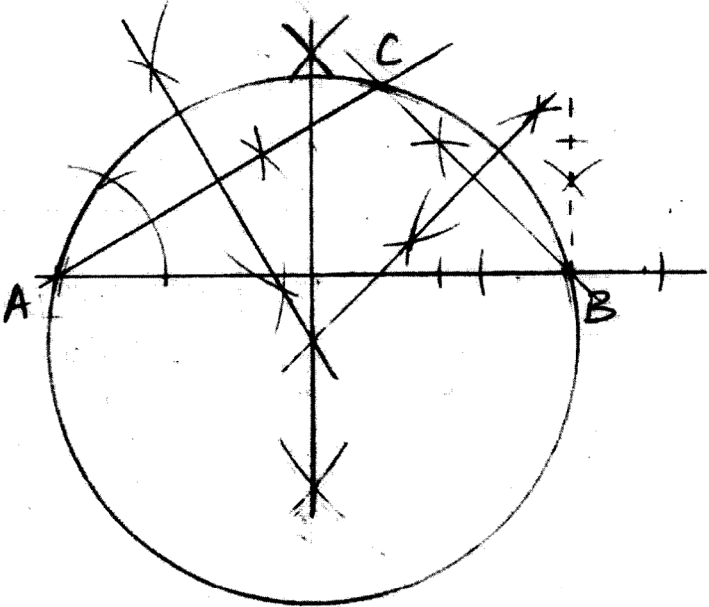


5.1.4 Mathematics Alternative B Paper 2 (122/2)

1.	$200 + \frac{90 \times 5}{10}$ $= 245$	B1 M1 A1  3	✓ rounding off ✓ operations												
2.	$mn = pm^2 - pn$ $mn + pn = pm^2$ $n(m + p) = pm^2$ $n = \frac{pm^2}{m + p}$	M1  M1  A1  3													
3.	$x(x - 3) = 108$ $x^2 - 3x - 108 = 0$ $(x - 12)(x + 9) = 0$ $x = 12 \text{ or } x = -9$ $\therefore \text{length} = 12m$	B1  M1  A1  3	or equivalent expression												
4. (a)	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 20%;">CLASS</th> <th style="width: 10%;">1-10</th> <th style="width: 10%;">11-20</th> <th style="width: 10%;">21-30</th> <th style="width: 10%;">31-40</th> <th style="width: 10%;">41-50</th> </tr> </thead> <tbody> <tr> <td>FREQUENCY</td> <td>3</td> <td>8</td> <td>10</td> <td>8</td> <td>7</td> </tr> </tbody> </table>	CLASS	1-10	11-20	21-30	31-40	41-50	FREQUENCY	3	8	10	8	7	B1 B1  B1  3	classes frequencies
CLASS	1-10	11-20	21-30	31-40	41-50										
FREQUENCY	3	8	10	8	7										
(b)	modal class $= 21 - 30$	B1  3													
5.	Interest = $195\,600 - 120\,000$ $= 75\,600$ Rate: $120\,000 \times R \times \frac{7}{2} = 75\,600$ $\Rightarrow R = \frac{75\,600 \times 2}{120\,000 \times 7} \times 100$ $= 18\%$	B1  M1  A1  3													

6.		B1	30° and 45° constructed
		B1	completion of Δ.
		B1	Perpendicular bisector at least 2 sides of Δ.
		B1	Drawing circle.
		4	
7.	$2x + y = 5 \dots (i)$ $11x + 4y = 17 \dots (ii)$ $8x + 4y = 20$ $11x + 4y = 17$ <hr style="width: 20%; margin-left: 0;"/> $x = -1$ <p>Subst. <math>x = -1</math> in (i): <math>2(-1) + y = 5</math></p> $y = 7$ $x = -1, y = 7$	M1	
		M1	
		A1	
		3	
8.	$\underline{OB} = \begin{pmatrix} 2 \\ 5 \end{pmatrix} + \begin{pmatrix} 4 \\ 5 \end{pmatrix}$ $= \begin{pmatrix} 6 \\ 10 \end{pmatrix}$ $OM = \frac{1}{2} \begin{pmatrix} 6 \\ 10 \end{pmatrix}$ $= \begin{pmatrix} 3 \\ 5 \end{pmatrix}$ <p>M is (3, 5)</p>	M1	
		M1	
		A1	
		3	

9.	Function of work done in 4 hours. $= 4\left(\frac{1}{10} + \frac{1}{15} + \frac{1}{18}\right)$ $\frac{8}{9}$	M1 A1																	
		2																	
10.	$AC^2 = 8^2 + 6^2 - 2 \times 8 \times 6 \cos 120^\circ$ $= 64 + 36 - 96 \times -0.5$ $AC = \sqrt{148} = 12.17$	M1 M1 A1																	
		3																	
11.	(a) <table border="1"> <thead> <tr> <th>x</th> <th>-3</th> <th>-2</th> <th>-1</th> <th>0</th> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td><math>y = 3x^2 + 8</math></td> <td>(35)</td> <td>20</td> <td>(11)</td> <td>8</td> <td>11</td> <td>(20)</td> <td>35</td> </tr> </tbody> </table>	x	-3	-2	-1	0	1	2	3	$y = 3x^2 + 8$	(35)	20	(11)	8	11	(20)	35	B1	
x	-3	-2	-1	0	1	2	3												
$y = 3x^2 + 8$	(35)	20	(11)	8	11	(20)	35												
(b)		P1 C1																	
		3																	

12.	$1^{\text{st}} \text{ bracket: } 9680 \times \frac{10}{100}$ $= 968$ $2^{\text{nd}} \text{ bracket: } (16420 - 9680) \times \frac{15}{100}$ $= 1011$ $\text{Net tax: } (968 + 1011) - 1056$ $= 923$	M1 M1 M1 A1	
		4	
13.	$a = 50\,000; r = 1.1$ $s_n = 50\,000 \times \frac{(1.1)^3 - 1}{1.1 - 1}$ $= 165\,500$	B1 M1 A1	
		3	
14.	$\text{Longitude difference} = 15^\circ + 6 = 21^\circ$ $\text{Time difference} = 21 \times 4 = 84 \text{ min}$ $\text{local time at R} = 8.30 + 1\text{h } 24 \text{ min}$ $= 9.54 \text{ pm}$	B1 B1 B1	
		3	
15.	$\begin{array}{ccc} & P & Q & R \\ \begin{pmatrix} a & b \\ c & d \end{pmatrix} & \begin{pmatrix} -3 & 1 & 4 \\ 1 & 3 & -2 \end{pmatrix} & = & \begin{pmatrix} 6 & -2 & -8 \\ -2 & -6 & 4 \end{pmatrix} \end{array}$ $-3a + b = 6 \qquad c + 3d = -6$ $a + 3b = -2 \qquad 4c - 2d = 4$ $a = -2 \qquad c = 0$ $b = 0 \qquad d = -2$ $\text{Matrix} = \begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$	M1 M1 A1 B1	
		4	

16.	<table border="1"> <tr> <td>x</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td></td> <td>2</td> <td>3</td> <td>6</td> <td>11</td> <td>18</td> <td>27</td> </tr> </table> <p><math>y = x^2 + 2</math></p> <p><math>Area = \frac{1}{2}\{(2 + 27) + 2(3 + 6 + 11 + 18)\}cm^2</math></p> <p><math>\frac{1}{2}\{29 + 2 \times 38\}</math></p> <p><math>= 52.5cm^2</math></p>	x	0	1	2	3	4	5		2	3	6	11	18	27	B1 M1 A1 3	√ ordinates (may be implied from working)
x	0	1	2	3	4	5											
	2	3	6	11	18	27											
17.	<p>(a) (i)</p> <p><i>Mass of type x:</i> <math>\frac{7}{10} \times 20 = 14kg</math></p> <p><i>Mass of type y:</i> <math>\frac{3}{10} \times 20 = 6kg</math></p> <p>(ii)</p> <p><i>Cost Price</i> = <math>14 \times 150 + 6 \times 240</math></p> <p>= Sh 3 540</p> <p><i>Selling Price</i> = Sh <math>\frac{125}{100} \times 3540</math></p> <p>= Sh 4 425</p> <p>(b) (i)</p> <p><math>\frac{150a + 240b}{a + b} = 186</math></p> <p><math>150a + 240b = 186a + 186b</math></p> <p><math>36a = 54b</math></p> <p><math>a:b = 3:2</math></p> <p>(ii)</p> <p><math>\frac{3}{5} \times 500g</math></p> <p>= 300g</p>	B1 B1 M1 M1 A1 M1 A1 M1 A1 10															

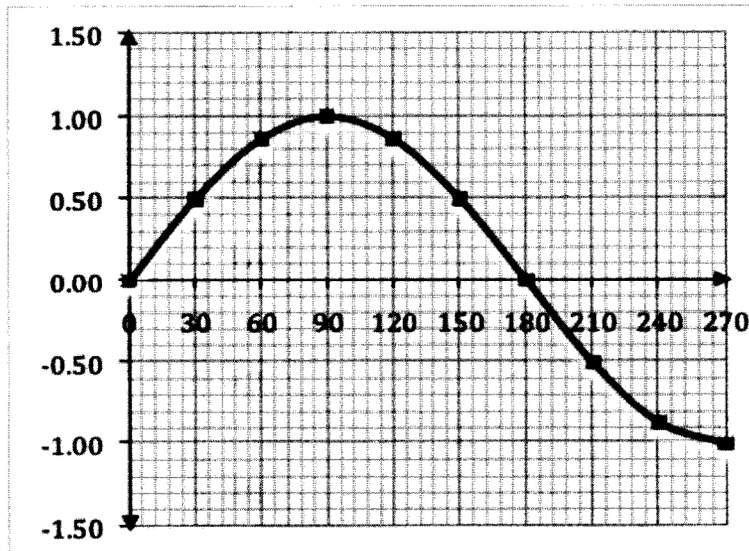
18.	<p>(a) <math>R = \begin{pmatrix} x &amp; 3 \\ 2x &amp; 3x \end{pmatrix}</math></p> <p><math>\therefore 3x^2 - 6x = 0</math>  <math>3x(x - 2) = 0</math>  <math>x = 0 \text{ or } x = 2</math></p> <p>(b) (i) <math>BA = \begin{pmatrix} 2 &amp; -1 \\ 0 &amp; 1 \end{pmatrix} \begin{pmatrix} 3 &amp; 1 \\ 2 &amp; 4 \end{pmatrix}</math>  <math>= \begin{pmatrix} 4 &amp; -2 \\ 2 &amp; 4 \end{pmatrix}</math></p> <p>(ii) <math>3B = 3 \begin{pmatrix} 2 &amp; -1 \\ 0 &amp; 1 \end{pmatrix} = \begin{pmatrix} 6 &amp; -3 \\ 0 &amp; 3 \end{pmatrix}</math></p> <p>(iii) <math>P = \begin{pmatrix} 4 &amp; -2 \\ 2 &amp; 4 \end{pmatrix} - \begin{pmatrix} 6 &amp; -3 \\ 0 &amp; 3 \end{pmatrix}</math>  <math>= \begin{pmatrix} -2 &amp; 1 \\ 2 &amp; 1 \end{pmatrix}</math></p> <p>(iv) <math> P  = -2 \times 1 - 2 \times 1</math>  <math>= -4</math></p> <p>Inverse of <math>P = -\frac{1}{4} \begin{pmatrix} 1 &amp; -1 \\ -2 &amp; -2 \end{pmatrix}</math>  <math>= \begin{pmatrix} -\frac{1}{4} &amp; \frac{1}{4} \\ \frac{1}{2} &amp; \frac{1}{2} \end{pmatrix}</math></p>	<p>M1 M1 A1 B1</p> <p>B1</p> <p>M1 A1</p> <p>B1</p> <p>M1</p> <p>A1</p>	
		10	

19. (a)

$x$	$0^\circ$	$30^\circ$	$60^\circ$	$90^\circ$	$120^\circ$	$150^\circ$	$180^\circ$	$210^\circ$	$240^\circ$	$270^\circ$
$\sin x$		0.5			0.87			-0.5	-0.87	-1

B2 Allow B1 for 3 or 4 values correct.

(b)



(c)  $x$  when  $y = 0.7$

$$x = 45^\circ$$

$$= 135^\circ$$

(d)  $\sin x = -0.4$

$$x = 204^\circ$$

S1  $\checkmark$  use of scale  
 P2 P1 for at least 7  $\checkmark$   
 C1 curve

B1  
 B1  
 B1  
 B1

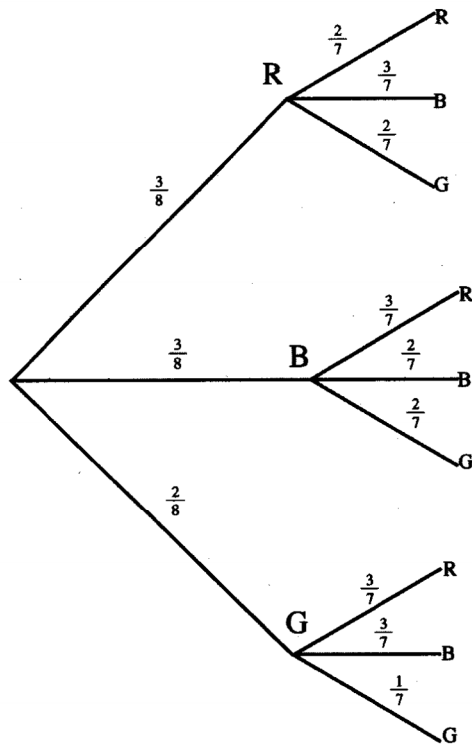
10

20.	<p>(a) (i)</p> $OP = \frac{2.5}{\sin 50^\circ}$ $= 3.26 \text{ cm}$ <p>(ii)</p> $AP = \frac{2.5 \sin 40^\circ}{\sin 50}$ $= 2.10$ <p>(iii)</p> $AC = 2 AE$ $= 2 \times 2.5 \sin 40^\circ$ $= 3.21$ <p>(b) (i)</p> $\angle PAC = 40^\circ$ <p>(sum of <math>\angle</math>s in <math>\triangle AEP</math>)</p> $\angle ADC = 40^\circ$ <p>(angle in alt. segment)</p> <p>(ii)</p> $\angle ACD = \frac{1}{2}(180^\circ - 40^\circ)$ $= 70^\circ$	M1 A1  M1 A1  M1 A1  B1  B1  M1 A1	
		10	
21.	<p>(a) Value of car after 3 years</p> $(100 - 10)\% = 90\%$ $500000 \times 0.9^3$ $= 364\ 500$ <p>(b) (i)</p> $364500 \times 1.15$ $= 419\ 175$ <p>(ii)</p> $419175 \times 1.12^2$ $= 525\ 813$ <p>(c) % gain from investment</p> $= \frac{(525813 - 364500)}{364500} \times 100$ $= 44.3\%$	M1 M1 A1  M1 A1  M1 A1  M1 M1 A1	
		10	



22.

(a)



B1 1<sup>st</sup> set branches

B1 2<sup>nd</sup> set branches

(b) (i) P (both balls red)

$$= \frac{3}{8} \times \frac{2}{7}$$

$$= \frac{3}{28}$$

M1

A1

(ii) P (one ball red and one ball green)

$$= \frac{3}{8} \times \frac{2}{7} + \frac{2}{8} \times \frac{3}{7}$$

$$= \frac{6}{56} + \frac{6}{56} = \frac{3}{14}$$

M1

M1

A1

(iii) P (different colours)

$$= 1 - \left[ \left( \frac{3}{8} \times \frac{2}{7} \right) + \left( \frac{3}{8} \times \frac{2}{7} \right) + \left( \frac{2}{8} \times \frac{1}{7} \right) \right]$$

$$= 1 - \frac{14}{56} = \frac{3}{4}$$

M1

M1

A1

P (same colours)

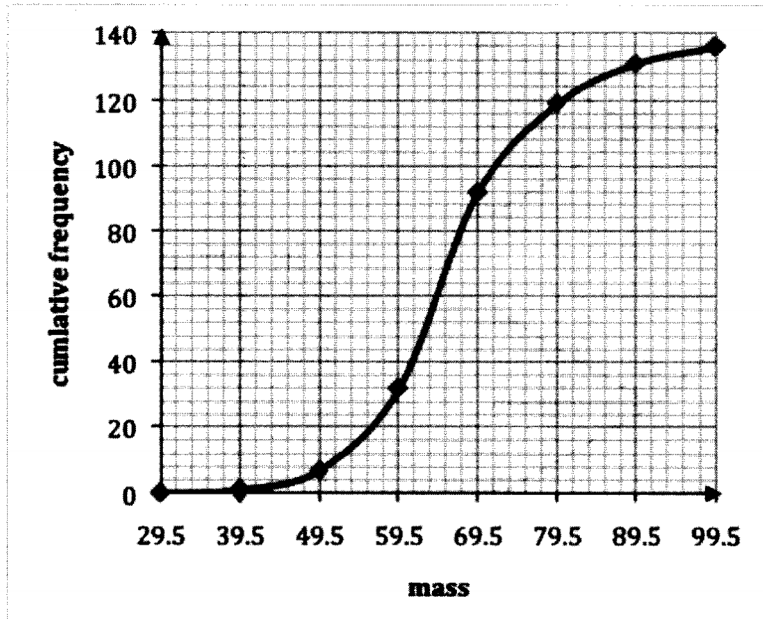
1 - P (same colours)

10

23.

Mass kg	30-39	40-49	50-59	60-69	70-79	80-89	90-99
Frequency	2	5	25	60	27	12	5
Upper class unit	39.5	49.5	59.5	69.5	79.5	89.5	99.5
Cumulative frequency	1	7	32	92	119	131	136

B1	for upper class limit
B1	for c.f.



(b) (i) identifying 68 patients  
reading  $65.5 \pm 1$  kg

(ii) identifying 50.5 kg  
reading 8 patients

S1	✓ scale
P2	✓ plotting allow B1 for 4-6
C1	points

B1
B1

B1
B1

10
----

24.	<p>(a) (i)</p> $S = \frac{kT}{R}$ $\Rightarrow 18 = \frac{k \times 9}{4}$ $k = \frac{18 \times 4}{9}$ $= 8$ <p>(ii)</p> $S = \frac{8T}{R}$ <p>(iii) value of T when S = 108 and R = 6</p> $T = \frac{S \times R}{8}$ $= \frac{108 \times 6}{8}$ $= 81$ <p>(b) % change of S</p> $\text{New } S = \frac{8 \times T}{1.2R}$ $\text{Old } S = \frac{8T}{R}$ $\text{change} = \frac{8T}{1.2R} - \frac{8T}{R}$ $\% = \left( \frac{1}{1.2} - 1 \right) \times 100$ $= -16\frac{2}{3}\%$	<p>B1</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>10</p>	<p>making T the subject</p> <p>✓ substitution</p>
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