GCSE

Applications of Mathematics (Pilot)

General Certificate of Secondary Education

Unit **A382/01:** Foundation Tier

Mark Scheme for June 2012

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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.

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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.   **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.
         ii.   **isw** means **ignore subsequent working** (after correct answer obtained).
         iii.   **nfww** means **not from wrong working**.
         iv.   **oe** means **or equivalent**.
         v.   **rot** means **rounded or truncated**.
         vi.   **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.
         vii.   **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.
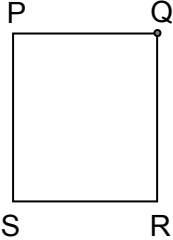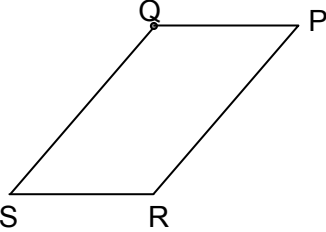
 If the answer space is blank but the correct answer is seen in the body allow full marks. Place the annotation ✓ next to the correct answer.

 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	Part Marks and Guidance	
1	(a)		(8) (4) (12) (10) (5) 15 (12) 6 18 28 (14) 42 30 15 (45)	4	**B1** for each correct row	
	(b)	(i)	15, 18, 21	1		
		(ii)	102	1		
	(c)		A repeating pattern order 5, with two squares shaded in each cycle	2	**M1** for any six squares shaded or for a repeating pattern of period 5	
2	(a)		Cross drawn at (6, 240)	1		
	(b)		40	2	**M1** for 240 ÷ 6	
	(c)		An answer in the range 300 to 340	2	**M1** for answer in range 280 to 360 or for line of best fit drawn from origin through a point between (8, 280) and (8, 360)	
	(d)		5 or 6	1		

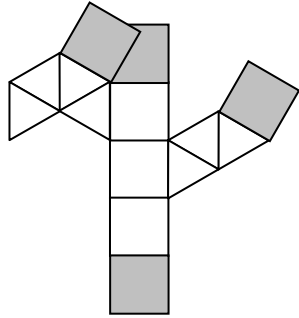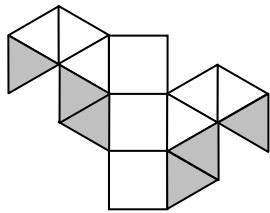| Question			Answer	Marks	Part Marks and Guidance	
3			Doses at: Thu 15:00; Thu 23:00; Fri 07:00; Fri 15:00	3	**B1** for first dose Thu 15:00 **B1** for last dose Fri 15:00 **B1** doses Thu 23:00 and Fri 07:00 **OR** **M2** for finishing point 24 hours after their starting point AND at least one more dose, with doses evenly spaced over the period from their starting point to their finishing point **or** **M1** for finishing point 24 hours after their starting point or for any starting point on Thursday, any finishing point on Friday, AND at least one more dose, with doses evenly spaced over the period from their starting point to their finishing point	
4	(a)	(i)	October	1		
		(ii)	24	1	Correct or **FT** from **(a)(i)**	
		(iii)	8	1	Correct or **FT** from **(a)(i)**	
	(b)		October September December November	2	**B1** for two or three correct	
	(c)		A pair of values giving eight more girls than boys A different pair of values giving eight more girls than boys	1 1		

Question			Answer	Marks	Part Marks and Guidance	
5	(a)		Rectangle PQRS drawn P Q S R	3	**B2** for parallelogram QPRS drawn Q P S R or for point P correctly placed, but rectangle not joined **or** **B1** for point P such that PQ is parallel to SR	Rectangle must be within the limits of the overlay Condone freehand
6	(a)		12	1		
	(b)		4	2	**M1** for 12 ÷ 3 **or** **B1** for 12 km in 3 hours	
	(c)	(i)	Correct line drawn through (3:30, 0 km) and (4:15, 12 km)	2	**M1** for a line starting at (3:30, 0 km) and ending at (any time, 12 km) or for a line of any length with the correct slope	Condone freehand
		(ii)	4 (o'clock)	1	Correct or **FT** from *their* graph	Accept alternative correct notations of the time Accept time such as 'just after 4 o'clock'
7			(5), 1, 7, 3, 6	4	**B1** for each correct match	

Question			Answer	Marks	Part Marks and Guidance	
8	(a)		Jess: 20; Laura: 20; Molly: 200	2	**B1** for two correct totals	
	(b)*		Indicates 'Yes' **or** 'No', and gives a complete, appropriate explanation relating to both the number of trials and to the range in the results	2	eg: • Yes, the range overall was pretty high • No, because 20 throws are not enough. With 200 it's almost equal numbers • No, in Molly's the scores were pretty consistent **1 mark** – Partial but incomplete explanation	Note: the range in the overall totals from 36 to 43 is acceptable to support either decision
9			Table completed correctly	3	**M2** for at least three names in the correct position in the table **or** **M1** for at least two names in the correct position in the table	Jato 1.39 Kosey 0.964 Amra 1.134 Tocho 1.02 Sab 1.3
10	(a)		Median	1		
	(b)*		Explains that the weights of the other potatoes may not have balanced out or that the calculation would be correct for the mean, not the median	1	eg: • The heavier potatoes might have been much heavier but the lighter ones only a bit lighter • He found the middle potato not the mean	
11	(a)		110 minutes	2	**M1** for 2 × 45 + 20	Accept 1 hour 50 minutes

Question	Answer	Marks	Part Marks and Guidance	
(b)*	Indicates No, and gives a completely generalised explanation	2	eg: • Only the amount of time for the weight of the chicken is doubled • You only add the last 20 minutes once • The 20 minutes doesn't change **1 mark** eg: • 2 kilograms was 110 minutes, but 1 kilogram is 65 minutes or indicates No, and gives an explanation relating only to one specific pair of chickens	
(c)	Vertical and horizontal axes labelled correctly	4	**B2** for vertical axis labelled correctly **or** **B1** for vertical axis labelled with evenly spaced intervals relative to the 0 or for at least two correct values in the correct positions **and** **B2** for horizontal axis labelled correctly **or** **B1** for horizontal axis labelled with evenly spaced intervals after 500 or for at least two correct values in the correct positions	Correct labels on vertical axis are: 20, 40, 60, 80, 100, 120 Correct labels on horizontal axis are: (500), 1000, 1500, 2000

Question	Answer	Marks	Part Marks and Guidance	
(d)*	Gives a complete answer relating to any reasonable weight of chicken	3	eg: • It is 45 minutes per kilogram in the first recipe, and over 44 minutes per kilogram in the second, so there is very little difference • The difference is only about half a minute per kilogram • Package: 0.0444 minutes per gram Book: 0.045 minutes per gram Almost the same **or** **2 marks** – Gives a partial explanation based on a particular weight of chicken or a particular time **or** **1 mark** – Gives a vague or incomplete explanation or calculation or partially correct calculations	

Question			Answer	Marks	Part Marks and Guidance	
12	(a)		A square drawn in one of the four possible positions **AND** A triangle drawn in one of the three possible positions on the left, and a triangle drawn in one of the three possible positions on the right 	3	**B1** for each correctly placed square or triangle	Accept inaccurate drawings provided the intended shape and position are clear
	(b)		6.2	3	*Trial and improvement* **M1** for a correctly evaluated trial **and** **M1** for a better trial correctly evaluated <u>Alternative</u> *(algebra)* **B1** for $t(1 + \sqrt{2}) = 15$ **B1** for $t = 15/(1 + \sqrt{2})$	

	Question		Answer	Marks	Part Marks and Guidance	
13	(a)		All five ticks correctly placed	3	**B2** for four correct **or** **B1** for three correct	True False ✓ ✓ ✓ ✓ ✓
	(b)		(Nevada) Oregon Arizona Washington California	4	**B1** for California in correct position (last) **B1** for Arizona placed anywhere below Oregon **B1** for Washington placed anywhere below Oregon **B1** for Washington placed anywhere below Arizona	Accept clear abbreviations
14	(a)	(i)	27	1		
		(ii)	54	2	**M1** for (area of one face) 3 × 3 or 9 or for area is 6 × *their* area of one face	
	(b)	(i)	n	1		
		(ii)	$6n^2$	1		
		(iii)	125	3	Correct or **FT** from *their* part **(ii)** provided this includes a multiple of n^2 **M1** for (n^2 or area of one face) = 150 ÷ 6 or 25 or for n (or edge length) = square root of *their* area for one face	

	Question		Answer	Marks	Part Marks and Guidance	
15			Plan view fully correct	2	**M1** for rectangle with line same length & parallel to the shorter side dividing shape into two rectangles, dimensions may not be accurate or rectangle 10cm by 3cm with no line	Condone diagrams drawn without a ruler
			Front view fully correct	2	**M1** for rectangle, dimensions may not be accurate	Condone diagrams not labelled side/plan/view or labels incorrectly assigned
			Side view fully correct	2	**M1** for trapezium with two right angles, dimensions may not be accurate	Do not accept nets or 3D diagrams
16	(a)		$5.8 \qquad 0.8 \qquad 5.4$ $5.4 \qquad 5.3\dot{7}\dot{0} \qquad 0.0\dot{2}9\dot{6} \qquad 5.3\dot{8}5\dot{1}$ $5.3\dot{8}5\dot{1} \quad 5.38514.. \quad 0.00004…$	5	**M1** for 5.8 and (±) 0.8 (1st row) and **M1** for 5.4 in 1st row final column and **M1** for 5.4 in 2nd row 1st column or same value given in 1st row final column and 2nd row 1st column and **M1** for $5.3\dot{7}\dot{0}$ and (±)$0.0\dot{2}9\dot{6}$ or $5.3\dot{8}5\dot{1}$ and **B1** for 5.38514… and 0.00004…	For 5.8 allow 29 ÷ 5 For $5.3\dot{7}\dot{0}$ allow 29 ÷ 5.4 or 5.37 – 5.3704 For $0.0\dot{2}9\dot{6}$ ignore ± and allow 0.0296 – 0.03 For $5.3\dot{8}5\dot{1}$ allow 5.385 – 5.39 For 5.38514… allow 5.38 – 5.386 For 0.00004 allow 4×10^{-5}
	(b)		5.385	1	Correct or **FT** *their* value given in last row of N/C column provided answer rounded to 4 sig figs.	

APPENDIX

Exemplar responses for question 8(b)

Response	Mark
No – Each dice shows a result that is really close to each other	1
No – It is fair because tests show random results	0
Yes – There is a low amount of 2s and 6s through all turns	1 BOD
Yes – It isn't fair as Molly has thrown the dice a lot more	0
Yes because Molly tested it many more times	0
You need to have an equal amount of tests to make it fair	0
Yes – The number two did not get landed on as many times as the other numbers	1
No – the results don't need to be the same they need to be close	1
No – when you look at both Laura & Jess results they balance okay	0
Yes – the probability should be 1/6 to get a number and Jess didn't get any 2s	0
Yes – Jess and Laura's results were quite similar	0
Yes – because Jess was not able to roll a 2 when the others were	0
No – because Molly rolled the dice 200 times and got all the numbers near enough the same amount of times	2
No – the probability should be 1/6	0
No – Tom is incorrect as the dice falls on the same number almost as equally as the others	1
Yes – Because any of the girls could pick different numbers as there's a range	0
No – I can tell that the number of times every number came up were fairly equal	1
Yes – Molly rolled the dice more times and the amount of times she got each number aren't far apart. 6 being the lowest at 31 and 4 being the highest at 36.	1 – should be 'No'
No – because all the numbers are all in the same area, single digits then in the 30s	1
No – when tested 200 times the numbers on the dice what came up are near enough the same	2
No – because Jess and Laura did not collect enough data for the results to be challenged by Tom	0
No – because all the number of times the dice rolled are all close to each other, it's almost evenly spread	1

Exemplar responses for question 10(b)

Response	Mark
Not all the potatoes weigh the same. There are big potatoes which weigh more and little potatoes which weigh less	0
The potatoes are different sizes meaning not all the potatoes weighed 90g	0
He thinks the average is 90g but that doesn't mean they all weigh 90g	0
As the last potato is the median it does not give the mean. The mean is what Alex would need to base this statement on	1
Alex would be right if he had found the mean	1

Exemplar responses for question 11(b)

Response	Mark
No – 2kg takes 110 minutes whereas 1kg takes 65 minutes	1
No – because if you double it you will be ×2 20 mins as well and you can't. You could double it −20	2
No – you cook the chicken for 45 minutes for every 1kg and then you add on 20 minutes meaning won't take twice as long to cook a chicken twice as big as another	0
No – 1kg takes 65 minutes and 2kg doesn't take twice as long	0
No – you don't double the extra 20 minutes	2
No – you don't have to do twice the amount of "plus 20 minutes" only double the 45 minutes	2

Exemplar responses for question 11(d)

Response	Mark
Two lots of 450 nearly make 1kg so they will be almost the same	0
There is approximately 2 450g in a kilogram so it will take 2 × 20 = 40 + 20 = 60 which is nearly 65 minutes	2
It takes 40 minutes to cook each 450g so 2kg would be 900g so the cooking time would be approximately 100 minutes and the book states it is 110 minutes and 10 minutes difference isn't much	0
1kg would take 60 minutes and not 65	1
450g on package takes 20 minutes but it takes 500g to cook in 22.5 minutes	0
For 65 minutes it would be 20+45 (20+25) 450 + 562.5 which is just over 1000g basically the same	2