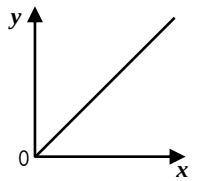
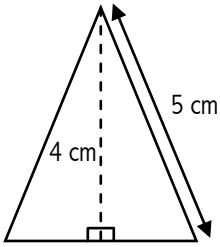
OCR Practice GCSE Examination Paper Higher Set 6 Paper 5 Non-Calculator	Solutions

Qu №	Answer	Solutions	Marks		Spec.
1		Convert to improper fractions: $2\frac{2}{3}\times\frac{5}{6}$ [multiply whole number by the denominator & add to the numerator] $=\frac{(2\times3)+2}{3}\times\frac{5}{6}$ [simplify]	M1		N2 N8
		$=\frac{8}{3}\times\frac{5}{6}$	M1		
		[multiply numerators together & multiply denominators together] $\frac{8}{3}\times\frac{5}{6}=\frac{(8\times5)}{(3\times6)}=\frac{40}{18}$	M1 multiplying		
	$2\frac{2}{9}$	[convert to mixed number by dividing numerator by the denominator] 40 ÷ 18 = 2 remainder 4 [write the whole number and write remainder over the denominator] $\frac{40}{18}=2\frac{4}{18}$ [simplify fraction] $=2\frac{4\div2}{18\div2}=2\frac{2}{9}$	A1 mixed number only	**4**	
2		2 numbers which add to make 0 and multiply to make –64: 8 + –8 = 0; 8 × –8 = –64	M1		A4
	$(x-8)(x+8)$	So, $x^2-64=(x-8)(x+8)$	A1	**2**	
3		The recommended retail price of the table has been reduced by $\frac{4}{7}$ $1-\frac{4}{7}=\frac{3}{7}$; £42 is $\frac{3}{7}$ of the recommended retail price of the table	M1		R3
		$\frac{1}{7}$ of the recommended retail price is 42 ÷ 3 = £14	M1		
		The recommended retail price of the table is 14 × 7	M1		
	£98	= £98	A1	**4**	
4		 Graph A shows that x is directly proportional to y. The graph is a straight line through the origin; if x increases, y increases by the same proportion.			R10
	A		A1	**1**	
5a		P(passing 1 test only) = P(passing 1st test only) + P(passing 2nd test only) = (0.7 × 0.4) + (0.3 × 0.6) = 0.28 + 0.18	M1		P8
	0.46	= 0.46	A1		
b		**Either:** P(passing at least 1 test) = 1 – P(not passing either test) = 1 – (0.3 × 0.4) = 1 – 0.12 **Or:** P(passing at least 1 test) = P(passing both tests) + P(passing 1st test only) + P(passing 2nd test only) = (0.7 × 0.6) + (0.7 × 0.4) + (0.3 × 0.6) = 0.42 + 0.28 + 0.18	M1		P8
	0.88	= 0.88	A1	**4**	

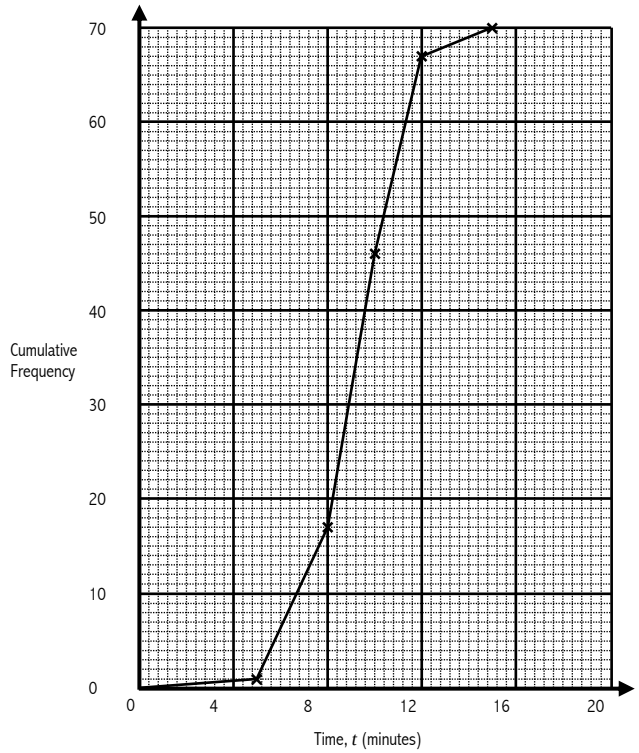
Qu №	Answer	Solutions	Marks		Spec.
6		$\mathbf{a}-2\mathbf{b}=\begin{pmatrix}-2\\6\end{pmatrix}-2\begin{pmatrix}3\\2\end{pmatrix}$	M1		G25
		$=\begin{pmatrix}-2\\6\end{pmatrix}-\begin{pmatrix}2\times3\\2\times2\end{pmatrix}=\begin{pmatrix}-2\\6\end{pmatrix}-\begin{pmatrix}6\\4\end{pmatrix}$	M1		
	$\begin{pmatrix}-8\\2\end{pmatrix}$	$=\begin{pmatrix}-2-6\\6-4\end{pmatrix}=\begin{pmatrix}-8\\2\end{pmatrix}$	A1	**3**	
7	'Show That' Qu *working must be shown*	The isosceles triangle can be divided into 2 identical right-angled triangles:  The length of the base of one right-angled triangle can be found by using Pythagoras' theorem: $a^2+b^2=c^2$ where a and b are sides of the right-angled triangle and c is the hypotenuse. The length of the base of the isosceles triangle is 2 × the length of the base of the right angled triangle. One side of a right-angled triangle is 4 cm long The hypotenuse of the right-angled triangle is 5 cm long. The other side of the triangle is $\sqrt{c^2-a^2}=\sqrt{5^2-4^2}=\sqrt{25-16}=\sqrt{9}=3\text{cm}$	M1 5^2-4^2 M1 $\sqrt{5^2-4^2}$		G20 G9
		The base of the isosceles triangle is 3 × 2 = 6 cm	M1		
		The diameter of the circle is 5.8 cm 6 cm is more than 5.8 cm ∴ the triangle will not fit inside the circle	A1	**4**	
8		$\sqrt{8.79+1.93\times2.29}$ Estimate answer by rounding. **e.g.** 8.**7**9 → 9, 1.**9**3 → 2 & 2.**2**9 → 2	M1		N14
		So $\sqrt{8.79+1.93\times2.29}\approx\sqrt{9+2\times2}$	M1		
		$=\sqrt{9+4}=\sqrt{13}$	M1		
	3.4 – 4	$\sqrt{9}=3$ & $\sqrt{16}=4\therefore\sqrt{13}\approx3.6$	A1	**4**	
9a		$\frac{2x+1}{x}+\frac{x-7}{6}=2$ [multiply by $6x$] $\frac{6x(2x+1)}{x}+\frac{6x(x-7)}{6}=2\times6x$ [simplify]	M1		A4 A18
		$6(2x+1)+x(x-7)=12x$ [expand]	M1		
		$12x+6+x^2-7x=12x$ [$-12x$] $x^2-7x+6=0$	M1		
		Factorise into form $(x+a)(x+b)$ where $a+b=-7,\ ab=6$ (–1) + (–6) = –7, (–1) × (–6) = 6 $(x-1)(x-6)=0$	M1 accept other methods		
	$x=1$ or $x=6$	$x-1=0$ or $x-6=0$ $x=1$ or $x=6$	A1		

Qu №	Answer	Solutions		Marks		Spec.
b		$4x+3y=23$	[rearrange for $3y$]			A4 A19
		$3y=23-4x$	[$\times 3$]			
		$9y=69-12x$		M1 rearrange		
		$2x^2-9y=41$	[substitute for $9y$]			
		$2x^2-(69-12x)=41$	[simplify]	M1 eliminate one variable		
		$2x^2+12x-110=0$	[$\div 2$]			
		$x^2+6x-55=0$	[factorise]	A1 simple quadratic		
		$(x+11)(x-5)=0$	[divide by either bracketed term]	M1 factorise (accept quad. formula)		
		$x+11=0$ or $x-5=0$				
		$x=-11$ or $x=5$		A1		
	$x=-11,\ y=\frac{67}{3}$	$3y=23-4x$	[substitute x values]			
	or $x=5,\ y=1$	$3y=23-4\times(-11)=67$ or $3y=23-4\times 5=3$		M1		
		$y=\frac{67}{3}$ or $y=1$		A1	**12**	
10a		PQR and PST are mathematically similar, $\therefore$ sides are proportional				G19
		$\therefore \frac{ST}{QR}=\frac{PS}{PQ}$	[substitute in side lengths]	M1 similar triangles		
		$\frac{ST}{15}=\frac{78+26}{26}=\frac{104}{26}=4$	[$\times$ 15]	M1		
	60 km	ST = 60 km		A1		
b		Turning 60° means 30° onto original bearing, then another 30° towards QS				G15
		This will create a triangle that is a reflection of PQR in the line QR				
		Therefore when the boat crosses the line QS it will only be 26 km from Q,				
	No, captain is not correct [with reason]	whereas point S is 78 km from Q				
		The captain is not correct		A1 any valid point (angle incorrect or lengths different)	**4**	

Qu №	Answer	Solutions	Marks		Spec.
11a					S3

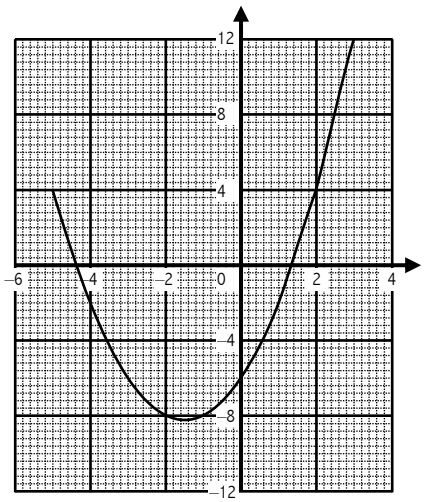
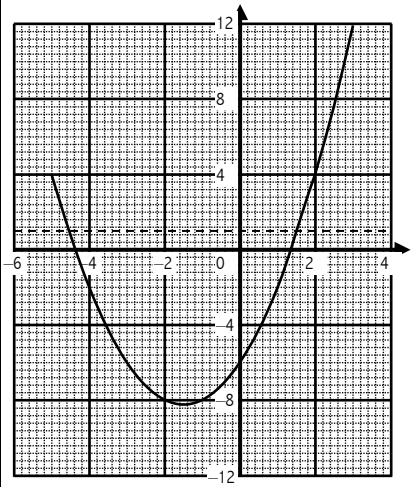
Time, t (minutes)	$t \le 5$	$t \le 8$	$t \le 10$	$t \le 12$	$t \le 15$
Cumulative Frequency	1	1 + 16 = 17	17 + 29 = 46	46 + 21 = 67	67 + 3 = 70

A1 at least 2 values correct
A1 all values correct

b			A1 all points plotted correctly A1 curve or straight line segments through plotted points A1 axis and scale correctly labelled		S3
c		Total number of members is 70 20% of the total members is $70 \times 0.2 = 14$	M1		R5 S3
	7.5 minutes	From the graph, the 14th fastest member ran 7.5 minutes	A1		
d	Any suitable explanation	**e.g.** the exact times of the members are not know. The answer given in part (c) is based on grouped data.	A1	**8**	S3
12		Area of larger rectangle $= 12 \times (x+3) = 12x + 36$ Area of smaller rectangle $= x \times (x+8) = x^2 + 8x$	B1		A18 G14
		Area of larger rectangle = 3 × area of smaller rectangle $\therefore 12x + 36 = 3(x^2 + 8x)$ [÷ 3]	M1		
		$4x + 12 = x^2 + 8x$ [gather terms on one side] $x^2 + 4x - 12 = 0$ [factorise]	A1 quadratic		
		$(x+6)(x-2) = 0$ [divide by either term]	M1 factorisation		
		$x + 6 = 0$ or $x - 2 = 0$ $x = -6$ or $x = 2$	A1		
		x cannot be -6 as dimensions must be positive, $\therefore x = 2$	B1		
	10 cm by 2 cm	Substitute into expressions for dimensions of smaller rectangle: $(x+8) = 2 + 8 = 10$ cm x = 2 cm Dimensions of smaller rectangle are 10 cm by 2 cm	A1	**7**	

Qu No	Answer	Solutions	Marks		Spec.
13a	$y = x^2 + 3x - 6$				

x	−5	−4	−3	−2	−1	0	1	2	3
y	4	**−2**	**−6**	−8	**−8**	**−6**	−2	4	**12**

			A1 at least 3 correct A1 all correct		A2
b			M1 points correctly plotted A1 parabola drawn connecting points		A14
c	$x = -4.4$ & $x = 1.3$	The roots of $y = x^2 + 3x - 6$ are the x intercepts of the graph The roots are $x = -4.4$ & $x = 1.3$	A1 allow ±0.1		A11
d		Solutions to the equation $x^2 + 3x - 6 = 1$ are the x co-ordinates where the line $y = 1$ crosses the graph of $y = x^2 + 3x - 6$ 	M1 drawing line at y = 1		A11
	$x = -4.5$ and $x = 1.5$	The two solutions are $x = -4.5$ and $x = 1.5$	A1 allow ±0.1	**7**	
14a	**'Prove That' Qu** *Reasoning must be shown*	***Reasons for each statement must be given*** Angle AED = angle ABC = 90° [given] [angle] Ange CAB = angle DAE [common angle] [angle]	M1		G3 G7
		Angle ADE = angle BCD [corresponding angles] [angle]	M1		
		All three angles in each triangle are the same ∴ triangle ADE is similar to triangle ABC by AAA (angle angle angle)	A1		
b		Triangle ADE is similar to triangle ABC ∴ the lengths of their corresponding sides are in the same ratio The ratio of their side lengths is 9 ÷ 3 = 3	M1		R12
		The length of AB is 4.2 × 3	M1		
	12.6 cm	= 12.6 cm	A1	**6**	

Qu №	Answer	Solutions	Marks		Spec.
15		In completed the square form $(y = (x + c)^2 + d)$, the coordinates of the turning point are $(-c, d)$ If the turning point is (5, 9), the quadratic is $y = (x - 5)^2 + 9$	M1		A11
		In the form $y = x^2 + ax + b$, $y = (x - 5)^2 + 9$ [expand brackets]	M1		
		$y = x^2 - 10x + 25 + 9$ [simplify]	M1		
	$a = -10$ & $b = 34$	$y = x^2 - 10x + 34$ $a = -10$ & $b = 34$	A1	**4**	
16a	$\frac{1}{4}$	There are 4 different outcomes: 1, 2, 3 & 4 The sections are of equal size. $P(4) = \frac{1}{4}$	A1		P3
bi	**Any two from:** There are three different ways of making 4, not 2 ($4 \times 1 = 4$; $1 \times 4 = 4$; $2 \times 2 = 4$) The total number of outcomes is 16, not 8 The probability is $\frac{3}{16}$		A1 at least 1 correct A1 2 correct		P2
ii		The sample space diagram shows all of the possible outcomes for the two spinners			P7

×	1	2	3	4
1	1	2	3	4
2	2	4	6	8
4	4	8	12	16
6	6	12	18	24

		There are $4 \times 4 = 16$ different outcomes in total	M1 total outcomes = 16 M1 sample space/ listing outcomes	
	$\frac{1}{8}$	An outcome of 12 occurs twice $P(12) = \frac{2}{16} = \frac{1}{8}$	A1	**6**

Qu №	Answer	Solutions	Marks		Spec.
17		Ratio of masses of sugar is $x : y$ When both masses are increased by 40 g, ratio becomes 1 : 2 $\therefore x + 40 : y + 40 = 1 : 2$ $\therefore \dfrac{x+40}{y+40} = \dfrac{1}{2}$ (1)	M1		
		When both masses are decreased by 15 g, ratio becomes 1 : 3 $\therefore x - 15 : y - 15 = 1 : 3$ $\therefore \dfrac{x-15}{y-15} = \dfrac{1}{3}$ (2)	M1		
		Rearrange (1) to make y the subject: $\dfrac{x+40}{y+40} = \dfrac{1}{2}$ $[\times(y+40)]$ $x + 40 = \dfrac{y+40}{2}$ $[\times 2]$ $2x + 80 = y + 40$ $[-40]$ $y = 2x + 40$ (3)	M1		R8 A21
		Substitute (3) into (2) to find x: $\dfrac{x-15}{y-15} = \dfrac{1}{3}$ [substitute $y = 2x + 40$] $\dfrac{x-15}{(2x+40)-15} = \dfrac{1}{3}$ [simplify] $\dfrac{x-15}{2x+25} = \dfrac{1}{3}$ $[\times(2x+25)]$ $x - 15 = \dfrac{2x+25}{3}$ $[\times 3]$ $3x - 45 = 2x + 25$ $[-2x]$ $x - 45 = 25$ $[+45]$ $x = 70$	M1		
		Substitute $x = 70$ into (3) to find y: $y = 2x + 40$ [substitute $x = 70$] $y = (2 \times 70) + 40$ [simplify] $y = 140 + 40 \therefore y = 180$	M1 substitution of found variable		
		The ratio of masses of sugar is 70 : 180 = 70 ÷ 10 : 180 ÷ 10	M1		
	7 : 18	= 7 : 18 in its lowest terms	A1	**7**	
18		***Reasoning must be given*** $x^2 = 36$			N6
	Ruben is not correct [with reason]	$x = \sqrt{36} = \pm 6$ Ruben is not correct; the answer could be 6 or -6	A1	**1**	N7

Qu №	Answer	Solutions	Marks		Spec.
19a		Convert to improper fractions: $3\frac{1}{5}\times 4\frac{1}{6}$ [multiply whole number by the denominator & add to the numerator] $=\frac{(3\times 5)+1}{5}\times\frac{(4\times 6)+1}{6}$ [simplify]	M1		N2 N8
		$=\frac{16}{5}\times\frac{25}{6}$	M1		
		[multiply the numerators together and the denominators together] $\frac{16}{5}\times\frac{25}{6}=\frac{(16\times 25)}{(5\times 6)}$ [simplify]	M1		
		$=\frac{400}{30}=\frac{40}{3}$	M1		
	$13\frac{1}{3}$	[convert to mixed number by dividing numerator by the denominator] $40 \div 3 = 13$ remainder 1 [write the whole number and write remainder over the denominator] $\frac{40}{3}=13\frac{1}{3}$	A1		
b	$8\frac{4}{5}+7\frac{6}{9}$ or $7\frac{4}{5}+8\frac{6}{9}$	Place the biggest numbers (7 and 8) as the whole number in the fractions, and the smallest number (5) as the divisor in the first fraction: $8\frac{4}{5}+7\frac{6}{9}$ or $7\frac{4}{5}+8\frac{6}{9}$	A1	**6**	N2
20		***Working must be shown*** $\text{Speed}=\frac{\text{Distance}}{\text{Time}}\therefore\text{Distance}=\text{Speed}\times\text{Time}\therefore\text{Time}=\frac{\text{Distance}}{\text{Speed}}$	M1		R11
		For the first two hours, Luis drove at an average speed of 60 mph In the first 2 hours, Luis travelled $2 \times 60 = 120$ miles	M1		
		The remaining 100 miles were completed at an average speed of 40 mph This took $100 \div 40 = 2.5$ hours	M1		
		The total number of miles travelled was $120 + 100 = 220$ The total time taken to travel 220 miles was $2 + 2.5 = 4.5$ hours	M1		
		The average speed for the journey was $\frac{220}{4.5}$	M1		
	Luis is not correct [with working]	$= 48.888\ldots$ mph $48.888\ldots$ mph < 50 mph $\therefore$ Luis is not correct	A1	**6**	
				Total Marks: 100	