OCR
Oxford Cambridge and RSA

GCSE

Applications of Mathematics (Pilot)

Unit **A381/02:** Higher Tier

General Certificate of Secondary Education

Mark Scheme for June 2017

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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 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

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 – √(*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 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. In questions with a final answer line:

   (i) If one answer is provided on the answer line, mark the method that leads to that answer.

   (ii) If more than one answer is provided on the answer line and there is a single method provided, award method marks only.

   (iii) If more than one answer is provided on the answer line and there is more than one method provided, award zero marks for the question unless the candidate has clearly indicated which method is to be marked.

9. In questions with no final answer line:

   (i) If a single response is provided, mark as usual.

   (ii) If more than one response is provided, award zero marks for the question unless the candidate has clearly indicated which response is to be marked.

10. 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.

11. 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.

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

13. 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.

MARK SCHEME

Question			Answer	Marks	Part marks and guidance	
1	(a)	(i)	1235.9 [kph]	3	**M2** for 72.2 x √293 or 1235 or 1236 or 1235.86 ... or 17.1(17…) **M1** for 293	
		(ii)	1.1 [kph]	3	**M2** for 1193 + 2.2 x 20 – *their* (i) **M1** for 1237	1237 – *their* (i)
2	(a)		$\frac{8}{15}, \frac{13}{24}, \frac{17}{30}$	**2**	**M1** for all 3 fractions written with a common denominator with at most 1 error in the numerators OR for converting all 3 fractions into decimals (rot to at least 2 decimal places)	LCM = 120 $\frac{13}{24} = \frac{65}{120}, \frac{17}{30} = \frac{68}{120}, \frac{8}{15} = \frac{64}{120}$ $\frac{13}{24} = 0.541666\ldots, \frac{17}{30} = 0.5666\ldots,$ $\frac{8}{15} = 0.5333\ldots$
	(b)		120	**2**	**B1** for a higher multiple of 120	Note that 15 × 24 × 30 = 10800 and 24 x 15 = 360
3	(a)		150	**1**		
	(b)		181, 182 or 183	**2**	**B1** for 1993.581… seen rot to 4sf or more, OR 10.9679… rot to 3sf or more OR 181.7 to 181.8	
4	(a)*		Clear structured working to show that: $\frac{1750}{500} \times 700 = 2450$ oe	**2-1**	**1** for unclear working but including one of: • $\frac{1750}{500}$ or $\frac{2450}{700}$ soi by 3.5 • $\frac{500}{1750}$ or $\frac{700}{2450}$ soi by $\frac{2}{7}$ or 0.2857…	

Question			Answer	Marks	Part marks and guidance	
	(b)		3850	**2**	**M1** for 1100×3.5 oe	oe could be $\times \frac{1750}{500}$, $\times \frac{2450}{700}$, $\div \frac{500}{1750}$ or $\div \frac{700}{2450}$
	(c)	**(i)**	3045	**2**	**M1** for 1750 × 1.74 oe, possibly soi by 1750 + 1295	
		(ii)	900	**3**	**M2** for (5481÷ 1.74) ÷ 3.5 possibly soi by 3150 ÷ 3.5 or **M1** for 5481÷ 1.74 or *their* 3150 ÷ 3.5	"*their* 3150" must not be 5481
		(iii)	39	**3**	**M2** for [100–] $\frac{2.42}{1.74}$ [×100] oe Or **M1** for 2.42 seen or an amount increased correctly by 142% (see notes)	May do calculations using a 'base' amount. eg.Using 1750 as a base: M1 for 1750 × 2.42 = 4235 earns **M1** Or **M2** for $\frac{1750\times2.42-1750\times1.74}{1750\times1.74}[\times 100]$
5	**(a)***		339 or 338.8 to 338.9 Supported by clear working including: • $\frac{2}{25}$ = 8[%] • [Renewables=] 100 – (57 + 17 + 8) = 18% • 61 ÷ 0.18 oe 339 or 338.8 to 338.9 with little or no working. *Or* [Renewables =] 18%	**4-3** **2-1**	**3** for 339 or 338.8 to 338.9 with only 2 correct stages of working *Or* 3 correct stages of working, but missing or unclear answer **1** for 8% seen	

Question			Answer	Marks	Part marks and guidance	
	(b)		98 with correct working and reasoning seen	**4**	**B1** for "JKG" = 180 – (42+38+45) oe soi by 55 & '[sum] angles in triangle = 180' **M1** for "BKG" = 180 – (30 + *their* 55) oe soi by 95 & '[sum] angles in triangle = 180' **M1** for 360 – (72 + 2× *their* 95) & '[sum] angles in quadrilateral = 360' If **0** then **SC2** for 98 as final answer with incomplete or no working / reasoning Or **SC1** for two of: • "JKG" = 55 • "BKG" = 180 – (30 + *their* 55) oe soi by 95 • [x =] 360 – (72 + 2× *their* 95)	For M and B marks, angles may be seen on diagram, but must have reasons stated Allow alternatie correct geometric reasoning For SC marks, angles may be seen on diagram

Question			Answer	Marks	Part marks and guidance	
	(c)	(i)	1527	4	**M3** for $\frac{11.3\div0.54}{25\times1.852}\times60$ [= 27.1 to 27.2] oe Or **M2** for $\frac{11.3\div0.54}{25\times1.852}$ [=0.45 to 0.452] oe or $\frac{11.3\div0.54}{their(25\times1.852)}\times60$ oe or $\frac{their(11.3\div0.54)}{25\times1.852}\times60$ oe Or **M1** for 25 × 1.852 soi by 46.3 or 11.3 ÷ 0.54 soi by 20.9[0] to 20.93	
		(ii)	Three points marked correctly (use overlay)	4	**M1** for line drawn at bearing of 127 to 129° at viewpoint. And **M2** for at least two correct bearings drawn out of: • line drawn at bearing of 14 to16° at control centre • line drawn at bearing of 31 to 33° at control centre • line drawn at bearing of 22 to 25° at control centre	May not be labelled "[Turbine] A", "[Turbine] B", "[Turbine] C" but must be unambiguous for full marks. Condone A, B, C in incorrect order. Lines drawn must be long enough to intersect. Full marks may be awarded for correct positioning but with missing or incomplete construction lines. **SC2** for two in correct position with the third either missing or inaccurate

Question			Answer	Marks	Part marks and guidance	
	(d)	(i)	164*d* + 112*n* + 446 = 3910 leading to 41*d* + 28*n* = 866, as given	**2**	**B1** for 164*d* + 112*n* seen or 1.64*d* + 1.12*n*	Also allow starting equation as: 164*d* + 112*n* = 3910 – 446 or 1.64*d* + 1.12*n* + 4.46 = 39.10 or 1.64*d* + 1.12*n* = 39.10 – 4.46 Also allow calculation first of 3910 – 446 = 3464 or 39.10 – 4.46 = 34.64 then 164*d* + 112*n* = 3464 or 1.647*d* + 1.12*n* = 34.64
		(ii)	230*d* + 140*n* +446 = 5176 oe **AND** [day-time unit=] 16 [night-time unit=] 7.5	**1** **AND** **3**	**M1** for 46*d* + 28*n* = 946 (or 943*d* + 574*n* = 19393 AND 943*d* + 644*n* = 19918) And **M1** for 5*d* = 80 (*or* 70*n* = 525 oe) If **M0** scored, **SC2** for 16 and 7.5 as final answers. Or **SC1** for one correct answer, or both correct but interchanged.	Look for: 230*d* + 140*n* = 4730 or 23*d* + 14*n* = 473 Allow equivalent mulitples of the equations Substitution method, for example: **M1** for $d = \frac{866-28n}{41}$ And **M1** for $230\left(\frac{866-28n}{41}\right) + 140n + 446 = 5176$ or better Maximum total mark for question with SC marks is **2**.

Question			Answer	Marks	Part marks and guidance	
6	(a)		2940 ÷ 2.8 [= 1050]	1		Answer given. Must see calculation Condone verification: 1050 × 2.8 = 2940 Or 2940 ÷ 1050 = 2.8
	(b)		78.6	3	**B2** for 78.57[14…] Or **M1** for 220000 ÷ 2800	
7	(a)		5.9	2	**B1** for figs 59 as final answer	
	(b)		4.6 mm or 0.46 cm	2	**B1** for figs 46 as final answer with incorrect or missing units	
	(c)	(i)	0.65 oe	2	**M1** for $\frac{260}{20^2}$ soi by figs 65	
		(ii)	12.75	3	**M2** for $0.51 \times \sqrt{\frac{260}{0.416}}$ oe Or **M1** for $\sqrt{\frac{260}{0.416}}$ soi by $\sqrt{625}$ or 25	

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