

GCSE

Applications of Mathematics (Pilot)

Unit **A382/01**: Foundation Tier

General Certificate of Secondary Education

Mark Scheme for June 2014

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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.

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Annotations used in the detailed Mark Scheme.

Annotation	Meaning
	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
✓	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

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.

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.

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 $180 \times (\textit{their '37'} + 16)$, or FT $300 - \sqrt{(\textit{their '5^2 + 7^2'})}$. Answers to part questions which are being followed through are indicated by eg FT $3 \times \textit{their (a)}$.

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.

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.

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).

nfw 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**.

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'.

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).

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.

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.

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.

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

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.

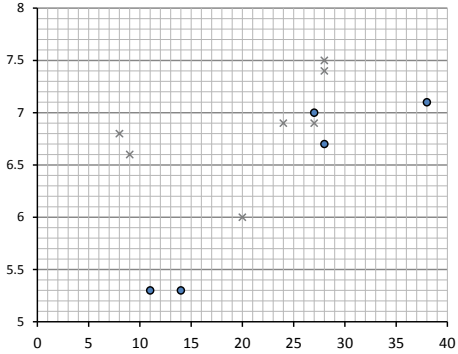
Anything in the mark scheme which is in square brackets [...] is not required for the mark to be earned, but if present it must be correct.

Question		Answer	Marks	Part Marks and Guidance	
1	(a)	16	3	M1 $2.4 \times 4 \times 5$ or 48 M1 <i>their</i> $48 \div 3$	All three values need to be used
	(b)	(i) 1	1		
		(ii) 1400	1		
		(iii) $4 \frac{1}{2}$ oe	1		Do not accept 4.30
	(c)	(i) 208.5136 rot	1		
		(ii) 46.6 to 47.2	2 FT	M1 $8 \times 35^2 \div$ <i>their</i> c(i) rot	Need to see working for FT marks. $8 \times 35^2 = 9800$
		(iii) Average weight of adult 40 – 130 (kg) 3 to 10 adults may be safely carried	M1 B1	M1 average weight assumption 40 – 130 (kg) B1 number in range 3 to 10 – integers only	
	(d)	(i) 8[.0]	1		
		(ii) No, wasn't true in 2011, Q1 or 8 was greater than Q4 or 7.8 o.e.	2	B1 True in 2009 or 2010 or B1 Not true in 2011	To gain full credit must quote 2011 and at least one figure or one quarter
		(iii) 30.6 and 30 600	3	M1 At least three of these seen and added 7.6 7.2 7.8 and 8(.0) A1 30.6 B1FT Follow through on units of a thousand to ordinary number.	Addition may be implied by value in the range 29 - 31
	(e)	(i) [electrical] wiring and [electrical] appliances	1	Both causes are needed	
		(ii) 1200	1		
	(f)	(i) 1250	2	M1 for 24×50 or 1200 or 25 seen	
		(ii)* No because a fire engine makes 625 cubic metres which is less than 5250 cubic metres	4	3 correct calculation of foam produced and consistent units changed correctly with wrong or no conclusion Or correct calculation and right conclusion for their figures with incorrect units or 2 Correct volume in litres of foam produced or 1 Correct change of units or $500 \times$ <i>their</i> f(i)	FT <i>their</i> f(i) for all marks To convert from litres to cubic metres is f(i) \times 0.5

Question		Answer	Marks	Part Marks and Guidance		
	(g)	(i)	56 to 72	2	M1 14 to 18 seen in working or as answer or M1 “number of squares” × 4 or M1 clear evidence of square counting (about half the squares ticked/dotted or numbered in some way)	Number of squares between 8 and 26
		(ii)	1.5 hours oe	1	Accept 90 minutes	
2	(a)	(i)	68 to 72 nfw	2	B1 6.8 to 7.2 seen or M1 “length” x 10	
		(ii)	A	1		
	(b)	(i)	Correct circle of radius 4cm drawn and correctly positioned	1		
		(ii)	Correctly shaded region	1FT	Intersection of all three circles shaded	Must have a third “circle”
		(iii)	Perpendicular bisector of P and Q	1	Passing through at least the intersections of P and Q circles	
	(c)		B A D	1 1 1		
	(d)		$100r \leq 10\,000$ <u> ✓ </u> $100r \geq 10\,000$ <u> </u> $10\,000 \leq 100r$ <u> </u> $r \leq 100$ <u> ✓ </u>	2	B1 for each correct. If more than 2 ticked -1 each error	

Question		Answer	Marks	Part Marks and Guidance	
	(e)	(i)	$\frac{3}{60}$ or equivalent fraction isw 0.05	1 1FT	Probability must be < 1 Allow follow through of decimal from their fraction
		(ii)*	Probable cost of not hiring extra crane = $0.05 \times 100\,000 = \text{£}5000$ hire cost is $\text{£}20\,000$ so best not to hire. Or calculations for a multiple of 20 projects with correct conclusion of not hiring the crane	4	3 At least <i>their</i> $0.05 \times 100\,000$ calculated and compared with $\text{£}20\,000$ with incorrect conclusion or correct calculations for a specified number of projects, usually a multiple of 20 with incorrect conclusion 2 <i>their</i> $0.05 \times 100\,000$ calculated or correct calculations for a specified number of years, n, usually a multiple of 20, $n \geq 20$ 1 Statement about relative likelihood of their probability from (e) (i) with correct conclusion for <i>their</i> probability or correct comment on <i>their</i> calculations for the cost of a number of projects
3	(a)		2.4 to 2.44	1	
	(b)	(i)	2.6[325] m compared with 2.4[39 ...] with suitable comment	3	M1 1.35×1.95 A1 2.6[325] and B1 Consistent comparison with <i>their</i> answer to part (a)
		(ii)	$h = \frac{s}{1.35}$ oe	1	e.g. Allow $h = s \div 1.35$ Do not accept flow diagram
	(c)		$\frac{1}{3}$	2	M1 $\frac{80}{240}$ oe

Question		Answer	Marks	Part Marks and Guidance	
	(d)	Can go under the world record as can run in 9.54 seconds	3	M1 45 x figs 8 A1 9.54 B1 for correct comparison of <i>their</i> 9.54 but NOT 8 with 9.58	See appendix
	(e)	(i) 11.4[0]	1		
		(ii) $60 < d \leq 80$ oe	1	Allow clear indication	
		(iii) Any correct relevant comment	1	e.g. Berlin peak speed later or peak speed faster.	See appendix
4	(a)	B and correct reason	1	B as easier to process responses or other correct reason	See appendix
	(b)	(i) A correct advantage	1	Quick/cheap/easy	See appendix
		(ii) A correct disadvantage	1	Biased/miss people	See appendix
	(c)	(i) Fairly happy 560	1 1		
		(i) 55	1		
		(ii) Any correct general statement	1	e.g. not much difference	See appendix
	(d)	Can be processed numerically oe	1	Answer should allude to calculations or processing and not just a range of answers or ease of answering	
	(e)	(i) 5	1		
		(ii) Mean = 7.41666... rot to at least 1 d.p. Mode = 7 Median = 7.5 Range = 6	2 1 1 1	M1 Evidence of correct total (89) or attempted sum of at least 10 correct values or <i>their</i> total \div 12	
		(iii) No because the mean and median are higher for '40 and over'	2	1 mark for No and reference to either mean or median or averages being higher in the '40 and over' FT <i>their</i> mean value	See appendix

Question		Answer	Marks	Part Marks and Guidance	
	(f) (i)	4 correctly plotted points 	2	B1 for 2 or 3 points correctly plotted Tolerance $\pm \frac{1}{2}$ small square	
	(ii)	Moderate or weak Positive correlation	1 1	1 for relative strength 1 for positive If 0 then SC1 for word version of positive correlation	
5	(a)	No as half of 140 is 70 oe	1	75p is not half of £1.40	Accept correct calculations for Josh's typical week and conclusion
	(b) (i)	33	2	M1 for $30 + 10\% \times 30$ oe	May be done in stages Do not accept 'of' instead of 'x'
	(ii)	£17.25	4	M3 for $30 \times 140 - \text{their (b)(i)} \times 75$ or M2 for 30×140 and $\text{their (b)(i)} \times 75$ or M1 for 30×140 or $\text{their (b)(i)} \times 75$ If M0 then SC1 for final answer 19.50 or 1950p	Accept all equivalent values if done in £ throughout Allow 1725p given as final answer Accept their (b)(i) x 75 not shown explicitly for M marks 4200 2475

Question		Answer	Marks	Part Marks and Guidance	
	(iii)	30 nfww	2FT	<p>M1 for 510 / <i>their</i> (b)(ii) or 29.5 – 29.6...</p> <p>Or T & I method using the two consecutive integer values x <i>their</i> (b)(ii) that lead to answers either side of 510 Eg [30 x 17.25 =] 517.5[0] & [29 x 17.25 =] 500.25 soi</p>	<p>Condone both 29.5 – 29.6... & 30 on answer line</p> <p>For 2FT must see working using <i>their</i> (b)(ii) leading to rounded up answer</p>
	(c)	Vertical axis should start at 0 oe	1		
	(d)	50p	2	M1 for $75 \div 3 \times 2$ oe	

APPENDIX

Exemplar responses for question 1f(ii)

Response	Mark
1200 in 1f(i) $500 \times 1200 = 600,000$ litres $5250 \times 1000 = 5250,000$ so not enough to fill the park	4
No you will need 8.4 fire engines as $5250,000 \div 625,000 = 8.4$	4
1200 in f(i) $5250,000 \div 600,000 = 8.75$ so not enough	4
1200 in f(i) Yes because the foam will expand to 600,000 litres and the volume of the park is 5250,000 litres	3
1200 in f(i) $1200 \times 500 = 600,000$ cubic metres which is bigger than 5250 cubic metres so Yes	3
$1250 \times 500 = 625,000$	2
1250×500	1
$5250\text{m}^3 = 5250,000$ litres	1
1200 litres = 1.2 cubic metres	1
No you will need 9 fire engines	0

Exemplar responses for question 2(e)(ii)

Response	Mark
$0.05 \times 100,000 = 5,000$. This is less than £20,000 so she should not get the crane	4
$1000,000 \times 0.05 = 5,000$ so she should buy the crane as 5,000 is less than 20,000	3
$100,000 \times 0.05 = 5,000$	2
You do not need another crane as 95% likely to be on time	1
She should not hire an extra crane because she only has a 0.05 chance of being late	1
The other 57 times you haven't struggled due to cranes so I would take the risk	0
No because her probability is 3/60	0
The saving would be $1000,000 - 20,000 = 80,000$	0
$£100,000 \div £20,000 = 5$ so No	0

Exemplar responses for question 3b(i)

Response	Mark
No because $1.35 \times 1.95 = 2.6$ and the length for his stride in part a = 2.4	3
2.4 and $1.35 \times 1.95 = 2.6$ The formula does match to an extent	3
6 in part (a) $1.35 \times 1.95 = 2.6$ so this does not match the formula	3
2.44 in part (a) $1.35 \times 1.95 = 2.63$ so they do not match	3
2.44 in part (a) $1.35 \times 1.95 = 2.63$ so they nearly match	3
$2.44 \div 1.35 = 1.80(\dots)$ so Bolt would be 1.80m tall which he is not – so the formula is wrong	3
0.46 in part (a) $1.35 \times 1.95 = 2.6325$ so strides should be 2.63m	2
2.44 in part (a) $1.35 \times 1.95 = 3.3$ so they do not match	2
2.43 in part (a) $1.35 \times 1.95 = 3.3$	1
287m in part(a) $287 \times 1.95 = 559.65$ Doesn't work	0

Exemplar responses for question 3d

Response	Mark
$80 \times 45 = 3600 = 3.6$ seconds, $72 \times 45 = 3240 = 3.24$ seconds. $3.6 - 3.24 = 0.36$ seconds. $9.90 - 0.36 = 9.54$ seconds so he would break the world record	3
$8 \times 45 = 360$ $0.001 \times 360 = 0.36$ seconds. $9.90 - 0.36 = 9.54$ so he would beat it	3
3.6 seconds on ground 6.3 seconds in air. $3.6 + 6.3 = 9.54$ Yes he would beat it by 0.04 seconds	3bod
$45 \times 8 = 360$ so he would not beat it	2
10% of 80 = 8 $80 - 8 = 72$ milliseconds. $9.90 - 0.072 = 9.828$ so he will not break the world record	1
$80 - 8 = 72$ 7.002 Yes he would break the record as his time would be 7.002 seconds	1
10% of 9.90 = 0.99 $9.90 - 0.99 = 8.91$ so he would break the record as his time is faster than 9.58	1
10% of 9.90 = 0.99 $9.90 - 0.91 = 8.99$ so he will break the record	1
10% of 80 = 8 so he will break the record	0

Exemplar responses for question 3e(iii)

Response	Mark
Barcelona was slower at $60 < d \leq 80$ whereas Berlins speed was still increasing	1
Barcelona's speed peaked earlier than Berlin	1
Barcelona was fastest in 40-60 but Berlin was fastest in the 60-80	1
They had fastest sections in different parts of the track	1
The speeds got higher in the middle then decreased at the end	0
Berlin picked their speed up more rapidly in the second half	0
$11.40 - 11.17 = 0.23$	0
Both slow down at the end	0
Barcelona were faster in the middle section	0
Berlin were slower in the early parts of the race	0
At Berlin they started off faster	0

Exemplar responses for question 4a

Response	Mark
B - It gives people guidelines to work with	1
B - It is easier to record results for later	1
B - You have choices to help you	1
B – You are given opinions to answer the question	1
B – You have got more of a choice and it is more detailed	1 bod
B – You have more options to choose from	1 bod
B – It is better laid out	1 bod
A – You can only give what's there on B whereas on A you can say what you want to say	1
A – You can be very specific when you give your mood	1
A – You have a wider choice of answers	1
B – Because it does not cover all possibilities	0
A - Because it makes the response easy to count	0

Exemplar responses for question 4b(i)

Response	Mark
It is quick and easy to do	1
It is quicker as you do not need to go round town	1
You don't need to go out to do it	1
Less paper meaning better for the environment	1
Low cost	1
Results can be obtained from people all over the country	1
You do not need to see a person's face so no mistrust	1
It will be easy to tally the scores and you do not have to go door to door	1 bod
You will get results faster	1
You don't have to ask face to face	1
You might get a decent answer on the phone	0
You might get people lying on the phone	0

Exemplar responses for question 4b(ii)

Response	Mark
People may forget the options & you may have to repeat	1
Not as many people may take part	1
You may not get through on the phone	1
People may not answer	1
People may be busy and not interested	1
There may be technical issues with the phone line	1
It can be time consuming to ask enough people	1
Many people do not like telephone surveys	1
It takes a lot of time and effort	1
You can annoy people and it be harder to do	1
You are more likely to get abuse on the phone	1
You don't know where people are in the country	0
You may only get housewives and disturb the cleaning	0

Exemplar responses for question 4c(iii)

Response	Mark
They are very similar	1
More men were fairly happy but more women were very happy	1
More men were fairly happy but equal amounts were very happy	1
They were equal in fairly unhappy and very unhappy	1
All the percentages are the same or very close	1
Males and females overall are the same happiness	1
Males are happier than females	1
More males consider themselves to be fairly happy	1
More women are very happy	1
More men are very happy	0
There are more men than women	0

Exemplar responses for question 4d

Response	Mark
It is easier to make an average out of it	1
You can work more with numbers	1
It is easy to understand and is easily calculated	1
Easy to use, gives people more options, easy to use for numbers	1
You can work out percentages and fractions from it	1
Can be calculated for mean, median and range	1
People have a choice of how far they agree with the answer	0
It is more straightforward to getting a clear answer	0
It is very quick and easy to complete	0
It can be an exact number	0
People may feel more comfortable answering	0
It gives people a wider range and would be interpreted the same by everyone	0
It is more accurate and has a range of options	0
There is a wider choice of options	0
It is more accurate	0
People may feel more comfortable answering	0
It gives the people more range to choose from and is more accurate	0

Exemplar responses for question 4e(iii)

Response	Mark
I think the 40 and over group is happier as they have a higher mean and median , however they have a higher range	2
The 40 and over group are happier because they have a bigger mean, median and range	2
No because the mean, median and mode are lower	2
No because all the mean, mode, median and range are either the same or higher for the Over 40s	2
By doing the averages/mean Under 40 7.036, Over 40 7.416. This proves the over 40s are happier	1
No because all the mean, mode, median and range are higher for the Over 40s	1
No because the mean is more in the Over 40s	1
No because the Over 40 averages are higher	1
The over 40s are happier as they have a higher median	1
Under 40 is happier than over 40 as they got better results	0
Mean over 40 = 8.09, so the 40 and over group have higher average by 1.05490	0
No because they have a lower range	0
No because the average amount of happy people who are in 40 and over is higher than 40 and under	0
Yes because they asked more under 40s	0
They are both as happy because they have the same mode	0
Yes because the mean was much higher in the 40s and over group than it was with the other group	0
Yes because the under 40s group has more bigger numbers than the 40 or over group	0
Yes because the range was less	0

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