AQA

Free-Standing Mathematics Qualification

MATHEMATICS

4988 Algebra and Graphs
Mark scheme

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Version 1.0: Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

Key to mark scheme abbreviations

M	mark is for method
m or dM	mark is dependent on one or more M marks and is for method
A	mark is dependent on M or m marks and is for accuracy
B	mark is independent of M or m marks and is for method and accuracy
E	mark is for explanation
√ or ft or F	follow through from previous incorrect result
CAO	correct answer only
CSO	correct solution only
AWFW	anything which falls within
AWRT	anything which rounds to
ACF	any correct form
AG	answer given
SC	special case
oe	or equivalent
A2,1	2 or 1 (or 0) accuracy marks
−x EE	deduct x marks for each error
NMS	no method shown
PI	possibly implied
SCA	substantially correct approach
c	candidate
sf	significant figure(s)
dp	decimal place(s)

No Method Shown

Where the question specifically requires a particular method to be used, we must usually see evidence of use of this method for any marks to be awarded.

Where the answer can be reasonably obtained without showing working and it is very unlikely that the correct answer can be obtained by using an incorrect method, we must award **full marks**. However, the obvious penalty to candidates showing no working is that incorrect answers, however close, earn **no marks**.

Where a question asks the candidate to state or write down a result, no method need be shown for full marks.

Where the permitted calculator has functions which reasonably allow the solution of the question directly, the correct answer without working earns **full marks**, unless it is given to less than the degree of accuracy accepted in the mark scheme, when it gains **no marks**.

Otherwise we require evidence of a correct method for any marks to be awarded.

Question	Solution	Mark	Total	Comment
1(a)	4 points correct	**B1**	3	$\pm$ 1 square
	All correct	**B1**		
	Line	**B1**		Reasonably correct
1(b)	6.2	**B1**	2	AWFW [6, 6.4] Allow (0, 6.2)
	The length of the spring when no weight is attached.	**B1**		Condone starting length, original length, minimum length. "The length of the spring is 6.2 cm" B0
1(c)	Gradient = $\dfrac{\text{change in } L}{\text{change in } m}$	**M1**	3	
	6.5	**A1**		AWFW [6.2, 6.8]
	L = (their 6.5)m + their 6.2	**A1ft**		allow $y = 6.5x + 6.2$
1(d)	20 = 6.5m + 6.2	**M1**	3	
	6.5m = 20 − 6.2			
	$m = \dfrac{20 - 6.2}{6.5}$	**M1**		
	2.12	**A1ft**		ft if in the range (1.2, 5) AWRT 2.1 always gains 3 marks AWFW [2, 2.3] NMS is SC1
	Total		**11**	

Question	Solution	Mark	Total	Comment
2(a)	37063000 × 3.3	**M1**	2	PI
	1.2×10^8	**A1**		
2(b)	238000 ÷ 1587000 or 0.149968...	**M1**	2	PI
	1.5×10^{-1}	**A1**		
2(c)	6494000 ÷ 0.0746	**M1**	2	PI
	8.7×10^7	**A1**		
	Total		**6**	

Question	Solution	Mark	Total	Comment
3(a)	$5B + 8C = 205$	**B1**	6	x and y used: B0B0 but can still get the remaining marks
	$7B + 6C = 196$	**B1**		
	$15B + 24C = 615$ or $35B + 56C = 1435$			
	$28B + 24C = 784$ or $35B + 30C = 980$	**M1**		For making B or C coefficients the same (condone 1 error)
	$13B = 169$ or $26C = 455$	**M1ft**		ft from previous M1
	$B = 13$	**A1**		M1 A1 for solving for B or C
	$65 + 8C = 205$			
	$8C = 140$			
	$C = 17.5$	**A1**		Or £17.50
3(b)	$12 \times 13 + 9 \times 17.5$ or 313.50	**M1**		
	313.50 or 313.5 and yes	**A1ft**	2	If their B = their C, M1A0ft
	Total		**8**	

Question	Solution	Mark	Total	Comment
4(a)	$27 - 2x$	**B1**	1	
4(b)	$x(27 - 2x)$	**B1**	1	oe
4(c)	$80x + 2x(27 - 2x) = 300$	**M1M1**	4	M1 for $80x$ or $2x(27 - 2x)$
	$80x + 54x - 4x^2 = 300$	**M1**		
	$0 = 4x^2 - 134x + 300$			
	$2x^2 - 67x + 150 = 0$	**A1**		For both of the last two lines
4(d)	$x = \dfrac{67 \pm \sqrt{(-67)^2 - 4 \times 2 \times 150}}{2 \times 2}$	**M1**	3	
	$x = 31.087 \ldots$ (impossible) or $2.4125..$	**M1**		Condone lack of 31.087
	2.4 (cm)	**A1**		"31.1 or 2.4" M1M1A0
	Total		**9**	

Question	Solution	Mark	Total	Comment
5(a)	$a^2 - (c - x)^2 = b^2 - x^2$		3	
	$a^2 - (c^2 - 2cx + x^2) = b^2 - x^2$	M1		Condone $a^2 - c^2 - 2cx + x^2 = b^2 - x^2$ But this will usually be M1M0A0
	$a^2 - c^2 + 2cx - x^2 = b^2 - x^2$	M1		
	$2cx = b^2 + c^2 - a^2$			
	$x = \dfrac{b^2 + c^2 - a^2}{2c}$	A1		For both of the last two lines
5(b)	$a = 57, b = 51, c = 30$	B1	3	PI e.g. from $57^2 - (30 - x)^2 = 51^2 - x^2$
	$x = \dfrac{51^2 + 30^2 - 57^2}{2 \times 30}$	M1		$\dfrac{51^2 + 30^2 - 57^2}{2 \times 51}$ or similar gets B0M1A0
	4.2 (m)	A1		
5(c)	It is a right angle	B1	1	
	Total		7	

Question	Solution	Mark	Total	Comment
6(a)	$\dfrac{25}{20}$	**M1**	2	
	1.25 (m/s²)	**A1**		Or $\dfrac{25}{20}$ or $\dfrac{5}{4}$
6(b)	$\dfrac{1}{2} \times 20 \times 25 + \dfrac{1}{2} \times 20 \times 25 + 180 \times 25$	**M1M1**	3	Or $\dfrac{1}{2} \times 25 \times (220 + 180)$ M2 (M1 if 1 error) M1 for $\dfrac{1}{2} \times 20 \times 25$ or 250 or 180×25 or 4500
	5000(m)	**A1**		5500 SC1
6(c)	$\dfrac{1}{2} \times 15 \times 30$ or 225	**M1**	4	
	Their 225 + 30T = their 5000	**M1**		
	30T = 4775	**M1**		Correct for their equation
	T = 159 (seconds)	**A1**		[159, 159.2]
				Nothing for $\dfrac{\text{their 5000}}{30}$ $\dfrac{\text{their 5000} - 450}{30}$ is M0M1M1A0
	Total		9	
	TOTAL		50	