



Independent Schools
Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

LEVEL 3 MARK SCHEME

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

Spring 2018

The majority of answers are worth two marks.

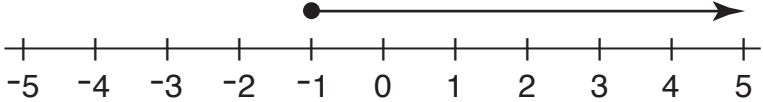
Award M: 1 A: 1 unless otherwise stated.

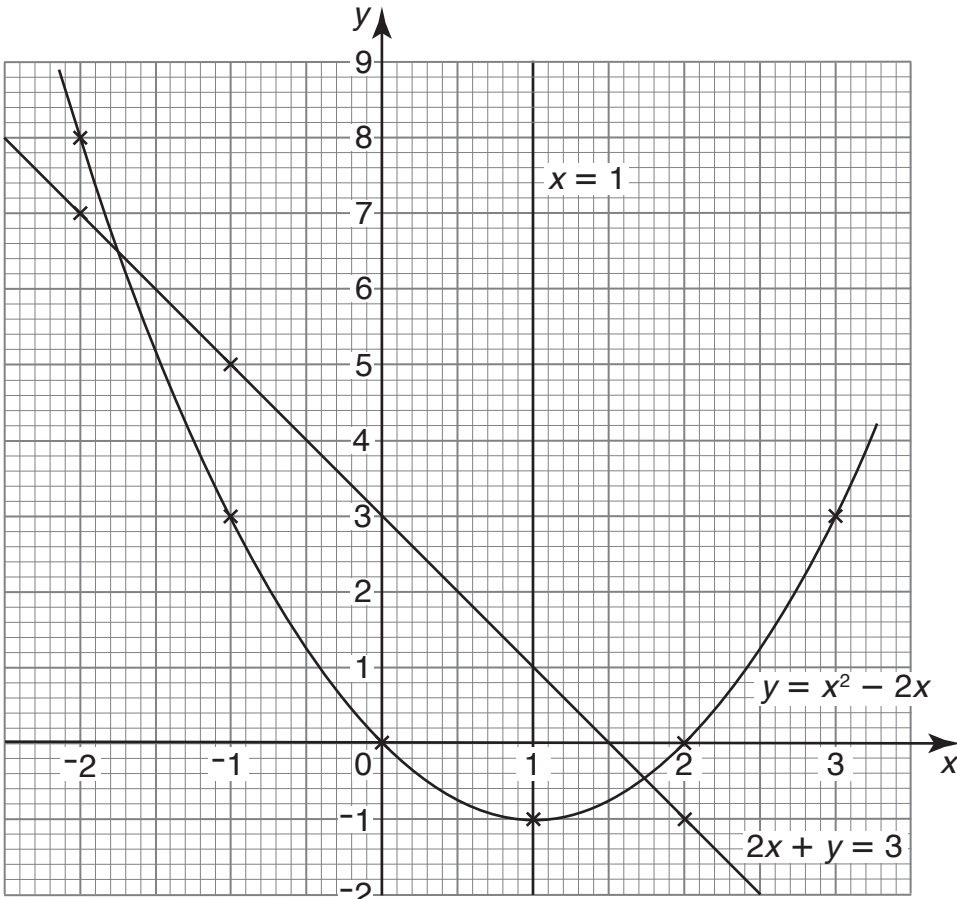
Some schools may wish to combine all their results and therefore pick multipliers: the multiplier for Level 3 to Level 2 is often set around 1.2 so that 60% on Level 3 approximates to 72% on Level 2.

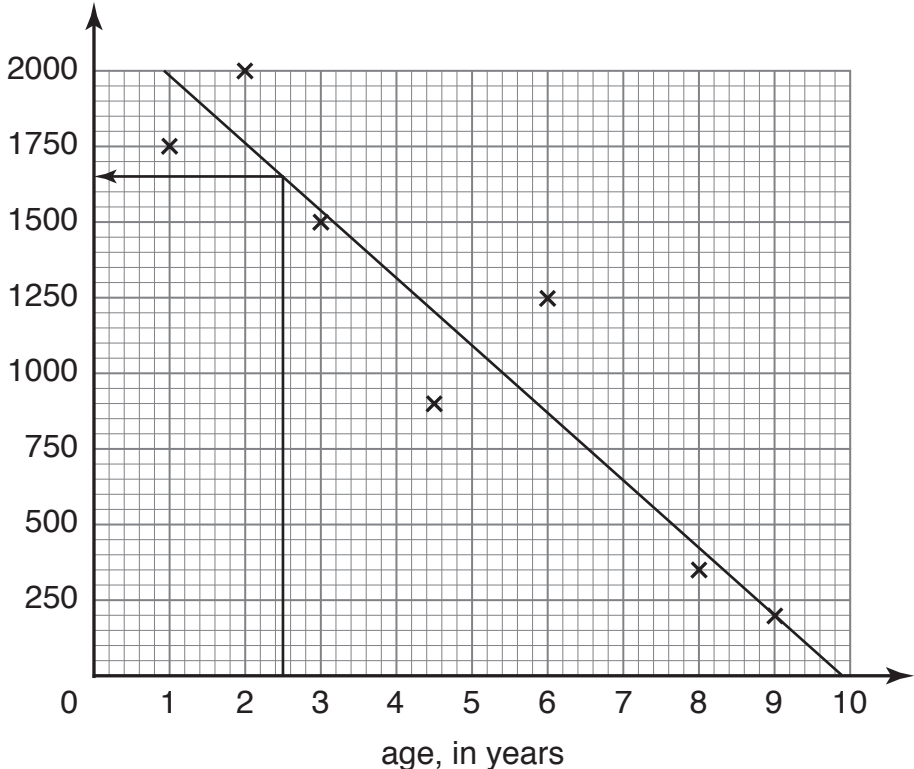


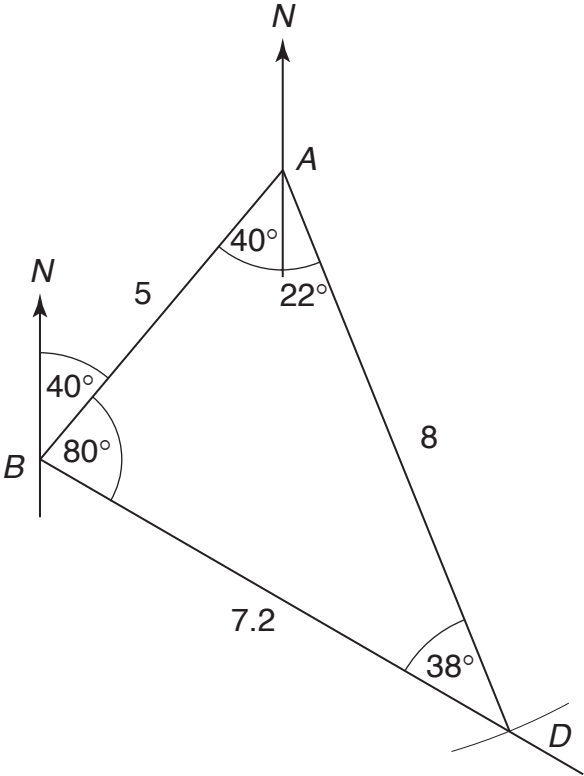
LEVEL 3: NON-CALCULATOR

Q.	Answer	Mark	Additional Guidance
1. (i)	£11.22	1	A: 1
(ii)	£78.56	2	
(iii)	£5.85	1	A: 1
(iv)	87p	2	
2.	the 150 ml tube is better value	2	M: 1 for 1.65 or 1.08 A: 1 for answer provided working shown
3. (i)	$2 \times 3^3 \times 5$	3	M: 1 for two of 2, 3, 5 A: 1 for $2 \times 3 \times 3 \times 3 \times 5$ A: 1 for answer
(ii)	100	2	M: 1 for $2^2 \times 5^2$ A: 1 for answer
4. (a) (i)	0.1505	1	A: 1
(ii)	15.05% $\frac{31}{200}$ $0.1\dot{5}$	2	A: 1 for 0.155 A: 1 for order
(b) (i)	990	1	A: 1
(ii)	50%	3	A: 1 for 510 or 640 M: 1 for 1150 out of 2300 A: 1 for answer
(c)	£320	2	M: 1 for 80 or $240 \times \frac{4}{3}$ A: 1 for answer
5. (i)	73	2	M: 1 for 8×9 A: 1 for answer
(ii)	-12	2	M: 1 for -8 A: 1 for answer
6. (a) (i)	12	2	M: 1 for 10 or + 2 A: 1 for answer
(ii)	9	2	M: 1 for 8 or - (-1) A: 1 for answer
(iii)	$\frac{2}{3}$	2	M: 1 for 6 A: 1 for answer
(b)	$v = 3$	2	M: 1 for $32 + 4v = 44$ A: 1 for answer

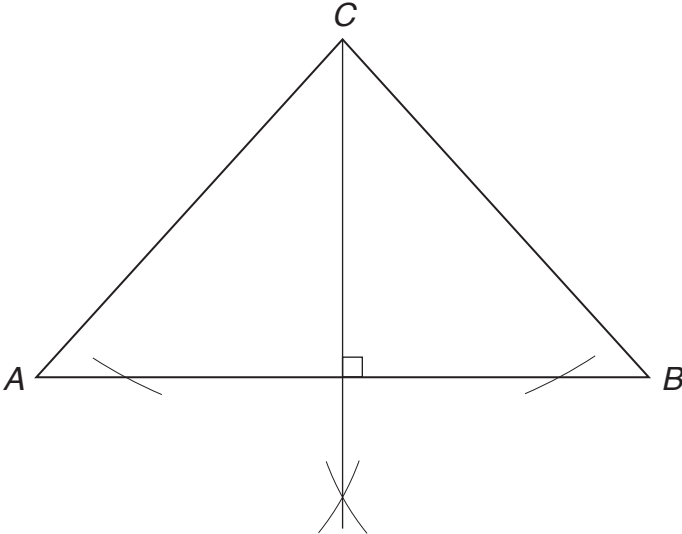
Q.	Answer	Mark	Additional Guidance
7. (i)	$4\frac{3}{20}$ kg	3	M: 1 for $\frac{8}{20}$ or $\frac{15}{20}$ A: 1 for $3\frac{23}{20}$ A: 1 for answer
(ii)	9 days	2	M: 1 for $\frac{7}{5} \times \frac{20}{3}$ or $\frac{7}{5} = \frac{28}{20}$ A: 1 for answer
8. (a) (i)	$a = 9$	1	A: 1
(ii)	$b = 7$	2	M: 1 for $5b = 35$ or $-3 = 4 - b$ A: 1 for answer
(iii)	$c = 4$	2	M: 1 for $4c - 1 = 15$ or equivalent A: 1 for answer
(b) (i)	$d \geq -1$	2	M: 1 for $d - 2 \geq -3$ or $2d \geq -6 + 4$ A: 1 for answer
(ii)		1	A: 1
(c)	$x + y = 5$	3	M: 1 for $2x + 2y = 10$ A: 1 for $\div 2$ or M: 1 for $4y = 6$ or $4x = 14$ A: 1 for $y = 1\frac{1}{2}$, $x = 3\frac{1}{2}$ A: 1 for answer

Q.	Answer	Mark	Additional Guidance														
9. (i) (a)	<table><tr><td>x</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>8</td><td>3</td><td>0</td><td>-1</td><td>0</td><td>3</td></tr></table>	x	-2	-1	0	1	2	3	y	8	3	0	-1	0	3	2	A: 1 for -1 A: 1 for symmetry
x	-2	-1	0	1	2	3											
y	8	3	0	-1	0	3											
(b)	 $y = x^2 - 2x$ $x = 1$ $y = x^2 - 2x$ $2x + y = 3$	2	A: 1 for plot A: 1 for curve														
(c)	$x = 1$	1	A: 1														
(ii) (a)	<table><tr><td>x</td><td>-2</td><td>-1</td><td>2</td></tr><tr><td>y</td><td>7</td><td>5</td><td>-1</td></tr></table>	x	-2	-1	2	y	7	5	-1	2	A: 1 for each						
x	-2	-1	2														
y	7	5	-1														
(b)	$2x + y = 3$	1	A: 1														
(iii)	$2x + (x^2 - 2x) = 3$ $\therefore x^2 = 3$ $\therefore x = \pm\sqrt{3}$ so they meet where $x = \sqrt{3}$	1	A: 1														

Q.	Answer	Mark	Additional Guidance
10. (a) (i)	183.6	1	A: 1
(ii)	108	1	A: 1
(b)	1.7×10^3	2	M: 1 for $2000 - 300$ A: 1 for answer
11. (i)	no reason: $68^\circ + 124^\circ \neq 180^\circ$ or $180 - 2 \times 56^\circ = 68^\circ \neq 56^\circ$	1	A: 1
(ii)	$c = 55^\circ$	2	M: 1 for $65 + 65 + 90 + 85 = 305$ A: 1 for answer
12. (i)	price, in £  age, in years 2 points		
(ii)	line of best fit	1	A: 1
(iii)	the older the motorcycle the less it costs <i>or equivalent</i>	1	A: 1
(iv)	£1650	2	allow sensible answer

Q.	Answer	Mark	Additional Guidance
13. (i)	 040° or equivalent	1	A: 1
(ii)	2.0 km	1	A: 1
(iii) (a)	<i>D</i>	2	A: 1 for 120° A: 1 for 8 cm arc
(b)	2.9 km or 2.88 km	2	A: 1 for 7.2 cm A: 1 for answer allow 2.80–2.96

Q.	Answer	Mark	Additional Guidance																																							
14. (i)	<table><tr><th>starter</th><th>main course</th><th>dessert</th></tr><tr><td>S</td><td>B</td><td>I</td></tr><tr><td>S</td><td>B</td><td>R</td></tr><tr><td>S</td><td>P</td><td>I</td></tr><tr><td>S</td><td>P</td><td>R</td></tr><tr><td>S</td><td>C</td><td>I</td></tr><tr><td>S</td><td>C</td><td>R</td></tr><tr><td>M</td><td>B</td><td>I</td></tr><tr><td>M</td><td>B</td><td>R</td></tr><tr><td>M</td><td>P</td><td>I</td></tr><tr><td>M</td><td>P</td><td>R</td></tr><tr><td>M</td><td>C</td><td>I</td></tr><tr><td>M</td><td>C</td><td>R</td></tr></table>	starter	main course	dessert	S	B	I	S	B	R	S	P	I	S	P	R	S	C	I	S	C	R	M	B	I	M	B	R	M	P	I	M	P	R	M	C	I	M	C	R		
	starter	main course	dessert																																							
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	M	C	I																																							
	M	C	R																																							
		1	A: 1																																							
(ii) (a)	$\frac{1}{3}$	1	A: 1 accept $\frac{4}{12}$																																							
(b)	$\frac{1}{6}$	1	A: 1 accept $\frac{2}{12}$																																							
(c)	$\frac{1}{4}$	1	A: 1 accept $\frac{3}{12}$																																							
(iii)	$\frac{1}{4}$	2	M: 1 for 2 from 8 A: 1 for answer																																							

Q.	Answer	Mark	Additional Guidance																		
15. (i)	 perpendicular from C to AB	2																			
(ii)	4.5 cm	1	A: 1 allow 4.4–4.55																		
(iii)	18 cm^2	2	M: 1 for $\frac{1}{2} \times 8 \times 4.5$ A: 1 for answer allow 17.6–18.2																		
(iv)	$\sqrt{6^2 - 4^2} = \sqrt{20}$ area = $\frac{1}{2} \times 8 \times \sqrt{20}$ $= 4\sqrt{20} = 8\sqrt{5}$	3	M: 1 for Pythagoras A: 1 for area = $\frac{1}{2} \times 8 \times \sqrt{20}$ A: 1 for conclusion																		
16. (i)	<table><tr><td>pattern number</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>number of rhombuses</td><td>1</td><td>3</td><td>5</td><td>7</td><td>9</td></tr><tr><td>number of 1-cm lines</td><td>4</td><td>10</td><td>16</td><td>22</td><td>28</td></tr></table> A: 1 A: 1	pattern number	1	2	3	4	5	number of rhombuses	1	3	5	7	9	number of 1-cm lines	4	10	16	22	28	2	
pattern number	1	2	3	4	5																
number of rhombuses	1	3	5	7	9																
number of 1-cm lines	4	10	16	22	28																
(ii)	$(6n - 2)$	2	A: 1 for $6n$ A: 1 for $- 2$																		

Q.	Answer	Mark	Additional Guidance
(iii)	46	2	M: 1 for $3 \times 15 + 1$ or pattern 8 A: 1 for answer
(iv)	pattern 25	2	M: 1 for $2n - 1 + 99 = 6n - 2$ or $4n - 1 = 99$ A: 1 for answer
Total		100	

LEVEL 3: CALCULATOR

Q.	Answer	Mark	Additional Guidance
1. (a) (i)	56.76018	1	A: 1
(ii) (a)	56.760	1	A: 1
(b)	57	1	A: 1
(b) (i)	$\frac{500 \times 3}{10}$	2	A: 1 for two correct A: 2 for three correct
(ii)	150	1	A: 1
(c)	$r = 3$	2	M: 1 for $36 \times \frac{3}{4} = 27$ A: 1 for answer
2. (a)	13 h 48 min	1	A: 1
(b)	540 m	3	M: 1 A: 1 for 20 m/s or $72000 \times \frac{27}{3600}$ A: 1 for answer
(c)	35 mph	3	A: 1 for 80 min or 30 min A: 1 for 70 miles in 2 hours A: 1 for answer

Q.	Answer	Mark	Additional Guidance
3. (a) (i)	45.3%	2	M: 1 for $1500 \div 3310 \times 100$ A: 1 for answer
(ii)	£2442	2	M: 1 for $3330 \times \frac{11}{15}$ A: 1 for answer
(iii)	£2450	2	M: 1 for 1 share $\equiv$ £350 A: 1 for answer
(b)	Alberto : Mark : Carol is 3 : 9 : 4	3	A: 1 for 180 and 300 A: 1 for 120 A: 1 for answer
4. (i)	58 years	1	A: 1
(ii)	44 years	2	M: 1 for 4th in order A: 1 for answer
(iii)	45 years	2	M: 1 for $\Sigma x = 315$ A: 1 for answer
(iv)	13 years	2	M: 1 for 328 years A: 1 for answer

Q.	Answer				Mark	Additional Guidance
5. (i)						
		car	bus	walk	total	
	boys	7	1	3	11	
	girls	9	3	2	14	
	total	16	4	5	25	
				2	A: 2 A: 1 off for each error	
(ii) (a)	$\frac{14}{25}$				1	A: 1
(b)	$\frac{1}{5}$				1	A: 1 accept $\frac{5}{25}$
(iii)	$\frac{6}{7}$				1	A: 1 accept $\frac{12}{14}$
6. (i)	$2a^3 - a$ or equivalent				1	A: 1
(ii)	$54cd^4$				2	A: 1 for $54c$ A: 1 for d^4
(iii)	$36e^5$				2	A: 1 for $+9e^2$ A: 1 for answer
(iv)	$2f + 1$				2	A: 1 for $2f$ A: 1 for $+ 1$
7. (a)	$18a^2 - 11a$				3	A: 1 for $18a^2$ A: 1 for $- 15a$ A: 1 for answer
(b) (i)	$12y(2y + 3)$				2	M: 1 for partial factorisation A: 1 for answer
(ii)	$3y(2y + 3)$ or equivalent				1	A: 1

Q.	Answer	Mark	Additional Guidance
8. (i)	10	2	A: 1 for 36° A: 1 for answer
(ii)	1440°	1	A: 1
(iii)	$x = 126^\circ$	2	M: 1 for 18° A: 1 for answer
9. (i)			
	B	1	A: 1
(ii)	C	2	M: 1 for 180° rotation A: 1 for accuracy
(iii)	D	2	A: 1 for each movement
(iv)	reflection in $y = -1$	1	A: 1

Q.	Answer	Mark	Additional Guidance
10.(a) (i) (a)	314 cm	1	A: 1
(b)	7850 cm ²	1	A: 1
(ii)	2150 cm ²	2	A: 1 for 10 000 A: 1 for answer
(iii)	205 cm	2	M: 1 for $\frac{1}{3} \times '314'$ or 100 A: 1 for answer
(b)	16.0 cm	2	M: 1 for $\sqrt{\frac{804}{\pi}}$ A: 1 for answer allow 16 cm
11. (i)	162 cm ³	2	A: 1 for 27×6 or cm ³ A: 1 for answer
(ii)	216 cm ²	3	A: 1 for 9 per face or cm ² A: 1 for 24 faces A: 1 for answer

Q.	Answer	Mark	Additional Guidance																		
12. (i)	<table><tr><th>favourite snack</th><th>number of pupils</th><th>angle</th></tr><tr><td>chips</td><td>10</td><td>40°</td></tr><tr><td>burger</td><td>20</td><td>80°</td></tr><tr><td>kebab</td><td>15</td><td>60°</td></tr><tr><td>pizza</td><td>45</td><td>180°</td></tr><tr><td>total</td><td>90</td><td>360°</td></tr></table>	favourite snack	number of pupils	angle	chips	10	40°	burger	20	80°	kebab	15	60°	pizza	45	180°	total	90	360°	2	A: 2 A: 1 off for each error
favourite snack	number of pupils	angle																			
chips	10	40°																			
burger	20	80°																			
kebab	15	60°																			
pizza	45	180°																			
total	90	360°																			
(ii)		3	A: 1 for drawing angles A: 1 for accuracy A: 1 for labels																		
(iii)	$\frac{1}{2}$	1	A: 1 accept $\frac{60}{120}$																		

Q.	Answer	Mark	Additional Guidance
13.	23 min	3	M: 1 for 41625 litres or 400 gallons per min A: 1 for $9250 \div 400$ or $41\,625 \div 1800$ A: 1 for answer
14. (i)	$4n$ units	1	A: 1
(ii)	$(4n + 1024)$ units	1	A: 1
(iii)	$n = 256$	2	A: 1 for $9n + 1024 = 3328$ A: 1 for answer
15. (i) (a)	sixth number is 121	2	A: 1 for $9^2 = 81$ or $49 + 32$ A: 1 for answer
(b)	8 and 16	1	A: 1
(c)	80	1	A: 1
(ii) (a)	14	2	A: 1 for 16 A: 1 for answer
(b)	68	2	A: 1 for 40 A: 1 for answer
16. (i)	9.8 hectares	2	A: 1 for $98\,000\text{m}^2$ A: 1 for answer
(ii)	$AB = 565\text{m}$	3	A: 1 for 75 M: 1 for Pythagoras $AB^2 = 560^2 + 75^2$ A: 1 for answer
(iii)	700 steps	1	A: 1
Total		100	

