

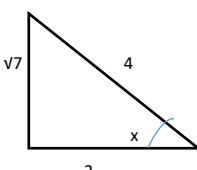
**MATHEMATICS**  
**FORM 4**  
**PAPER 1 – MARKING SCHEME**

<p>1. Evaluate</p> $\frac{3}{4} + \frac{2}{5} \div \frac{3}{5} \text{ of } \frac{5}{3}$ <hr/> $\frac{7}{4} - \frac{2}{8} \times \frac{2}{9}$ <hr/> $\frac{3}{4} + \frac{2}{5} \times 1$ <hr/> $\frac{7-5}{8} - \times \frac{2}{9}$ <hr/> $\frac{3}{4} + \frac{2}{5}$ <hr/> $\frac{9}{8} \times \frac{2}{9}$ <hr/> $\frac{15+8}{20} = \frac{23}{20} \dots\dots\dots \text{M1}$ $\frac{1}{4} \dots\dots\dots \text{M1}$ <hr/> $\frac{23}{20} \div \frac{1}{4}$ <hr/> $\frac{23}{20} \times \frac{4}{1}$ <hr/> $\frac{23}{5}$ <hr/> $4\frac{3}{5} \text{ or } 4.6 \dots\dots\dots \text{A1}$																
<p>2.</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;"></th> <th style="width: 15%; text-align: center;"><u>3yrs ago</u></th> <th style="width: 15%; text-align: center;"><u>new</u></th> <th style="width: 15%; text-align: center;"><u>2 yrs to come</u></th> <th style="width: 40%;"></th> </tr> </thead> <tbody> <tr> <td>Mary</td> <td style="text-align: center;">3x</td> <td style="text-align: center;">3x+3</td> <td style="text-align: center;">3x + 5</td> <td></td> </tr> <tr> <td>Oloo</td> <td style="text-align: center;">x</td> <td style="text-align: center;">x+3</td> <td style="text-align: center;"><math>\frac{x+5}{\text{sum } 62}</math></td> <td style="text-align: right;">).....</td> </tr> </tbody> </table> <p>3x +  5+x+5=62.....</p> <p>4x = 52</p> <p>X= 13</p> <p>Mary 3x+3=3(13)+3 =42 Yrs .....</p> <p>Oloo x+3 =13 +3 = 16 yrs.....</p>		<u>3yrs ago</u>	<u>new</u>	<u>2 yrs to come</u>		Mary	3x	3x+3	3x + 5		Oloo	x	x+3	$\frac{x+5}{\text{sum } 62}$	).....	<p>B1</p> <p>M1</p> <p>M1</p> <p>A1 For both answers.</p>
	<u>3yrs ago</u>	<u>new</u>	<u>2 yrs to come</u>													
Mary	3x	3x+3	3x + 5													
Oloo	x	x+3	$\frac{x+5}{\text{sum } 62}$	).....												
<p>3.</p> <p>3 rec 0.6735 + 13 rec 0.156</p> <p>3 rec <math>(6.375 \times \frac{1}{10})</math> + 13 rec <math>(1.56 \times \frac{1}{10})</math>.....</p> <p><math>(3 \text{ rec } 6.375 \times \frac{1}{10}) + (13 \text{ rec } 1.56 \times \frac{1}{10})</math></p>	<p>M1</p>															

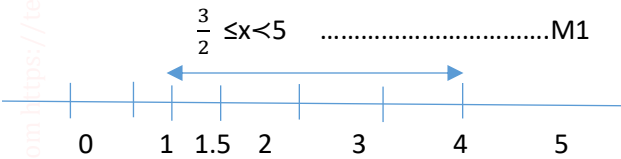
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<p><math>(3 \times 0.1485 \times 10) + (13 \times 0.6410 \times 10) \dots\dots\dots</math>  <math>4.455 + 83.33</math>  <u><math>87.785 \dots\dots\dots</math></u></p>	<p>M1  A1 to 3d.p</p>
<p>4.  A.S.F = <math>\frac{108}{192}</math>  L.S.F = <math>\frac{3}{4} \dots\dots\dots</math> M1  V.S.F = <math>\frac{27}{64}</math>  <math>\frac{27}{64} = \frac{x}{572}</math>  <math>X = \frac{27}{64} \times 512 \dots\dots\dots</math> M1  = <math>216\text{CM}^3</math> A1</p>	
<p>5.  Cost of mixture of 5kg <math>2 \times 140 + 3 \times 160 \dots</math> M1  <math>280 + 480 = 760</math>  Cost of 1kg = <math>\frac{760}{5} = \text{Shs.}152</math>  Selling price = Shs 240  Profit per Kg = <math>240 - 152</math>  = Shs. 88 ..... B1  % profit = <math>\frac{88}{152} \times 100 = 57.8947 \dots\dots\dots</math> A1</p>	
<p>6.  <math>\frac{\Delta y}{\Delta x} = \frac{6-5}{-1- -4} = \frac{1}{4-1} = \frac{1}{3}</math>  <math>\frac{y- -4}{x-5} = \frac{1}{3} \dots\dots\dots</math> M1  <math>\frac{y+4}{x-5} = \frac{1}{3}</math>  <math>\frac{y- 6}{x+1} = -3 \dots\dots\dots</math> M1  <math>y - 6 = -3(x+1)</math>  <math>y-6 = -3x - 3</math>  <math>y = -3x - 3 + 6</math>  <math>y = -3x + 3 \dots\dots\dots</math> A1</p>	
<p>7.  <math>X + y = 13, \quad y = 13 - x</math>  <math>10y + x - 10x - y = 9 \dots\dots\dots</math> M1  <math>9y - 9x = 9 \dots\dots\dots</math> (ii)</p>	<p>Formation of equation</p>

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<p>9(13-x)-9x=9            117-9x-9x=9            117-18x=9.....M1            117-9=18x  <math>\frac{108}{18} = \frac{18x}{18}</math>            X=6            Y=13-x            Y=13-6            Y=7            Xy=67</p> <p style="text-align: right;">A1</p>	<p>Attempting to solve for x</p>
<p>8.            9550 x 165.57            Kshs.1,581,193.5 .....M1  <math>\frac{95.5}{100} \times 1,581,193.5</math>            1,510,039.79            0.75 x 1510039.78            Ksh 1,132,529.84 .....m1            Remaining ksh 377,509.84  <math>\frac{377509.95}{141.95}</math>            US \$ 2659.46            ~_ US \$ 2659</p> <p style="text-align: right;">A1</p>	<p>Conversion to kshs</p> <p>Getting <math>\frac{3}{4}</math> of total amount</p>
<p>9.            i) <math>8\cos^2x+2\cos x-5=0</math>  <math>8(1-\cos^2x)+2\cos x-5=0</math>  <math>8-8\cos^2x+2\cos x-5=0</math>  <math>-8\cos^2x+2\cos x+3=0</math>  <math>8\cos^2x-2\cos x-3=0</math>.....m1  <math>8\cos^2x-6\cos x+4\cos x-3=0</math>  <math>2\cos x(4\cos x-3)+1(4\cos x-3)=0</math>  <math>(2\cos x+1)(4\cos x-3)=0</math>.....M1  <math>2\cos x=-1</math> or <math>4\cos x=3</math>  <math>\cos x = -\frac{1}{2}</math> or <math>\cos x = \frac{3}{4}</math>  <math>\cos x \neq -\frac{1}{2}</math> <math>\cos x = \frac{3}{4}</math>.....B1</p>  <p>Tan x = <math>\frac{\sqrt{7}}{3}</math></p> <p style="text-align: right;">A1</p>	

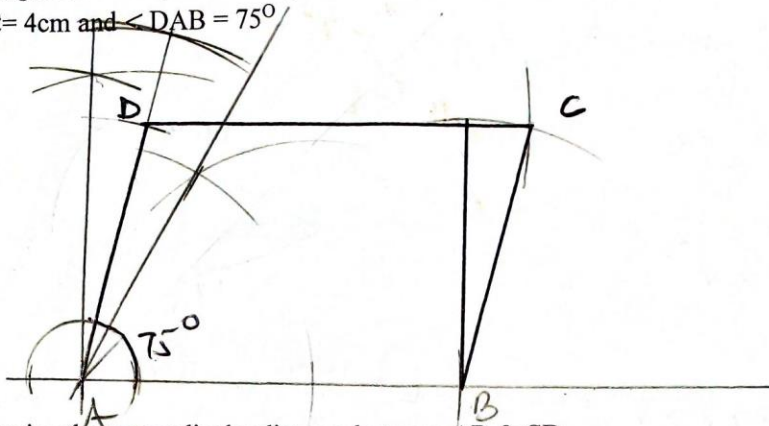
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<p>10.</p> $3x - 8 < 2x - 3$ $3x - 2x < -3 + 8$ $x < 5 \quad \dots\dots\dots M1$ $3x - 8 \geq x - 5$ $3x - x \geq 3$ $2x \geq 3$ $x \geq 1.5$ $\frac{3}{2} \leq x < 5 \quad \dots\dots\dots M1$  <p>11.</p> $\frac{D}{75} \text{ and } \frac{D}{95}$ $\frac{d}{75} - \frac{d}{95} = \frac{20}{60} \dots\dots\dots M1$ $1140\left(\frac{d}{75}\right) - (1140)\frac{d}{95} = \frac{20}{60} \times 1140 \dots\dots\dots M1$ $15.2d - 12d = 380$ $d = \frac{380}{3.2}$ $118.75 \text{ km} \dots\dots\dots A1$	<p>for compound statement</p> <p>B1 For drawing the number line correctly</p>
<p>12.</p> $OB - OA = (4i + j - 3k) - (3i - 2j + k)$ $4i - 3i + j + 2j - 3k - k$ $i + 3j - 4k \quad \dots\dots\dots M1$ $ AB  = \sqrt{1^2 + 3^2 + (-4)^2} \quad \dots\dots\dots M1$ $ AB  = \sqrt{26} = 5.099$ <p>5.10 \dots\dots\dots A1</p>	<p>answer given to 2.d.p</p>

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13.

13. Using a ruler and pair of compass only. (a) Construct a parallelogram ABCD  
 BC = 4cm and  $\angle DAB = 75^\circ$

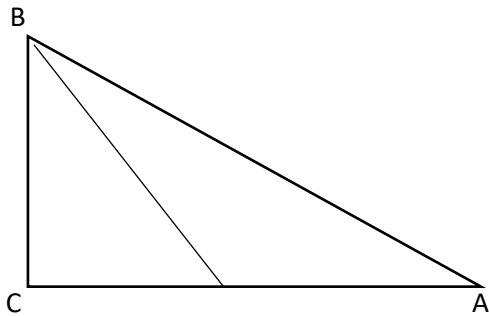


b) Determine the perpendicular distance between AB & CD.

4cm



14.



$$\tan 45^\circ = \frac{60}{bc}$$

$$BC = \frac{60}{\tan 45^\circ}$$

= 60m.....B1

$$\angle x = \tan^{-1} 0.25$$

.....M1


= 14.04.....

.....A1

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<p>15.  <math>X^2+5X+P=0</math>  <math>3^2+5(3)+P=0</math>  <math>9+15+P=0</math>  <math>24+P=0</math>  <math>P=-24</math>.....B1</p> <p><math>X^2+5X-24=0</math>  <math>X^2+8X-3X-24=0</math>  <math>X(X+8)-3(X+8)=0</math>  <math>(X-3)(X+8)=0</math> .....M1</p> <p><math>X=3</math> OR <math>X=-8</math> .....A1</p>	<p>Obtaining the value of P</p> <p>Obtaining the factors</p>
<p>16.</p> <p><math>A=\frac{144}{360}X 2X\frac{22}{7}XR^2</math></p> <p><math>385=\frac{144}{360}X 2X\frac{22}{7}XR^2</math> .....M1</p> <p><math>R^2=306.25</math>  <math>R=17.5\text{cm.}</math> .....B1</p> <p><math>L=\frac{144}{360}x2x\frac{22}{7}x17.5</math>  <math>L=44\text{cm}</math>  <math>\text{Perimeter}=17.5\text{cm}+17.5\text{cm}+44\text{cm}=79\text{cm}</math>.....A1</p>	

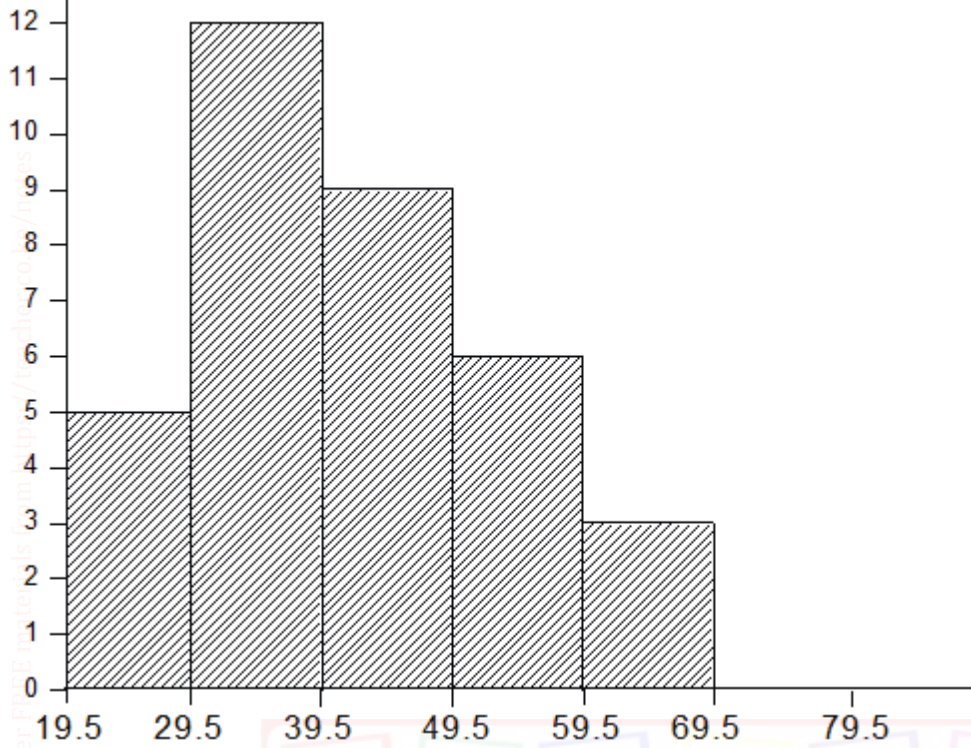
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(a) Gradient = $\frac{6-3}{-1--2} = \frac{3}{1} = 3$	M1	
$\frac{y-6}{x+1} = 3$	A1	
$y - 6 = 3x + 3$		
$y = 3x + 9$	M1	
(b) $m_2 = -\frac{1}{3}$		
$\frac{y-6}{x+1} = -\frac{1}{3}$	A1	
$3y - 18 = -x - 1$	M1	
$x + 3y = 17$		
(c) $\frac{y-2}{x-1} = 3$	M1	
$y - 2 = 3x - 3$		
$y = 3x - 1$	A1	
$x$ intercept $x = \frac{1}{3}$	M1	
$y$ intercept $y = -1$		
(d) $x + 3y = 17$	M1	
$3x - y = 1$		
$x + 3y = 17$	A1	
$9x - 3y = 3$		
$x = 2, y = 5$	10mks	
(2,5)		
		
18.)		
(a) (i) $\frac{14}{21} = \frac{x}{22.5+x}$	M1	
$21x = 315 + 14x$	A1	
$7x = 315$		
$x = 45$	M1	
$V = \left(\frac{1}{3} \times \frac{22}{7} \times 21 \times 21 \times 67.5\right) -$	M1	
$\left(\frac{1}{3} \times \frac{22}{7} \times 14 \times 14 \times 45\right)$	A1	
$= 31185 - 9240$		
$= 21945 \text{ cm}^3$	M1	
(ii) mass = $V \times d$		
$= 21945 \times 3 \text{ g/cm}^3$	A1	
$= 65835 \text{ g}$	M1	
$= 65.835 \text{ kg}$		
(b) $\frac{80}{100} \times 21945$	M1	
$= 17556 \text{ cm}^3$	A1	
$= \sqrt[3]{17556}$		
$= 25.99 \text{ cm}$	10mks	

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<p>19.</p> <table border="1"> <thead> <tr> <th>Class</th> <th>Frequency</th> <th>Midpoint x</th> <th>Fx</th> </tr> </thead> <tbody> <tr> <td>20-29</td> <td>5</td> <td>24.5</td> <td>122.5</td> </tr> <tr> <td>30-39</td> <td>12</td> <td>34.5</td> <td>414</td> </tr> <tr> <td>40-49</td> <td>9</td> <td>44.5</td> <td>400.5</td> </tr> <tr> <td>50-59</td> <td>6</td> <td>54.5</td> <td>327</td> </tr> <tr> <td>60-69</td> <td>3</td> <td>64.5</td> <td>193.5</td> </tr> <tr> <td></td> <td></td> <td></td> <td><u>1,457.5</u></td> </tr> </tbody> </table> <p>b)</p> $\text{mean} = \frac{\sum fx}{\sum f}$ $= \frac{1457.5}{35}$ $= 41.64$	Class	Frequency	Midpoint x	Fx	20-29	5	24.5	122.5	30-39	12	34.5	414	40-49	9	44.5	400.5	50-59	6	54.5	327	60-69	3	64.5	193.5				<u>1,457.5</u>	<p>B1</p> <p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p>	<p>Classes</p> <p>Frequency</p> <p>Midpoints</p> <p>Fx column</p>
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<p>Download this and other revision materials from <a href="https://teacher.co.ke/">https://teacher.co.ke/</a></p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p>	<p>Teacher.co.ke</p>																												

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20.  $P \propto \frac{Q^3}{R^2}$  .....B1

$$p = \frac{kQ^3}{R^2}$$

$$16 = \frac{k2^3}{3^2} \text{ .....M1}$$

$$16 = \frac{8k}{9}$$

$$k = 18 \text{ .....A1}$$

$$288 = \frac{18 \times 4^3}{R^2}$$

$$R^2 = \frac{18 \times 64}{288} \text{ .....M1}$$

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$R^2 = 4$ $R = 2 \dots\dots\dots A1$ <p>b)</p> $P = \frac{KQ^3}{122}$ $P_1 = \frac{K(0.7)^3 Q^3}{R^2(1.4)^2 R^2} \dots\dots\dots M1$ $P_1 = \frac{0.343KQ^3}{1.96R^2} \dots\dots\dots B1$ $(P_1 - P) = 0.343K \frac{1}{1.96} Q^3 - \frac{KQ^3}{R^2} \dots\dots\dots M1$ $(P_1 - P) = \frac{-29.106Q^3}{1.96R^2}$ $\frac{-29.106Q^3}{1.96R^2} \times \frac{R^2}{18Q^3} \times 100 \dots\dots\dots M1$ $= -82.5\%$ <p>P decreases by 82.5% \dots\dots\dots A1</p> <p>21</p> <p>Det=10-12=-2\dots\dots\dots B1</p> <p>(a) <math>m^{-1} = \frac{-1}{2} \begin{bmatrix} 5 &amp; -3 \\ -4 &amp; 2 \end{bmatrix} \dots\dots\dots M1</math></p> $m^{-1} = \begin{bmatrix} -\frac{5}{2} & \frac{3}{2} \\ 2 & -1 \end{bmatrix} \dots\dots\dots A1$ <p>(i) <math>4x + 6y = 1280 \dots\dots\dots B1</math></p> $8x + 10y = 2360 \dots\dots\dots B1$		
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Or

$$2x + 3y = 640$$

$$4x + 5y = 1180$$

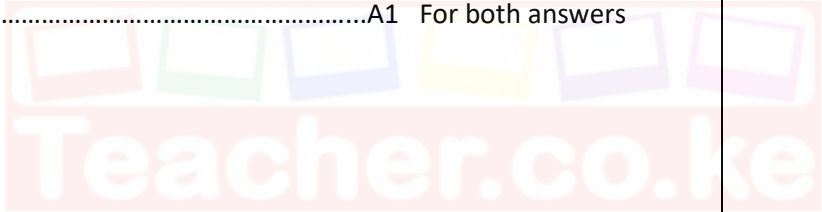
$$(ii) -\frac{1}{2} \begin{bmatrix} 5 & -3 \\ -4 & 2 \end{bmatrix} \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = -\frac{1}{2} \begin{bmatrix} 5 & -3 \\ -4 & 2 \end{bmatrix} \begin{bmatrix} 640 \\ 1180 \end{bmatrix}$$

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = -\frac{1}{2} \begin{pmatrix} 32000 - 3540 \\ -2560 + 2360 \end{pmatrix} \dots\dots\dots \text{Pre-multiplication by inverse M1}$$

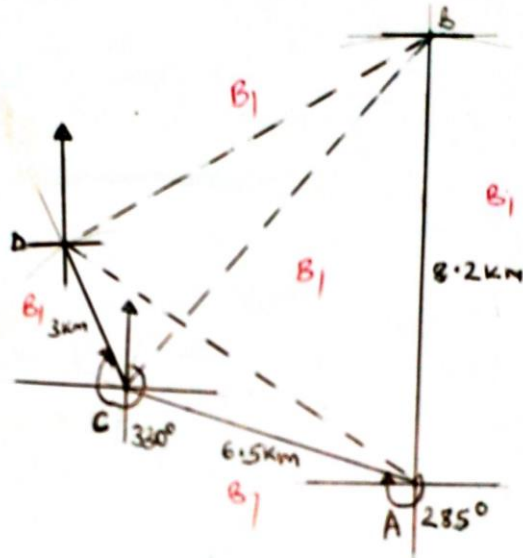
$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{2} \begin{bmatrix} -340 \\ -200 \end{bmatrix} \dots\dots\dots \text{B1}$$

X = shs 170

Y = shs. 100 .....A1 For both answers



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i) Find the distance and bearing of B from C. (2mk)

$$\begin{array}{l|l} 9.10m \pm 0.1 & 043^\circ B_1 \\ \hline 91km + 1km & \end{array}$$

ii) Distance and bearing of D from B. (2mks)

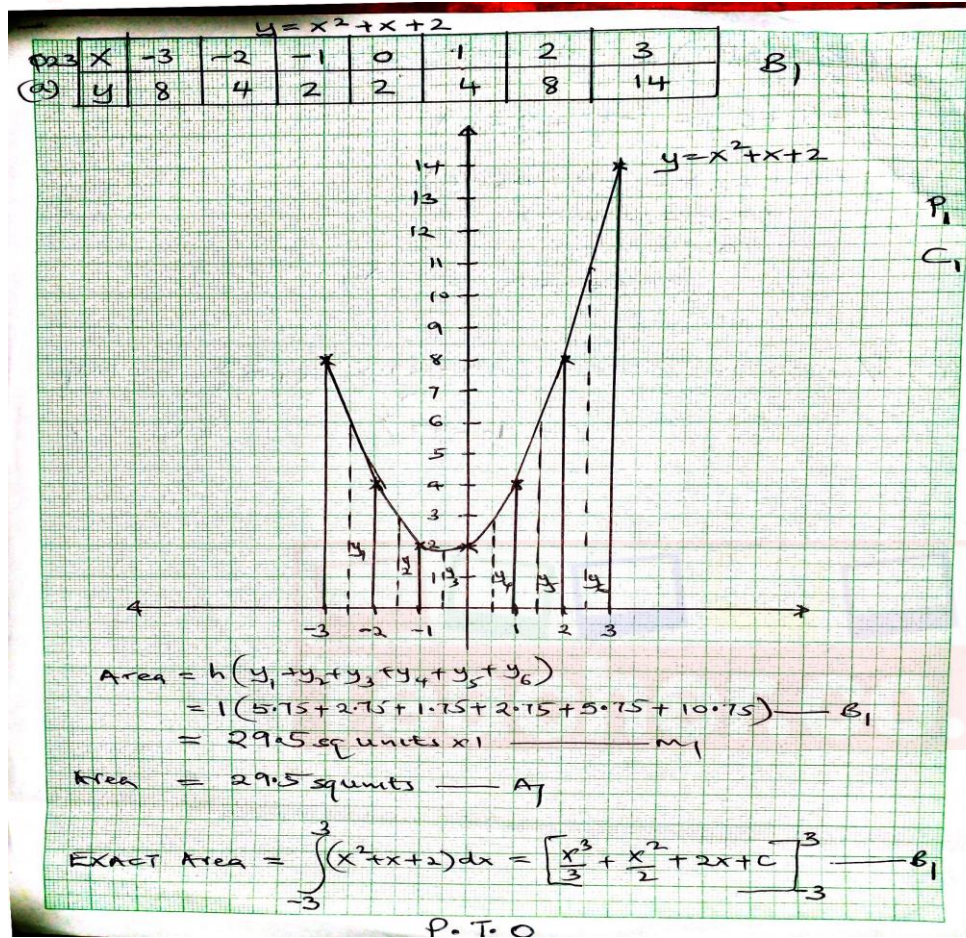
$$\begin{array}{l|l} 8.20m \pm 0.1 & 243^\circ B_1 \\ \hline 82km + 1km & \end{array}$$

iii) The bearing of A from D. (1mk)

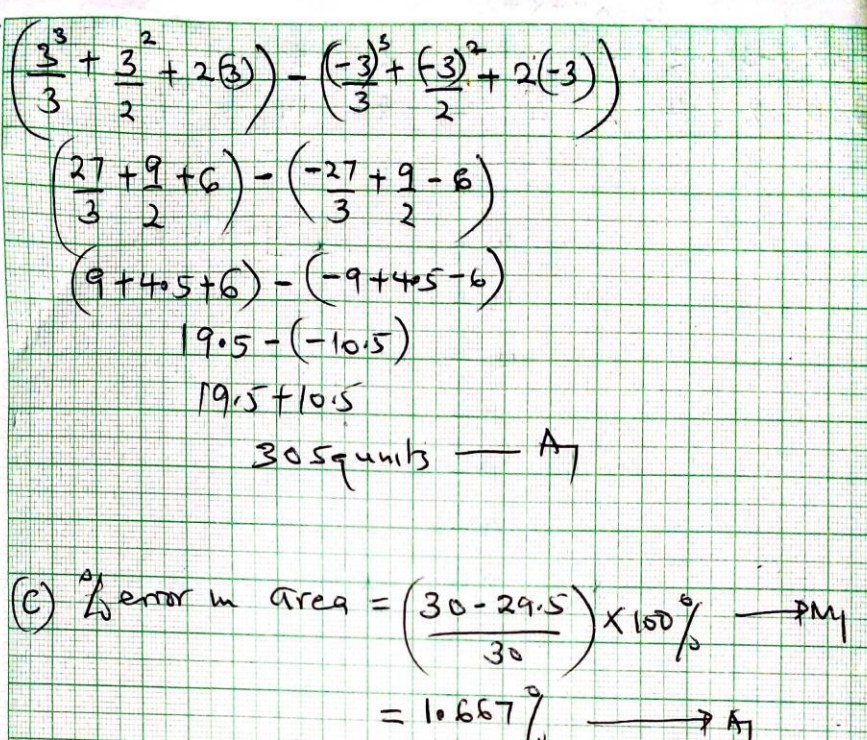
$$121^\circ B_1$$

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 <p> <math display="block">\left(\frac{3^3}{3} + \frac{3^2}{2} + 2(3)\right) - \left(\frac{(-3)^3}{3} + \frac{(-3)^2}{2} + 2(-3)\right)</math> <math display="block">\left(\frac{27}{3} + \frac{9}{2} + 6\right) - \left(\frac{-27}{3} + \frac{9}{2} - 6\right)</math> <math display="block">(9 + 4.5 + 6) - (-9 + 4.5 - 6)</math> <math display="block">19.5 - (-10.5)</math> <math display="block">19.5 + 10.5</math> <math display="block">30.5 \text{ units} \rightarrow A_1</math> </p> <p>             (c) % error in area = <math>\left(\frac{30 - 29.5}{30}\right) \times 100\% \rightarrow M_1</math>  <math>= 1.667\% \rightarrow A_1</math> </p>		
<p>24. <math>v = \frac{1}{2}t^2 - 3t + 7</math>  <math>v = \frac{8^2}{2} - 3(8) + 7 \dots\dots\dots M_1</math></p> <p><math>32 - 24 + 7</math></p> <p><math>15 \text{ m/s} \dots\dots\dots A_1</math></p> <p>b) <math>a = \frac{dy}{dt} = (t - 3) \text{ m/s}^2 \dots\dots\dots M_1</math></p> <p><math>a = -3 \text{ m/s}^2 \dots\dots\dots A_1</math></p>		
<p>c) <math>t - 3 = 0</math>  <math>t = 3 \text{ sec}</math>  <math>v = \frac{1}{2}t^2 - 3t + 7</math>  <math>= \frac{9}{2} - 9 + 7 \dots\dots\dots M_1</math></p>		

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<p>4.5-9+7=2.5M/S.....A1</p> <p>d) <math>s = \frac{1}{6}t^3 - \frac{3t^2}{2} + 7t + c</math></p> <p><math>\left[\frac{t^3}{6} - \frac{3t^2}{2} + 7t + c\right]^2</math>.....M1</p> <p><math>\left\{\frac{8}{6} - 6 + 14 + c\right\} - \{0 + c\}</math></p> <p><math>1\frac{1}{3} + 8 + c - c</math></p> <p><math>9\frac{1}{3}m</math>.....A1</p> <p>e) <math>\left(\frac{1t^3}{6} - \frac{3t^2}{2} + 7t + c\right)^2</math></p> <p><math>\left\{\frac{27}{6} \frac{27}{2} + 21 + c\right\} - \left\{\frac{8}{6} - 6 + 14 + c\right\}</math> .....M1</p> <p><math>12 + c - 9\frac{1}{3}c</math></p> <p><math>12 - 9\frac{1}{3} = 2\frac{2}{3}</math> .....A1</p>		
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