Rewarding Learning

General Certificate of Secondary Education

Mathematics

M3

Calculator Paper

Higher Tier

[GMC31]

Assessment

MARK SCHEME

GCSE MATHEMATICS

Introduction

The mark scheme normally provides the most popular solution to each question. Other solutions given by candidates are evaluated and credit given as appropriate; these alternative methods are not usually illustrated in the published mark scheme.

The marks awarded for each question are shown in the right hand column and they are prefixed by the letters **M**, **W** and **MW** as appropriate. The key to the mark scheme is given below:

M indicates marks for correct method.

W indicates marks for working.

MW indicates marks for combined method and working.

The solution to a question gains marks for correct method and marks for an accurate working based on this method. Where the method is not correct no marks can be given.

A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be **followed through** from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

Positive marking:

It is our intention to reward candidates for any demonstration of relevant knowledge, skills or understanding. For this reason we adopt a policy of **following through** their answers, that is, having penalised a candidate for an error, we mark the succeeding parts of the question using the candidate's value or answers and award marks accordingly.

Some common examples of this occur in the following cases:

(a) a numerical error in one entry in a table of values might lead to several answers being incorrect, but these might not be essentially separate errors;

(b) readings taken from candidates' inaccurate graphs may not agree with the answers expected but might be consistent with the graphs drawn.

When the candidate misreads a question in such a way as to make the question easier only a proportion of the marks will be available (based on the professional judgement of the examining team).

General Marking Advice

(i) If the correct answer is seen in the body of the script and the answer given in the answer line is clearly a transcription error, full marks should be awarded.

(ii) If the answer is missing, but the correct answer is seen in the body of the script, full marks should be awarded.

(iii) If the correct answer is seen in working but a completely different answer is seen in the answer space, then some marks will be awarded depending on the severity of the error.

(iv) Work crossed out but not replaced should be marked.

(v) In general, if two or more methods are offered, mark only the method that leads to the answer on the answer line, if two (or more) answers are offered (with no solution offered on the answer line), mark the poorest answer.

(vi) For methods not provided for in the mark scheme, give as far as possible equivalent marks for equivalent work.

(vii) Where a follow through mark is indicated on the mark scheme for a particular part question, the marker must ensure that you refer back to the answer of the previous part of the question.

(viii) Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures seen, e.g. the answer in the mark scheme is 4.65 and the candidate then correctly rounds to 4.7 or 5 on the answer line. Allow full marks for 4.65 seen in the working.

(ix) Anything in the mark scheme which is in brackets (...) is not required for the mark to be earned, but if present it must be correct.

(x) For any question, the range of answers given in the mark scheme is inclusive.

				AVAILABLE MARKS
1	**(a)**	32	A1	
	(b)	$9n = 54$	MA1	
		6	A1	3
2	**(a)**	0, 1, 2, 6, 11 (entries L to R, row by row) (award [1] for any 3 correct)	A2	
	(b)	7	A1	3
3		$8e - 9w$	A1 A1	2
4		$1400 \div 100 \times 4$ (or equivalent)	M1	
		56	MA1	
		$56 \times 3 = 168$	A1	3
		ans 168 gains 3 marks, ans 56 gains 2 marks, with or without work shown		
5	**(a)**	**(i)** 45	A1	
		(ii) 38	A1	
	(b)	**(i)** Stay the same	A1	
		(ii) Stay the same	A1	
		(iii) Increase	A1	5
6		Evidence of 160cm and 80cm as dimensions	MA1	
		$160 + 160 + 80 + 80$ (= 480 cm)	MA1	
		4.8	A1	3
		480 as answer gains 2 marks		
7		$38 \times 9.80 = 372.40$	MA1	
		$473.90 - 372.40 = 101.50$	MA1	
		$101.50 \div 14.50 = 7$	A1	3
		follow through for numerical errors		
8		17:42 to 18:00 = 18 mins	MA1	
		18:00 to 20:00 = 2 hours	MA1	
		18 mins + 2 hours + 11 mins = 2 hours 29 mins	A1	3
		correct ans of 2hrs 29min or 149min gains 3 marks		

			AVAILABLE MARKS
9	12.8 ÷ 100 × 5 (oe)	MA1	
	0.64 or 64p	MA1	
	13.44	A1	3
10	**(a)** 6 points plotted correctly ((4, 43), (1, 41), (9, 48), (6, 45), (5, 46), (5, 42)) (award [1] for 3, 4 or 5 correct)	A2	
	(b) 5	A1	
	(c) more, higher	A1	
	(d) line drawn (roughly direction from (1, 40) to (9, 48) with approximately same number of points on either side)	A1	
	(e) reading from graph (where this line has 8 as first coordinate)	A1	6
11	**(a)** $4t + 21 = 49$ (or similar, accept $4t = 28$ but not $t = 7$)	A1	
	(b) $4t = 28$	MA1	
	7	A1	3
12	Garden Store: 480 ÷ 32 = 15		
	15 × 27 = 405	MA1	
	Perfect Patio: 480 ÷ 80 = 6		
	6 × 70 = 420	MA1	
	10% discount so final price 378	MA1	
	Quinn's Paving: 480 ÷ 16 = 30		
	Needs to buy 25 boxes to get 30	MA1	
	25 × 17 = 425	MA1	
	Perfect Patio is the cheapest follow through for numerical errors, but not for use of incorrect methods in any of the three calculations	A1	6
13	3 (x + 2)	A1	1
14	**(a)** QPR = QRS = 65° (mark gained for angle QRS as 65 in diagram)	MA1	
	TSR = 77° (may be marked in diagram)	MA1	
	x = 180 – (77 + 65) = 38° (3 marks for correct ans)	MA1	
	(b) No because 50 + 142 ≠ 180° **or** because 65 + 103 ≠ 180° **or** because the angles between the two lines do not add up to 180 so not parallel **or** because 38 ≠ 50, corresponding. Allow A1 for numerical error but correct argument	A2	5

			AVAILABLE MARKS
15	$6x - 2 + 5 = 4x + 8$ (1st mark for multiplying out correctly)	MA1	
	$6x - 4x = 8 - 5 + 2$		
	$2x = 5$ (2nd mark for reaching this stage)	MA1	
	$x = 2.5$	MA1	3
	follow through for numerical errors only if work equally difficult, e.g. error in 2nd line giving $2x = 6$ – do not follow, but error in 2nd line giving $2x = 7$ – follow to last line for $x = 3.5$		
16	Median class = $80 < W \leq 90$	A1	
	Mean = $\frac{1 \times 65 + 5 \times 75 + 4 \times 85 + 6 \times 95}{16}$	MA1	
	$= \frac{1350}{16} = 84.375$	A1	
	Yes his statement is correct.	A1	4
17	11 yes – only 2 factors (1 and itself) 111 no – divides by 3 1111 no – divides by 11 reason required in each case	A2 for 3 correct, A1 for 2 correct	2
18	**(a)** after 1 year = £20 400	MA1	
	after 2 years = £17 340	MA1	
	(b) No because		
	the overall depreciation is £6660	MA1	
	which is $\frac{6660}{24\,000} \times 100 = 27.75\%$ change	MA2	
	or		
	No because 30% of £24 000 = £7200	MA2	
	and the caravan has only depreciated by £6660	MA1	
	or		
	No because 30% of £24 000 = £7200	MA2	
	So value would be £16 800, still £17 340	MA1	5
19	**(a)** all points correctly plotted	MA1	
	straight line	A1	
	(b) **(i)** 40	A1	
	(ii) 20	A1	
	(c) £40 + 450 × 20p	M1	
	130	A1	6

			AVAILABLE MARKS
20	Area of large circle = $\pi \times 6^2 = 113.0973355$	M1 A1	
	Area of each semicircle = $\frac{1}{2} \times \pi \times 2^2 = 6.283185307$	MA1	
	Shaded area = $113.0973355 - 3 \times 6.283185307$ (must use 3 semicircles)	M1	
	$= 94.24777961$	A1	5
21	Recognition for LCM of 250 and 450	M1	
	Alternative $250 = 2 \times 5 \times 5 \times 5$		
	$450 = 2 \times 3 \times 3 \times 5 \times 5$		
	LCM $= 2 \times 3 \times 3 \times 5 \times 5 \times 5$	MA1	
	LCM = 2250	A1	
	9 packets of coffee and 5 packets of tea	MA1	
	$9 \times 4.20 + 5 \times 3.60$	M1	
	$= 55.80$	A1	5
22	The median is higher in Maths	A1	
	There is a similar range of marks in both subjects	A1	
	There is a greater interquartile range in Maths (or semi-interquartile range)	A1	3
23	**(a)** $p(p - 3)$	A1	
	(b) $(10 - t)(10 + t)$	A1	
	(c) $(x + 5)(x - 3)$	A2	4
24	$\sin 21 = \frac{x}{8.4}$	M1	
	$x = 8.4 \sin 21$	MA1	
	$x = 3.01(0290776) \times 2 = 6.02(0581552)$	MA1	
	perimeter = $16.8 + 6.02(0581552) = 22.82(058155)$	MA1	4
	accept any correct rounding, also correct base using cos rule		
25	$120.96 \div 72 \times 100$ (or equivalent)	MA1	
	$= 168$	A1	2
26	$P = \frac{33\,000}{6000}$ or $\frac{8250}{1500}$	MA1	
	$= 5.5$	A1	2
27	$A = \frac{305}{360} \times \pi \times 3^2$	MA1	
	$= 23.95\ (464\,398)$	A1	2
	accept any correct rounding		

			AVAILABLE MARKS
28	$6(3x + 2) - 5(3x - 4) = 2$	MA1	
	$18x + 12 - 15x + 20 = 2$	MA1	
	$3x = -30$	MA1	
	$x = -10$	A1	
	Alternative Solution:		
	$\frac{6x}{5} + \frac{4}{5} - x + \frac{4}{3} = \frac{2}{15}$	MA2	
	$\frac{x}{5} = -2$	MA1	
	$x = -10$	A1	4
	follow for numerical errors, but not omission of key elements of method		
		Total	**100**