GCSE

Applications of Mathematics (Pilot)

Unit **A382/01:** Foundation Tier

General Certificate of Secondary Education

Mark Scheme for June 2016

Annotations used in the detailed Mark Scheme.

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 <u>using a correct method</u> and are not lost for purely numerical errors.
    A marks are for an <u>accurate</u> answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
    B marks are <u>independent</u> of **M** (method) marks and are for a correct final answer, a partially correct answer, or a correct intermediate stage.
    SC marks are for <u>special cases</u> 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 <u>not from wrong working</u> **full marks** should be awarded.

    Do <u>not</u> award the marks if the answer was obtained from an incorrect method, ie incorrect working is seen <u>and</u> 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 – √(*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.

  i. **cao** means **correct answer only**.
  ii. **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.
  iii. **isw** means **ignore subsequent working** (after correct answer obtained).
  iv. **nfww** means **not from wrong working**.
  v. **oe** means **or equivalent**.
  vi. **rot** means **rounded or truncated**.
  vii.   **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.
  viii.   **soi** means **seen or implied**.

6.   Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise, indicated for example by the instruction 'mark final answer'.

7.   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).

8.   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.

9. 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.

10. If the correct answer is seen in the body and the answer given in the answer space is a clear transcription error allow full marks unless the mark scheme says 'mark final answer' or 'cao'. Place the annotation ✓ next to the correct answer.

    If the answer space is blank but the correct answer is seen in the body allow full marks. Place the annotation ✓ next to the correct answer.

    If the correct answer is seen in the working but a completely different answer is seen in the answer space, then accuracy marks for the answer are lost. Method marks would still be awarded. Use the M0, M1, M2 annotations as appropriate and place the annotation ✗ next to the wrong answer.

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.

13. 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.
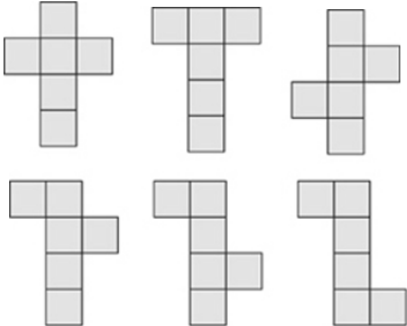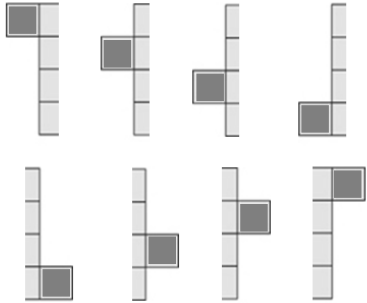
Question			Answer	Marks	Guidance	
1	(a)	(i)	Toilet flushing & personal washing	1		
		(ii)	$\dfrac{1}{3}$	1	**B1** for **a**ny fraction whose decimal equivalent is $0.3 \le x \le 0.4$ isw	
		(iii)	50	1FT		$150 \times$ *their* $\dfrac{1}{3}$
	(b)	(i)	23	1		
		(ii)	54 to 55	2	**B1** for 20 (weeks)	
		(iii)	200 000 tonnes of water in the iceberg is reduced to 0.54 to 0.55 x 200 000 =108 000 to 110 00 which will be enough for 108 000 to 110 000 ÷ 3000 = 36 to 36.7 days So yes, headline could be true	3FT	**M1** for *their* b(ii) x 200 000 correctly evaluated and **M1** for *their* 108 000 to 110 000 ÷ 3000 or 3000 x 28 to 31 or *their* 108 000 to 110 000 ÷ 30 and **B1** for their correct conclusion for their figures	0.54 to 0.55 x 200 000 =108 000 to 110 000 3000 × 28 = 84 000 3000 × 31 = 93 000 Alternative approach – find the 84 000 to 93 000 and say it is 42 to 46.5% so headline is true
	(c)	(i)	2520	1		
		(ii)	2.268	2FT	**M1** for *their* 2520 × 900 or × 0.0009 oe or figs 2268 (or FT equivalent)	Condone 2.3 from 2 268 000 for full marks
	(d)	(i)	Small	1		
		(ii)	45 ≤ h < 75 .... 45 ≥ h ≥ 75 .... 45 < h > 75 .... 45 ≤ h ≤ 75 ..✓.. 45 < h ≤ 75 .... 45 > h ≥ 75	1		
	(e)		11 000 to 14 000	2	**B1** for 11 to 14 seen	
	(f)	(i)	50	1		
		(ii)	49	2	**M1** for 56 ÷ 8 or better e.g. 7/8 of 56	Not just the 7 from the ratio

Question			Answer	Marks	Guidance	
	(g)		35 to 45	1 1 1	**B1** for AC= 12.5 to 13.5 **B1** for CB = 4.7 to 5.3 **Or** **M2** for $\sqrt{(120^2 + 50^2)}$ or **M1** for $120^2 + 50^2$ 35 to 45 cao **SC1** for answer of 40 without working	Mark the diagram for lengths Need to see a diagram for all marks unless using Pythagoras
2	**(a)**		$\dfrac{8}{15}$ oe isw	2	**B1** for $\dfrac{3+5}{15}$	Accept 0.53 (…) for 2 marks
	(b)	**(i)**	5	1		
		(ii)	F3	1		
		(iii)	= B3+D3	1 1		Condone F2=B3+D3 for both marks
3	**(a)**	**(i)**	2008	1		
		(ii)	Salient general points as illustrated by the graph i.e. • 2 peaks • Downward trend • Now going down • Fallen by over a half	2	**1:** For each point- max 2. Do not accept figures for a particular year – general trends are required as illustrated in this rough chart →	
		(iii)	40 or 39.8(...)	2	**M1** for figs 398 or ÷ 4.22 or × 0.236(…) **Or** **SC1** for answer of 39	
		(iv)	4.2	1		
		(v)	2005 and 2006	1		

Question			Answer	Marks	Guidance	
		(vi)	One mark each for up to two valid comparisons.	1+1	Examples might be Ecuador has gone up and down, but Uruguay has gone down or Equator is always greater than Uruguay or Both are more or less going down	1 max. for each point difference or similarity See LIST after SSU
	(b)	(i)	1.07	1		
		(ii)	250	1FT	267.5(0) ÷ *their* 1.07	
		(iii)	1.8 Added 0.2 or equivalent	B1 B1		
		(iv)	270	2	**M1** for 0.6×450 oe	May be done in stages
		(v)	$400 \div 1.4 = 285.71$ No they are not below the poverty line oe	2 B1	**M1** for $400 \div 1.4$ (=285.71 ...) **and** **A1** for 285.71 **B1** for correct comparison based on *their* figures	
		(vi)	Suitable reason why an internet survey might not be best	1	e.g. Everyone does not have the internet or computer could crash or people could do the survey more than once	
	(c)	(i)	13 000	1		
		(ii)	715	1		
		(iii)	£20 000 to less than £30 000	1		Condone 20 - 30
	(d)	(i)	14.5	1		
		(ii)	Argentina or Australia or Spain	1		
		(iii)	Brazil	1		Do not accept 42.0

Question			Answer	Marks	Guidance	
	(e)	**(i)**	Bolivia indicated on scatter diagram	1		
		(ii)	(Weak) negative correlation **or** As the inequality factor increases so the percentage in extreme poverty decreases oe	1		
	(f)	**(i)**	USA **or** Portugal	1	Only one correct answer needed	If extras use choice
		(ii)	Positive correlation or word version e.g. As income inequality increases so do health and social problems oe	1		
		(iii)	Axes not numbered or cannot tell what the figures or scales are o.e.	1	e.g. there is no origin or scale or we don't know what low or high mean	
4*			10080 Volume of water = 10080 x 0.1 = 1008 Volume of a cup is 200 to 400 ml oe Correct comparison of *their* 1008 with *their* cup volume Correct conclusion for their figures or comparison	**M1** **M1** **B1** **1FT** **1FT**	**M1** for 60 x 24 x 7 (= 10080) **M1** for *their* 10080 x 0.1 oe **B1** for sensible assumption Compares *their* 1008 to *their* 200 – 400 or compares *their* 1008 to *their* cupful size	1008 ÷ 250 = 4, Amber is wrong gains 1 + 1 + 0 + 1 + 1 – there needs to be specific mention of cup volume Might be dividing their volume of water by their volume of a cup

Question			Answer	Marks	Guidance	
5	(a)	(i)	580 - 600	1		
		(ii)	4	1		
		(iii)	$\dfrac{4}{19}$	1FT +1	1 each for correct numerator or denominator FT *their* 4	
		(iv)	250 to 650	1		
			Valid reason for their choice Used mean or its about near to the centre	1	e.g. 600 because most values are close to it	
	(c)	(i)	450	3	**M2** for $4 \times 1.5^2 \times 50$ or 9×50 or **M1** for 4×1.5^2 or 2.25 or number $\times 50$	
		(ii)	Any one of these correct nets	2	**M1** for two correctly sized squares added that would not make a cube	Mark for intent – need not necessarily be drawn with a ruler.

Question			Answer	Marks	Guidance	
		(iii)		3	**3** marks for all correct **2** marks for 3 correct **1** mark for 2 correct	If extras places use choice
6	a		Cycle by 69 miles or cycle by 110[.4]km oe	4	**M3** for 969 – (1440 x 5/8) or (969 x 8/5) – 1440 or Cycle <u>and</u> either 900 [miles] or 1550[.4] [km] Or **M2** for 1440 x 5/8 oe or 969 x 8/5 oe Or **M1** for 5/8 = 0.625 soi or 8/5 = 1.6 soi	69 [miles] or 110[.4] [km] For full marks accept if cycle & correct difference with units seen, but not both written on answer line 900 [miles] or 1550[.4] [km] Condone m for miles if clearly converting to imperial units
	b		Difficult to count that many Number has been rounded Too precise oe	1		Ignore irrelevant additional comments provided not contradictory Something to do with the counting or something to do with rounding / number being too precise

Question			Answer	Marks	Guidance
	c		700 000 or 705 000 or 710 000 nfww or a number in the range 704 000 to 710 000 inclusive rounded to the nearest hundred with working shown nfww	**5**	**M4** for 969 ÷ (π x 70 / 160 000) oe or (100000 x 969 x 8/5) ÷ (π x 70) oe or 700 000 to 710 000 with working shown Or **M3** for (969x8/5) ÷ (π x figs 7) oe or 969 ÷ (π x 70 / figs 16) oe or (100 000 x 969 x 8/5) ÷ 70 oe or (100 000 x 969 x 8/5) ÷ (35 x π) oe or (70 x π) ÷ (100 000 x 8/5) Or **M2** for π x figs 7 **and** 969 x 8/5 or (70 x π) **and** (100 000 x 8/5) or 969 ÷ (π x figs 7) or 100 000 x 969 x 8/5 or 1000 x 969 x 8/5 **and** 70 ÷ 100 Or **M1** for π x figs 7 or 969 x 8/5 oe or 100 000 x 8/5 oe or 70 ÷ 100 000 oe or 100 000 ÷ 70 Or **SC3** for *their* 1550[.4] [km] from part (a) ÷ (π x figs 7)	May be done in stages May be embedded FT their method if rounded or truncated Figs 705… 2 214 857 1 410 021.85… 0.001374… π x 70 = 219.8 to 220 100 000 ÷ (π x 70) = 454.7- 455 155 040 000 (70 x π) ÷ (100 000 x 8/5) = 0.00137 to 0.0014 1550[.4] 100 000 x 8/5 = 160 000 70 ÷ 100 000 = 0.0007 100 000 ÷ 70 = 1428.57…

Question			Answer	Marks	Guidance	
	d*		969 ÷ (9 x *their* hours) seen & evaluated where *their* hours 5 to 12 inclusive **and** assumption hours cycled per day stated & hours 5 to 12 inclusive	**3**		For 3 or 2 marks must see their calculation For 1 mark if no assumption then must see calculation Answers rounded or truncated Hours do not need to be integers
			969 ÷ (9 x *their* hours) seen where their hours within range 5 to 12 inclusive with no or incorrect or irrelevant assumption(s) Or 969 ÷ (9 x n) where 1≤ n ≤ 24 **and** assumption of hours per day in range 4 to 16 inclusive	**2 – 1**	For lower mark assumption of hours per day in range 4 to 16 inclusive or 969 ÷ (9 x n) where 1≤ n ≤ 24 Ignore irrelevant assumptions provided not contradictory	12 hours: 8.972…mph 11 hours: 9.7878…mph 10 hours: 10.766…mph 9 hours: 11.96…mph 8 hours: 13.458…mph 7 hours: 15.38…mph 6 hours: 17.94…mph 5 hours 21.53…mph 969 ÷ (9 x 24) = 4.486 to 4.5 969 ÷ 9 = 107.6 to 107.7
				90		

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

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