

121/1 MS  
MATHEMATICS (All. A)  
Paper 1  
Nov 2019  
MARKING SCHEME

mathematics  
paper 1 scheme

**THE KENYA NATIONAL EXAMINATIONS COUNCIL.**

**Kenya Certificate of Secondary Education**

**MATHEMATICS (All. A)**

**PAPER 1**

**MARKING SCHEME  
(CONFIDENTIAL)**

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**This marking scheme consists of 15 printed pages**

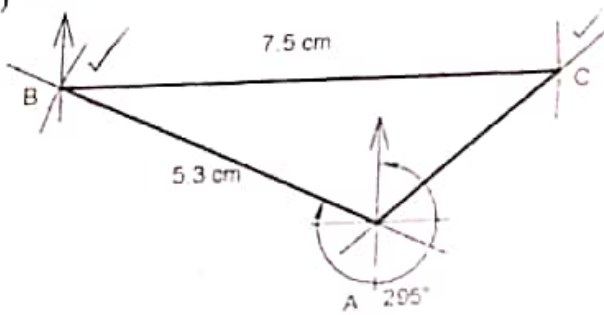
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121/1 MS

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MATHEMATICS ALT. A 121/1 PAPER 1 MARKING SCHEME

No.	Marking Scheme	Marks	Comments
1.	$\frac{5.4}{0.025 \times 3.6} = \frac{5.4 \times 10^4}{0.025 \times 3.6 \times 10^4}$ $= \frac{54 \times 1000}{25 \times 36}$ $= \frac{6000}{100}$ $= 60$	<p>M1</p> <p>M1</p> <p>A1</p> <p>3</p>	<p>Removal of decimals or equivalent</p> <p>Simplification</p>
2.	$1728 = 2^6 \times 3^3$ or $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$ $2025 = 3^4 \times 5^2$ or $3 \times 3 \times 3 \times 3 \times 5 \times 5$  $\frac{\sqrt[3]{1728}}{\sqrt{2025}} = \frac{\sqrt[3]{2^6 \times 3^3}}{\sqrt{3^4 \times 5^2}} = \frac{2^2 \times 3}{3^2 \times 5}$  $= \frac{4}{15}$ or 0.26 <i>Accept 0.2667</i>	<p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>4</p>	<p>✓ removal of cube root and square root</p>
3.	<p>Time taken =</p> $= \frac{10.15}{8.30} - \frac{1.45}{1.45}$ <p>= 1 hr 45 mins = 1.75hrs = <math>1\frac{3}{4}</math></p> <p>Speed = <math>\frac{140}{1.75}</math></p> <p>= 80 km/h</p>	<p>M1</p> <p>M1</p> <p>A1</p> <p>3</p>	<p>Correct subtraction of time.</p> <p><del>Correct conversion of time taken to hours =</del></p> <p>or <math>\frac{140}{1\frac{3}{4}}</math></p>
4.	$4(q+6) + 7(q-3) = 4q + 24 + 7q - 21$ $= 11q + 3$	<p>M1</p> <p>A1</p> <p>2</p>	

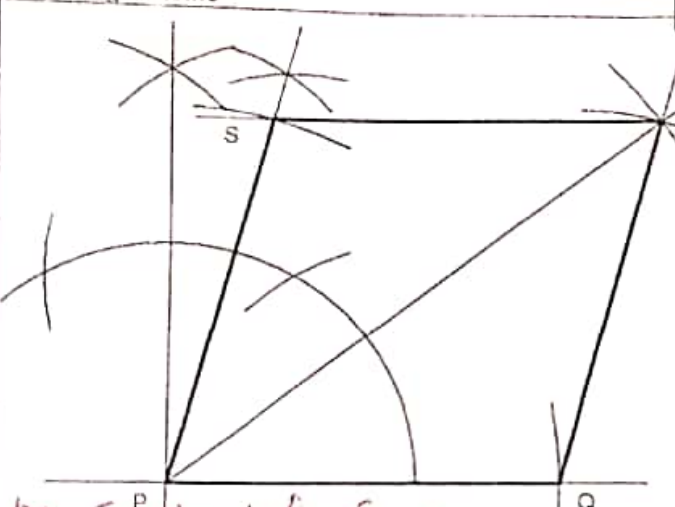
No.	Marking Scheme	Marks	Comments
5.	$\text{Area of trapezium} = \frac{1}{2}(8 + 6)h = 28$ $7h = 28$ $h = 4\text{cm}$	M1 A1 2	units not correct
6.	$\sqrt{9^4} = 3^n$ $(3^2)^4 = 3^n$ $3^8 = 3^n$ $n = \frac{8}{3} = 2\frac{2}{3}$	M1 M1 A1 4	ALT. Base 3 (both sides) $\frac{4}{3} \log 9 = n \log 3$ $= \frac{4 \log 9}{3 \log 3} = n$ $2.66\bar{6} = n$ or $2.667$
7.	(a)  (b)	B1 B1 B1 4	Location of B Location of C for AC = 3.5cm + 0.1 for AC = 35km
8.	$40 = 2 \times 2 \times 2 \times 5$ $250 = 2 \times 5 \times 5 \times 5$ $350 = 2 \times 5 \times 5 \times 7$ $\text{LCM} = 2 \times 2 \times 2 \times 5 \times 5 \times 5 \times 7$ $= 7000\text{g}$	M1 M1 A1 3	process of calc the LCM <del>process of calc the LCM</del>

ALT.  
 $9^{\frac{4}{3}} = 7^{\frac{1}{2}n}$   
 $\frac{4}{3} = \frac{1}{2}n$   
 $n = \frac{8}{3}$

No.	Marking Scheme	Marks	Comments
9.	$\sin 2x = \cos(3x - 10)$ $2x + (3x - 10) = 90$ $5x - 10 = 90$ $5x = 100$ $x = 20^\circ$ $\tan 20^\circ = 0.3640$	MI AI BI 3	Or equivalent
10.	$\$5820 = \text{Ksh } (5820 \times 102.10) = \text{Ksh } 594222$ Balance in \$ $= \frac{594222 - 450000}{103.0} = \frac{144222}{103}$ $= 1400 \text{ US Dollars}$	MI MI AI 3	multiplication for conversion to \$
11.	$a = 3 \begin{pmatrix} 3 \\ 2 \end{pmatrix} - 2 \begin{pmatrix} 2 \\ 4 \end{pmatrix}$ $= \begin{pmatrix} 9 \\ 6 \end{pmatrix} - \begin{pmatrix} 4 \\ 8 \end{pmatrix}$ $= \begin{pmatrix} 5 \\ -2 \end{pmatrix}$ $ a  = \sqrt{5^2 + (-2)^2}$ $= 5.39$	MI AI MI AI 4	for substituting

if a candidate writes  $\sqrt{5^2 + (-2)^2}$  we write until we see  $\sqrt{25 + 4}$  MI

\* If the candidate fails to label the rhombus, we wait and confirm his/her measurement of  $PR = 9.5\text{cm}$  then we award all the marks above.

No.	Marking Scheme	Marks	Comments
12.	 <p data-bbox="295 828 973 1276"> <math>PR = 9.5\text{ cm}</math> </p>	<p data-bbox="973 324 1085 380">B1</p> <p data-bbox="973 380 1085 448">B1</p> <p data-bbox="973 448 1085 515">B1</p> <p data-bbox="973 515 1085 582">B1</p> <p data-bbox="973 582 1085 649">B1</p> <p data-bbox="973 649 1085 716">B1</p> <p data-bbox="973 716 1085 784">B1</p> <p data-bbox="973 784 1085 851">B1</p> <p data-bbox="973 851 1085 918">B1</p> <p data-bbox="973 918 1085 985">B1</p> <p data-bbox="973 985 1085 1052">B1</p> <p data-bbox="973 1052 1085 1120">B1</p> <p data-bbox="973 1120 1085 1187">B1</p> <p data-bbox="973 1187 1085 1254">B1</p> <p data-bbox="973 1254 1085 1321">B1</p> <p data-bbox="973 1321 1085 1388">B1</p> <p data-bbox="973 1388 1085 1456">B1</p> <p data-bbox="973 1456 1085 1523">B1</p> <p data-bbox="973 1523 1085 1590">B1</p> <p data-bbox="973 1590 1085 1657">B1</p> <p data-bbox="973 1657 1085 1724">B1</p> <p data-bbox="973 1724 1085 1792">B1</p>	<p data-bbox="1085 324 1388 515">If <math>75^\circ</math> is measured then; <math>B_0</math> <math>B_1</math> <math>B_1</math> <math>B_1</math> } (3 mks)</p> <p data-bbox="1085 515 1388 582">Construction of <math>75^\circ</math></p> <p data-bbox="1085 582 1388 649">✓ Locating point R</p> <p data-bbox="1085 649 1388 716">Complete Rhombus</p>
13.	<p data-bbox="295 1276 973 1344"><math>2x - 1 \leq 3x + 4</math></p> <p data-bbox="295 1344 973 1411"><math>-5 \leq x</math></p> <p data-bbox="295 1411 973 1478"><math>3x + 4 &lt; 7 - x</math></p> <p data-bbox="295 1478 973 1545"><math>4x &lt; 3</math></p> <p data-bbox="295 1545 973 1612"><math>x &lt; \frac{3}{4}</math></p> <p data-bbox="295 1612 973 1680"><math>-5 \leq x &lt; \frac{3}{4}</math></p> <p data-bbox="295 1680 973 1792">reject solution on a number line</p>	<p data-bbox="973 1276 1085 1344">B1</p> <p data-bbox="973 1344 1085 1411">B1</p> <p data-bbox="973 1411 1085 1478">B1</p> <p data-bbox="973 1478 1085 1545">B1</p> <p data-bbox="973 1545 1085 1612">B1</p> <p data-bbox="973 1612 1085 1680">B1</p> <p data-bbox="973 1680 1085 1747">B1</p> <p data-bbox="973 1747 1085 1792">B1</p>	<p data-bbox="1085 1276 1388 1344">3</p>

$90^\circ$  must be constructed for a candidate to earn  $B_1$  for  $75^\circ$  at P.

No.	Marking Scheme	Marks	Comments
14	$\begin{pmatrix} 2 & 3 \\ 4 & 4 \end{pmatrix} \begin{pmatrix} x & 1 \\ 2 & 3 \end{pmatrix} = \begin{pmatrix} 2x+6 & 11 \\ 4x+8 & 16 \end{pmatrix}$ $\begin{pmatrix} 2x+6 & 11 \\ 4x+8 & 6 \end{pmatrix} = 0$ $16(2x+6) - 11(4x+8) = 0$ $32x + 96 - 44x - 88 = 0$ $32x - 44x = 88 - 96$ $-12x = -8$ $x = \frac{-2}{-3} = 0.6$	<p>M1</p> <p>M1</p> <p>A1</p> <p>3</p>	<p>process of multiplication</p>
15.	$\begin{cases} A + B = 50 \\ 60A + 56B = 2872 \end{cases}$ $60A + 56(50-A) = 2872$ $4A = 2872 - 2800$ $4A = 72$ $A = 18$	<p>M1</p> <p>M1</p> <p>A1</p> <p>3</p>	<p>the two eqns</p> <p>substituting for B</p>
16.	<p>Time taken -</p> $\begin{array}{r} 5 \text{ hours } 40 \text{ min} \\ + 3 \text{ hours } 15 \text{ min} \\ \hline 40 \text{ min} \\ \hline 9 \text{ hours } 35 \text{ min} \end{array}$ <p>Arrival time = 08.15 + 9 hrs 35 min</p> <p>= 1750 hours</p>	<p>M1</p> <p>M1</p> <p>A1</p> <p>3</p>	<p>Or equivalent</p> <p>Accept 1750</p> <p>17.50 A.O</p>

ALT. b(ii) Total vol =  $2.4 \times 2 + 1.5 = 7.2 \text{ m}^3 = 7200 \text{ l}$

Amount of water in the tank =  $2.4 \times 2 \times 0.45 \times 1000 + 10 \times 2160 - 480 = 3480 \text{ l}$

Amount remaining to be filled  $7200 - 3480 = 3720 \text{ m}^3$

Time =  $\frac{3720}{360} = 10\frac{1}{2} \text{ hrs}$   $\therefore$  Total time =  $10\frac{1}{2} \text{ hrs} + 3 \text{ hrs} = 13\frac{1}{2} \text{ A}_1$

No.	Marking Scheme	Marks	Comments
17.	(a) Volume of water required		
	$= 2.4 \times 2 \times (1.5 - 0.45) \text{ m}^3$	M1	Or equivalent $2.4 + 2 + 1.05$
	$= 2.4 \times 2 \times 1.05 \text{ m}^3$		
	Amount of water in litres		
	$= 2.4 \times 2 \times 1.05 \times 1000 \text{ litres}$	M1	Conversion to litres
	$= 5040 \text{ litres}$	A1	
	(b) (i)		
	Amount of water let in by 3h is		
	$= 10 \times 3 \times 60 = 1800 \text{ litres}$		
	Amount of water drawn from the tank in 2h is		
	$= 4 \times 120 = 480 \text{ litres}$		
	Total amount of water in tank after 3h		
	$= 2160 + 1800 - 480$	M1	} F.T. @ }
	$= 3480 \text{ litres}$	A1	
	Height of water in tank is		
	$= \frac{3480}{1000 \times 2 \times 2.4}$	M1	
	$= 0.725 \text{ m}$	A1	
b(ii) Height of water to be filled			
$= 1.5 - 0.725 = 0.775 \text{ m}$			
( <del>ALT</del> )			
Time in hours taken to fill the tank is			
$= 3h + \left( \frac{2.4 \times 2 \times 0.775 \times 1000}{6 \times 60} \right) h$	M1		
$= 3h + 10\frac{1}{3} h$	M1		
$= 13\frac{1}{3} h$ (or 13h 20min)	A1		
800min or 48,000 Sec.	10		

ALT. b(ii) Volume remaining to be filled after 3hrs

$5040 - 1320 = 3720 \text{ m}^3$

Time =  $\frac{3720}{360} = 10 \text{ hrs } 20 \text{ min}$

Time taken to fill  $10 \text{ hrs } + 20 \text{ min} + 3 \text{ hrs}$   
 $= 13 \text{ hrs } 20 \text{ min}$  A1

ALT. (i) Water added after 3hrs

$600 + 720 = 1320$  A1

height added

$\frac{1320}{1000 \times 2 \times 2.4} = 0.275$  m1

New height =  $0.45 + 0.275 = 0.725$  A1

No.	Marking Scheme	Marks	Comments
18.	<p>(a) Gradient</p> $\frac{7-3}{5-3} \text{ or } \frac{3-7}{3-5}$ $= 2 \quad = 2$ <p>Equation of <math>L_1</math></p> $\frac{y-3}{x-3} = 2$ $y - 2x - 3$ <p>(b) (i) Gradient of <math>L_2</math></p> $= -\frac{1}{2}$ <p>Equation of <math>L_2</math></p> $\frac{y-3}{x-2} = -\frac{1}{2} \text{ or } \frac{y-3}{x-2} = -\frac{1}{2}$ $y-3 = -\frac{1}{2}x-1$ $y = -\frac{1}{2}x+2$ <p>(b)(ii) When <math>y=0</math></p> $\frac{1}{2}x + 2 = 0$ $x = -4$ <p>The x intercept of <math>L_2</math> is <math>-4</math></p> <p>(c) At point of intersection of <math>L_1</math> and <math>L_2</math></p> $2x-3 = -\frac{1}{2}x+2$ $2\frac{1}{2}x = 5$ $x = 2$ <p>When <math>x = 2</math>, <math>y = 2(2) - 3 = 1</math></p> <p>Point of intersection is <math>(2,1)</math></p>	<p>M1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>M1</p> <p>M1</p> <p>A1</p> <p>10</p>	<p>reject <math>G = \frac{\Delta x}{\Delta y}</math></p> <p>Or equivalent</p> <p>Or equivalent</p>

no  
m  
A

R2



No.	Marking Scheme	Marks	Comments
19.			<p>If the line <math>y = x + 1</math> is not drawn then its <math>P_0</math> <math>L_0</math> <math>B_0</math></p>
	(a) (i) $\triangle ABC$ correctly drawn	B1	
	(ii) Line $y = x + 1$	P1 L1	plotting ✓ line drawn
	(iii) Triangle $A'B'C'$		+ becomes 20
	Identifying coordinates of vertices of $\triangle A'B'C'$	B1	If line not drawn
	$\triangle A''B''C''$ correctly drawn	B1	if the line is dotted then
	(b) Correct rotation of $-90^\circ$	B1	P1
	Correct vertices of $\triangle A''B''C''$	B1	L0
	$\triangle A''B''C''$ correctly drawn	B1	B1 ✓
	(c) (i) Oppositely Congruent	B1	
	(ii) Directly Congruent	B1	
		10	B1 ✓

No.	Marking Scheme	Marks	Comments
20.	(a)		
	$\frac{AB}{8} = \frac{10}{20}$	M1	
	$AB = \frac{1}{2} \times 8$		
	$= 4 \text{ cm}$	A1	
	(b) (i) $AC = \sqrt{16+16} \text{ cm}$	M1	
	$= \sqrt{32} \text{ cm}$		
	$= 5.66 \text{ cm}$	A1	
	(ii) 1. height of pyramid		
	$\sqrt{10^2 - \left(\frac{1}{2} \times 5.66\right)^2} = \sqrt{(10^2 - 2.83^2)}$	M1	
	$= 9.59 \text{ cm}$	A1	
(c) Volume of VABCD			
$= \frac{1}{3} \times 4 \times 4 \times 9.59$	M1		
$= 51.15 \text{ cm}^3$			
Volume of VEF'GH			
$= \frac{1}{3} \times 8 \times 8 \times (2 \times 9.59)$	M1	$2 \times 9.59 = 19.18$	
$= 409.17$			
Volume of frustum ABCDEFGH			
$= 409.17 - 51.15$	M1		
$= 358.02 \text{ cm}^3$	A1		
		10	

ALT. (C)

$L : f = 1 : 2$

$V : S : f = 1 : 8$

$V \text{ of frustum} = V_{\text{Big}} - V_{\text{Small}} = 7$

$V \text{ of pyramid} = 7 \times \text{vol of small}$

121/1 MS

$7 \times \frac{1}{3} \times 4 \times 4 \times 9.59 \text{ minimum}$

$358.02 \text{ A}_1$

$\downarrow$   
10

ALT. (i) Candidate who uses his/her own assumed mean

then; Column 4 for M1

$$\text{mean} = \frac{\sum fd}{\sum f} \times M1$$

177 A1

No	Marking Scheme	Marks	Comments																																
21	(a) $2 + 8 + 10 + 6 + 2 + x = 40$ $x = 12$	B1																																	
	(b) Modal class = 180 - 189	B1																																	
	(c) (i) Mean																																		
	<table border="1"> <thead> <tr> <th>Height</th> <th>Mid pt</th> <th>Freq</th> <th>fx</th> </tr> </thead> <tbody> <tr> <td>150 - 159</td> <td>154.5</td> <td>2</td> <td>309</td> </tr> <tr> <td>160 - 169</td> <td>164.5</td> <td>8</td> <td>1316</td> </tr> <tr> <td>170 - 179</td> <td>174.5</td> <td>10</td> <td>1745</td> </tr> <tr> <td>180 - 189</td> <td>184.5</td> <td>12</td> <td>2214</td> </tr> <tr> <td>190 - 199</td> <td>194.5</td> <td>6</td> <td>1167</td> </tr> <tr> <td>200 - 209</td> <td>204.5</td> <td>2</td> <td>409</td> </tr> <tr> <td></td> <td></td> <td>40</td> <td>7160</td> </tr> </tbody> </table>	Height	Mid pt	Freq	fx	150 - 159	154.5	2	309	160 - 169	164.5	8	1316	170 - 179	174.5	10	1745	180 - 189	184.5	12	2214	190 - 199	194.5	6	1167	200 - 209	204.5	2	409			40	7160	M1 M1	for midpoint x } all correctly for fx } all correctly
Height	Mid pt	Freq	fx																																
150 - 159	154.5	2	309																																
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200 - 209	204.5	2	409																																
		40	7160																																
	Mean height = $\frac{7160}{40}$	M1																																	
	= 179	A1	C.A.O																																
	(i) Median																																		
	<table border="1"> <tbody> <tr> <td>U.C.B</td> <td>159.5</td> <td>169.5</td> <td>179.5</td> <td>189.5</td> <td>199.5</td> <td>209.5</td> </tr> <tr> <td>C.F</td> <td>2</td> <td>10</td> <td>20</td> <td>32</td> <td>38</td> <td>40</td> </tr> </tbody> </table>	U.C.B	159.5	169.5	179.5	189.5	199.5	209.5	C.F	2	10	20	32	38	40	B1 B1	From table or implied																		
U.C.B	159.5	169.5	179.5	189.5	199.5	209.5																													
C.F	2	10	20	32	38	40																													
	Median Height = height of 20 <sup>th</sup> athlete = 179.5	M1 A1	C.A.O																																
	* ALT. Median = $169.5 + \left(\frac{20-10}{10}\right) \times 10$	M1 B1																																	

$$= 179.5 \quad 121/1 \text{ MS} \quad A1$$

H/B  $\Rightarrow$  If a candidate does the average for 20<sup>th</sup> & 21<sup>st</sup> then; B1 B0 M0 A0. f B1 - is for C.F }

No.	Marking Scheme	Marks	Comments
22.	(a) Let $\angle BDC = \theta$ $\frac{\sin \theta}{5} = \frac{\sin 30^\circ}{4}$	M1	Follow thro Question
	$\sin \theta = \frac{5 \times \sin 30^\circ}{4} = 0.625$	A1	
	Acute $\theta = 38.68^\circ$		
	Obtuse $\theta = 141.32^\circ$	B1	
	(b) Length AD Angle ABD = $180 - 38.68 \times 2 = 102.64$	M1	process of getting 102.64
	$AD^2 = 4^2 + 4^2 - 2 \times 4 \times 4 \cos 102.64 = 39$	M1	use of cosine rule / sin rule
	AD = 6.25m	A1	
	(c) Length of DC $\angle DBC = 180 - (30 + 141.32) = 8.68^\circ$ Using sine rule $\frac{\sin 8.68}{D} = \frac{\sin 30}{4}$	M1	
	$\Rightarrow D = 8 \sin 8.68 = 1.21m$	A1	
	(d) Area of ABC $= \frac{1}{2} \times 4 \times 5 \sin(8.68 + 102.64) = 9.32m^2$	M1 A1 10	ALT. Heron's formula - $S = 8.23$ $A = 9.31m^2$ $8.68^\circ + 102.64^\circ = 111.32^\circ$

ALT.  
 b)  $4 \cos 38.68^\circ = \frac{1}{2} AD$   
 $AD = 4 \cos 38.68^\circ = 6.25m$  A1  
 b)  $\frac{AD}{\sin 102.64} = \frac{4}{\sin 38.68}$

ALT.  
 $AD = \frac{4 \sin 102.64}{\sin 38.68} = 6.25m$  A1

P12

No.	Marking Scheme	Marks	Comments																																
23.	<p>(a)</p> <table border="1"> <thead> <tr> <th>x</th> <th>0</th> <th>200</th> <th>400</th> <th>600</th> <th>800</th> <th>1000</th> <th>1200</th> </tr> </thead> <tbody> <tr> <td>Ordinates along AB</td> <td>200</td> <td>240</td> <td>280</td> <td>300</td> <td>280</td> <td>240</td> <td>200</td> </tr> <tr> <td>Ordinates along <del>AB</del> CD</td> <td>400</td> <td>500</td> <td>580</td> <td>600</td> <td>580*</td> <td>580</td> <td>640</td> </tr> <tr> <td>AC - AB</td> <td>200</td> <td>260</td> <td>300</td> <td>300</td> <td>300</td> <td>540</td> <td>440</td> </tr> </tbody> </table> <p>(b) Area of piece of land ABCD using trapezium rule  <i>Area under curve AB</i>  <math>= \frac{1}{2} \times 200 \{ (200 + 200) + 2(240 + 280 + 300 + 280 + 240) \}</math> — M1  <math>= 100(400 + 2680)</math>  <math>= 308\,000 \text{ m}^2</math>  <i>Area under curve CD</i>  <math>= \frac{1}{2} \times 200 \{ (400 + 640) + 2(500 + 580 + 600 + 580 + 580) \}</math> — M1  <math>= 100(1040 + 5680)</math>  <math>= 672\,000</math>            Area of land ABCD  <math>= 672\,000 - 308\,000</math>  <math>= 364\,000 \text{ m}^2</math> — A1  <math>= \frac{364\,000}{10\,000} \text{ ha}</math>  <math>= 36.4 \text{ ha}</math> — B1</p> <p>(c) (c) Area using mid ordinate Rule:  <math>= 400 \{ (500 + 600 + 580) - (240 + 300 + 240) \}</math> — B1  <math>= 400 \times 900</math> — M1  <math>= 360\,000 \text{ m}^2</math> — A1  <math>= \frac{360\,000}{10\,000}</math>  <math>= 36 \text{ ha}</math> — B1</p>	x	0	200	400	600	800	1000	1200	Ordinates along AB	200	240	280	300	280	240	200	Ordinates along <del>AB</del> CD	400	500	580	600	580*	580	640	AC - AB	200	260	300	300	300	540	440	10	For ordinates along CD At x = 800, accept 580 ≤ 580* ≤ 590  Mid ordinates subtraction
x	0	200	400	600	800	1000	1200																												
Ordinates along AB	200	240	280	300	280	240	200																												
Ordinates along <del>AB</del> CD	400	500	580	600	580*	580	640																												
AC - AB	200	260	300	300	300	540	440																												

B ✓

No.	Marking Scheme	Marks	Comments
24.	<p>(a)(i)</p> $y = x^3 + x^2 - x - 1$ $\frac{dy}{dx} = 3x^2 + 2x - 1$ <p><math>3x^2 + 2x - 1 = 0</math> at stationary point.</p> $(x + 1)(3x - 1) = 0$ <p><math>x = -1</math> or <math>\frac{1}{3}</math></p> <p><math>(-1, 0)</math> and <math>(\frac{1}{3}, -1\frac{5}{27})</math> or <math>(0.3, -1.185)</math></p>	M1 M1	
	<p>(b)(ii) Nature of stationary points</p> $\frac{d^2y}{dx^2} = 6x + 2$ <p>At <math>x = -1</math></p> $\frac{d^2y}{dx^2} = -6 + 2 = -4$ <p>(Negative)</p> <p><math>x = -1</math> is a maximum point.</p> <p>At <math>x = \frac{1}{3}</math>,</p> $\frac{d^2y}{dx^2} = \frac{6}{3} + 2 = 4$ <p>At <math>x = \frac{1}{3}</math> is a minimum point</p>	A1 B1 B1	<p>reject <math>(\frac{1}{3}, -\frac{32}{27})</math> A0</p> <p>for testing and stationary</p> <p>for testing and stationary</p>

If a student gets a(i) A0 but uses -1 &  $\frac{1}{3}$  correctly

for testing & stationary then the student is given B1 ✓

in a(ii)

B1 ✓

No.	Marking Scheme	Marks	Comments
	(b) (i) at $x = 1$ $y = 0$ At $x = 1$ $\frac{dy}{dx} = 3(1) + 2(1) = 4$ Equation of tangent	B1	
	$\frac{y-0}{x-1} = 4$	M1	
	$y = 4x - 4$	A1	
	(b) (ii) Let gradient of normal = $m_2$ $m_2 \times 4 = -1$ $m_2 = -\frac{1}{4}$ $\frac{y-0}{x-1} = -\frac{1}{4}$	M1	
	$y = -\frac{1}{4}x + \frac{1}{4}$	A1	
		10	