

### 4.3 MATHEMATICS ALTERNATIVE A (121)

#### 4.3.1 Mathematics Alternative A Paper 1 (121/1)

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No.	Marking Scheme	Marks	Comments
1.	$\sqrt{\frac{0.0961}{4.0836 - 3.7112}} = \sqrt{0.2581}$ $= 0.5080$ <p>Standard form = <math>5.080 \times 10^{-1}</math></p>	<p>M1</p> <p>A1</p> <p>B1</p> <p><b>3</b></p>	
2.	$189 = 3 \times 3 \times 3 \times 7$ $= 3^3 \times 7$ <p><math>\therefore p^3 \times q = 3^3 \times 7</math></p> <p><math>p = 3, q = 7</math></p>	<p>B1</p> <p>B1</p> <p>B1</p> <p><b>3</b></p>	
3.	<p>Let the number of kg of maize be <math>m</math> and number of kg of beans be <math>b</math></p> <p>Buying price = <math>20m + 60b</math></p> <p>Selling price = <math>48(m+b)</math></p> $\frac{60}{100} = \frac{48(m+b) - (20m + 60b)}{20m + 60b}$ $0.6 = \frac{28m - 12b}{20m + 60b}$ $\Rightarrow 12m + 36b = 28m - 12b$ $16m = 48b$ $\frac{m}{b} = \frac{3}{1}$ <p><math>\therefore</math> Ratio <math>m:b = 3:1</math></p>	<p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p><b>4</b></p>	or equivalent

4.	$\angle BAC = 180^\circ - (80^\circ + 30^\circ) = 70^\circ$ <p><b>PDF Compressor Free Version</b></p> $\frac{AC}{\sin 80^\circ} = \frac{12}{\sin 70^\circ}$ $= 12.58 \text{ cm}$ $\text{Area of } \triangle ABC = \frac{1}{2} \times 12 \times 12.58 \sin 30^\circ$ $= 6 \times 12.58 \times 0.5$ $= 37.74 \text{ cm}^2$	M1          M1          A1 <b>3</b>	or equivalent																													
5.	No. of sides of a hexagon = 6  Each exterior angle, $x = \frac{360}{6}$  $= 60^\circ$  Size of each exterior angle  $= 180^\circ - 60^\circ$  $= 120^\circ$	B1          B1 <b>2</b>																														
6.	<table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;">No.</th> <th style="text-align: left;">Log</th> <th></th> </tr> </thead> <tbody> <tr> <td><math>(1.654)^2</math></td> <td><math>0.2185 \times 2</math></td> <td></td> </tr> <tr> <td></td> <td>0.4370</td> <td></td> </tr> <tr> <td>45.73</td> <td>1.6602</td> <td rowspan="2" style="border: 1px solid black; width: 50px; height: 20px;"></td> </tr> <tr> <td>0.56</td> <td>1.7482 or (-0.2518)</td> </tr> <tr> <td></td> <td>1.4084</td> <td></td> </tr> <tr> <td colspan="3" style="text-align: center;">.</td> </tr> <tr> <td></td> <td><math>\bar{1}.0286</math> or <math>(-0.9714) \times \frac{1}{3}</math></td> <td></td> </tr> <tr> <td></td> <td><math>\bar{1}.6762</math> or <math>-0.3238</math></td> <td></td> </tr> <tr> <td></td> <td><math>= 0.4745</math></td> <td></td> </tr> </tbody> </table>	No.	Log		$(1.654)^2$	$0.2185 \times 2$			0.4370		45.73	1.6602		0.56	1.7482 or (-0.2518)		1.4084		.				$\bar{1}.0286$ or $(-0.9714) \times \frac{1}{3}$			$\bar{1}.6762$ or $-0.3238$			$= 0.4745$		M1          M1          M1          A1 <b>4</b>	All logs correct          Correct squaring and multiplication          Correct cube root and division
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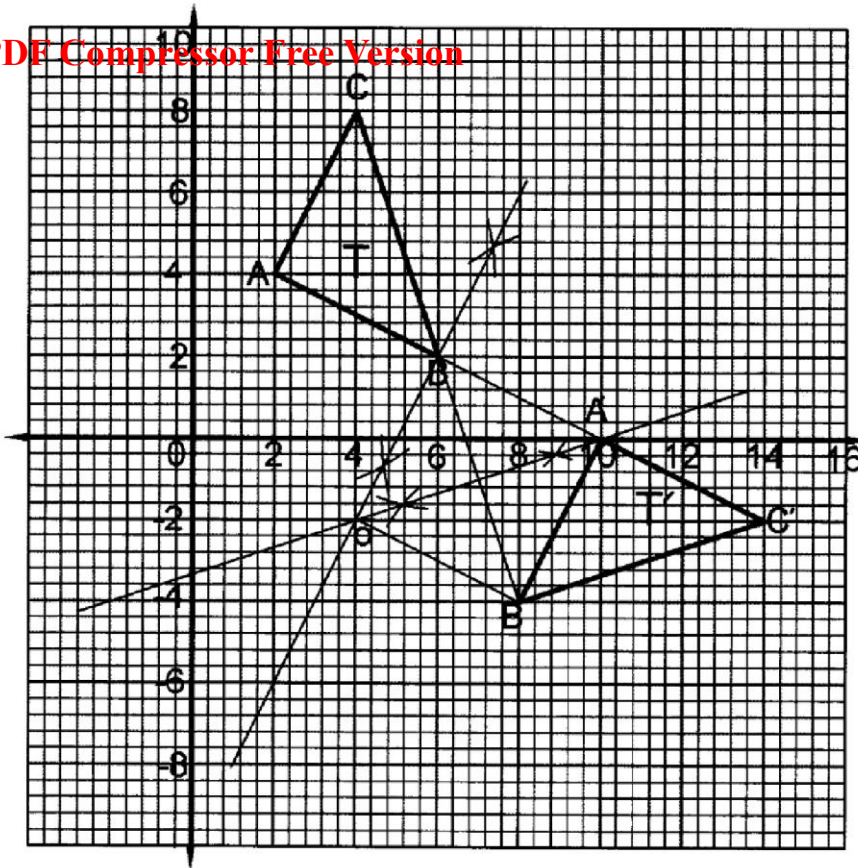
7.	<p>(a) <math>\frac{2x}{3} + \frac{5y}{7} = 1</math>  <math>14x + 15y = 21</math></p> <p><math>y = \frac{-14}{15}x + \frac{21}{15}</math></p> <p>gradient of L = <math>\frac{15}{14}</math></p> <p>(b) Equation of L</p> <p><math>\frac{y-11}{x-4} = \frac{15}{14}</math></p> <p><math>y = \frac{15}{14}x + \frac{47}{7}</math></p>	B1	
		M1	
		A1	
		3	
8.	<p><math>\pi^c = 180^\circ</math></p> <p><math>\frac{2\pi^c}{9} = \frac{180 \times \frac{2\pi}{9}}{\pi}</math></p> <p><math>= 40^\circ</math></p>	M1	
		A1	
		2	
9.	<p>Area = <math>\frac{1}{2} \times b \times h</math></p> <p>Let h be the other shorter side</p> <p><math>346.8 = \frac{1}{2} \times 17 \times h</math></p> <p><math>h = 40.8</math></p> <p>longest side = <math>\sqrt{17^2 + 40.8^2}</math></p> <p><math>= \sqrt{1953.64}</math></p> <p><math>= 44.2\text{m}</math></p>	B1	
		M1	
		A1	
		3	

10.	$L_1 : y - x \leq 1$	B1	or equivalent
	<b>PDF Compressor Free Version</b>	B1	
	$L_3 : x + 2y \geq 6$	B1	or equivalent
		<b>3</b>	
11.	$\frac{840}{x} - \frac{840}{x+1} = 4$	M1	
	$4x^2 + 4x - 840 = 0$		
	$x^2 + x - 210 = 0$	M1	
	$(x+15)(x-14) = 0$		
	$x = 14$	A1	
	No of seedling planted by Murimi per row = $\frac{840}{14}$		
	$= 60$	B1	
		<b>4</b>	
12.	£500 000 to Ksh = $50\ 000 \times 130.10$		
	= Ksh 6 505 000	B1	
	Balance after expenditure		
	$= \frac{20}{100} \times 6\ 505\ 000$		
	= Ksh 1 301 000	B1	
	Amount in Rands		
	$= \frac{1\ 301\ 000}{9.58}$		
	= R 153 804	B1	
		<b>3</b>	

13.	<p>Mid ordinates are</p> <p><b>PDF Compressor Free Version</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>3</td> <td>1</td> <td>3</td> <td>5</td> <td>7</td> </tr> <tr> <td>y</td> <td>10</td> <td>2</td> <td>2</td> <td>10</td> <td>26</td> <td>50</td> </tr> </table> <p>Area = 2 (10 + 2 + 2 + 10 + 26 + 50)</p> <p style="text-align: center;">= 200</p>	x	3	1	3	5	7	y	10	2	2	10	26	50	<p>B1</p> <p>M1</p> <p>A1</p> <p style="text-align: center;"><b>3</b></p>	
x	3	1	3	5	7											
y	10	2	2	10	26	50										
14.	$3 \begin{pmatrix} 4 \\ 3 \end{pmatrix} - 2 \begin{pmatrix} x \\ y \end{pmatrix} + 4 \begin{pmatrix} -2 \\ -5 \end{pmatrix} = \begin{pmatrix} 10 \\ -19 \end{pmatrix}$ $\begin{pmatrix} 4 - 2x \\ -11 - 2y \end{pmatrix} = \begin{pmatrix} 10 \\ -19 \end{pmatrix}$ <p>4 - 2x = 10  -2x = 6  x = -3</p> <p>-11 - 2y = -19  -2y = -8  y = 4</p> $b = \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$	<p>M1</p> <p>M1</p> <p>A1</p> <p style="text-align: center;"><b>3</b></p>	<p>Attempt to solve for x or y</p>													

15. (a)

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B1

B1

(b) Centre of rotation (4, -2).

B1

Angle of rotation  $-90^\circ$

B1

4

16.

$$3t + 2a = 9000$$

$$4t + a = 9500$$

$$a = 9500 - 4t$$

$$3t + 2(9500 - 4t) = 9000$$

$$-5t = -10000$$

$$t = 2000$$

$$\Rightarrow a = 9500 - 8000 = 1500$$

Cost of hiring 2 technicians 5 artisans

$$= 2 \times 2000 + 5 \times 1500 = \text{Ksh } 11500$$

M1

Attempt to solve

A1

For both values of a and t

B1

3

17.	<p>(a)</p> $2y - 3x = 6$ $3y + x = 20$ <hr/> $2y - 3x = 6$ $9y + 3x = 60$ <hr/> $11y = 60$ $y = 6$ $x = 20 - 18$ $= 2$ Coordinates of A are (2, 6)  <p>(b) <math>L_2 : 3y = -x + 20</math></p> $y = -\frac{1}{3}x + 20$ Gradient of perpendicular = 3  $\frac{y-6}{x-2} = 3$ $y = 3x - 6 + 6$ $y = 3x$  <p>(c) Gradient of <math>L_4 =</math> gradient of <math>L_1</math></p> $= \frac{3}{2}$  $\frac{y-3}{x+1} = \frac{3}{2}$ $2y - 6 = 3x + 3$ $2y - 3x = 9$ When $x = 0$ $y = 4.5$ When $y = 0$ $x = -3$	 M1  A1 B1   B1  M1  A1   M1  A1 B1 B1 <b>10</b>	 Attempt to solve  for $x = 2$ $y = 6$
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18. (a)

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Mass Kg	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79
Freq. (f)	2	4	8	9	11	7	5	3	1

B1 correct classes

B1 correct frequencies

(b) (i) Mean =

$$2 \times 37 + 4 \times 42 + 8 \times 47 + 9 \times 52 + 11 \times 57 + 7 \times 62 + 5 \times 67 + 3 \times 72 + 1 \times 77$$

50

$$= \frac{2775}{50}$$

$$= 55.5 \text{ kg}$$

M1 correct midpoints

M1

A1

(ii) C.f's 2,6,14,23,34,41,46,49,50

$$\text{Median} = 54.5 + \frac{2}{11} \times 5$$

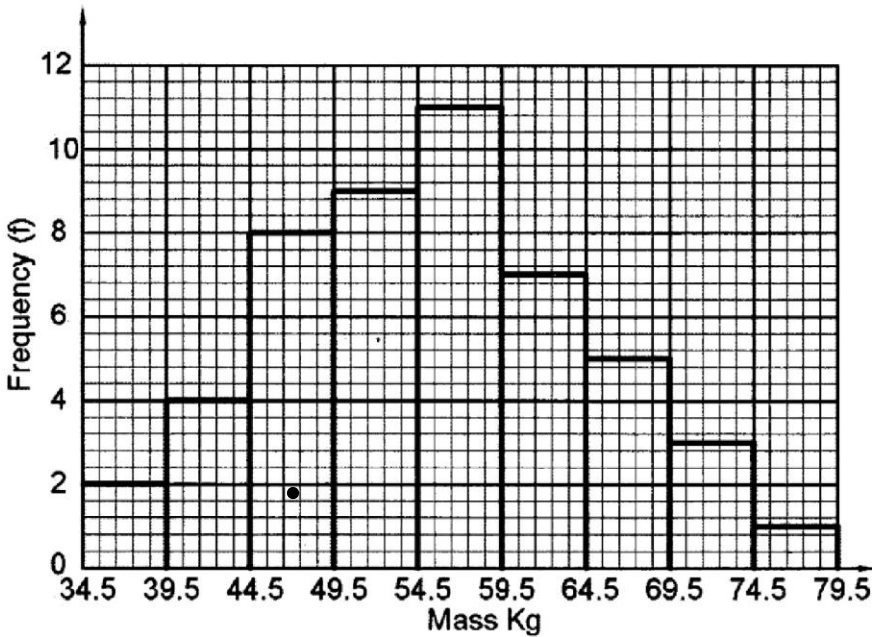
$$= 55.4 \text{ kg}$$

B1

M1

A1

(c)



B2

10

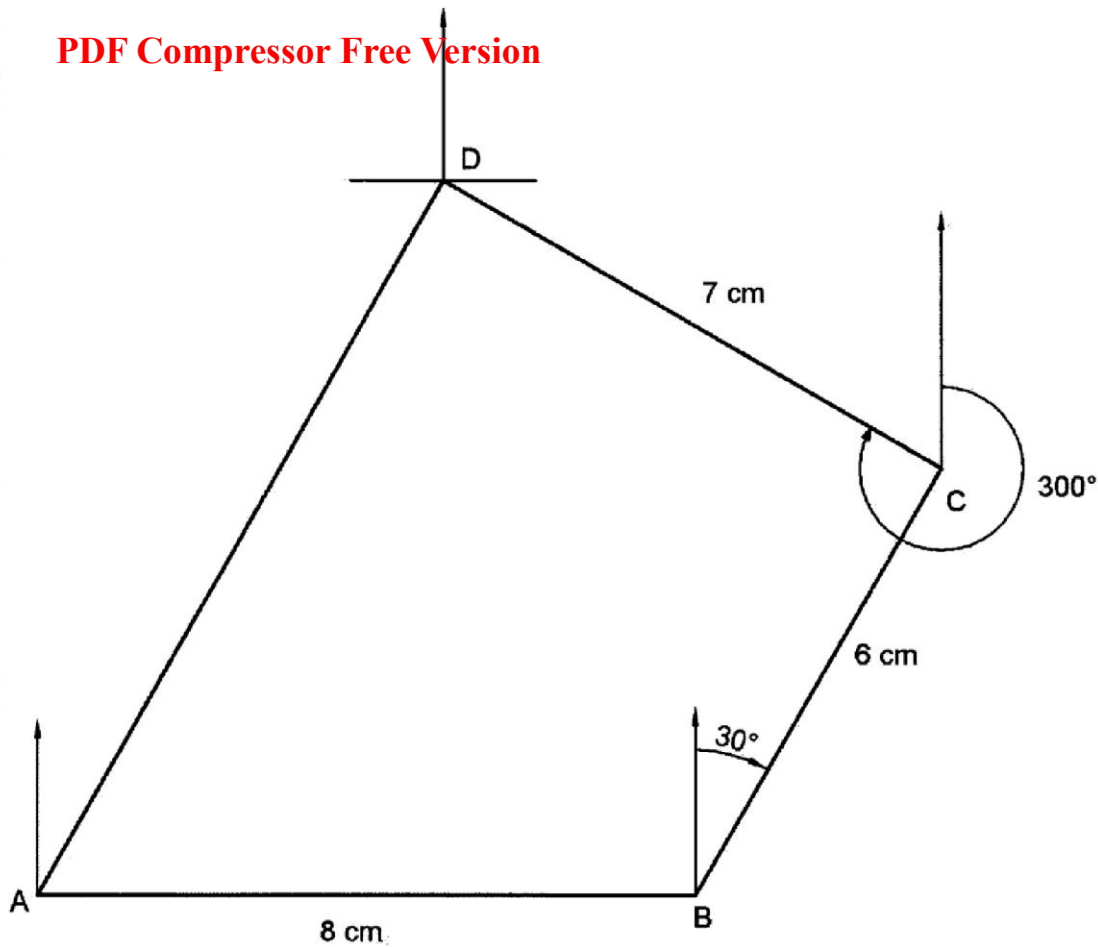


19.	<p>(a) Volume of Solid S</p> <p><b>PDF Compressor Free Version</b></p> <p>Volume of conical part</p> $= \frac{1}{3} \pi \times (0.9)^2 \times 1.5$ $= 1.3\text{m}^3$ <p>Volume of cylindrical part</p> $= \pi \times (0.9)^2 \times 3$ $= 7.6\text{m}^3$ <p>Volume of pillar = 1.3 + 7.6</p> $= 8.9\text{m}^3$ <p>(b) S.A. of Solid S</p> <p>Slant length of conical part</p> $= \sqrt{(1.5)^2 + (0.9)^2} = 1.7$ <p>S.A. of conical part</p> $= \pi \times (0.9) \times 1.7$ $= 4.8\text{m}^2$ <p>S.A. of cylindrical part</p> $= 2\pi \times 0.9 \times 3 + \pi \times (0.9)^2$ $= 19.5\text{m}^2$ <p>S.A. of Solid S = 19.5m<sup>2</sup> + 4.8m<sup>2</sup></p> $= 24.3\text{m}^2$ <p>(c) (1.6)<sup>2</sup> × L = 8.9m<sup>3</sup></p> $h = 3.5\text{m}$	<p>M1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>	
		<b>10</b>	

20. (a)	Length DC = $\sqrt{3^2 + 5^2}$ <b>PDF Compressor Free Version</b> = 5.8cm	M1 A1	
(b)	$\tan^{-1} \frac{5}{3} = 59.0^\circ$	M1 A1	or equivalent
(c)	Size of angle ACB  $11^2 = 5^2 + 8^2 - 2 \times 5 \times 8 \cos C$  $\cos C = \frac{5^2 + 8^2 - 11^2}{2 \times 5 \times 8}$  = -0.4  $\angle ACB = \cos^{-1}(-0.4)$  $\angle ACB = 113.6^\circ$	M1     M1 A1	
(d)	Area of ABCD = Area of ACD + Area of ABC  $= \frac{1}{2} \times 3 \times 5 + \frac{1}{2} \times 5 \times 8 \sin 113.6$  $= 25.8\text{cm}^2$	M1 M1  A1  10	

21.

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(a) Location of B

B1

Location of C

B1

Location of D

B1

Complete quadrilateral ABCD

B1

(b) Bearing of A from D =  $180 + 30$   
 $= 210^\circ$

B1

(c) Distance  $BD = 9.2 \text{ cm} \times 1 \text{ km}$   
 $= 9.2 \text{ km} \pm 0.1$

M1

A1

(d) Perimeter:

$AD = 10.0 \pm 0.1 \text{ km}$

B1

	Perimeter = $10 + 8 + 6 + 7$ $= 31 \text{ km}$ <b>PDF Compressor Free Version</b>	M1	
		A1	
		10	
22.	(a) $\begin{pmatrix} 3 & x \\ x+1 & 2 \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 3 & 0 \end{pmatrix} = \begin{pmatrix} 3+3x & 6 \\ x+7 & 2x+2 \end{pmatrix}$  $\begin{pmatrix} 3+3x & 6 \\ x+7 & 2x+2 \end{pmatrix} = 0$  $\Rightarrow (3+3x)(2x+2) - 6(x+7) = 0$  $6x + 6x^2 + 6x - 6x - 36 = 0$ $6x^2 + 6x - 36 = 0$ $x^2 + x - 6 = 0$ $(x+3)(x-2) = 0$ $x = 2 \text{ or } -3$	M1 A1	
		M1	
		A1	
	(b) (i) $3x + 5y = 165$ $2x + 4y = 120$	B1	
	(ii) $\begin{pmatrix} 3 & 5 \\ 2 & 4 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 165 \\ 120 \end{pmatrix}$		
	Let $A = \begin{pmatrix} 3 & 5 \\ 2 & 4 \end{pmatrix}$ $A^{-1} = \frac{1}{2} \begin{pmatrix} 4 & -5 \\ -2 & 3 \end{pmatrix}$	B1	
	$\frac{1}{2} \begin{pmatrix} 4 & -5 \\ -2 & 3 \end{pmatrix} \begin{pmatrix} 3 & 5 \\ 2 & 4 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{2} \begin{pmatrix} 4 & -5 \\ -2 & 3 \end{pmatrix} \begin{pmatrix} 165 \\ 120 \end{pmatrix}$	M1	
	$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 30 \\ 15 \end{pmatrix}$		
	$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 30 \\ 15 \end{pmatrix}$		

Cost of an exercise book = Ksh. 30

Cost of a pen = Ksh. 15

(iii)  $2 \times 36 \times 30 + 36 \times 15$

= Ksh 2700

A1

M1

A1

**10**

23.

(a) (i) Original price =  $\frac{16200}{x}$

B1

(ii) Price after discount =  $\frac{16200}{x+3}$

B1

(b) (i)  $\frac{16200}{x} - 60 = \frac{16200}{x+3}$

M1

$\frac{16200 - 60x}{x} = \frac{16200}{x+3}$

$(16200 - 60x)(x+3) = 16200x$

M1

$60x^2 + 180x - 48600 = 0$

$x^2 + 3x - 810 = 0$

M1

$(x+30)(x-27) = 0$

$x = 27$

A1

(ii)  $\frac{16200}{27+3}$

M1

= Ksh 540

A1

(iii)  $\frac{16200}{27} \times \frac{15}{100}$

M1

= Ksh 90

A1

**10**

24.	<p>(a) (i) When <math>x = 2</math></p> <p><del>PDF Compressor Free Version</del> <math>\frac{9}{2}(2)^2 + 3</math></p> <p><math>= -29</math></p> <p>(ii) <math>\frac{dy}{dx} = 6x^2 - 9x - 15</math></p> <p>at <math>x = 2</math></p> <p><math>\frac{dy}{dx} = -9</math></p> <p>Equation of tangent;</p> <p><math>\frac{y+29}{x-2} = -9</math></p> <p><math>y = -9x + 18 - 29</math></p> <p><math>y = -9x - 11</math></p> <p>(b) <math>\frac{dy}{dx} = 6x^2 - 9x - 15</math></p> <p>At turning point</p> <p><math>6x^2 - 9x - 15 = 0</math></p> <p><math>6x^2 + 6x - 15x - 15 = 0</math></p> <p><math>(6x - 15)(x + 1) = 0</math></p> <p><math>x = -1</math> or <math>2.5</math></p> <p>at <math>x = -1; y = 11.5</math></p> <p>turning point = <math>(-1, 11.5)</math></p> <p>at <math>x = 2.5, y = -31\frac{3}{8}</math></p> <p>turning point = <math>\left(2.5, -31\frac{3}{8}\right)</math></p>	<p>M1</p> <p>A1</p> <p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>B1</p> <p>10</p>	<p>Equating to zero</p>
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