



Independent Schools
Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

LEVEL 3 MARK SCHEME

This is a suggested, not a prescriptive, mark scheme.

Autumn 2014

The majority of answers are worth two marks.

Award M: 1 A: 1 unless otherwise stated.

The multiplier for Level 3 to Level 2 is often set around 1.2, so that 60% on Level 3 approximates to 72% on Level 2.

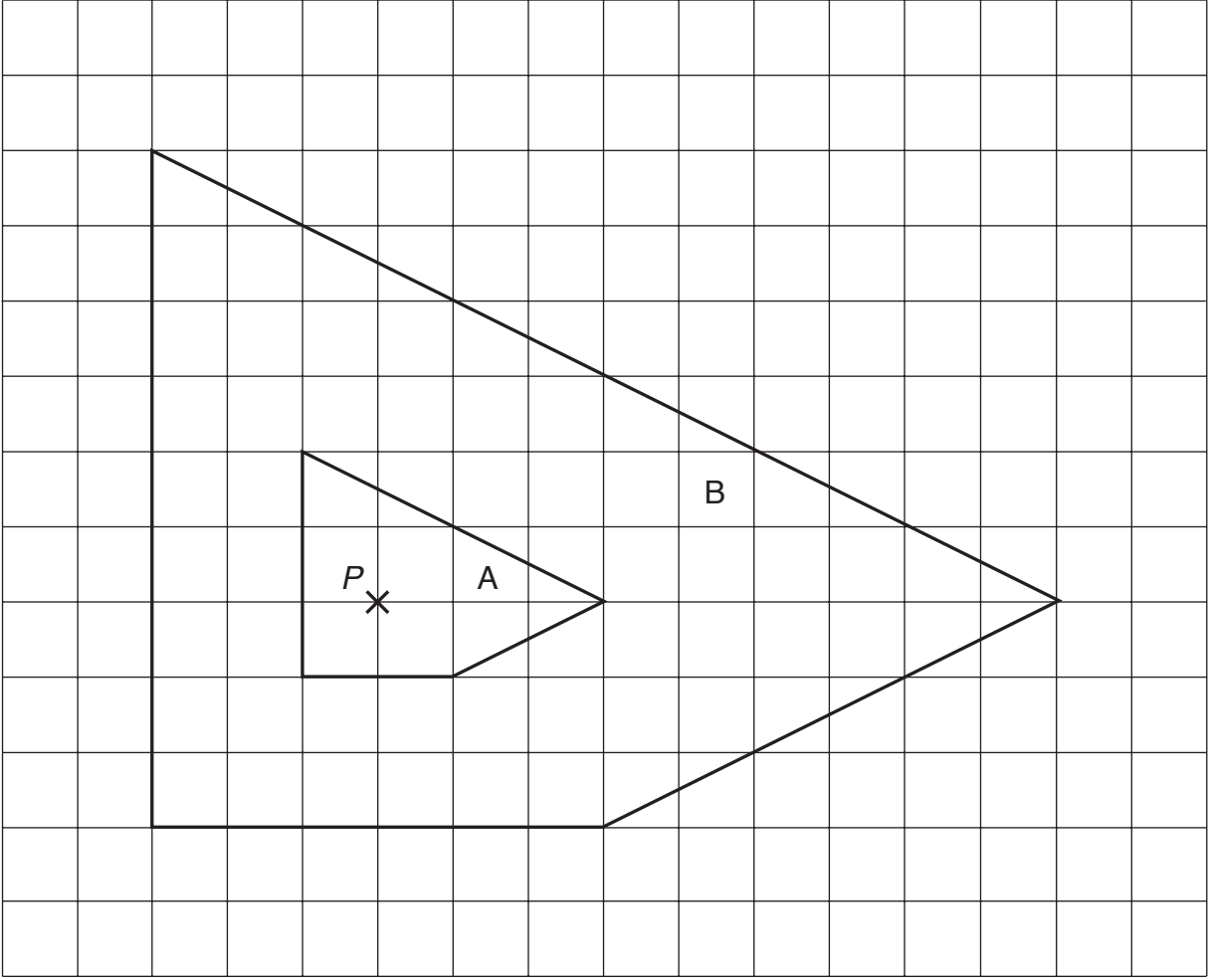


LEVEL 3: NON-CALCULATOR

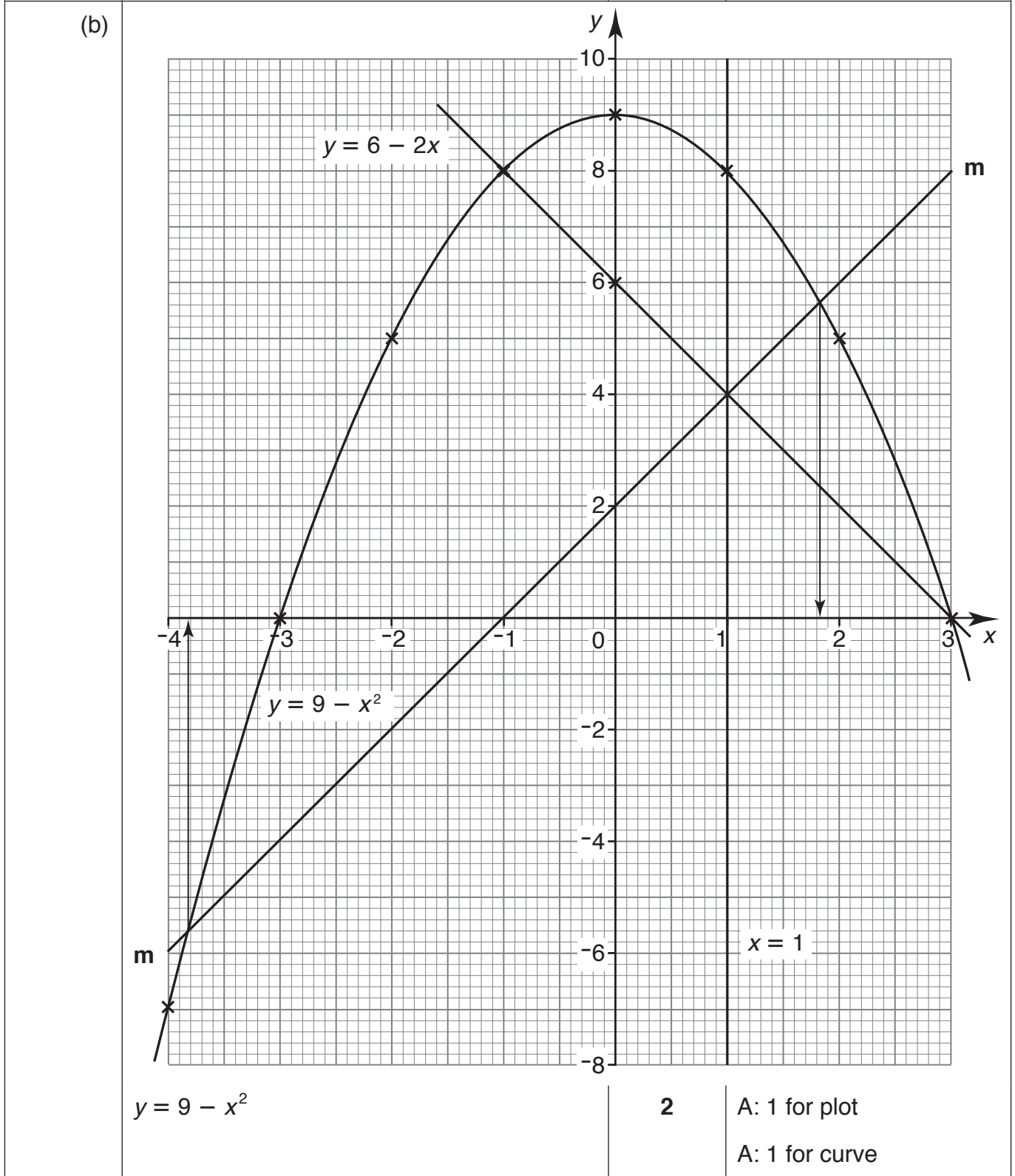
Q.	Answer	Mark	Additional Guidance
1. (i)	11.58	1	A: 1
(ii)	1.82	2	
(iii)	2.34	2	
(iv)	2600	2	
2. (i) (a)	£16.25	2	M: 1 for $\frac{65}{100} \times 25$ A: 1 for answer
(b)	2750 g	2	M: 1 for $3300 \times \frac{5}{6}$ or 2.75 A: 1 for answer
(ii) (a)	16%	1	A: 1
(b)	0.019, $\frac{4}{25}$, 18%, $\frac{1}{5}$	2	A: 1 for 0.019 smallest A: 1 for order
3. (i)	7	2	M: 1 for -7 or $+8$ A: 1 for answer
(ii)	-6	2	M: 1 for 9×2 A: 1 for answer
4. (i)	$2 \times 2 \times 3 \times 7$ or <i>equivalent</i>	2	M: 1 for two of 2, 3, 7 A: 1 for answer
(ii)	420 s	2	M: 1 for matching multiples A: 1 for answer
5. (i)	1600	1	A: 1
(ii)	7p	2	M: 1 for $11\,200 \div 1600$ A: 1 for answer
(iii)	£32	2	A: 1 for 80 A: 1 for answer

Q.	Answer	Mark	Additional Guidance
6. (i)	$\frac{7}{20}$ kg	2	M: 1 for $\frac{15}{20}$ or $\frac{8}{20}$ A: 1 for answer
(ii) (a)	$\frac{3}{8}$ kg	1	A: 1
(b)	13.2 ounces	2	M: 1 for $35.2 \times \frac{3}{8}$ A: 1 for answer
7. (i)	21	2	M: 1 for $12 + 9$ or $\frac{7}{4} \times 12$ A: 1 for answer
(ii)	25	2	M: 1 for $20 \times \frac{5}{4}$ A: 1 for answer
8. (a) (i)	19	2	M: 1 for 15 or +4 A: 1 for answer
(ii)	11	2	M: 1 for 27 or -16 A: 1 for answer
(iii)	-1	2	M: 1 for -5 A: 1 for answer
(b)	$u = \pm 7$	2	M: 1 for $169 = u^2 + 120$ A: 1 for answer but accept $u = 7$

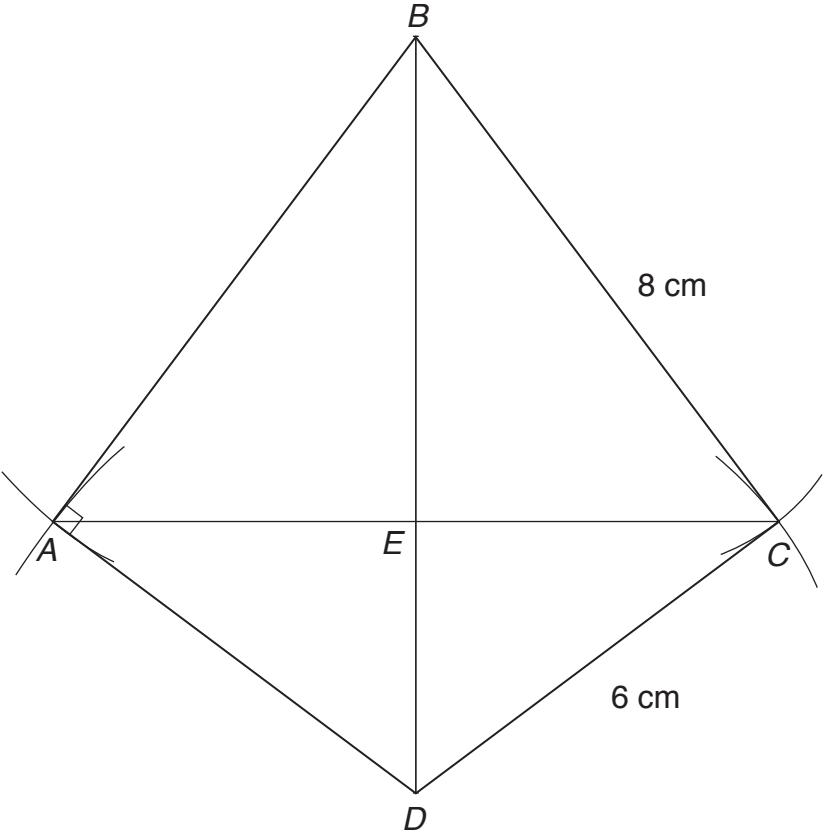
Q.	Answer	Mark	Additional Guidance
9. (i)			
	conversion line	2	A: 1 for straight line through (0,0) A: 1 for accuracy
(ii) (a)	19.2 km/l	1	A: 1 allow 19–19.5
(b)	17 mpg	1	A: 1 allow 16–17.5
(c)	car by 3 mpg	2	M: 1 for 38 mpg A: 1 for answer

Q.	Answer	Mark	Additional Guidance
10. (i)			
	B	2	M: 1 for enlargement A: 1 for accuracy
(ii)	11.7 cm	1	A: 1
(iii)	63 cm ²	2	M: 1 for × 9 A: 1 for answer

Q.	Answer	Mark	Additional Guidance																		
11. (i) (a)	<table border="1"> <tr> <td>x</td> <td>-4</td> <td>-3</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>y</td> <td>-7</td> <td>0</td> <td>5</td> <td>8</td> <td>9</td> <td>8</td> <td>5</td> <td>0</td> </tr> </table>	x	-4	-3	-2	-1	0	1	2	3	y	-7	0	5	8	9	8	5	0	2	A: 1 for 8 and -7 A: 1 for symmetry
	x	-4	-3	-2	-1	0	1	2	3												
y	-7	0	5	8	9	8	5	0													



Q.	Answer	Mark	Additional Guidance								
(ii) (a)	<table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 25%;">x</td> <td style="width: 25%;">-1</td> <td style="width: 25%;">0</td> <td style="width: 25%;">3</td> </tr> <tr> <td>y</td> <td>.....8</td> <td>.....6</td> <td>.....0</td> </tr> </table>	x	-1	0	3	y860	2	A: 1 for 6 and 0 A: 1 for 8
x	-1	0	3								
y860								
(b)	$y = 6 - 2x$	1	A: 1								
(iii)	m	1	A: 1								
(iv)	$x = -3.8$ and $x = 1.8$	2	A: 1 for each value allow -3.7 to -3.9 1.7 to 1.9								

Q.	Answer	Mark	Additional Guidance
12. (i)	 <p>$\triangle BCD$</p>	2	A: 1 for compasses A: 1 for accuracy
(ii)	reflection in BD	1	A: 1
(iii)	$10^2 = 6^2 + 8^2$ – Pythagoras	2	M: 1 for using Pythagoras A: 1 for $10^2 = 6^2 + 8^2$
(iv)	24 cm^2	1	A: 1
(v)	$CE = 4.8 \text{ cm}$	2	M: 1 for $24 = \frac{1}{2} \times 10 \times CE$ A: 1 for answer
(vi)	$6^2 - 4.8^2 = x^2 = 12.96$ $x = 3.6$	2	M: 1 for $6^2 - 4.8^2$ or 23.04 A: 1 for $\sqrt{12.96}$
13. (i)	$a = 64^\circ$ $b = 52^\circ$ $c = 58^\circ$ $d = 58^\circ$	1 2 2 1	A: 1
(ii)	$\widehat{BCD} = 58^\circ \neq \widehat{BAD} = 52^\circ$ or $BC \neq DC$ or $b \neq d$ or $AD \neq DC$ etc	1	A: 1

Q.	Answer	Mark	Additional Guidance																				
14. (i) (a)	<table border="1"> <thead> <tr> <th>pattern</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>dark dots</td> <td>4</td> <td>9</td> <td>16</td> <td>25</td> </tr> <tr> <td>light dots</td> <td>1</td> <td>4</td> <td>9</td> <td>16</td> </tr> <tr> <td>total number of dots</td> <td>5</td> <td>13</td> <td>25</td> <td>41</td> </tr> </tbody> </table>	pattern	1	2	3	4	dark dots	4	9	16	25	light dots	1	4	9	16	total number of dots	5	13	25	41	2	A: 1 for '3' column A: 1 for '4' column
	pattern	1	2	3	4																		
	dark dots	4	9	16	25																		
	light dots	1	4	9	16																		
total number of dots	5	13	25	41																			
(b)	49	1	A: 1																				
(c)	113	2	A: 1 for 64 or 49 A: 1 for answer																				
(ii) (a)	<table border="1"> <thead> <tr> <th>pattern</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>dark lines</td> <td>4</td> <td>12</td> <td>24</td> <td>40</td> </tr> <tr> <td>light lines</td> <td>0</td> <td>4</td> <td>12</td> <td>24</td> </tr> <tr> <td>total number of lines</td> <td>4</td> <td>16</td> <td>36</td> <td>64</td> </tr> </tbody> </table>	pattern	1	2	3	4	dark lines	4	12	24	40	light lines	0	4	12	24	total number of lines	4	16	36	64	2	A: 1 for '2' column A: 1 for remainder
	pattern	1	2	3	4																		
	dark lines	4	12	24	40																		
	light lines	0	4	12	24																		
total number of lines	4	16	36	64																			
(b)	60	1	A: 1																				
(c)	144	1	A: 1																				
(iii)	<table border="1"> <thead> <tr> <th>n</th> <th>n^2</th> <th>$2n^2 + 2n + 1$</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>25</td> <td>61</td> </tr> <tr> <td>10</td> <td>100</td> <td>221</td> </tr> <tr> <td>15</td> <td>225</td> <td>481</td> </tr> <tr> <td>12</td> <td>144</td> <td>313</td> </tr> <tr> <td>11</td> <td>121</td> <td>265</td> </tr> </tbody> </table>	n	n^2	$2n^2 + 2n + 1$	5	25	61	10	100	221	15	225	481	12	144	313	11	121	265	2	A: 1 for a correct row if $n \geq 10$ A: 1 for answer		
	n	n^2	$2n^2 + 2n + 1$																				
	5	25	61																				
	10	100	221																				
	15	225	481																				
	12	144	313																				
	11	121	265																				
$n = 11$																							

Q.	Answer	Mark	Additional Guidance
15. (i)	$3x + 5y = 87$	1	A: 1
(ii)	$6x + 9y = 162$	1	A: 1
(iii)	$x = 9$ $y = 12$	4	M: 1 for balancing equation A: 1 for correct subtraction A: 1 for $x = 9$ A: 1 for $y = 12$
(iv)	10	1	A: 1
Total		100	

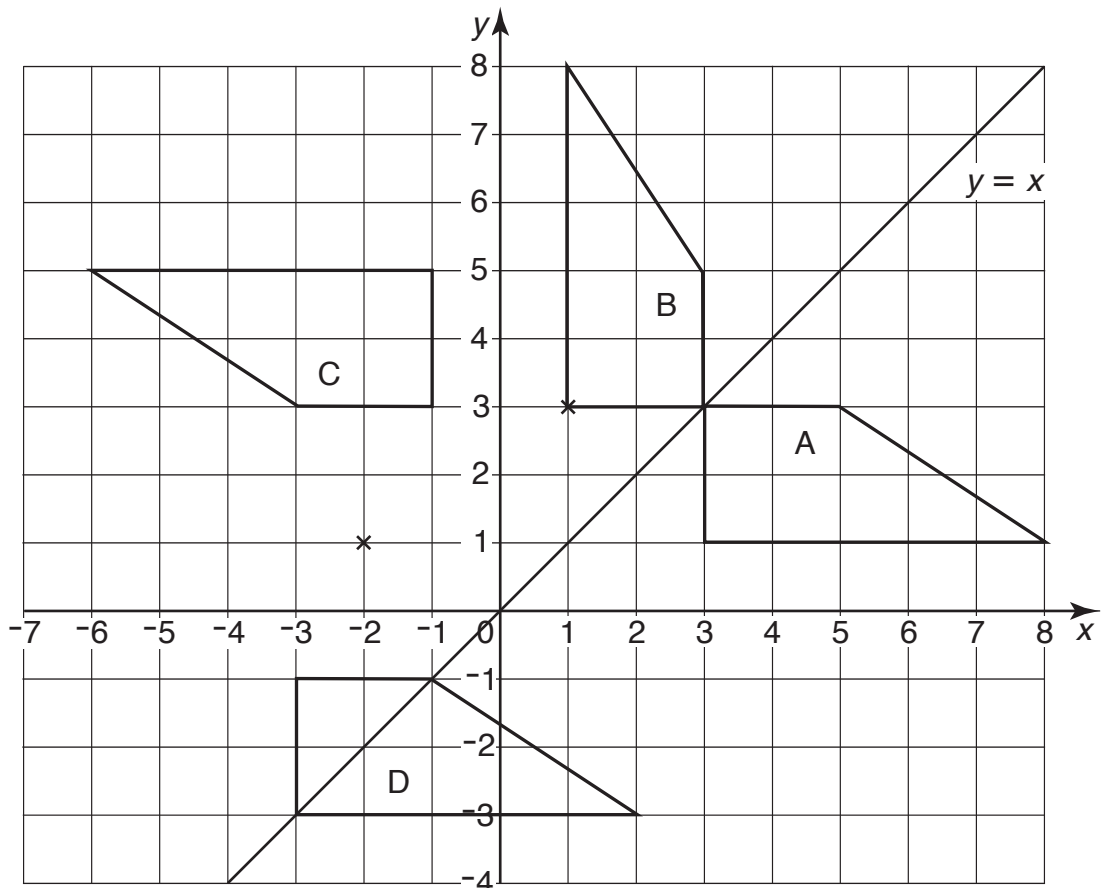
LEVEL 3: CALCULATOR

Q.	Answer	Mark	Additional Guidance
1. (i) (a)	$\frac{60 + 100}{4}$	2	A: 1 for one correct A: 1 for three correct
(b)	40	1	A: 1
(ii) (a)	40.02518892	2	A: 1 for 158.9 A: 1 for answer
(b)	40.03	1	A: 1
(c)	40.0	1	A: 1

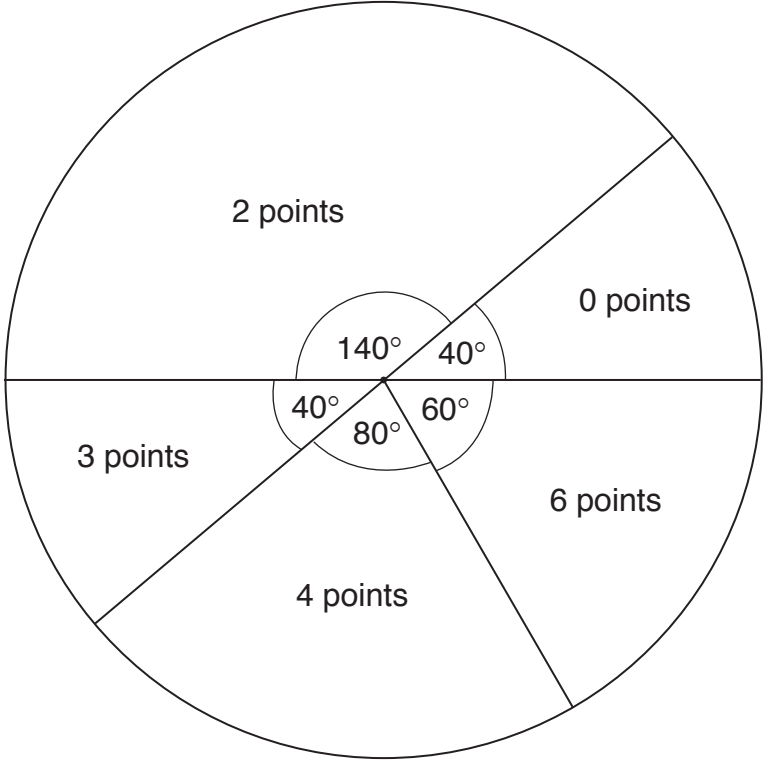
Q.	Answer	Mark	Additional Guidance
2. (i)	37.8%	2	M: 1 for $17 \div 45 \times 100$ A: 1 for answer accept 38% if greater accuracy shown
(ii)	40	2	M: 1 for 2×20 or $14 \div 0.35$ A: 1 for answer
(iii)	Bob by 9 votes	3	A: 1 for 78 and 75 A: 1 for 87 A: 1 for answer
3. (a)	$67\frac{1}{2}^\circ$	2	M: 1 for $7\frac{1}{2}^\circ$ per share A: 1 for answer
(b) (i)	50	2	M: 1 for 5 games per share A: 1 for answer
(ii)	12	2	M: 1 for 6 games per share A: 1 for answer
(iii)	5:5:4	2	A: 1 for 15, 15, 12 A: 1 for answer
4. (i)	300 km	2	M: 1 for $240 \times 1\frac{1}{4}$ or + 60 A: 1 for answer
(ii)	180 km/h	2	M: 1 for $420 \div 2\frac{1}{3}$ A: 1 for answer
(iii)	1h 20 min	2	M: 1 for 680 and 4 A: 1 for answer

Q.	Answer	Mark	Additional Guidance
5. (i)	$7q^2 - 11q$	2	A: 1 for $7q^2$ A: 1 for $-11q$
(ii)	$6s^5t^6$	2	M: 1 for s^5 or t^6 A: 1 for answer
(iii)	$30t^3$	2	A: 1 for $27t^3$ A: 1 for answer
(iv)	$2 + 3w^2$	2	A: 1 for 2 A: 1 for $3w^2$
6. (a)	$3 - 3y$	2	M: 1 for $-15 + 6y$ A: 1 for answer
(b) (i)	$12y(2y + 1)$	2	M: 1 for partial factorisation A: 1 for answer
(ii)	$s = (2y^2 + y)$ cm or equivalent	2	M: 1 for $12s = 24y^2 + 12y$ A: 1 for answer

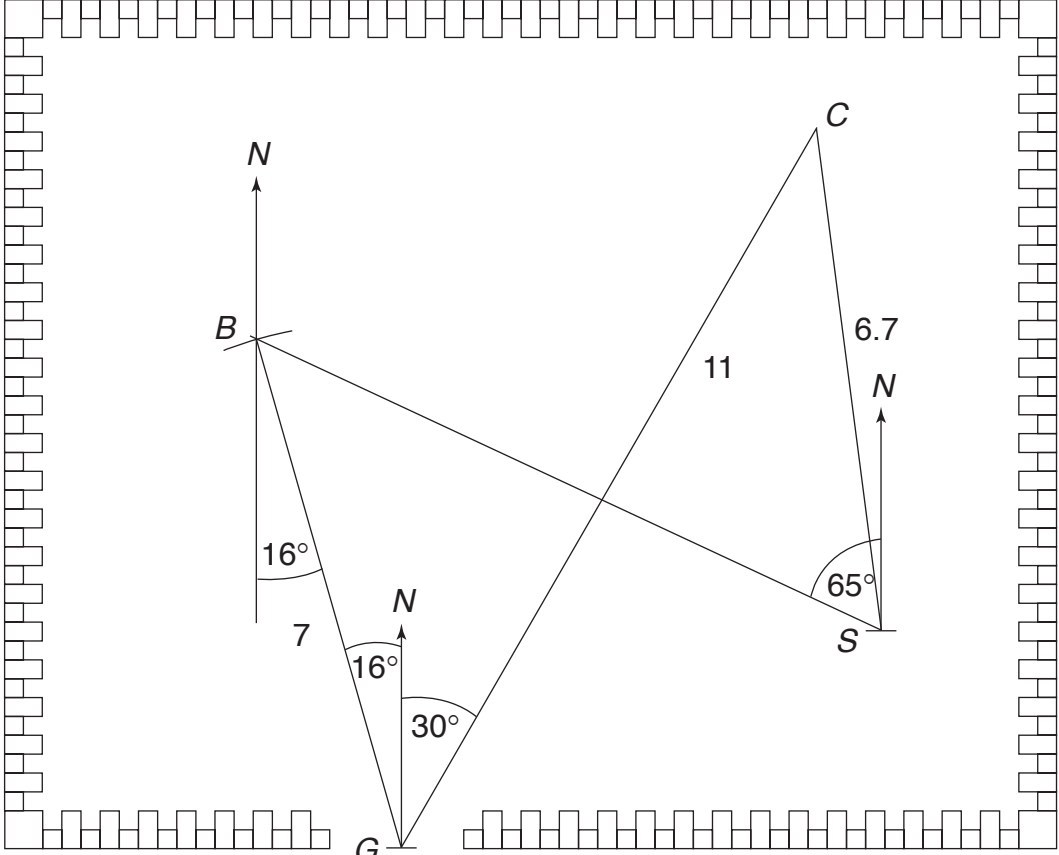
7.



Q.	Answer	Mark	Additional Guidance
7. (i)(a)	$y = x$ (see opposite)	1	A: 1
(b)	B (see opposite)	1	A: 1
(ii)	C (see opposite)	2	M: 1 for 180° rotation A: 1 for accuracy
(iii)	D (see opposite)	2	A: 1 for each movement
(iv)	180° rotation about (-2, 1)	2	A: 1 for 180° rotation A: 1 for (-2,1)
8.(a) (i)	$k = 16$	2	M: 1 for $\frac{3}{4}k = 12$ A: 1 for answer
(ii)	$m = -5$	2	M: 1 for $8m + 12$ A: 1 for answer
(b) (i) (a)	$n \geq 1\frac{4}{5}$	2	M: 1 for $5n \geq 9$ A: 1 for answer
(b)	$n < 7$	2	M: 1 for $19 - 5 > 2n$ or $-2n > -14$ A: 1 for answer
(ii)	720	1	A: 1
9. (i)(a)	9	1	A: 1
(b)	nonagon	1	A: 1
(ii)	$w = 140^\circ$	1	A: 1
	$x = 120^\circ$	2	
	$y = 120^\circ$	1	A: 1
	$z = 20^\circ$	2	

Q.	Answer	Mark	Additional Guidance
10. (i)	2	1	A: 1
(ii)	2.5	2	M: 1 for 9th/10th A: 1 for answer
(iii)	3	2	M: 1 for $\Sigma fx = 54$ A: 1 for answer
(iv)	 <p>pie chart</p>	3	A: 1 for angles A:1 for labels A: 1 for accuracy
(v)	mean range median mode	2	subtract A: 1 for each error

Q.	Answer	Mark	Additional Guidance
11. (i) (a)	$\frac{4}{7}$	2	A: 1 for 2, 3, 5, 7 A: 1 for answer
(b)	$\frac{5}{7}$	2	A: 1 for 1, 2, 3, 4, 6 A: 1 for answer
(ii) (a)	$\frac{1}{4}$	2	A: 1 for 3, 3, 3, 6, 6 A: 1 for answer
(b)	$\frac{5}{19}$	2	A: 1 for 3 + 1 or 3 + 6 A: 1 for answer
12. (i)	5.48 m	2	M: 1 for $3.6 + \frac{1}{2} \times 2\pi r$ A: 1 for answer
(ii)	1.29 m ²	2	M: 1 for $0.72 + \frac{1}{2} \times \pi r^2$ A: 1 for answer
(iii)	15	1	A: 1
(iv)	23 kg	2	M: 1 for area $\times 0.04 \times 450$ = 23.14 or 23.22 A: 1 for answer

Q.	Answer	Mark	Additional Guidance
13. (i)		C	<p>2</p> <p>A: 1 for 11 cm A: 1 for 30°</p>
(ii)	B	2	<p>A: 1 for 295° A: 1 for 7 cm</p>
(iii)	north-line	1	A: 1
(iv)	164°	1	<p>A: 1 allow 162°–166°</p>
(v)	33.5 m	2	<p>A: 1 for 6.7 cm A: 1 for answer allow 32.0–34.5</p>
Total		100	