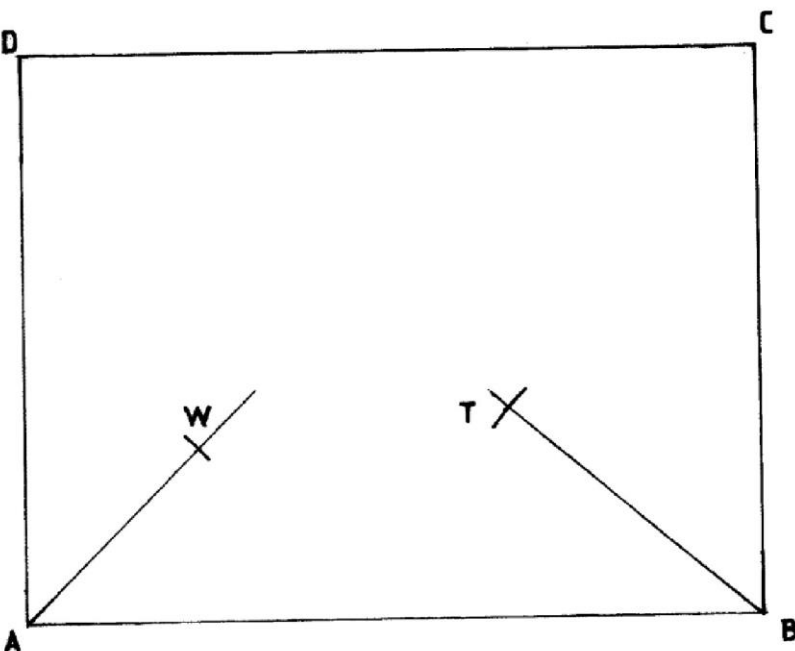


#### 4.4 MATHEMATICS ALTERNATIVE B (122)

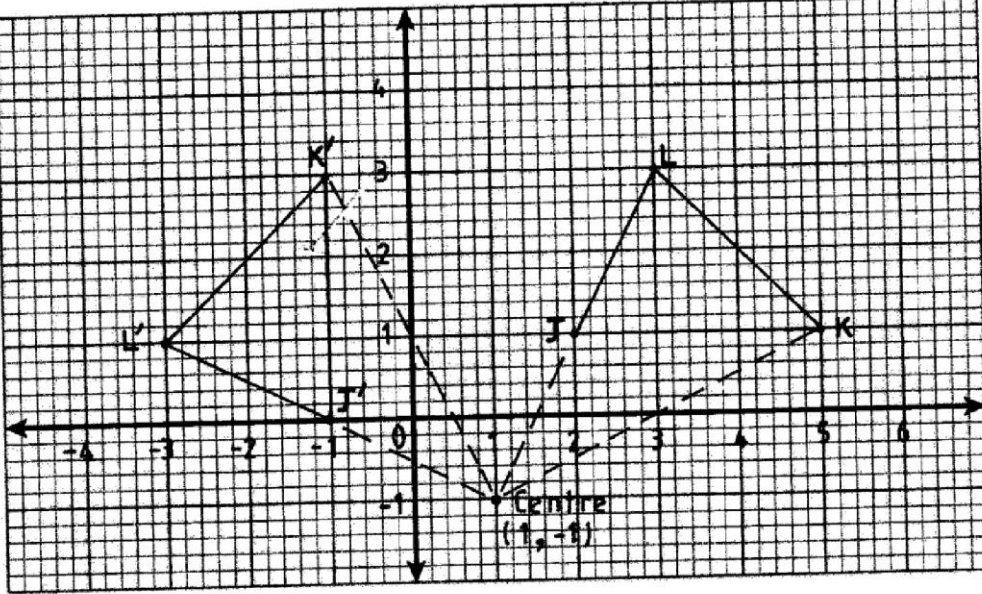
##### 4.4.1 Mathematics Alternative B (122/1)

1.	368800 and 369000 Difference : $369000 - 368000$ $= 200$	B1 B1 2													
2.	(a) $28 = 2^2 \times 7$ $16 = 2^4$ $40 = 2^3 \times 5$  Length of ribbon = $2^4 \times 5 \times 7$ $= 560$  (b) $\frac{560}{16} = 35$	M1 A1 B1 3	For all factors												
3.	Volume = $\frac{5.06 \times 1000}{2.3}$  $= 2200 \text{ cm}^3$  Length = $\frac{2200}{44} = 50 \text{ cm}$	M1 A1 B1 3													
4.	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Number</th> <th>Log</th> </tr> </thead> <tbody> <tr> <td>0.04068</td> <td><math>\bar{2}.6094</math></td> </tr> <tr> <td>35.72</td> <td><math>1.5529^+</math></td> </tr> <tr> <td>0.2799</td> <td><math>0.1623</math> <math>\bar{1}.4470^-</math></td> </tr> <tr> <td></td> <td><math>0.7153 \times \frac{1}{3}</math></td> </tr> <tr> <td>1.732</td> <td>0.2384</td> </tr> </tbody> </table>	Number	Log	0.04068	$\bar{2}.6094$	35.72	$1.5529^+$	0.2799	$0.1623$ $\bar{1}.4470^-$		$0.7153 \times \frac{1}{3}$	1.732	0.2384	M1 M1 A1 3	All logs  Operations  Accept 1.731
Number	Log														
0.04068	$\bar{2}.6094$														
35.72	$1.5529^+$														
0.2799	$0.1623$ $\bar{1}.4470^-$														
	$0.7153 \times \frac{1}{3}$														
1.732	0.2384														
5.	$360 = x^2 + 26x$  $x^2 + 26x - 360 = 0$  $(x + 36)(x - 10) = 0$ $x = 10$	M1 M1 A1 3													

6.	 <p>Distance <math>WT = (3.8 \pm 0.1) \times 10</math>  <math>= 38 \pm 1\text{m}</math></p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>4</p>	<p>Suitable scale used</p> <p>Rectangular field ABCD correctly drawn.</p> <p>✓ Location of W and T</p>
7.	<p>Angle at the centre = <math>120^\circ</math></p> $\frac{120}{360} \times \frac{22}{7} \times 3.5 \times 3.5 - \frac{1}{2} \times (3.5)^2 \sin 120^\circ$ <p><math>= 12.83 - 5.304</math>  <math>= 7.526</math></p>	<p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>4</p>	<p>Area of sector</p> <p>Area of triangle</p>

8.	$3 \geq 10x - 5$ $8 \geq 10x$ $x \leq \frac{4}{5}$ , $x > -4$ Integral values; $-3, -2, -1, 0$ .	M1  A1  B1 <hr/> 3	
9.	Let x be monthly salary $x - \left\{ \frac{1}{5}x + 26000 + \frac{3}{8}x \right\} = 8000$ $\frac{17}{40}x = 34000$ $x = \text{Ksh. } 80000$	M1  M1  A1 <hr/> 3	Simplification
10.	(a) Gradient of $L_1 = -\frac{1}{3}$  Equation of $L_1$ $\frac{y+4}{x-3} = -\frac{1}{3}$ $-3y - 12 = x - 3$ $3y + 12 = -x + 3$ $x + 3y = -9$  (b) x intercept $x = -9$	B1    M1    A1    B1 <hr/> 4	

11.



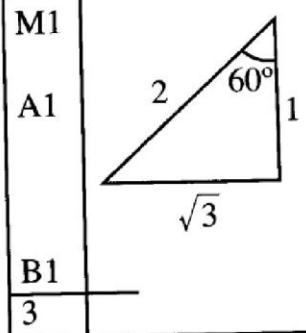
Drawing object JKL  
 Locating image points J', K' and L'  
 Image J' K' L' drawn

B1  
 B1  
 B1 Image J'K'L'  
 drawn  
 3

12. (a) 3rd side of  $\Delta = \sqrt{2^2 - 1^2} = \sqrt{3}$

$$\sin 60^\circ = \frac{\sqrt{3}}{2}$$

(b)  $\tan 30^\circ = \frac{1}{\sqrt{3}}$



13. Number of whole tile along the length  
 $= \frac{307.8}{34.2} = 9$

Number of whole tiles along the width

$$= \frac{236.7}{34.2} = 6$$

Total number of tiles fitted  
 $= 9 \times 6 = 54$

M1  
 M1  
 A1  
 3

14.	<p>Hypotenuse of <math>\Delta = \sqrt{5^2 + 12^2} = 13</math></p> <p>Area of <math>\Delta s = \frac{1}{2} \times 12 \times 5 \times 2</math></p> <p style="text-align: center;">= 60</p> <p>Area of rectangles:</p> <p>= <math>5 \times 30 + 12 \times 30 + 13 \times 30</math></p> <p>= 900</p> <p>Total S.A = <math>900 + 60 = 960 \text{ cm}^2</math></p>	<p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p> <hr/> <p>4</p>	
15.	<p>Volume of hemisphere</p> <p><math>\frac{1}{2} \times \frac{4}{3} \pi r^3 = 41.2</math></p> <p><math>r = \sqrt[3]{\frac{41.2 \times 3}{2\pi}}</math></p> <p style="text-align: center;">= 2.7</p>	<p>M1</p> <p>A1</p> <hr/> <p>2</p>	
16.	<p>Distance covered</p> <p>= <math>\frac{1}{2} (16 \times 25) + 34 \times 25 + \frac{1}{2} \times 25 \times 40</math></p> <p style="text-align: center;">= 1550</p> <p>Speed = <math>\frac{1550}{90}</math></p> <p style="text-align: center;">= 17.2 m/s</p>	<p>M1</p> <p>M1</p> <p>A1</p> <hr/> <p>3</p>	



18.	<p>(a) (i) Expression:</p> $2(x + x + 12) = 4x + 24$ <p>(ii) <math>4x + 24 = 84</math>  <math>4x = 60</math>  <math>x = 15</math></p> <p>Length of plot <math>15 + 12 = 27\text{m}</math>  Ratio of length to width  <math>27: 15 = 9:5</math></p> <p>(b) (i) Length of 1 strand with allowance</p> $84 - 3 + 0.3$ $= 81.3$ <p>Total length:</p> $81.3 \times 4$ $= 325.2 \text{ m}$ <p>(ii) Number of poles:</p> $\frac{84}{3}$ $= 28$	<p>B1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>10</p>	<p>or <math>\frac{81}{3} + 1 = 28</math></p>
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19.	(a) (i) $\frac{3 \times 2.5 \times 4 \times 100 \times 100 \times 100}{1000}$	M1	Volume Conversion to litre
		M1	
	= 30000 litres	A1	
	(ii) $3 \times 4 \times 2 + 2.5 \times 4 \times 2 + 3 \times 2.5$	M1	
	= 24 + 20 + 7.5 = 51.5 m <sup>2</sup>	A1	
	(b) (i) $\pi r^2 \times 4 = 3 \times 2.5 \times 4$	M1	
$r = \sqrt{\frac{7.5}{\pi}}$	M1		
= 1.5	A1		
(ii) $\pi(1.5 \times 1.5) + 2 \times 1.5 \times \pi \times 4$	M1		
= 44.8 m <sup>2</sup>	A1		
	10		



<p>20. (a)</p>		<p>B1</p> <p>B1</p>	<p>Construction of <math>60^\circ</math></p> <p>Construction of quad ADBC</p>
<p>(b) (i) ADBC is a rhombus</p>	<p>(ii) - All sides equal          - Opposite sides equal and parallel          - Opposite <math>\angle</math>s equal          - Diagonals bisect each other at right angles</p>	<p>B1</p> <p>B1</p> <p>B1</p>	<p>Any two correct 1 mark each.</p>
<p>(c) Construction of circle:</p>		<p>B1</p> <p>B1</p>	<p>Identifying centre</p> <p>Circle drawn</p>

(d)	<p>Area inside quad. and outside circle.</p> $8^2 \sin 60^\circ - \pi \times 3.5^2$ $55.4 - \pi \times 3.5^2$ $= 55.4 - 38.5$ $= 16.9 \text{ cm}^2$	<p>M1</p> <p>M1</p> <p>A1</p> <p>10</p>	<p>Area of rhombus</p> <p>Area of circle (radius <math>3.5 \pm 0.1</math>)</p>
21.	<p>(a) <math>\angle XYN = 70^\circ</math> angle in alternate segment</p> <p>(b) <math>\angle ZYX = 180 - (70 + 35) = 75^\circ</math> Sum of angles on a straight line</p> <p>(c) <math>\angle ZXY = 35^\circ</math> angle in alternate segment.</p> <p>(d) <math>\angle ZWY = 35^\circ</math> angle in alternate segment or angle subtended by chord ZY</p> <p>(e) <math>\angle WXZ = 130 - 70 = 60^\circ</math> exterior angle in triangle equal to sum of opposite interior angles</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>10</p>	<p>NB</p> <p>Reason should be relevant to situation.</p>

22.	<p>(a) (i) Discount = <math>\frac{1.2}{100} \times \frac{3}{5} \times 300 \times 1700</math>  = Ksh 3672</p> <p>(ii) <math>\frac{3}{100} \times 120 \times 1700 + \frac{2}{100} \times 180 \times 1700</math>  = 6120 + 6120 = Ksh 12 240</p> <p>Net commission:  = 12240 - 3672 = Ksh 8568</p> <p>(b) Profit:  = 300 (1850 - 1700) + 3672 - 3000  = Ksh 45 672</p> <p>(c) Tax:  <math>\frac{16}{100} \times 45672</math>  = Ksh 7307.52</p>	M1 A1 M1 A1 B1 M1 M1 A1 M1 A1 10	
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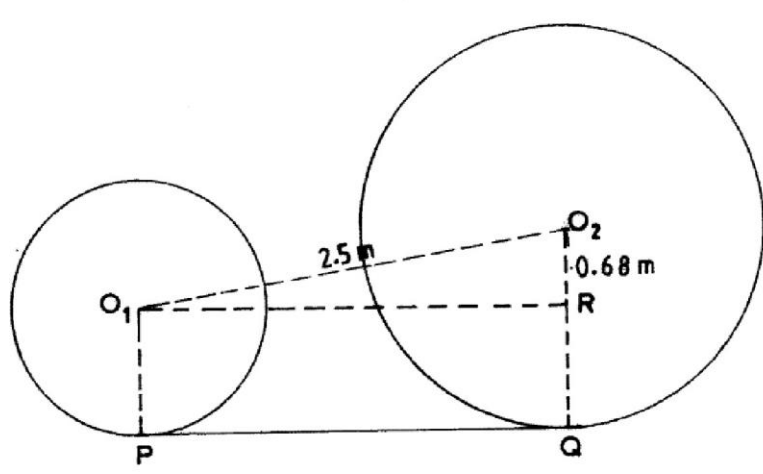


24.	<p>(a) <math>\frac{1}{2} \times \frac{600 \times 500 \times \sin 30 \times 2}{10000}</math>  <math>= 15 \text{ ha}</math></p> <p>(b) (i) <math>\frac{6 \times \frac{1}{2} \times 10^2 \sin 60}{10000}</math>  <math>= 0.026 \text{ ha}</math></p> <p><math>\therefore \text{grazing area} = 15 - 0.026</math>  <math>= 14.974 \text{ ha}</math></p> <p>(ii) Number of animals  <math>= 14.974 \div 0.0625</math>  <math>= 239.584</math>  <math>= 239 \text{ animals}</math></p>	<p>M1  M1  A1</p> <p>M1  M1  A1</p> <p>B1</p> <p>M1  A1  B1</p> <p>10</p>	<p>Conversion to hectares</p> <p>area of 1 triangle  mult. by 6</p>
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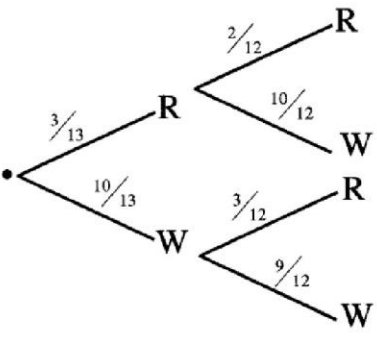
4.4.2 Mathematics Alternative B Paper 2 (122/2)

1.	$= \frac{3.84^2 - \sqrt[3]{110.592}}{0.03885}$ $= \frac{14.7456 - 4.8}{0.03885}$ $= 256$	B1 B1 2	Squaring and cube root
2.	<p>(a) Annual salary in the 7<sup>th</sup> year:</p> $= 120\,600 + 2880 \times 6$ $= \text{Ksh}137\,880$ <p>(b) Total earnings for 6 years</p> $S_6 = \frac{6}{2} \{2 \times 120\,600 + 5(2880)\}$ $= \text{Ksh} 766\,800$	M1 A1 M1 A1 4	
3.	$\left(x - \frac{4}{3}\right)\left(x + \frac{1}{2}\right) = 0$ $x^2 - \frac{5}{6}x - \frac{2}{3} = 0$ $6x^2 - 5x - 4 = 0$	M1 A1 3	
4.	$P + \frac{PRT}{100} = 37600$ $P + \frac{P \times 5 \times 3.5}{100} = 37\,600$ $P(1.175) = 37600$ $P = \frac{37600}{1.175}$ $= \text{Ksh} 32\,000$	M1 M1 A1 3	

5.	$3x = 100 - (17.5 + 15 + 30)$ $x = 12.5\%$ <p>Angle for peace initiative</p> $= \frac{12.5}{100} \times 360$ $= 45^\circ$	M1   M1 A1  3																												
6.	$2AB = 2 \left[ \begin{pmatrix} 2 & 1 & 2 \\ 3 & 2 & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 2 & 1 \\ 1 & 2 \end{pmatrix} \right] = 2 \begin{pmatrix} 6 & 5 \\ 8 & 4 \end{pmatrix}$ $= \begin{pmatrix} 12 & 10 \\ 16 & 8 \end{pmatrix}$	M1 M1 A1  3	<b>AB</b>  Multiplication by scalar																											
7.	<table border="1"> <thead> <tr> <th>Classes</th> <th>10 - 14</th> <th>15 - 19</th> <th>20 - 24</th> <th>25 - 29</th> <th>30 - 34</th> <th>35 - 39</th> <th>40 - 44</th> <th>45 - 49</th> </tr> </thead> <tbody> <tr> <td>frequency f</td> <td>2</td> <td>6</td> <td>14</td> <td>24</td> <td>13</td> <td>10</td> <td>8</td> <td>3</td> </tr> <tr> <td>c.f</td> <td>2</td> <td>8</td> <td>22</td> <td>46</td> <td>59</td> <td>69</td> <td>77</td> <td>80</td> </tr> </tbody> </table> <p>cumulative frequency</p> $\text{Median} = 24.5 + \frac{40 - 22}{24} \times 5$ $= 24.5 + 3.75$ $= 28.25$	Classes	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	frequency f	2	6	14	24	13	10	8	3	c.f	2	8	22	46	59	69	77	80	B1   M1   A1  3	
Classes	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49																						
frequency f	2	6	14	24	13	10	8	3																						
c.f	2	8	22	46	59	69	77	80																						

8.	$\begin{pmatrix} 2 & 0 \\ 0 & -2 \end{pmatrix} \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} 4 \\ -6 \end{pmatrix}$ $2a = 4 \Rightarrow a = 2$ $-2b = -6 \Rightarrow b = 3$ <p>Coordinates of A = (2,3)</p>	M1 M1 A1 3	
9.	<p>(a) <math>L = C + an</math></p> <p>(b) <math>78\,000 = C + 50a</math></p> $85\,200 = C + 70a$ $20a = 7200$ $a = 360$ $C = 78\,000 - 50 \times 360$ $= 60\,000$ $L = 60\,000 + 100 \times 360$ $= 96\,000$	B1 M1 A1 B1 4	For both C and a
10.	$O_2R = 0.8 - 0.12 = 0.68$ $PQ = \sqrt{2.5^2 - 0.68^2}$ $= 2.41$ 	B1 M1 A1 3	



11.	<p>Difference in longitude = <math>12^\circ + 5 = 17^\circ</math></p> <p>Time difference = <math>17 \times 4</math></p> <p style="padding-left: 40px;">= 68 minutes</p> <p>Time at R:</p> <p style="padding-left: 40px;">= 2245 h - 1 hr 08 min</p> <p style="padding-left: 40px;">= 2137 h</p> <p style="padding-left: 40px;">= 9.37 pm</p>	<p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p>	
12.	<p><math>4 \tan x = 5</math></p> <p><math>\tan x = \frac{5}{4} = 1.25</math></p> <p><math>x = \tan^{-1}(1.25)</math></p> <p style="padding-left: 20px;">= <math>51.34^\circ</math></p> <p style="padding-left: 20px;">and <math>231.34^\circ</math></p>	<p>M1</p> <p>A1</p> <p>B1</p>	
13.	<p>(a)</p>  <p>(b) <math>P(R + W)</math></p> <p style="padding-left: 40px;"><math>= \frac{3}{13} \times \frac{10}{12} + \frac{10}{13} \times \frac{3}{12}</math></p> <p style="padding-left: 40px;"><math>= \frac{5}{13}</math></p>	<p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p>	<p>for 1<sup>st</sup> branch correct</p> <p>for 2<sup>nd</sup> branch correct</p>



17.	<p>(a) (i) <math>A:B = 3:4</math></p> <p><math>B:C = 1:2 \Rightarrow B:C = 4:8</math></p> <p><math>\therefore A:B:C = 3:4:8</math></p> <p>(ii) <math>\frac{3}{15} \times 20</math></p> <p><math>= 4 \text{ litres}</math></p> <p>(b) (i) Cost of production per litre</p> <p><math>= \frac{80 \times 3 + 84 \times 4 + 90 \times 8}{15}</math></p> <p><math>= \text{Ksh } 86.4</math></p> <p>(ii) Selling price of 1 litre for a 25% profit:</p> <p><math>= 86.4 \times \frac{125}{100}</math></p> <p><math>= \text{Ksh } 108</math></p> <p>(c) In 1h machines P and Q blend</p> <p><math>\frac{14000}{7} + \frac{12000}{5}</math></p> <p><math>= 2000 + 2400 = 4400 \text{ litres}</math></p> <p>Time taken to blend 550000 litres</p> <p><math>= \frac{550000}{4400}</math></p> <p><math>= 125 \text{ hours}</math></p>	<p>B1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>	
		10	

18.	<p>(a) (i) Full squares = 37</p> <p>Part squares = 27</p> <p>Total area = <math>37 + \frac{27}{2}</math></p> <p style="padding-left: 40px;">= 50.5 cm<sup>2</sup></p> <p>(ii) area in km<sup>2</sup></p> <p style="padding-left: 40px;">= <math>\frac{50.5 \times 50000 \times 50000}{1000 \times 1000 \times 100 \times 100}</math></p> <p style="padding-left: 40px;">= 12.625 km<sup>2</sup></p> <p>(b) (i) Number of 5 ha parcels:</p> <p style="padding-left: 40px;">= <math>\frac{12.625 \times 1000 \times 1000}{5 \times 100 \times 100}</math></p> <p style="padding-left: 40px;">= 252.5</p> <p style="padding-left: 40px;">Number of equal parcels = 252</p> <p>(ii) Remainder in hectares:</p> <p style="padding-left: 40px;">= 0.5 × 5</p> <p style="padding-left: 40px;">= 2.5 ha</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>10</p>	<p>conversion</p>
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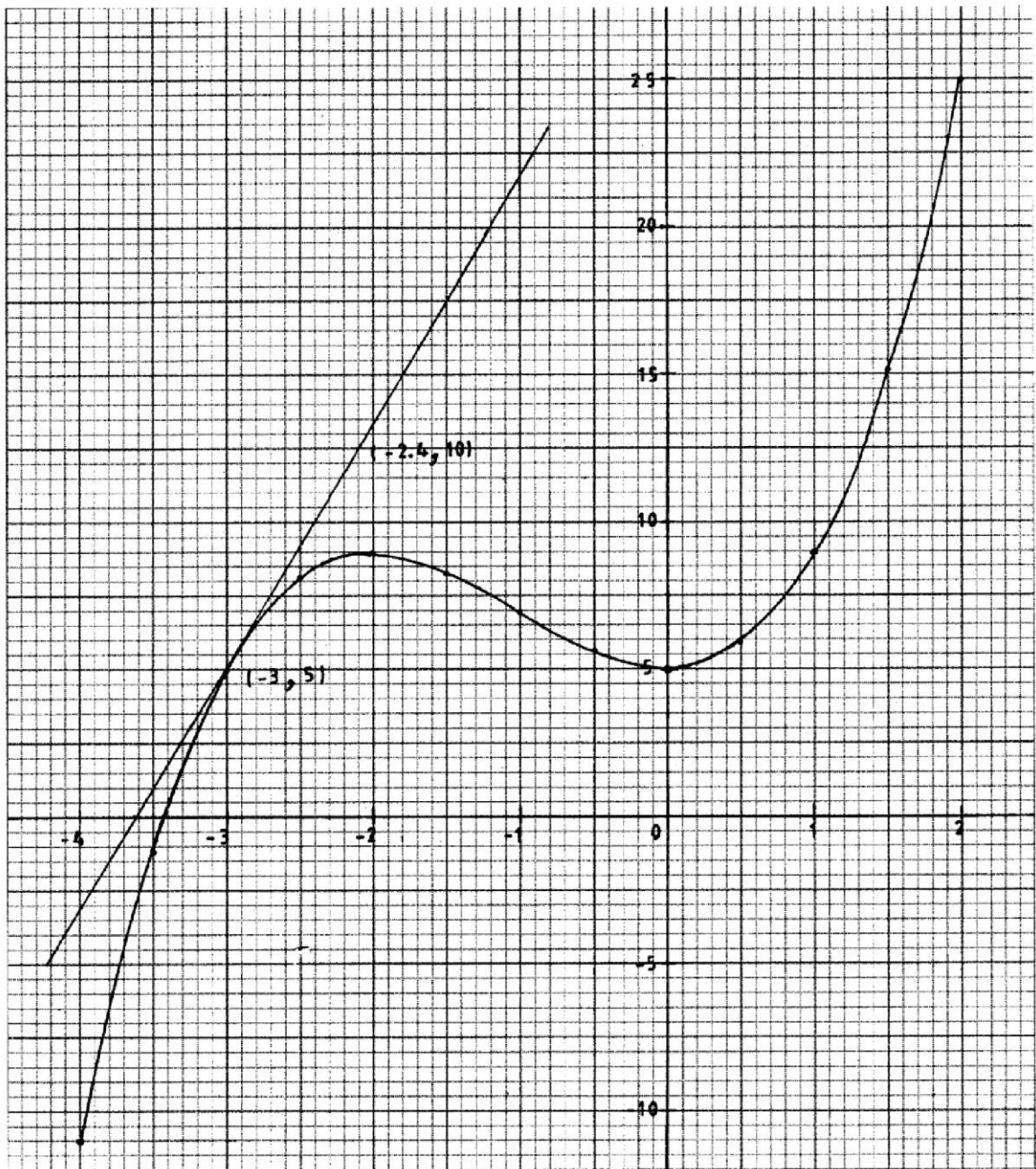
19.	<p>(a) Size of angle CTD = <math>33^\circ</math></p> <p>- Angle in alternate segment</p> <p>(b) <math>(x + 4.1) 4.1 = 7^2</math></p> $4.1x + 4.1^2 = 49$ $4.1x = 32.19$ $x = 7.851219512$ $\simeq 7.9$ <p>(c) (i) <math>\frac{\sin \theta}{7} = \frac{\sin 33}{4.1}</math></p> $\sin \theta = \frac{7 \sin 33}{4.1}$ $= 0.9299$ $\therefore \theta = 68^\circ$ <p>obtuse angle = <math>180^\circ - 68^\circ = 112^\circ</math></p> <p>(ii) <math>\angle ACT = 180^\circ - 112^\circ = 68^\circ</math></p> $\angle ATC = 180^\circ - (68 + 33) = 79^\circ$ $\angle ABC = 180^\circ - 79^\circ = 101^\circ$	<p>B1</p> <p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>B1</p> <p>B1</p> <p>10</p>
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20. (a)

x	-4	-3.5	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2
y	-11			8.1		8.4	7		5		9		25

B2 Allow B1 for 4 ✓

(b)



S1

P1

C1

(c) (i)  $\frac{20.5 - 5.9}{1.8 - 0.5} = 11.23$

M1  
A1

(ii) tangent line at  $x = -3$

B1

gradient :  $\frac{10 - 5}{-2.4 - -3} =$   
 $= 8.3$

M1  
A1

10

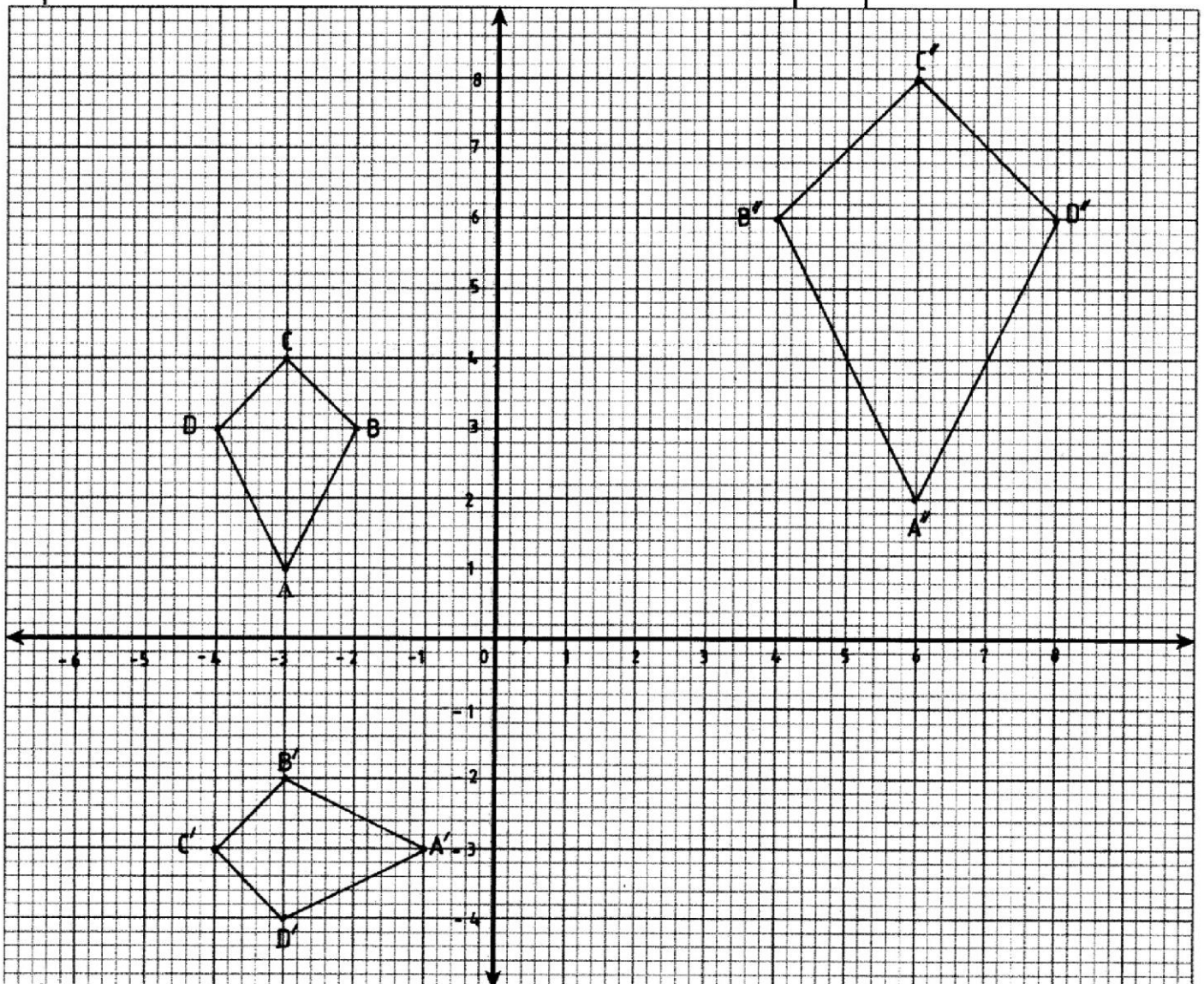
21.	<p>(a) (i) <math>(x - 1)(x - 8) = 4.56</math></p> $x^2 - 9x + 8 = 4.56$ $x^2 - 9x + 3.44 = 0$ <p>(ii) <math>x^2 - \frac{9}{2}x + \left(\frac{9}{2}\right)^2 = \left(\frac{9}{2}\right)^2 - 3.44</math></p> $\left(x - \frac{9}{2}\right)^2 = \frac{81}{4} - 3.44$ $\left(x - \frac{9}{2}\right) = \sqrt{16.81}$ $x = 4.5 \pm 4.1$ $= 8.6 \text{ or } 0.4$ $x = 8.6 \text{ m}$ <p>Length of pavement = <math>8.6 - 1 = 7.6 \text{ m}</math></p> <p>Width of pavement = <math>8.6 - 8 = 0.6 \text{ m}</math></p> <p>(b) No. of <math>0.4 \text{ m} \times 0.3</math> tiles</p> $\frac{7.6 \times 0.6}{0.4 \times 0.3}$ $= 38$	M1	
		A1	
		M1	
		M1	
		A1	
		B1	
		B1	
		B1	
		M1	
		A1	
		10	

22.	<p>(a) (i) <math>\text{Ksh. } 4\,000\,000 \times (1.2)^3</math></p> <p style="padding-left: 40px;"><math>= \text{Ksh } 6\,912\,000</math></p> <p>(ii) <math>4\,000\,000 \times (1.2)^3 \times (1.15)^2</math></p> <p style="padding-left: 40px;"><math>= \text{Ksh } 9\,141\,120</math></p> <p>(b) (i) <math>\frac{7\,125\,000 \times 100}{95}</math></p> <p style="padding-left: 40px;"><math>= \text{Ksh } 7\,500\,000</math></p> <p>(ii) <math>9\,141\,120 \times \left(1 - \frac{r}{100}\right)^2 = 7\,500\,000</math></p> <p style="padding-left: 40px;"><math>\left(1 - \frac{r}{100}\right)^2 = \frac{7\,500\,000}{9\,141\,120} = 0.82</math></p> <p style="padding-left: 40px;"><math>1 - \frac{r}{100} = 0.91</math></p> <p style="padding-left: 40px;"><math>\frac{r}{100} = 1 - 0.91 = 0.09</math></p> <p style="padding-left: 40px;"><math>r = 9\%</math></p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>M1</p> <p>M1</p> <p>A1</p>	
		10	



23.

(a) (i) 
$$\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} -3 & -2 & -3 & -4 \\ 1 & 3 & 4 & 3 \end{pmatrix} = \begin{pmatrix} -1 & -3 & -4 & -3 \\ -3 & -2 & -3 & -4 \end{pmatrix}$$
 M1  
 Coordinates: A'(-1,-3), B'(-3,-2), C'(-4,-3), D'(-3,-4) A1



(ii) Object ABCD drawn

Image A'B'C'D' drawn

(b) (i) 
$$\begin{pmatrix} 0 & -2 \\ -2 & 0 \end{pmatrix} \begin{pmatrix} -1 & -3 & -4 & -3 \\ -3 & -2 & -3 & -4 \end{pmatrix} = \begin{pmatrix} 6 & 4 & 6 & 8 \\ 2 & 6 & 8 & 6 \end{pmatrix}$$
 M1

Coordinates: A''(6,2), B''(4,6), C''(6,8), D''(8,6)

(ii) image A''B''C''D'' drawn

(iii) 
$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 6 & 4 & 6 & 8 \\ 2 & 6 & 8 & 6 \end{pmatrix} = \begin{pmatrix} -3 & -2 & -3 & -4 \\ 1 & 3 & 4 & 3 \end{pmatrix}$$
 M1

$$a = -\frac{1}{2}, b = 0, c = 0, d = \frac{1}{2}$$
 M1

Matrix 
$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} -\frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{pmatrix}$$
 A1

10

24. (a)

Masses (kg)	f	Mid-point	fx	d = x - 38	fd	fd <sup>2</sup>
26 - 30	9	28	252	-10	-90	900
31 - 35	13	33	429	-5	-65	325
36 - 40	20	38	760	0	0	0
41 - 45	15	43	645	5	75	375
46 - 50	6	48	288	10	60	600
51 - 55	2	53	106	15	30	450
	Σ = 65		Σfx = 2480		Σfd = 10	Σfd <sup>2</sup> = 2650

Mid points column

B1

fx column

B1

$$\text{Mean} = \frac{\sum fx}{\sum f} = \frac{2480}{65} = 38.15$$

M1

A1

(b) (i) variance:

$$\begin{aligned} & \frac{\sum fd^2}{\sum d} - \left( \frac{\sum fd}{\sum f} \right)^2 \\ &= \frac{2650}{65} - \left( \frac{10}{65} \right)^2 \\ &= 40.769 - 0.02367 \\ &= 40.75 \end{aligned}$$

B1

B1

B1

M1

A1

d = x - 38 column

fd

fd<sup>2</sup>

(ii) Standard deviation

$$= \sqrt{40.75} = 6.38$$

B1

10