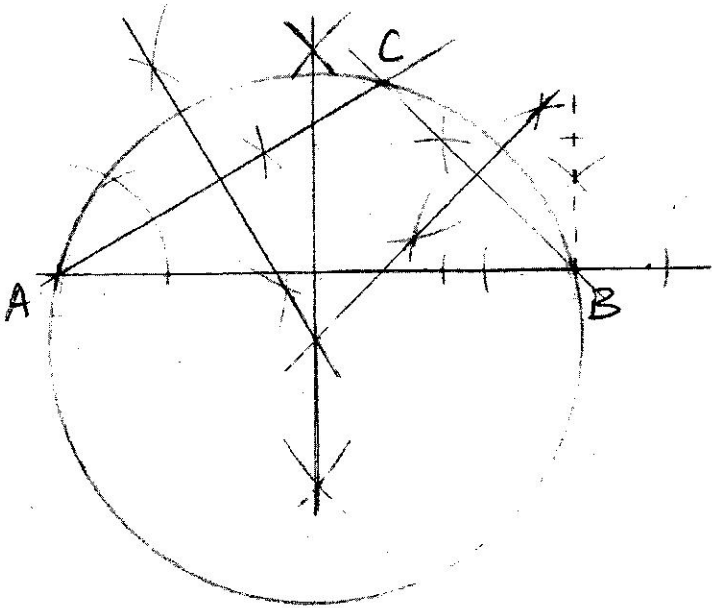


5.1.4 Mathematics Alternative B Paper 2 (122/2)

1.	$200 + \frac{90 \times 5}{10}$ $= 245$	B1 M1 A1	\checkmark rounding off \checkmark operations												
2.		M1 M1 A1													
3.		B1 M1 A1	or equivalent expression												
4. (a)	<table border="1" style="width: 100%; border-collapse: collapse;"> <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	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													
5.		B1 M1 A1													
		3													

6.		B1 B1 B1 B1	30° and 45° constructed completion of Δ. Perpendicular bisector at least 2 sides of Δ. 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. $x = -1$ in (i): $2(-1) + y = 5$</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>$y = 3x^2 + 8$</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.	$\begin{matrix} & P & Q & R & & P' & Q' & R' \\ \begin{pmatrix} a & b \\ c & d \end{pmatrix} & \begin{pmatrix} -3 & 1 & 4 \\ 1 & 3 & -2 \end{pmatrix} & = & \begin{pmatrix} 6 & -2 & -8 \\ -2 & -6 & 4 \end{pmatrix} \\ -3a + b = 6 & & & c + 3d = -6 \\ a + 3b = -2 & & & 4c - 2d = 4 \\ \\ a = -2 & & & c = 0 \\ b = 0 & & & d = -2 \\ \\ \text{Matrix} = \begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix} \end{matrix}$	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> $y = x^2 + 2$ $Area = \frac{1}{2}\{(2 + 27) + 2(3 + 6 + 11 + 18)\}cm^2$ $\frac{1}{2}\{29 + 2 \times 38\}$ $= 52.5cm^2$ </p>	x	0	1	2	3	4	5		2	3	6	11	18	27	B1 M1 A1 3	$\sqrt{\quad}$ 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>Mass of type x: $\frac{7}{10} \times 20 = 14kg$</p> <p>Mass of type y: $\frac{3}{10} \times 20 = 6kg$</p> <p>(ii)</p> <p>Cost Price = $14 \times 150 + 6 \times 240$</p> <p style="padding-left: 40px;">$= Sh\ 3\ 540$</p> <p>Selling Price = $Sh\ \frac{125}{100} \times 3540$</p> <p style="padding-left: 40px;">$= Sh\ 4\ 425$</p> <p>(b) (i)</p> <p>$\frac{150a + 240b}{a + b} = 186$</p> <p>$150a + 240b = 186a + 186b$</p> <p>$36a = 54b$</p> <p>$a:b = 3:2$</p> <p>(ii)</p> <p>$\frac{3}{5} \times 500g$</p> <p style="padding-left: 40px;">$= 300g$</p>	B1 B1 M1 M1 A1 M1 A1 M1 A1 10															

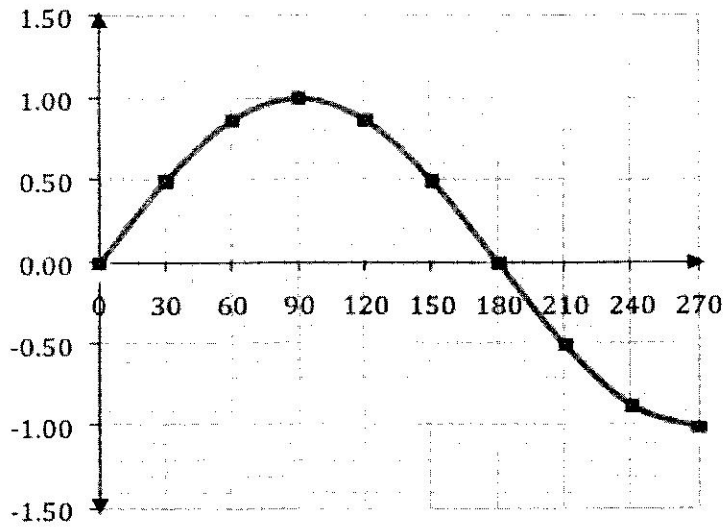
18.	<p>(a) $R = \begin{pmatrix} x & 3 \\ 2x & 3x \end{pmatrix}$</p> <p>$\therefore 3x^2 - 6x = 0$ $3x(x - 2) = 0$ $x = 0$ or $x = 2$</p> <p>(b) (i) $BA = \begin{pmatrix} 2 & -1 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 3 & 1 \\ 2 & 4 \end{pmatrix}$</p> <p style="margin-left: 100px;">$= \begin{pmatrix} 4 & -2 \\ 2 & 4 \end{pmatrix}$</p> <p>(ii) $3B = 3 \begin{pmatrix} 2 & -1 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 6 & -3 \\ 0 & 3 \end{pmatrix}$</p> <p>(iii) $P = \begin{pmatrix} 4 & -2 \\ 2 & 4 \end{pmatrix} - \begin{pmatrix} 6 & -3 \\ 0 & 3 \end{pmatrix}$</p> <p style="margin-left: 100px;">$= \begin{pmatrix} -2 & 1 \\ 2 & 1 \end{pmatrix}$</p> <p>(iv) $P = -2 \times 1 - 2 \times 1$</p> <p style="margin-left: 100px;">$= -4$</p> <p>Inverse of $P = -\frac{1}{4} \begin{pmatrix} 1 & -1 \\ -2 & -2 \end{pmatrix}$</p> <p style="margin-left: 100px;">$= \begin{pmatrix} -\frac{1}{4} & \frac{1}{4} \\ \frac{1}{2} & \frac{1}{2} \end{pmatrix}$</p>	<p>M1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>M1</p> <p>A1</p>	
		10	

19. (a)

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

B2	Allow B1 for 3 or 4 values correct.
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(b)



(c) x when $y = 0.7$

$$x = 45^\circ$$

$$= 135^\circ$$

(d) $\sin x = -0.4$
 $x = 204^\circ$

S1	✓ use of scale
P2	P1 for at least 7 ✓
C1	curve

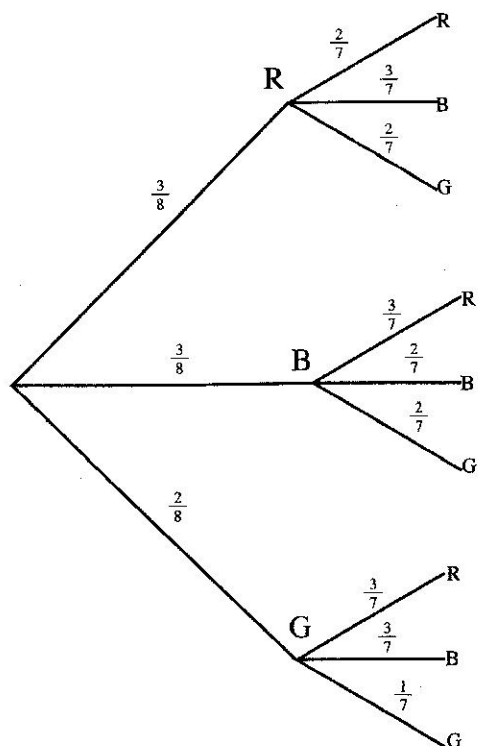
B1
B1
B1
B1

10

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

22.

(a)

B1 1st set branchesB1 2nd 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)

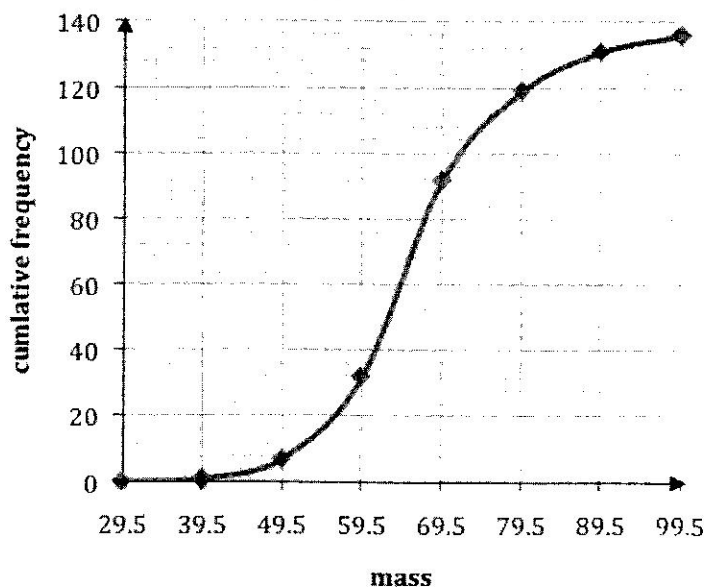
1 - P (same colours)

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.



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

(b) (i) identifying 68 patients
reading 65.5 ± 1 kg

B1
B1

(ii) identifying 50.5 kg
reading 8 patients

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>M1</p> <p>A1</p> <p>10</p>	<p>making T the subject</p> <p>✓ substitution</p>
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