Rewarding Learning

General Certificate of Secondary Education
January 2015

Mathematics

Unit T6 Paper 1
(Non-calculator)
Higher Tier

[GMT61]

WEDNESDAY 14 JANUARY
9.15 am–10.30 am

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, A** and **MA** as appropriate. The key to the mark scheme is given below:

M indicates marks for correct method.

A indicates marks for accurate working, whether in calculation, readings from tables, graphs or answers.

MA indicates marks for combined method and accurate 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.

It should be noted that where an error trivialises a question, or changes the nature of the skills being tested, then as a general rule, it would be the case that not more than half the marks for that question or part of that question would be awarded; in some cases the error may be such that no marks would be awarded.

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 examiner).

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.

Quality of written communication

In GCSE Mathematics, particular questions are identified where candidates must demonstrate the quality of their written communication.

In particular, candidates must:

(i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear (i.e. comprehension and meaning is clear by using the correct notation and labelling conventions);

(ii) select and use a form and style of writing appropriate to their purpose and to complex subject matter (i.e. reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning); and

(iii) organise information clearly and coherently, using specialist vocabulary where appropriate (i.e. the mathematical methods and processes used are coherently and clearly organised and appropriate mathematical vocabulary used).

This assessment may be through, for example, an explanation of the geometrical properties of a given shape or, for example, through concise mathematical argument in a multi-step problem.

			AVAILABLE MARKS
1	150 mins $= 2\frac{1}{2}$ hours or 2.5 hours or $\frac{5}{2}$ hours	A1	
	$240 \div 2\frac{1}{2}$ or $240 \times \frac{2}{5}$ or $240 \div 2.5$ or $240 \div \frac{5}{2}$	M1	
	= 96 km/hr	A1	3
	alternatively		
	240 = 150 (÷ 5 or ÷ 10)	M1	
	48 km = 30 mins or 24 km = 15 mins	A1	
	96 km/hr	A1	
	or $\frac{240}{150}$ or 240 ÷ 150 or 1.6 or $1\frac{3}{5}$	M1	
	16 km in 10 mins	A1	
	96	A1	
2	$V = \sqrt{2 \times 10 \times 20}$	M1	
	$= \sqrt{400}$	A1	
	= 20	A1	3
3	$\frac{4(12+9)}{3}$	MA1	
	$\frac{84}{3}$	MA1	
	28	A1	3
4	direction	A1	
	3 points correct	A2	3
	(2 points correct – A1)		
5	1 – (0.05 + 0.2 + 0.65) = 0.1	C2	
	300 × 20p = £60	C1	
	0.05 × 300 × £1 = £15		
	0.1 × 300 × 50p = £15		
	0.2 × 300 × 10p = £6	3 correct C2 (2 correct C1)	
	Profit = £60 – £36 = £24	C1	6
6	**(a)** $\frac{5}{8}$ or 0.625 or 62.5%	A1	
	(b) Not a valid conclusion as he has not made enough trials to support this.	A1	2

				AVAILABLE MARKS
7	(a)	$-\frac{7}{3} < n \leqslant 2$	MA1	
		–2, –1, 0, 1, 2	M1 A1	
		(–1 for each extra or omitted answer)		
	(b)	$3x - 12 < 5x - 20$	MA1	
		$8 < 2x$		
		$4 < x$	A1	
		$x = 5$	A1	6
8		Option A: circle area = 16π or 50.24	C1	
		Option B: $2 \times 4 \times 6 + \frac{1}{2} \times \pi \times 16 = 48 + 8\pi$ or 73.12	C1	
		Option C: $\frac{3}{4} \times \pi \times 16 = 12\pi$ or 37.68	C1	
		Option B with correct area of 48 + 8π or 73.12	A1	4
9	(a)	1.08×10^{-4}	A1	
	(b)	4×10^3 or 4000	A1	
	(c)	$99x = 72$	MA1	
		$x = \frac{8}{11}$	A1	4
10		$0.4 \times 0.3 + 0.6 \times 0.15 + 0.4 \times 0.7$	M1	
		$0.12 + 0.09 + 0.28$	A1	
		0.49	A1	3
		alternatively		
		$1 - (0.6 \times 0.85)$	M1	
		$1 - 0.51$	A1	
		0.49	A1	
11	(a)	V = P (both right angles in rectangles)		
		VUS = SQR (alternate) = QSP (alternate)		
		or VUS = PSQ (corresponding)		
		USV = RSQ (vert. opp) = SQP (alternate)		
		or USV = SQP (corresponding)		
		So 3 angles equal so similar		
		Need to prove 2 pairs equal A1 each and final statement A1	A3	
	(b)	Areas 108 : 12 = 9 : 1 Lengths 3 : 1	MA1	
		SP = 7.5 ÷ 3 = 2.5 cm	MA1	
		PQ = 9.6 cm	A1	6
		alternatively		
		Areas 108 : 12 = 9 : 1 Lengths 3 : 1	MA1	
		VS = 108 ÷ 3.75 = 28.8 cm	MA1	
		PQ = 9.6 cm	A1	

			AVAILABLE MARKS
12	**(a)** $2x - \frac{12}{x} = \frac{1}{2}x + 2$		
	$2x^2 - 12 = \frac{1}{2}x^2 + 2x$	MA1	
	$4x^2 - 24 = x^2 + 4x$	MA1	
	$3x^2 - 4x - 24 = 0$	MA1	
	alternatively		
	$\frac{3}{2}x - \frac{12}{x} - 2 = 0$	MA1	
	$\frac{3}{2}x^2 - 12 - 2x = 0$	MA1	
	$3x^2 - 24 - 4x = 0$	MA1	
	(b) $2x - \frac{12}{x} = ax + b$		
	$2x^2 - 12 = ax^2 + bx$	MA1	
	$(2 - a)x^2 - bx - 12 = 0$	MA1	
	$2 - a = 4 \quad a = -2$	MA1	
	$b = 2$	A1	7
	alternatively		
	$4x^2 - 2x - 12 = 0$		
	$4x - 2 - \frac{12}{x} = 0$	MA1	
	$2x - \frac{12}{x} = 2 - 2x \equiv ax + b$	MA1	
	$a = -2$ and $b = 2$	A1 A1	
		Total	**50**