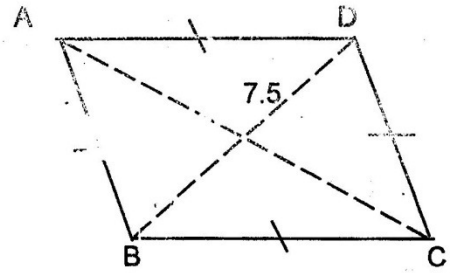
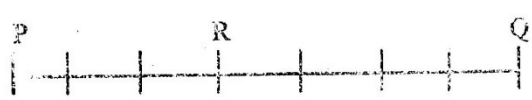
MARKING SCHEME 2005 PAPER 1

SOLUTION	MARKS	ALT. METHOD
1. $\frac{3/4 + 1\,5/7 \div 4/7 \times 2\,1/3}{(1\,3/7 - 5/8) \times 2/3} = \frac{3/4 + 12/7 \times 7/4 \times 7/3}{(1\,\frac{24-35}{56}) \times 2/3}$	M1	
Num. $3/4 + 12/7 \times 7/4 \times 7/3 = 31/4$	M1	
Deno. $45/56 \times 2/3 = 15/28$		
$31/4 \times 28/15 = 14\,7/15$	A1	
2. 2 | 1470 | 7056	M1	1470 = 2 x 735
735 | 3528		= 2 x 3 245
2 | 1764		= 2 x 3 x 5 x 49
2 | 882		= 2 x 3 x 5 x 7 x 7
2 | 441		= **2 x 3 x 5 x 7^2**
3 | 735 | 441		
3 | 245 | 147	B1	7056
5 | 49 | 49		= 3528 x 2
7 | 7 | 7		= 2 x 2 x 1764
7 | 1 | 1		= 2 x 2 2 x 882
		= 2 x 2 x 2 x 2 x 441
1470 = 2 x 3 x 5 x 7 x 7		= 2 x 2 x 2 x 2 x 3 x 147
= **2 x 3 x 5 x 7^2**		= 2^4 x 3 x 3 x 49
7056 = 2 x 2 x 2 x 2 x 3 x 3 x 7 x 7		= 2^4 x 3^2 x 7 x 7
= **2^4 x 3^2 x 7^2**		= **2^4 x 3^2 x 7^2**
$\frac{1470^2}{\sqrt{7056}} = \frac{2^2 \times 3^3 \times 5^2 \times 7^4}{3 \times 5^2 \times 7^3}$	A1	
= **3 x 5^2 x 7^3** **Ans.**		

3. 	M1	
AD $= \sqrt{7.5^2 + 4^2}$	M1	
$= 72.25$		
$= 8.5$		
Perimeter $= 8.5 \times 4$	A1	
$= 34cm$		
4. $\dfrac{9t^2 - 25a^2}{6t^2 + 19at + 15a^2} = \dfrac{(3t)^2 - (5a)^2}{6t^2 + 9at + 1[illegible]at + 15a^2}$	B1 M1	
$= \dfrac{(3t + 5a)(3t - 5a)}{(3t + 5)(2t + 3a)} = \dfrac{3t - 5a}{2t + 3a}$	A1	
5. $6x = 360^0$	B1	
$X = 60^0$		
$(180 - 60)\,n = 360$	M	
$120n = 360$		
$n = 3$	A1	
6. 	B1	
		
$P = 3/7\,[illegible]$		

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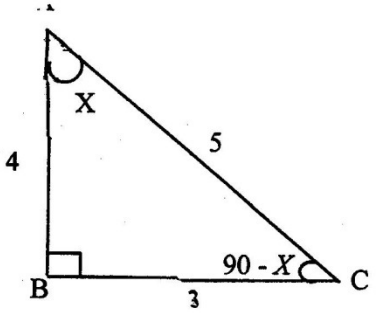
$\overrightarrow{PR} = {}^3/_5 PS$ But $\overrightarrow{PR} = \overrightarrow{PR}$ ${}^3/_7 \overrightarrow{PQ} = {}^3/_5 \overrightarrow{PS}$ $\overrightarrow{PS} = {}^5/_7 \overrightarrow{PQ}$ $\lvert PS \rvert = {}^5/_7 \times 8 = {}^{40}/_7$ But $\overrightarrow{RS} = {}^2/_5 \overrightarrow{PS}$ $\lvert RS \rvert = {}^2/_5 \times {}^{40}/_7$ $= 2$ [illegible]	1Mk 1[illegible] A1	
7.  $\text{Sin}(90-x) = \frac{AB}{AC}$ $\text{Sin}(90-x) = {}^8/_{10} = {}^4/_5$ $\tan x \quad \frac{BC}{AB}$ $= 0.75$	B1 M1 A1	

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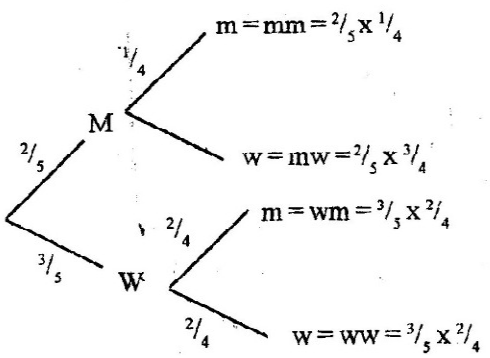
8 	B1	
$MM = {}^{2}/_{20}$ $MW = {}^{6}/_{20}$ $WM = {}^{6}/_{20}$ $WW = {}^{6}/_{20}$	M1	
a) P(mm or ww) = P(mm) + P(ww) $= {}^{2}/_{20} + {}^{6}/_{20} = {}^{2}/_{5}$ **Ans.**	A1	
b) P(MW OR WM) = P(MW) + P(WM) $= {}^{6}/_{20} + {}^{6}/_{20}$ $= {}^{3}/_{5}$ **Ans.**	A1	
9. L.C = 1cm A-E = 0.5 Limits of A are 3.5 nd 4.5 Limits of 6 are 5.5 and 6.5 Min. Area = $\frac{1}{2}$ x 3.5 x 5.5 = 9.625 Max. Area = $\frac{1}{2}$ x 4.5 x 6.5 = 14.625 Working Area = [illegible] x 4 x 6 12.[illegible]		M1

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	Workig Area - Min. Area = 12 - 9.625 = 2.375 Max Area - Working Area = 14.625 - 12 = 2.625 Absolute Error in Area $= \frac{2.375 + 2.625}{2}$ **= 2.5**	M1	
b)	% Error = $\frac{\text{A.E}}{\text{A.M}} \times 100$ $= \frac{2.5}{12} \times 100 = 20\frac{5}{6}\%$	A1	
10.	$P^2 = (P - q)(P - r)$ $P^2 = P^2 - Pr - Pq + qr$ $= - Pr - Pq + qr$ $Pr + Pq = qr$ $P(r + q) = qr$ $P = \frac{qr}{q + r}$	B1 M1 A1	
11.	$7y - 3x + 30 = 0$ At y - intercept the value of $x = 0$ Therefore $7y = -30$ $y = -\frac{30}{7} = -4\frac{2}{7}$ The coordinates are $(0, -4\frac{2}{7})$	B1 M1 A1	

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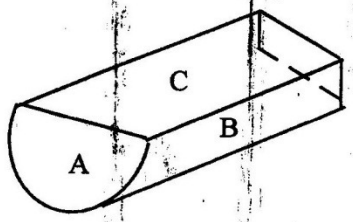
12.



Area $A = \pi r^2$ — B1

$= {}^{22}/_{7} \times 4.2 \times 4.4$

$= 55.44cm^2$

Area $B = 2\pi rh \times {}^{1}/_{2}$ — M1

$= {}^{22}/_{7} \times 4.2 \times 150$

$= 1980cm^2$

Area $C = 2 \times 4.2 \times 150$

$= 1260cm^2$ — M1

Total Area $= 55.44 + 1980 + 1260$

$= \mathbf{3295.44cm^2}$ — A1

Surface Area of cylinder

$= {}^{2}/_{2}\pi rh + \pi r^2 + 2rh$

$= {}^{22}/_{7} \times 4.2 \times 150 + {}^{22}/_{7} \times 4.2 \times 4.2 + 2 \times 4.2 \times 150$

$= \mathbf{3295.44cm^2}$

13. $A = \begin{pmatrix} 1 \\ -1 \\ 1 \end{pmatrix}$, $B \begin{pmatrix} X \\ Y \\ Z \end{pmatrix}$ and. — M1

$T = \begin{pmatrix} 2 \\ 0 \\ 1.5 \end{pmatrix}$

Mid point - AB= $T = \left[\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2}\right]$ — B1

$\left[\frac{1+x}{2}, \frac{y-1}{2}, \frac{1+z}{2}\right] \equiv (2,0,1.5)$

$X = 3, y = 1$ and $z = 2$

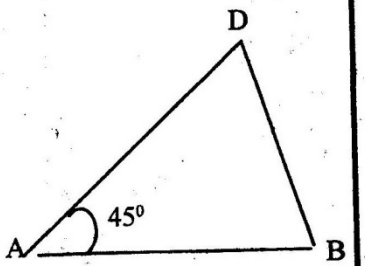
Hence $B \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 3 \\ 1 \\ 2 \end{pmatrix}$

$\mathbf{B = 3i + j}$ Ans. — A1

14.

a) $12 \sin 30^0 = 12 \times {}^1/_2$ — A1

$= 6cm$



$\angle ADB = 6$

$\frac{8}{\text{Sin D}} = \frac{6}{\text{Sin } 45^0}$ — M1

$\text{Sin D} = \frac{.8 \sin 4.5}{6}$

$= 70^030^1$ — A1

15. i) $I = \frac{PRT}{100}$ — B1

$= {}^5/_{100} \times 2 \times p$

$= 0.1p$

ii) $A = P(1 + 0.05)^2$ — M1

$= 1.1025p$

Interest $= 0.1025p$

Difference in interest $= 0.1025p - 0.1p$ — M1

$210 = 0.0025p$

Therefore $P = \frac{210}{0.0025} = 82{,}000/=$ — A1

16 $\int a\,dt = \int (25 - 9t^2)\,dt$ — B1

$= 25t - 3t^3 + c$

$4 = 25t - 3t + c$ when $t = 0$ — M1

$4 = c$

Hence $V = 25t - 3t^2 + 4$ — A1

b) $V = 25 \times 2 - 3 \times 2^2 + 4$ — A1

$= 50 + 4 - 12$

$= 42ms^{-1}$

Q17 The speed of the car is $(x + 20)$ km/h — B1

Time taken by lorry $= {}^{280}/_{x}$ hrs. — M1

Time taken by the car $= {}^{280}/_{x+20}$ hrs

${}^{280}/_{x} - {}^{280}/_{x+20} = {}^{7}/_{6}$

$$\frac{280(x+20) - 280x}{x(x+20)} = {}^{7}/_{6}$$

$7x^2 + 140x = 33600$

$x^2 + 20x - 4800 = 0$

$x^2 - 60x + 80x - 4800 = 0$ — M1

$x(x - 60) + 80(x - 60) = 0$

$(x - 60)(x + 80) = 0$

$x = -80$ or $x = 60$ — A1

b) Time taken by the lorry $= 12.15$ — A1

$= 4$ hrs

Distance covered by lorry = speed x time

$= 60 \times 4$ — M1

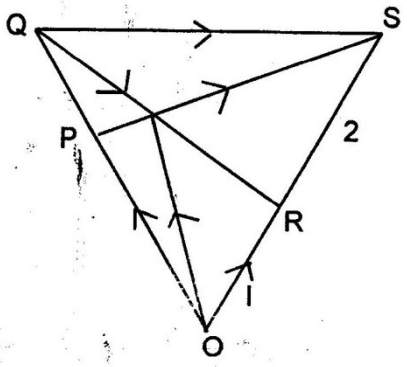
$= 240$km

Time taken by the car $= \frac{\text{distance}}{\text{Time}} = \frac{240}{100} = 2.4$ hrs — M1

Time left town M = 12.15 - 2 hrs 24min

= 9.51 a.m — A1

18.



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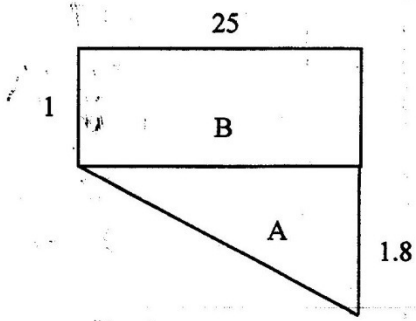
a)	$\overrightarrow{PS} = -\overrightarrow{PO} + \overrightarrow{OS}$ $= -2p + 3r$ $= 3r - 2p$	M1	Hence QR $\uparrow\uparrow$ QT Q is common point Hence Q,T,R are Collinear	A1
	$\overrightarrow{OT} = {}^1/_7\,OS + {}^6/_7\,OP$ $= {}^1/_7 \times 3\underset{\sim}{r} + {}^6/_7 \times 2\underset{\sim}{p}$ $= {}^3/_7\underset{\sim}{r} + {}^{12}/_7\underset{\sim}{p}$	A1	b) ii) $\overrightarrow{QT} : \overrightarrow{TR}$ $\overrightarrow{QT} = {}^3/_7\underset{\sim}{r} - {}^9/_7\underset{\sim}{p}$ $\overrightarrow{TR} = \overrightarrow{OT} + \overrightarrow{OR}$ $= -{}^3/_7\underset{\sim}{r} - {}^{12}/_9\underset{\sim}{p} + r$ $= {}^4/_7\,\underset{\sim}{r} - {}^{12}/_7\underset{\sim}{p}$	B1
	$\overrightarrow{QT} = \overrightarrow{QP} + \overrightarrow{PT}$ $= -{}^1/_3\,(3\underset{\sim}{p}) + 1/7\,(3\underset{\sim}{r} - 2p)$ $= {}^3/_7 r - {}^9/_7 p$	A1	Hence $\overrightarrow{QT} : \overrightarrow{TR}$ ${}^3/_7\underset{\sim}{r} - {}^9/_7\underset{\sim}{p} : {}^4/_7 - {}^{12}/_7 p$ $\Rightarrow {}^3/_7\underset{\sim}{r} : {}^4/_7\underset{\sim}{r}$ 3 : 4 OR $-{}^9/_7\,\underset{\sim}{p} : -{}^{12}/_7\underset{\sim}{p}$ 3 : 4 Hence QT : TR = 3:4	A1
b) i)	$\overrightarrow{QT} = {}^3/_7\underset{\sim}{r} - {}^9/_7\underset{\sim}{p}$ $\overrightarrow{QR} = \underset{\sim}{r} - 3\underset{\sim}{p}$ QR $\uparrow\uparrow$ QT if $\overrightarrow{QR} = K\overrightarrow{QT}$ $\underset{\sim}{r} - 3\underset{\sim}{p} = K\,({}^3/_7\underset{\sim}{r} - {}^9/_7\underset{\sim}{p})$ $r = {}^3/_7 kr$ $k = {}^7/_3$ Also $-3\underset{\sim}{p} = -{}^9/_7 pk$ $k = {}^7/_3$	M1		
19.	Cross sectional area = ½ bh + l x b = ½ x 25 x 1.8 + 25 x 1 = <u>47.5m²</u>	B1 M1		
	Volume = 47.5 x 10 = **475m³**	A1		

b i) Volume A ½ x 25 x 1.8 x 10 B1
= 225
Volume B = 10 x 1 x 25 M1
= 250
Total volume = 250 + 225
= 475m³ A1



B2

ii) 225m³ = 9 hours

Therefore 250m³ = $\frac{250 \times 9}{225}$

= 10 hours A1

20. See graph next page

y_1	y_2	y_3	y_4	y_5	y_6
2	5	9	14	20	27

mid ordinate

Area = $h(y_1 + y_2 + y_3 + y_4 + y_5 + y_6)$

$= 1(2 + 5 + 9 + 14 + 20 + 27)$

$= 77cm^2$

b) Error = $78cm^2 - 77cm^2$

= 1cm

% Error = $\frac{1}{78} \times 100$

= $12\frac{32}{39}$% or 12.82

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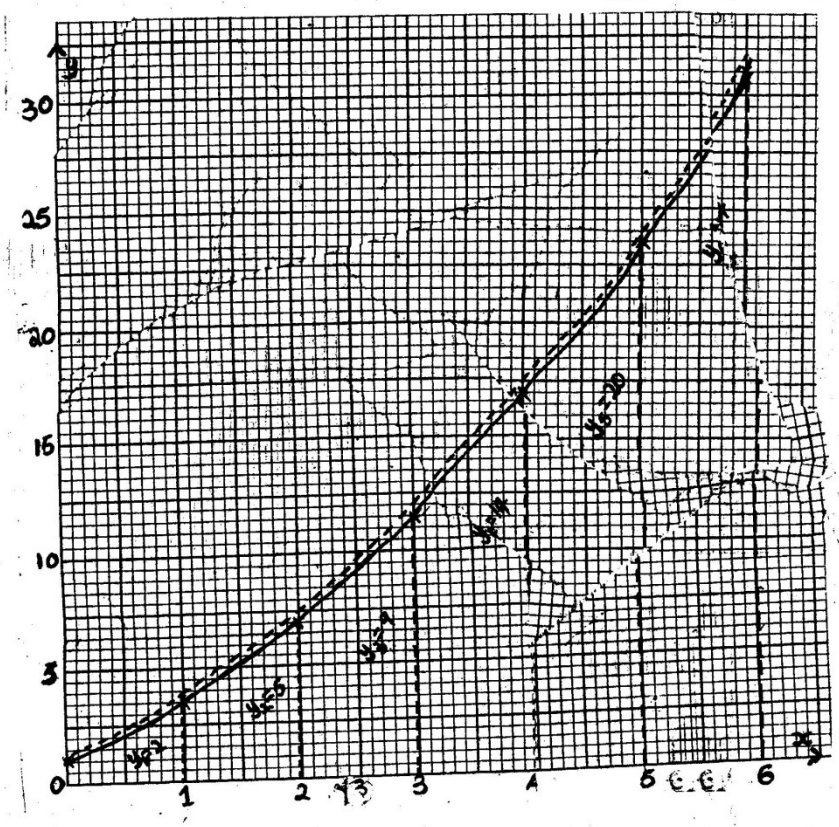

21 a) $dy/dx = 0$ at turning points		b) $dy/dx = 4x - 3$	
Hence $4x - 3 = 0$		and $dy/dx = 7$	
$x = ¾$	A1	Therefore $4x - 3 = 7$	M1
Min. value = y at min. point		$x = 5/2$	B1
Hence at minimum point $x = ¾$	M1	subst. for x	
and $y = -1/8$	B2	$y = 6$	
$= (4x - 3)\,dx$		Hence the point is (2.5, 6)	A1
$y = 2x^2 - 3x + c$ subst. $x = ¾$			
$c = 1$ $y = 1/8$			
Hence $y = 2x^2 - 3x + 4$	A1		

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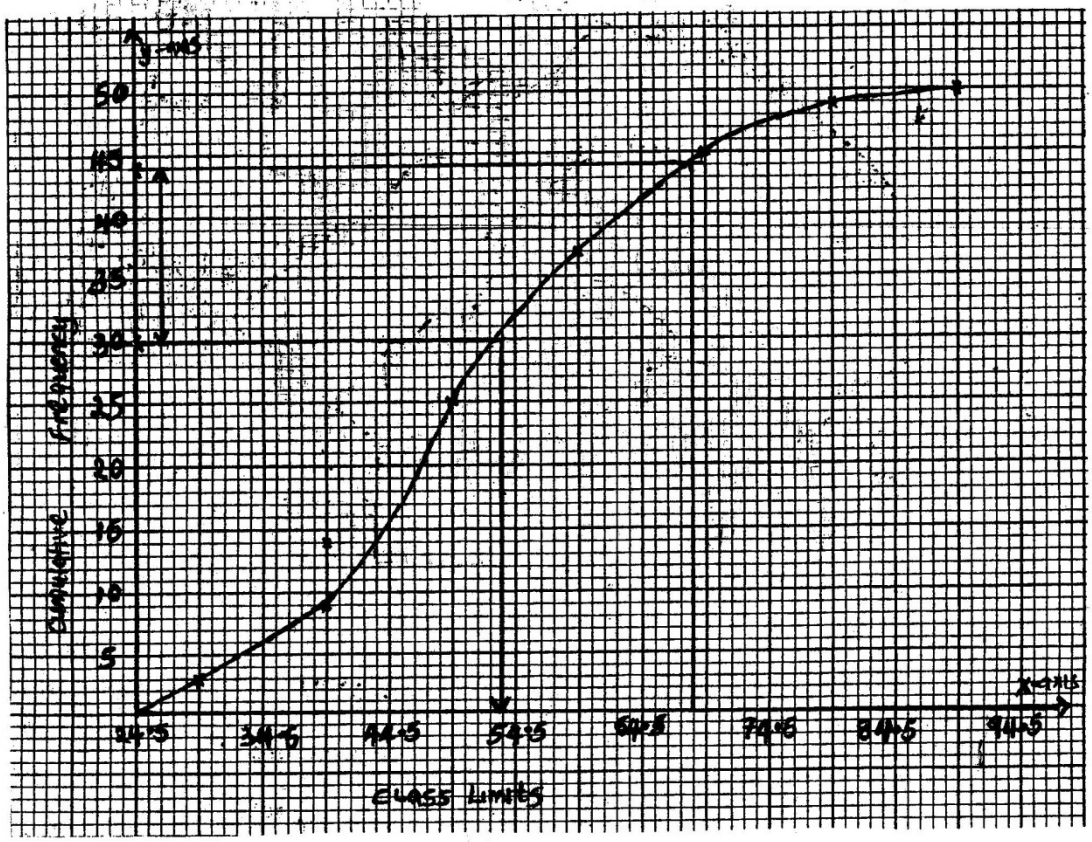
Mass (g)	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75 - 74	85 - 94
No of potatoes	3	6	16	12	8	4	1
C.F.	3	9	25	37	45	49	50



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23. $\text{Cos } x^0 = 3/5$

i) Hence TL = 3

BL = 4

$BT = \sqrt{4^2 + 3^2}$

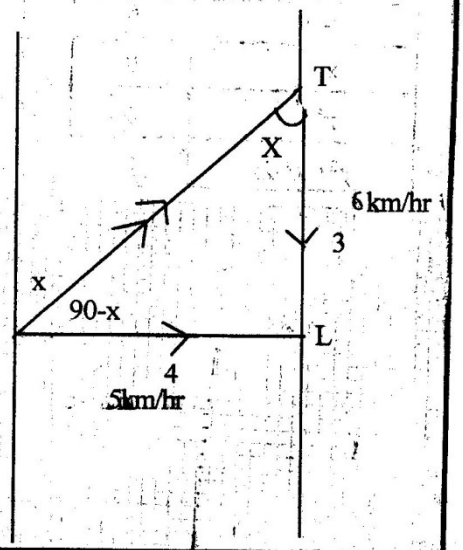
$= 5$

Revolving speed

$|BT| = \sqrt{6^2 - 5^2}$

$= \sqrt{36 - 25}$

$= 3\text{km / hr}$



M1

A1

ii) $\text{Cos } x^0 = {}^3/_5 = 0.6$

$= 53.1^0$

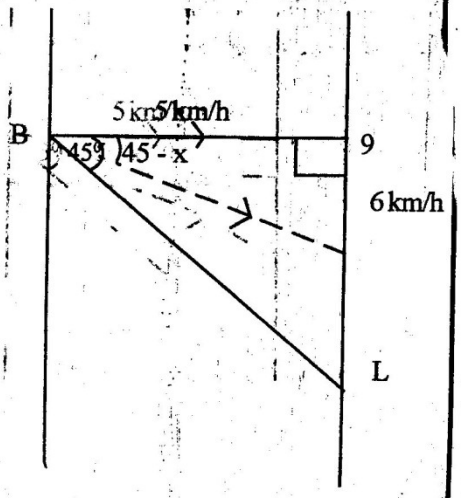
B1

A1

b) Resultant speed $= \sqrt{25 + 36}$

$= \sqrt{61}$

$= 7.8\text{km/hr}$



M1

$\text{Cos } \theta = {}^5/_{7.8}$

$= 0.64$

$\theta = 50.2^0$

But θ $45 \pm x$

$x = \pm 5$

M1

Possible course $= 135 - 5$

$= 130^0$

A1

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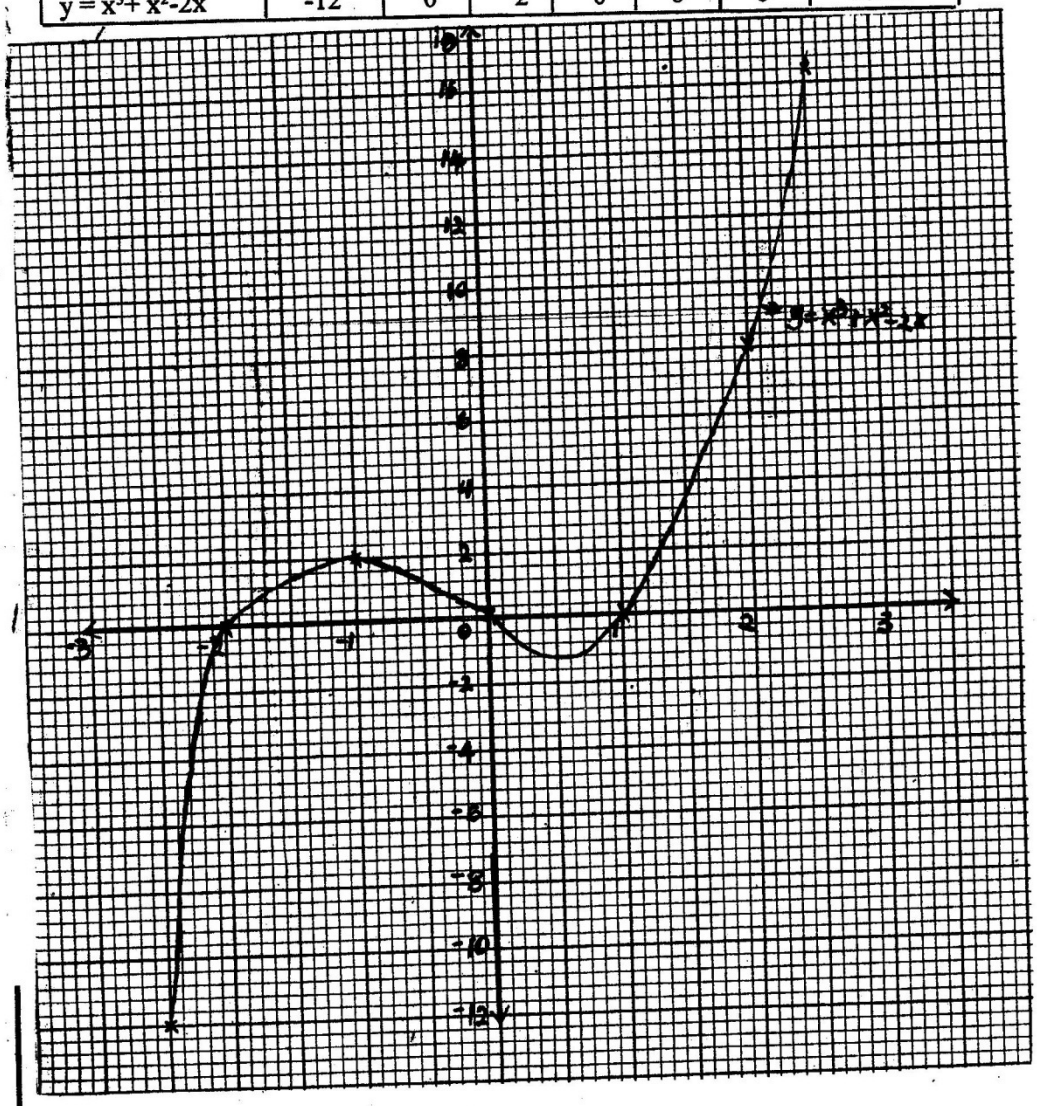
x	-3	-2	-1	0	1	2	2.5
-2x	6	4	2	0	-2	-4	-5
x^2	9	4	1	0	1	4	6.25
x^3	-27	-8	-1	0	1	8	15.625
$y = x^3 + x^2 - 2x$	-12	0	2	0	0	8	16.88

M2



24.

i) $X < -2$ — M1 A1

b) (-2,0) and (1, 0) — A2

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