overset{\frown}{SQ} + RS + \overset{\frown}{RQ}$ ✓

$= 6.25(2.215) + 5$

$+ 10(1.571)$ ✓

$= 34.554$ cm. ✓

d) Area of quadrant OQR:

$\frac{1}{2}(10)^2(1.571) = 78.55$ ✓1

Area of △OPS:

$\frac{1}{2} \times (10 - 6.25) \times 5 = 9.375$ ✓1

Area of sector PQS: ✓1

$\frac{1}{2}(6.25)^2(2.215) = 43.262$

Area of shaded region:

$78.55 - 9.375 - 43.262$ ✓

$= 25.913$ cm^2 ✓

12 buses − x, rental RM 500

vans − y, rental RM 200

a)

I : $x + y \leq 10$ ✓

II : $2x \leq 3y$ ✓ $y \geq \frac{2}{3}x$ or $x \leq \frac{3}{2}y$

III : $500x + 200y \leq 3000$ ✓

*

Number of bus to van is at most 3 : 2

$\frac{x}{y} \leq \frac{3}{2}$ ← write ratio as fraction

$2x \leq 3y$

c) i) $x = 4$, From graph, min number of vans = 3 ✓

c) ii) $48x + 12y = k$

Let $k = 48$ →

x	0	1
y	4	0

From graph, maximum point is $(4, 5)$ ✓

$48(4) + 12(5)$ ✓

$= 252$ ✓

Maximum number of students = 252.

b) All lines correct − 2

(Any 2 correct − award 1)

R shaded correctly − 1

$x + y = 10$

x	0	10
y	10	0

$2x = 3y$

x	0	3
y	0	2

$5x + 2y = 30$

x	2	6
y	10	0

NO: DATE:

13. a) $\frac{4.50}{p} \times 100 = 150$

$p = \frac{4.50 \times 100}{150}$ ✓1

$= 3.00$ or

$q = \frac{2.16}{2.00} \times 100$ ✓1

$= 108$

$p = 3.00$ and $q = 108$ ✓2

(2)

b) $\bar{I} = \frac{\Sigma IW}{\Sigma W}$

Ac Chart

Items	Index	Weightage
A	120	72
B	144	90
C	150	36
D	90	138
E	108*	*24

$\bar{I} = \frac{120(72) + 144(90) + 150(36) + 90(138) + 108(24)}{360}$ ✓ ✓

$= \frac{42012}{360}$

$= 116.7$ ✓

(3)

c) 20% increase of all items:

~~New $\bar{I}$~~

$\frac{120}{100}$ ✓

$\bar{I}_{2010/2008} = \frac{120}{100} \times 116.7$ ✓

$= 140.04$ ✓

$\frac{P_{2010}}{50} \times 100 = 140.04$ ✓

$P_{2010} = \frac{140.04 \times 50}{100}$

$= RM\ 70.02$

Cost in 2010 = RM 70.02 ✓

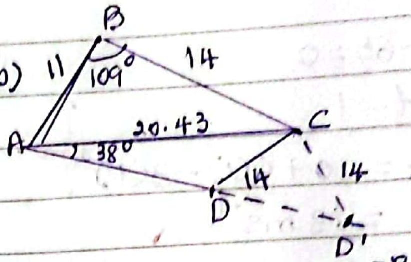
(5)

14 a) $AC^2 = 11^2 + 14^2 - 2(11)(14)\cos 109°$ ✓

$AC = 20.427$ cm

$= 20.43$ (4 s.f.) ✓

(2)

b) 

$\frac{\sin \angle ADC}{20.43} = \frac{\sin 38°}{14}$ ✓

$\sin \angle ADC = \frac{\sin 38°}{14} \times 20.43$

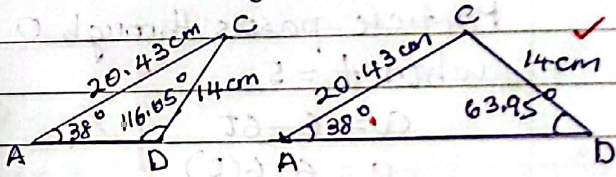
$\angle ADC = 63.95°$

Two possible values of $\angle ADC$

$= 63.95°$ and $(180° - 63.95°)$

$= 63.95°$ and $116.05°$ ✓

Possible triangles of ADC:



✓

(3)

c) i) $\angle ACD = 180° - 38° - 63.95°$

$= 78.05°$

$\frac{AD}{\sin 78.05°} = \frac{14}{\sin 38°}$ ✓

$AD = \frac{14}{\sin 38°} \times \sin 78.05°$

$= 22.25$ cm ✓

ii)

Area of ACD:

$\frac{1}{2}(20.43)(14)\sin 78.05°$

$= \cancel{136.80}\ 139.91$ or ✓1

Area of ABC

$= \frac{1}{2}(11)(14)\sin 109°$

$= 72.80$ ✓1

Area of ABCD

$= 72.80 + 139.91$ ✓

$= 212.71$ ✓

(5)

15 $v = 10 + 6t - 3t^2$

a) $\frac{dv}{dt} = 6 - 6t$ ✓

$\frac{dv}{dt} = 0$

$6 - 6t = 0$

$t = 1$

$v_{max} = 10 + 6(1) - 3(1)^2$ ✓

$= 13\ ms^{-1}$ ✓

③

b) $s = \int 10 + 6t - 3t^2\ dt$

$s = 10t + 3t^2 - t^3 + c$ ✓1

$t = 0,\ s = 0,\ c = 0$

$\therefore\ s = 10t + 3t^2 - t^3.$

when $s = 0$

$t(10 + 3t - t^2) = 0$ ✓1

$t(5 - t)(2 + t) = 0$

$t = 0$ or 5

Particle passes through O when $t = 5$

$a = 6 - 6t$ ✓1

$a = 6 - 6(5)$

$a = -24\ ms^{-2}$ ✓1

④

c) $a = -12,\quad 6 - 6t = -12$ ✓

$t = 3$

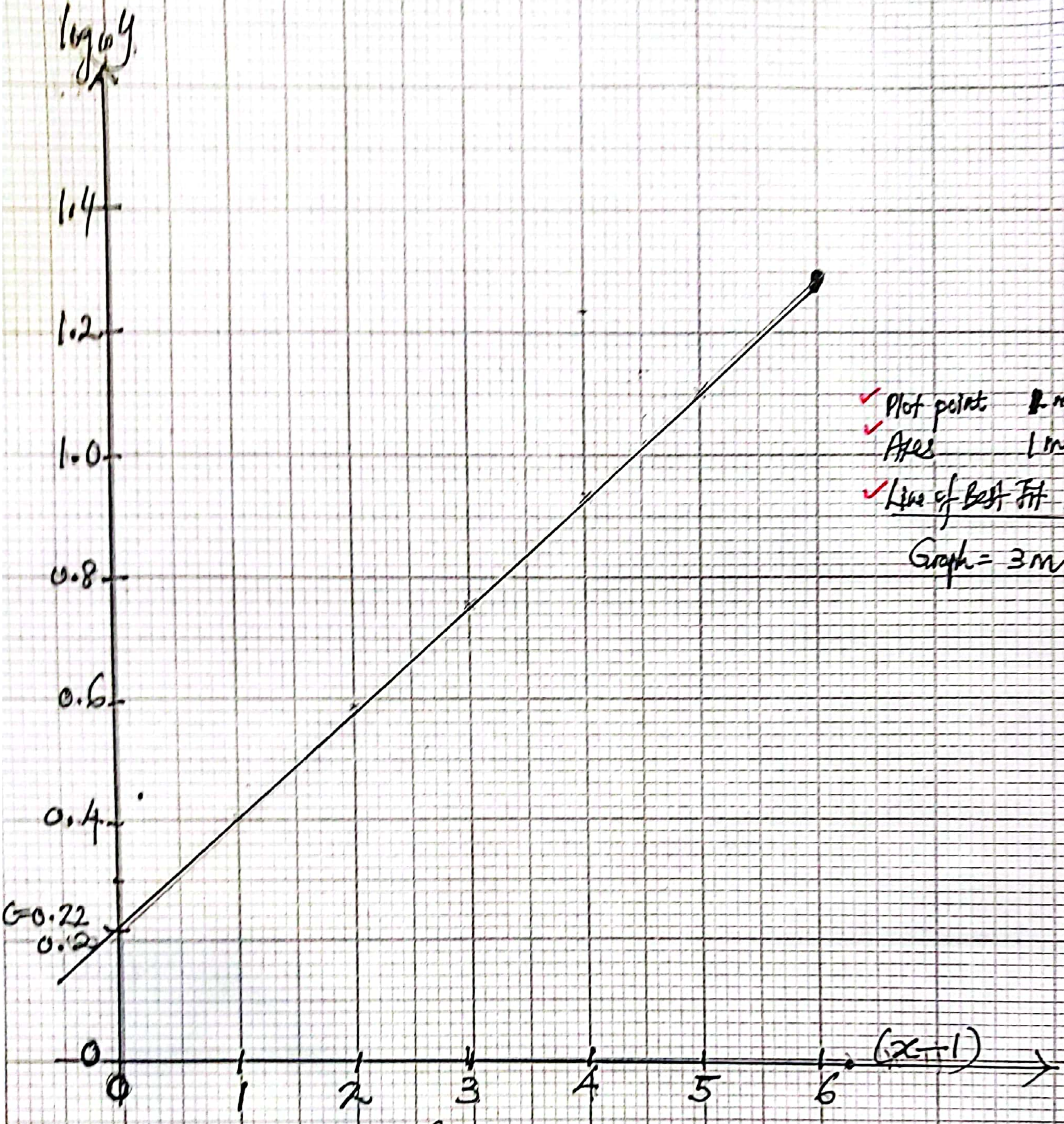
$s = 10(3) + 3(3)^2 - 3^3$ ✓

$= 30\ m.$ ✓

③

$x-1$	1	2	3	4	5	6	1m
$\log_{10} y$	0.4031	0.5852	0.7566	0.9345	1.1139	1.290	1m
OR $\log_{10} y$	0.40	0.59	0.76	0.93	1.11	1.29	

A = 0.2275
B = 0.1778 (2M)



Plot point 1m
Axes 1m
Line of Best Fit 1m (3M)
Graph = 3m

$\log_{10} y = (\log_{10} q)(x-1) + \log_{10} p$ → (1)m

OR $\log_{10} y = 0.1778\,(x-1) + 0.22$

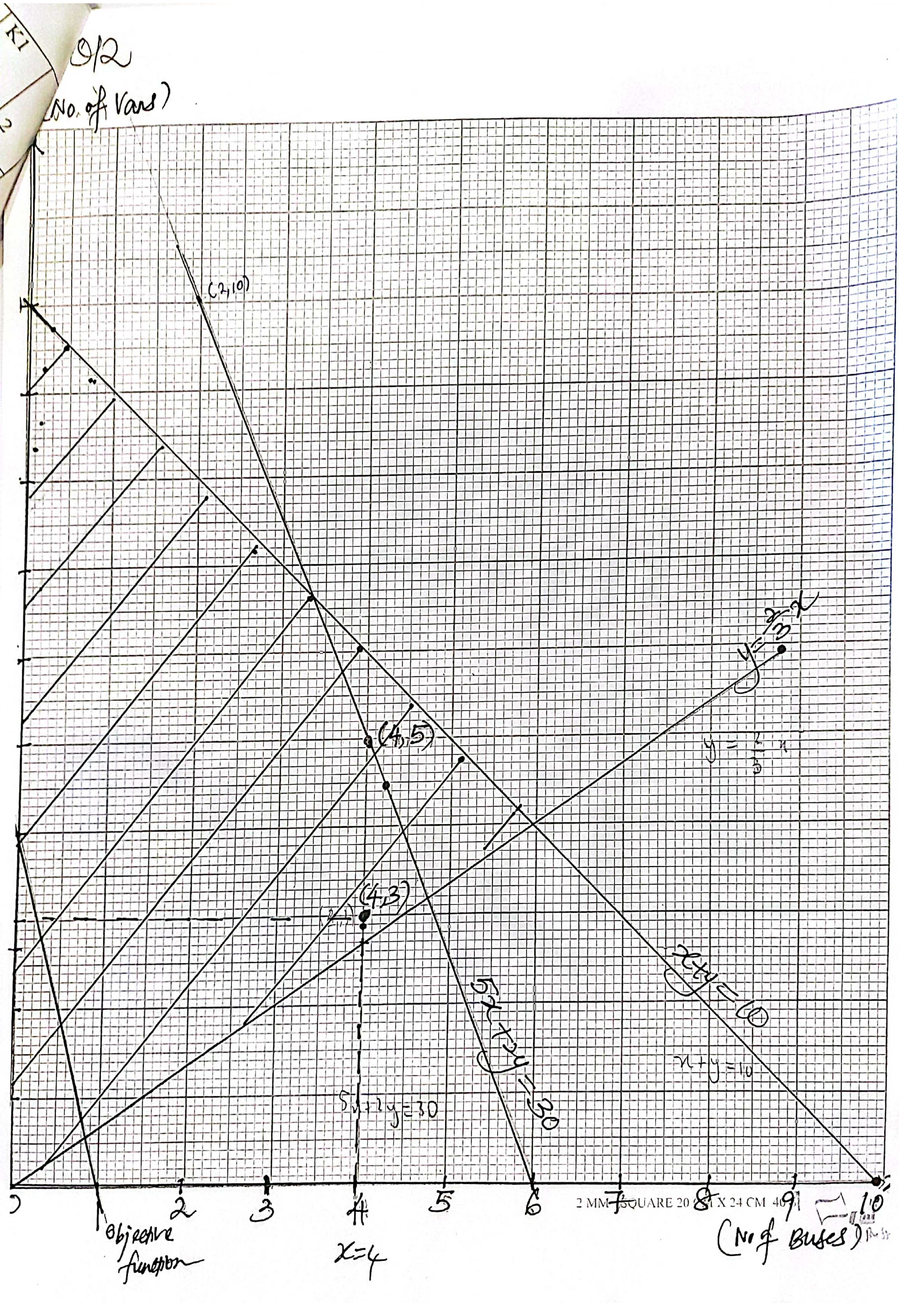
[0.17 ⟷ 0.19] [0.22 ⟷ 0.25] (5M)

$\log_{10} q = 0.1778$ → (1)m $\log_{10} p = 0.22$ → (1)m

$q = 1.506$ → (1)m $p = 1.660$ → (1)m

[1.48 ⟷ 1.55] [1.66 ⟷ 1.78]

4 s.f



9/2
(No. of Vans)
(2,10)
(4,5)
(4,3)
$y = \frac{2}{3}x$
$x + y = 10$
$5x + 2y = 30$
0
2
3
4
5
6
7
8
9
10
Objective function
$x = 4$
(No of Buses)
2 MM SQUARE 20 X 24 CM