GCSE

Applications of Mathematics (Pilot)

Unit **A381/02:** Application of Mathematics 1 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for November 2015

11.   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 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 <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.

   - **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.

14. 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)		300	5	**M1** for [Economy =] 4 × 15 soi by 60[%] oe AND **M1** for [Business=] 20[%] AND **M1** for [First=] 100 – 15 – *their* 60 – *their* 20 soi by 5[%] AND **M1** for 15 ÷ *their* 0.05 oe	Allow no working seen for 1st 3M marks For 4th M mark, if FT then must see method <u>Alternative approach using fractions</u> **M1** for [Prem. Econ=] $\frac{3}{20}$ oe AND **M1** for [Econ =] $\frac{60}{100}$ oe AND **M1** for [First =] $1 - \frac{1}{5} - their\frac{3}{20} - their\frac{60}{100}$ soi by $\frac{1}{20}$ oe AND **M1** for 15 × *their* 20 oe <u>Alternative approach using equations</u> **M2** for $15 + \frac{1}{5}n + \frac{15}{100}n + \frac{60}{100}n = n$ oe or **M1** for two of $\frac{1}{5}n$ oe, $\frac{15}{100}n$ oe, or $\frac{60}{100}n$ oe AND **M1** for $1500 = 5n$ oe

Question			Answer	Marks	Part marks and guidance	
	(b)	(i)	<table><tr><td><i>h</i> (km)</td><td>0</td><td>5</td><td>10</td><td>15</td></tr><tr><td><i>d</i> (°C)</td><td>0</td><td>32</td><td>64</td><td>96</td></tr></table>	1		Must have both correct
		(ii)	Single straight line from (0,0) to (15, 96) and no incorrect points plotted	2	**M1** for *their* 3 or 4 correct points plotted ± ½ small square Or **M1** for single straight line joining (0, 0) and (15, 96)	
		(iii)	30 000 ÷ 1000 × 0.3 57 to 58 Incorrect	M1 B1 A1	soi by 9 [km] Only earnt if 57 to 58 value quoted If **M1 B0** then also **SC1** for *their* correct conclusion following from *their* correct reading from graph	Allow M1 for 9000m Could be indicated on graph
		(iv)	− 6[°C]	2	**M1** for 10 − 6.4 × 2.5 soi by 10 − 16 **SC1** for 10 − *their 16 read from their graph*	Accuracy: +/- ½ small square
2	(a)		33.75 or 33.8	2	**M1** for 27 × 1.25 oe If **0** then **SC1** for final answer 31.05	
	(b)	(i)	20	2	**M1** for 90 − 70 oe	

Question			Answer	Marks	Part marks and guidance	
		(ii)	Angle BXY = angle BYX [Triangle BXY] is isosceles	1 1	May be implied by BXY = [70 – 50 =] 20	May be shown on the diagram
		(iii)	Point marked correctly (use overlay)	**3**	**M1** for line drawn at bearing of 49-51° at X. And **M1** for line drawn at bearing of 269-271° at Y.	May not be labelled "B", but must be unambiguous for full marks Correct lines drawn must be long enough to intersect for full marks Full marks may be awarded for correct positioning but with missing or incomplete construction lines.
		(iv)	[BY =] 6.7 to 7 cm *their* 33.75 ÷ 5 OR *their* BY measurement × 5 OR *their* 33.75 ÷ *their* 6.8 6.75 compared to their BY OR 33.5 to 35 compared to their (a) OR *their* 4.9[6] compared to 5	**B1 FT** **AND** **M1** **AND** **A1 FT**		FT from their diagram. May be shown on diagram. Must follow from their working Accept sensible comment for comparison

Question			Answer	Marks	Part marks and guidance	
3	(a)		Correct conclusion, Nhish is correct oe eg true for adults, not true for children and supported by full correct working	4-3	Lower mark for full correct working with at most one error or omission and correct conclusion	Full correct working includes finding % saving OR costs with a 25% reduction for both adults & children Adults [6 × 2.75 =] 16.50 [Discounted = 0.75 × 16.50 =] 12.37 to 12.38 $[\frac{16.50-9.50}{16.50} \times 100 =]$ 42[..]% saving 6 children [6 × 1.90 =] 11.40 [Discounted = 0.75 × 11.40 =] 8.55 $[\frac{11.40-9.50}{11.40} \times 100 =]$ 16% to 17% saving
			Their correct conclusion and at least one relevant calculation for either children *or* adults eg finding 16.50 with comment true for adults as saving £7 which is nearly 50% OR Finding % saving for adults with no or incorrect conclusion OR Finding % saving for children with no or incorrect conclusion OR Two correct relevant calculations	2-1	Lower mark for one correct relevant calculation	Alternative approach Each ride [9.5 ÷ 6 =] 1.58[33…] 1.58 ÷ 0.75 = 2.10 to 2.12 Ignore additional irrelevant work if not referred to in conclusion For 3 or 4 marks must see either % saving or 25% used in calculations

Question			Answer	Marks	Part marks and guidance	
(b)			17.7	4	**M1** for $14 = k\sqrt{10}$ oe possibly soi by $[k =]$ $\frac{14}{\sqrt{10}}$ oe or 4.42 to 4.23 And **M1** for *their* $\frac{14}{\sqrt{10}} \times \sqrt{16}$ oe And **B1** for $\frac{28\sqrt{10}}{5}$ or 17.5 or 17.71 to 17.72 If **M0** and **B0** scored then **SC2** for 22.4	
(c)			14.7	3	**B1** for 72 seen And **M1** $\frac{9.8 \times their\ 72}{120 - their\ 72}$ or better If **M0** then also **SC1** for final answer 6.53[33...]	*their* 72 must be less than 120
(d)	(i)		717602 or 717603	3	**M2** for 516298 × 1.23 × 1.13 oe Or **M1** for 516298 × 1.23 oe soi by 635046 or 635047 And **M1** for *their* 635046 × 1.13 oe	

Question			Answer	Marks	Part marks and guidance	
		(ii)	20	3	**M2** for 0.84 ÷ 1.05 oe soi by 0.8 Or **B1** for 0.84 seen	
	(e)	(i)	$8f + 12c = 892$ or $0.08f + 0.12c = 8.92$ leading to $2f + 3c = 223$	1	Answer given. Method must be shown	
		(ii)	$6f + 5c = 457$ oe [Fizzy Fish =] 32 [Candy Crown =] 53	1 **AND** 3	 **M1** for $6f + 9c = 669$ (or $18f + 15c = 1371$ AND $10f + 15c = 1115$) And **M1** for $4c = 212$ (or $8f = 256$) If **M0** scored, **SC2** for 32 and 53 as final answers. Or **SC1** for one correct answer, or both correct but interchanged	Condone 6f + 5c = 4.57 ***provided*** 8f + 12c = 8.92 also used Allow equivalent multiples of the equations Alternative methods can score full marks eg Substitution method: **M1** for $f = 111.5 - 1.5c$ **M1** for $6(111.5 - 1.5c) + 3c = 223$ or better

Question			Answer	Marks	Part marks and guidance	
	(f)		$4t + \frac{7}{3}t + \frac{16}{15}t = 95.46$ oe 12.9[0]	3 AND 1	**M2** for $4t + \frac{7}{3}t + \frac{16}{15}t$ oe seen Or **M1** for $\frac{7}{3}t$ oe or $\frac{16}{15}t$ oe	Condone working in pence
4	(a)		7	3	**B2** for 6 from correct reasoning or no working Or **M1** for meet every 10 minutes or 60 ÷ 10 or at least 3 of [8.]10, [8.]20, [8.]30, [8.]40, [8.]50 seen.	Note 60/2 – 60/2.5 = 6 is incorrect reasoning and scores B0
	(b)		2 [years] 36 [weeks]	3	**M2** for 42 ÷ (0.1 × 3) or 42000 ÷ (100 × 3) oe soi by 140 Or **M1** for 0.3 oe seen or 42000 seen	Alternative method in *days* **M2** for 42000 ÷ $(\frac{3 \times 100}{7})$ oe soi by 980 Or **M1** for 300 seen FT correct alternative methods for all marks
	(c)		5.6[0…]	3	**M2** for $40 \div \sqrt{\frac{40.8}{0.8}}$ or $40 \times \sqrt{\frac{0.8}{40.8}}$ Or **M1** for $\sqrt{\frac{40.8}{0.8}}$ or $\sqrt{\frac{0.8}{40.8}}$ soi by $\sqrt{51}$ or 7.14[1…] or 0.14[0…]	Could be $\frac{1}{\sqrt{51}}$ or $\frac{\sqrt{51}}{51}$

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