

# KAPSABET HIGH SCHOOL

## MARKING SCHEME

1.	Max value = $3.45 \times 9.85 - 2.65 \times 2.95 = 26.165$ Min value = $3.35 \times 9.75 - 2.75 \times 3.05 = 24.275$ Working value = $3.4 \times 9.8 - 2.7 \times 3.0 = 25.22$ Error = $\frac{1}{2} (26.165 - 24.275) = 0.945$ % error = $\frac{0.945}{25.22} \times 100 = 3.747\%$	M <sub>1</sub> M <sub>1</sub>  M <sub>1</sub> A <sub>1</sub>	
2.	$3(2x-1) = 8x-1$ $6x-3 = 8x-1$ $-2x = 2$ $x = -1$	M <sub>1</sub>  A <sub>1</sub>	
3.	$A = P \left[ 1 + \frac{r}{100} \right]^n$  $= 200,000 \left[ 1 + \frac{7}{100} \right]^4$  $= 200,000 (1.3107960)$ $= \text{Sh. } 262159.20$ $I = 262159.20 - 200000 = \text{Sh. } 62,159$	M <sub>1</sub>  A <sub>1</sub> B <sub>1</sub>	For correct substitution
4.	$\frac{(\sqrt{2} + \sqrt{3})(\sqrt{6} + \sqrt{3})}{(\sqrt{6} - \sqrt{3})(\sqrt{6} + \sqrt{3})}$  $\frac{\sqrt{12} + \sqrt{6} + \sqrt{18} + 3}{6 - 3}$ $\frac{2\sqrt{3} + \sqrt{6} + 3\sqrt{2} + 3}{3}$	M <sub>1</sub>  M <sub>1</sub> A <sub>1</sub>	For multiplication by conjugate surd.  For rationalisation
5.	$\frac{30}{x-2} - \frac{30}{x} = \frac{1}{2}$  $\frac{30x - 30(x-2)}{x(x-2)} = \frac{1}{2}$  $x(x-2) = 120$ $x^2 - 2x - 120 = 0$ $x^2 - 2x + (\frac{1}{2}x - 2)^2 = 120 + \left[ \frac{-2}{2} \right]^2$  $x^2 - 2x + 1 = 121$ $(x-1)^2 = 121$  $x-1 = \pm \sqrt{121}$  $x-1 = \pm 11$ $x=12 \text{ or } x=-10$	M <sub>1</sub>  A <sub>1</sub> M <sub>1</sub>  A <sub>1</sub>	For quadratic equation   For both
6.	$12^{\text{th}} \text{ term} = ar^{11}$ $10^{\text{th}} \text{ term} = ar^9$  $\frac{ar^{11}}{ar^9} = \frac{9}{1}$ $r^{11-9} = 9$ $r^2 = 9$ $r = \pm 3$	M <sub>1</sub>  A <sub>1</sub>	

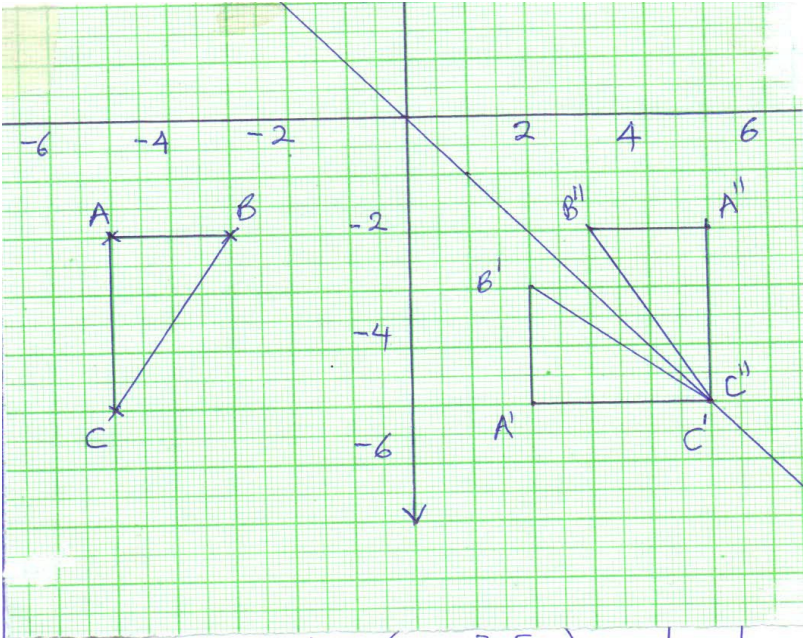
	$r = 3 \text{ or } -3$																
7.	$(2 - \frac{1}{4}x)^5 = 2^5 + (2^4)(5)(\frac{-1}{4}x)^2 +$ $10(2^2)(\frac{-1}{4}x)^3 + 5(2)(\frac{-1}{4}x)^4 + (\frac{-1}{4}x)^5$ $= 32 - 20x + 5x^2 - \frac{5}{8}x^3 + \frac{5}{128}x^4 - \frac{1}{1024}x^5$	B <sub>1</sub>															
ii.	$1.96^5 = 32 - 20(0.16) + 5(0.16)^2 - \frac{5}{8}(0.16)^3 + \frac{5}{128}(0.16)^4 -$ $\frac{1}{1024}(0.16)^5$ $= 28.925$	M <sub>1</sub>															
		A <sub>1</sub>															
8.	a) $QW \times QX = QY \times QZ$ $11 \times 6 = 4(a+4)$ $4a + 16 = 66$ $4a = 50$ $a = 25$ b) $QS^2 = QY \times QZ$ $= 4(4+12.5)$ $QS = \sqrt{66}$ $= 8.124$	M <sub>1</sub>															
		A <sub>1</sub>															
		M <sub>1</sub>															
		A <sub>1</sub>															
9.	$x(x-1) - 3x(x+1) = 0$ $x^2 - x - 3x^2 - 3x = 0$ $-2x^2 - 4x = 0$ $-2x(x+2) = 0$ $x = 0 \text{ or } x = -2$	M <sub>1</sub>	Det = 0														
		M <sub>1</sub>	Factors														
		A <sub>1</sub>	For both														
10.	$\frac{s - sr}{a} = 1 - r^n$ $r^n = 1 - \frac{s - sr}{a}$ $n \log r = \log \left[ 1 - \frac{s - sr}{a} \right]$ $n = \frac{\log \left[ 1 - \frac{s - sr}{a} \right]}{\log r}$ or $n = \frac{\log \left[ \frac{a - s + sr}{a} \right]}{\log r}$	M <sub>1</sub>															
		A <sub>1</sub>															
11.	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Men</th> <th style="text-align: left;">hrs</th> <th style="text-align: left;">land</th> <th style="text-align: left;">days</th> </tr> </thead> <tbody> <tr> <td>18</td> <td>8</td> <td>1</td> <td>12</td> </tr> <tr> <td>24</td> <td>12</td> <td><math>\frac{3}{4}</math></td> <td>?</td> </tr> </tbody> </table> $\frac{18}{24} \times \frac{8}{12} \times \frac{3}{4} \times 12$ 4 $\frac{1}{2}$ days	Men	hrs	land	days	18	8	1	12	24	12	$\frac{3}{4}$	?	M <sub>1</sub>			
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12.	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">No</th> <th style="text-align: left;">log</th> </tr> </thead> <tbody> <tr> <td>0.8465</td> <td><math>\frac{1.9277}{+}</math></td> </tr> <tr> <td>12.14</td> <td><math>\frac{1.0842}{+}</math></td> </tr> <tr> <td></td> <td>1.0119</td> </tr> <tr> <td>214.5</td> <td><math>\frac{2.3314}{-}</math></td> </tr> <tr> <td>9.067</td> <td><math>\frac{0.9574}{-}</math></td> </tr> <tr> <td></td> <td>1.3740</td> </tr> </tbody> </table>	No	log	0.8465	$\frac{1.9277}{+}$	12.14	$\frac{1.0842}{+}$		1.0119	214.5	$\frac{2.3314}{-}$	9.067	$\frac{0.9574}{-}$		1.3740	M <sub>1</sub>	All logs correct
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	$\frac{1.0119 - \frac{1.3740}{1.96379 \times \frac{1}{4}}}{8.119 \times 10^{-1}} = 1.9095$ $= 0.8119$	A <sub>1</sub>	C.A.O																					
13.	<table border="1"> <thead> <tr> <th>x</th> <th>f</th> <th>cf</th> </tr> </thead> <tbody> <tr> <td>45 – 50</td> <td>2</td> <td>2</td> </tr> <tr> <td>51 – 56</td> <td>10</td> <td>12</td> </tr> <tr> <td>57 – 62</td> <td>11</td> <td>23</td> </tr> <tr> <td>63 – 68</td> <td>20</td> <td>33</td> </tr> <tr> <td>69 – 74</td> <td>6</td> <td>39</td> </tr> <tr> <td>75 – 80</td> <td>1</td> <td>40</td> </tr> </tbody> </table> <p> <math>\frac{1}{4} \times 50 = 12.5^{\text{th}} = \left[ 56.5 + \frac{12.5 - 12}{11} \right] 6</math>  <math>= 56.77\text{kg}</math> </p> <p> <math>\frac{3}{4} \times 50 = 37.5^{\text{th}} ;</math>  <math>62.5 + \left[ \frac{37.5 - 23}{20} \right] 6</math>  <math>= 66.85\text{kg}</math>          Quartile deviation <math>= \frac{1}{2} (66.85 - 56.77)</math>  <math>= 5.04</math> </p>	x	f	cf	45 – 50	2	2	51 – 56	10	12	57 – 62	11	23	63 – 68	20	33	69 – 74	6	39	75 – 80	1	40	B <sub>1</sub>         B <sub>1</sub>   B <sub>1</sub>	For both quartiles
x	f	cf																						
45 – 50	2	2																						
51 – 56	10	12																						
57 – 62	11	23																						
63 – 68	20	33																						
69 – 74	6	39																						
75 – 80	1	40																						
14.	$P = \frac{KQ^3}{\sqrt{R}}$ $P_1 = \frac{K(1.2Q)^3}{\sqrt{0.64R}}$ $= \frac{1.728KQ^3}{0.8\sqrt{R}}$ $= 2.16 \frac{KQ^3}{\sqrt{R}}$ $\frac{2.16 - 1}{1} \times 100$ $= 116\%$	M <sub>1</sub>    M <sub>1</sub>  A <sub>1</sub>																						
15.	<p>Let cos x be y</p> $8y^2 - 2y - 1 = 0$ $4y + 1)(2y - 1) = 0$ <p>y = - ¼ or ½</p> <p>cos x = ¼ =&gt; x = 75.52</p> <p>angle in 2<sup>nd</sup> and 3<sup>rd</sup> quadrant</p> <p>∴ x = 104.48, 255.52</p> <p>Cosx = ½ =&gt; x = 60<sup>0</sup></p>	M <sub>1</sub>   A <sub>1</sub>	For obtaining both a acute angles 75.52 <sup>0</sup> and 60 <sup>0</sup>																					

	<p>Angle in 1<sup>st</sup> and 4<sup>th</sup> quadrant.</p> <p><math>x = 60^0, 300^0</math></p> <p><math>\therefore x = 104.48, 255.52^0, 60^0, 300^0</math></p>	B <sub>1</sub>	All must be correct
16.	$AB = \begin{bmatrix} 1 \\ 5 \end{bmatrix} - \begin{bmatrix} 0 \\ 3 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$ $BC = \begin{bmatrix} 4 \\ 11 \end{bmatrix} - \begin{bmatrix} 1 \\ 5 \end{bmatrix} = \begin{bmatrix} 3 \\ 6 \end{bmatrix}$ <p>KAB = BC</p> $K \begin{bmatrix} 1 \\ 2 \end{bmatrix} = \begin{bmatrix} 3 \\ 6 \end{bmatrix}$ <p>K = 3</p> <p><math>\therefore 3AB = BC</math></p> <p>AB//BC and B is common</p>	<p>B<sub>1</sub></p> <p>B<sub>1</sub></p> <p>B<sub>1</sub></p> <p>B<sub>1</sub></p>	For both expressions
17.	<p>a. i) <math>OB = p + q</math></p> <p>ii) <math>AD = \frac{3}{5}(5q) - p</math> <math>3q - p</math></p> <p>iii) <math>CB = -sq + p + q</math> <math>= -4q + p</math></p> <p>b. <math>OX = rOB</math> <math>= r(p + q) = rp + rq</math> <math>OX = p + k(3kq - pk)</math></p> <p><math>rp + rq = p + 3kq - pk</math></p> <p><math>r = 1 - k</math></p> <p><math>r = 3k</math></p> <p><math>k = 3k</math></p> <p><math>k = \frac{1}{4}</math></p> <p><math>r = 1 - \frac{1}{4} = \frac{3}{4}</math></p>	<p>B<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p> <p>B<sub>1</sub></p> <p>B<sub>1</sub></p> <p>B<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p>	For both
18.	<p>a) <math>\frac{25}{10} = \frac{x + 15}{x}</math></p> <p><math>25x = 10x + 150</math></p> <p><math>15x = 150</math></p> <p><math>x = 10</math></p> <p><math>\frac{1}{2}(\sqrt{25^2 + 25^2}) = 17.68</math></p>	B <sub>1</sub>	

	$H = \sqrt{25^2 - 17.68^2} = 17.68$ $\frac{1}{2} \sqrt{10^2 + 10^2} = 7.071$ $h = \sqrt{10^2 - 7.071^2} = 7.071\text{cm}$ <p>Height of frustrum = <math>17.68 - 7.071</math></p> <p>= <math>10.6\text{cm}</math></p> <p>b) i)</p> $\begin{array}{c} 25 \\ \ominus \\ \text{Cos } \Theta = \frac{17.68}{25} = 0.7072 \\ \Theta = 45^{\circ} \end{array}$ <p>ii)</p> $\begin{array}{c} 17.68 \\ \ominus \\ 12.5 \\ \text{Tan } \Theta = \frac{17.68}{12.5} = 1.414 \\ \Theta = 54.74 \\ \approx 54.7^{\circ} \end{array}$ <p>c) <math>\frac{1}{3} \times 625 \times 17.68 - \frac{1}{3} \times 100 \times 7.071</math>  <math>3,683.3 - 235.7</math>  <math>= 3,447.6\text{cm}^3</math></p>	<p>M<sub>1</sub></p> <p>A<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p> <p>M<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p>	
19.	<p>a) Taxable income = <math>21,000 + 9000</math>  p.a = sh. <math>30,000</math>  <math>\frac{30000 \times 12}{12} = \text{K}\text{£ } 18,000</math> p.a</p> <p><math>2 \times 3900 = 7,800</math>  <math>3 \times 3900 = 11,700</math>  <math>4 \times 3900 = 15,600</math>  <math>5 \times 3900 = 19,500</math>  <math>7 \times 2400 = \underline{16,800}</math>  71,400</p> <p><math>\frac{15}{100} \times 2000 = 300</math></p> <p>Total relief p.a = <math>(300 + 1056) \times 12</math>  = sh. <math>16,272</math></p> <p>Tax paid <math>71400 - 16272 = \text{sh. } 55, 128</math></p>	<p>B<sub>1</sub></p> <p>B<sub>1</sub></p> <p>B<sub>1</sub></p> <p>B<sub>1</sub></p> <p>B<sub>1</sub></p> <p>B<sub>1</sub></p>	

	<p>P.A.Y.E <math>\frac{55128}{12} = \text{sh } 4594</math></p> <p>b) Total deductions = <math>4594 + 2000 + 2000 + 2500 = \text{sh. } 11,094</math> per month</p> <p>Net salary = <math>30,000 - 11,094</math> <math>= \text{sh. } 18,906</math></p>	<p>B<sub>1</sub></p> <p>M<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p>	
<p>20.</p>	<p>i) <math>\frac{7}{200} \times 50 + \frac{19}{400} \times 30</math></p> <p><math>1.75 + 1.425</math> <math>= 3.175</math></p> <p>ii) <math>\frac{3.175 \times 100}{80}</math></p> <p><math>= 3.96875\%</math></p> <p>iii) let the masses be x</p> $\left[ \frac{\frac{19}{400}x + \frac{7}{200}(50 - x)}{50} \right] 100 = 4$ $\left[ \frac{1.25x + 1.75}{50} \right] 100 = 4$ <p><math>1.25x + 175 = 200</math> <math>1.25x = 25</math></p> <p><math>x = \frac{25}{1.25}</math></p> <p><math>x = 20</math> <math>x &gt; 20</math></p>	<p>M<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p> <p>M<sub>1</sub></p> <p>M<sub>1</sub></p> <p>M<sub>1</sub></p> <p>A<sub>1</sub></p> <p>B<sub>1</sub></p>	
<p>21.</p>	<p>b) i) <math>(\frac{7}{12} \times \frac{6}{11} \times \frac{5}{10}) + (\frac{7}{12} \times \frac{5}{11} \times \frac{6}{10}) + (\frac{5}{12} \times \frac{7}{11} \times \frac{6}{10})</math></p> <p><math>= \frac{21}{44}</math></p>	<p>M<sub>1</sub></p> <p>A<sub>1</sub></p>	

	<p>ii) <math>(\frac{7}{12} \times \frac{5}{11} \times \frac{4}{10}) + (\frac{5}{12} \times \frac{7}{11} \times \frac{4}{10}) + (\frac{5}{12} \times \frac{4}{11} \times \frac{7}{10})</math></p> $= \frac{7}{22}$ <p>iii) <math>(\frac{5}{12} \times \frac{4}{11} \times \frac{7}{10}) + (\frac{5}{12} \times \frac{7}{11} \times \frac{4}{10}) + (\frac{7}{12} \times \frac{5}{11} \times \frac{4}{10}) + (\frac{5}{12} \times \frac{7}{11} \times \frac{6}{10}) + (\frac{7}{12} \times \frac{5}{10} \times \frac{6}{10}) + (\frac{7}{12} \times \frac{6}{11} \times \frac{5}{10}) + (\frac{7}{12} \times \frac{6}{11} \times \frac{5}{10})</math></p> $= \frac{427}{440}$	M <sub>1</sub> A <sub>1</sub> M <sub>1</sub> A <sub>1</sub>																									
22.	 <p>c) <math>\begin{bmatrix} a &amp; b \\ c &amp; d \end{bmatrix} \begin{bmatrix} -5 &amp; -3 &amp; -5 \\ -2 &amp; -2 &amp; -5 \end{bmatrix} \begin{bmatrix} 5 &amp; 3 &amp; 5 \\ -2 &amp; -2 &amp; 5 \end{bmatrix}</math></p> <p><math>a = -1, b = 0, c = 0, d = 1</math></p> $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$ <p>d) <u>Reflection in y-axis</u> (<math>x = 0</math>)</p> <p>e) <math>A^{111} 2 = \frac{d}{2}</math>     <math>\frac{d}{2} = 4</math> units parallel to x-axis</p> <p><math>A^{111} (0, -2)</math>  <math>B^{111} (2, -2)</math>  <math>C^{111} 2 = \frac{d}{5}</math>     <math>d = 10</math></p> <p><math>\therefore C^{111} (-5+10, -5) = C^{111}(5, -5)</math></p>	B <sub>1</sub> B <sub>1</sub> B <sub>1</sub> M <sub>1</sub> M <sub>1</sub> A <sub>1</sub> B <sub>2</sub> B <sub>1</sub> B <sub>1</sub>	<p>Correctly draw ABC</p> <p>FOR 4A<sup>1</sup>B<sup>1</sup>C<sup>1</sup></p> <p>For all coordinates of A<sup>111</sup>, B<sup>111</sup>, C<sup>111</sup></p> <p>For at least one method.</p> <p>For all coordinates of A<sup>111</sup>, B<sup>111</sup> and C<sup>111</sup></p>																								
23	<table border="1" style="border-collapse: collapse; text-align: center;"> <tbody> <tr> <td>x</td> <td>0</td> <td>40</td> <td>80</td> <td>120</td> <td>160</td> <td>200</td> <td>240</td> </tr> <tr> <td><math>2\sin(x+20^\circ)</math></td> <td>0.7</td> <td>1.7</td> <td>2.0</td> <td>1.3</td> <td>0.0</td> <td>-1.3</td> <td>-2.0</td> </tr> <tr> <td><math>\sqrt{3} \cos x</math></td> <td>1.7</td> <td>1.3</td> <td>0.3</td> <td>-0.9</td> <td>-1.6</td> <td>-1.6</td> <td>-0.9</td> </tr> </tbody> </table>	x	0	40	80	120	160	200	240	$2\sin(x+20^\circ)$	0.7	1.7	2.0	1.3	0.0	-1.3	-2.0	$\sqrt{3} \cos x$	1.7	1.3	0.3	-0.9	-1.6	-1.6	-0.9	B <sub>2</sub> B <sub>1</sub> B <sub>0</sub>	<p>For all values correct</p> <p>For one value wrong.</p> <p>More than one value wrong.</p>
x	0	40	80	120	160	200	240																				
$2\sin(x+20^\circ)$	0.7	1.7	2.0	1.3	0.0	-1.3	-2.0																				
$\sqrt{3} \cos x$	1.7	1.3	0.3	-0.9	-1.6	-1.6	-0.9																				

b)		S1 P1 C1 P1 C1	
	$x = 30^\circ \text{ or } 208^\circ + 2$		
c i)		B <sub>1</sub>	
ii)	$2 - 1.7 = 0.3$	B <sub>1</sub>	
24.			
a)	Distance $270 \times 12$	M <sub>1</sub>	
i)	$= 3240\text{nm}$	A <sub>1</sub>	
ii)	In km, $= 3240 \times 1.853$	M <sub>1</sub>	
	$= 6003.72$	A <sub>1</sub>	
b)	$600 \times 14 = 840\text{nm}$	M <sub>1</sub>	
	$3240 - 840 = 2400\text{nm}$		
	$\frac{240}{60}$	M <sub>1</sub>	
	$= 40^\circ\text{E.}$	A <sub>1</sub>	
		M <sub>1</sub>	
c)	$54 \times 4 = 216 \text{ minutes}$		
	$= 3 \text{ hrs } 36 \text{ mins.}$		
	$9.13 - 3 \text{ hrs } 36 \text{ mins}$	M <sub>1</sub>	
	$= 5.37 \text{ pm.}$	A <sub>1</sub>	