OCR
Oxford Cambridge and RSA

GCSE

Mathematics A

Unit **A502/02:** Unit B (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2016

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

Annotations

Annotation	Meaning
	Correct
	Incorrect
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working (after correct answer obtained), provided method has been completed
M0	Method mark awarded 0
M1	Method mark awarded 1
M2	Method mark awarded 2
A1	Accuracy mark awarded 1
B1	Independent mark awarded 1
B2	Independent mark awarded 2
MR	Misread
SC	Special case
^	Omission sign

These should be used whenever appropriate during your marking.

The **M**, **A, B**, etc annotations must be used on your standardisation scripts for responses that are not awarded either 0 or full marks.
It is vital that you annotate these scripts to show how the marks have been awarded.
It is not mandatory to use annotations for any other marking, though you may wish to use them in some circumstances.

Subject-Specific Marking Instructions

1. **M** marks are for using a correct method and are not lost for purely numerical errors.
   A marks are for an accurate answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
   B marks are independent of **M** (method) marks and are for a correct final answer, a partially correct answer, or a correct intermediate stage.
   SC marks are for special cases that are worthy of some credit.

2. Unless the answer and marks columns of the mark scheme specify **M** and **A** marks etc, or the mark scheme is 'banded', then if the correct answer is clearly given and is not from wrong working **full marks** should be awarded.

   Do not award the marks if the answer was obtained from an incorrect method, ie incorrect working is seen and the correct answer clearly follows from it.

3. Where follow through (**FT**) is indicated in the mark scheme, marks can be awarded where the candidate's work follows correctly from a previous answer whether or not it was correct.

   Figures or expressions that are being followed through are sometimes encompassed by single quotation marks after the word *their* for clarity, eg FT 180 × (*their* '37' + 16), or FT 300 – $\sqrt{}$(*their* '$5^2 + 7^2$'). Answers to part questions which are being followed through are indicated by eg FT 3 × *their* (a).

   For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

4. Where dependent (**dep**) marks are indicated in the mark scheme, you must check that the candidate has met all the criteria specified for the mark to be awarded.

5. The following abbreviations are commonly found in GCSE Mathematics mark schemes.

   - **figs 237**, for example, means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point eg 237000, 2.37, 2.370, 0.00237 would be acceptable but 23070 or 2374 would not.
   - **isw** means **ignore subsequent working** after correct answer obtained and applies as a default.
   - **nfww** means **not from wrong working**.
   - **oe** means **or equivalent**.
   - **rot** means **rounded or truncated**.
   - **seen** means that you should award the mark if that number/expression is seen anywhere in the answer space, including the answer line, even if it is not in the method leading to the final answer.
   - **soi** means **seen or implied**.

6. In questions with no final answer line, make no deductions for wrong work after an acceptable answer (ie **isw**) unless the mark scheme says otherwise, indicated for example by the instruction 'mark final answer'.

7. In questions with a final answer line following working space,

   (i) if the correct answer is seen in the body of working and the answer given on the answer line is a clear transcription error allow full marks unless the mark scheme says 'mark final answer'. Place the annotation ✓ next to the correct answer.

   (ii) if the correct answer is seen in the body of working but the answer line is blank, allow full marks. Place the annotation ✓ next to the correct answer.

   (iii) if the correct answer is seen in the body of working but a completely different answer is seen on the answer line, then accuracy marks for the answer are lost. Method marks could still be awarded. Use the M0, M1, M2 annotations as appropriate and place the annotation × next to the wrong answer.

8. As a general principle, 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, mark the poorer (poorest).

9. When the data of a question is consistently misread in such a way as not to alter the nature or difficulty of the question, please follow the candidate's work and allow follow through for **A** and **B** marks. Deduct 1 mark from any **A** or **B** marks earned and record this by using the MR annotation. **M** marks are not deducted for misreads.

10. Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures even if this is rounded or truncated on the answer line. For example, an answer in the mark scheme is 15.75, which is seen in the working. The candidate then rounds or truncates this to 15.8, 15 or 16 on the answer line. Allow full marks for the 15.75.

11. Ranges of answers given in the mark scheme are always inclusive.

12. For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.

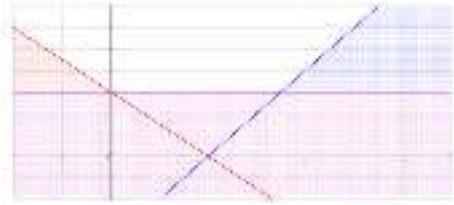
    Anything in the mark scheme which is in square brackets […] is not required for the mark to be earned, but if present it must be correct.

Question			Answer	Marks	Part Marks and Guidance	
1	(a)		All Some Square Two pairs of [adjacent] sides equal oe	1 1 1 1	 Allow other correct properties of kites eg Diagonals meet at 90° Two [opposite] angles equal	Condone true Do not allow cube, sphere or circle Allow necessary but not sufficient conditions such as two sides equal Interior/exterior angles sum to 360° One line of symmetry/symmetrical Has 4 sides
	(b)		Reasonable attempt at congruent shape	1	Correct vertices	Condone freehand
2 C8	(a)		4 correct points	2	**B1** for 1 point correct	± one small square Overlay available Ignore any joining or extra points
C	(b)		Positive	1		Ignore strong etc
C	(c)		Correct straight line	1		Within overlay $4.5 \leq$ teams ≤ 11.5 Condone good freehand

Question			Answer	Marks	Part Marks and Guidance	
C	(d)		76, 80, 84, 88 or 92 cao consistent with their number of rolls and with all correct supporting working	4	**M1** for 115 to 140 or *their* number of rolls **M1** for (115 to 140) ÷ 6 (attempted) or *their* number of rolls ÷ 6(attempted) **M1** for (19, 20, 21, 22, 23 or 24) × 4 or *their* integer quotient × 4 If 0 scored **SC1** for 76, 80, 84, 88 or 92 without supporting working.	FT *their* line if outside range (may be a curve) ± 1 small square soi by 19 to 24 in a calculation (not 6×4) May be rounded to multiple of 6
3	(a)		$\frac{1}{4}$	2	Or **M1** for $\frac{6}{24}$ oe or $\frac{3}{4}$	
	(b)		$\frac{13}{15}$ or equivalent fraction	2	Or **M1** for $\frac{3}{15}$ oe or $\frac{10}{15}$ oe	ie attempt to use a common denominator with one fraction successfully converted 0 for attempts only using decimals

Question			Answer	Marks	Answer
3c*			Answer 71 miles & 6 days with full clear working Or a trial method of multiplication or division leading to correct answer	5	eg $x = 11.8\dot{3}$ $10x = 118.\dot{3}$ $9x = 106.5$ $18x = 213$ $x = \frac{213}{18} = \frac{71}{6}$
			As above but may include either or both of • Lack of clarity in the working • Small gaps in the working Or a less simple but 'correct' answer eg 213 and 18 Or a full method and conclusion with one arithmetic error	4-3	For lower mark their working will get as far as correctly eliminating decimals Or answer of 70.98 miles or better & 6 days Or a trial method of multiplication or division with one error
			Multiplication of 11.83 (or better) by 10^n and subtraction attempted Or multiplication by 3 or a multiple of 3 attempted	2-1	For lower mark there will be an indication of multiplication of 11.83 (or better) by any integer.
				0	Nothing of any worth

Question			Answer	Marks	Part Marks and Guidance	
4	(a)	(i)	Straight line with negative gradient and *y*-intercept 4 marked.	2	**B1** for line with negative gradient or *y*-intercept 4 marked. Non-linear graph does not score.	Condone freehand line for 2 marks Ignore anything on *x*-axis
		(ii)	-1	1		Not $-x$ etc
C	(b)	(i)	Correct ruled line from (1, 60) to (7, 300)	**2**	**B1** for 3 points correct	± 1 small square Condone freehand line for max 1 mark
C		(ii)	20 40	**1** **1**		
5	(a)	(i)	0	1		
		(ii)	Division by 0 is not defined oe	1		
	(b)		-14	1		Not -14^2
6			12 5040	2 3	**M1** for $x + 14x = 180$ or $180 \div 15$ oe **M1** for $360 \div$ *their x* And **M1** for ((*their* 30 – 2) x 180 or 14 × 12 × *their* 30 If **M0** then **SC1** for 168	 Not dep on first **M1**

Question			Answer	Marks	Part Marks and Guidance	
7	(a)		Solid line through (0,3) and (4.5, 3)	1		Condone dotted line for 1
	(b)		Correct region clearly indicated.	3	**M2** for correct regions shaded for 2 of the inequalities OR **M1** for correct region shaded for 1 of the inequalities -1 for each extra shaded region	

Question			Answer	Marks	Part Marks and Guidance	
8	(a)		$8x+7y-14=4x+4y$	1		
	(b)		$6x+5y=25$ oe	M1	Condone one error	
			$12x+9y=42$ or $20x+15y=70$ $12x+10y=50$ $18x+15y=75$	M1	For multiplying both equations to make either coefficient equal (allow 1 error)	Attempts at eliminating x then eliminating y count as part of one method
			$y=8$ or $2x=-5$	M1dep	For subtracting equations (allow 1 error)	
			or $x=-2.5$	A1	For either x or y correct oe isw	
			x = -2.5 oe y = 8	A1	Mark final answer	Correct answer with no working scores **4**
					If substitution used **M1** for rearranging one equation to get x or y (allow 1 error) **M1** dep for substitution (allow 1 error)	If $6x+5y=25$ oe not found, the next two **M** marks can be earned for attempting to solve two **equations**
9	(a)	(i)	$1\frac{1}{4}$ oe	2	**M1** for $[3^0]=1$ or $[4^{-1}]=\frac{1}{4}$ oe	
		(ii)	8	2	**M1** for $[16^{\frac{1}{4}}]=\sqrt[4]{16}$ or better	

Question			Answer	Marks	Part Marks and Guidance	
	(b)		$9\sqrt{2}$	2	**M1** for $\left[\sqrt{32}\right] = 4\sqrt{2}$ or $\left[\sqrt{50}\right] = 5\sqrt{2}$	nfww but $4+\sqrt{2}$ etc loses 1 mark eg $4+\sqrt{2}+5+\sqrt{2}=9\sqrt{2}$ scores 1, $4+\sqrt{2}=4\sqrt{2}$ does not score
10	(a)		279 Alternate segment [Angles round a point = 360]	2 1	**B1** for BED = 81 or 360 – *their* BED	If parallel lines etc assumed the reason mark is not earned
	(b)		Valid geometric reason Valid geometric reason Valid algebraic approach eg to angles in triangle, quad'l etc Clear proof that hangs together eg all triangles/angles defined	B1 B1 M1 A1	To a max 2	eg Angle between tangent and radius = 90° Angles in a quad'l = 360 eg $x+5x+90+90=360$

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