

**GCSE Mathematics (1MA0) – Foundation Tier Paper 2F**

**June 2016 mark scheme**

## NOTES ON MARKING PRINCIPLES

### Guidance on the use of codes within this mark scheme

M1 – method mark for appropriate method in the context of the question. This mark is given for showing your working and may be awarded even if working is incorrect.

A1 – accuracy mark. This mark is generally given for a correct answer following correct working.

B1 – working mark. This mark is usually given when working and the answer cannot easily be separated.

C1 – communication mark. This mark is given for explaining your answer or giving a conclusion in context supported by your working.

In some cases full marks can be given for a question or part of questions where no working is seen. However, it is wise to show working for one small slip could lead to all marks being lost if no working is shown.

Some questions (such as QWC) require all working to be shown; in such questions, no marks will be given for an answer with no working (even if it is a correct answer).

Note that in some cases a correct answer alone will not score marks unless supported by working; these situations are made clear in the mark scheme. Examiners are prepared to award zero marks if the student's response is not worthy of credit according to the mark scheme.

### Question 1 (Total 4 marks)

This lower demand question tested students' ability to write numbers in words and from words (specification references **Na**, **Nb** and **Nu**).

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	Four thousand, seven hundred and twenty six	B1	This mark is awarded for the correct answer  Examiners were also prepared to accept an answer of 4 thousand 7 hundred and twenty six
(b)	5 000 000	B1	This mark is awarded for the correct answer only
(c)	3600	B1	This mark is awarded for the correct answer only
(d)	7.04, 7.47, 7.58, 7.6, 7.69	B1	This mark is awarded for the correct answer only

**Examiner's comments:** Most students successfully wrote the number 4726 in words and five million in figures although it was not uncommon to see five million written as 500 000 or 50 000. Most students rounded 3648 to the nearest hundred correctly. Those who failed to achieve the mark commonly rounded up to 3700.

A significant number of students failed to score in part (d). 7.6 was often written as the second number in the list, and sometimes the first, with the rest being correct. Inevitably some wrote the list in reverse order.

**The average score for this question was 3.07. Students aiming for grade C would be expected to score all 4 marks; students aiming for grade F would also be expected to score at least 3 marks.**

## Question 2 (Total 3 marks)

This lower demand question tested students' ability to interpret a wide range of graphs and diagrams and draw conclusions (specification references **SPi**).

Part	Working an or answer examiner might expect to see	Mark	Notes
(a)	8	B1	This mark is awarded for the correct answer only
(b)	$4 + 6 + 8 + 9 + 3 (= 30)$	M1	This mark is awarded for a method to find total number of apples sold
	Tuesday, Thursday	A1	This mark is awarded for the correct answer only

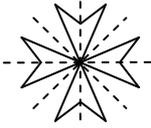
**Examiner's comments:** The majority of students identified the correct bar and read off the scale proficiently in part (a).

Many students did not read or understand the question in part (b) thoroughly, focussing on 'twice the number' instead. These students wrote Monday and Wednesday as their answer, writing, for example, Wednesday  $(8) = 2 \times$  Monday  $(4)$  or Tuesday and Friday (as Tuesday  $(6) = 2 \times$  Friday  $(3)$ ). Several students lost marks by putting the numbers 9 and 6 instead of the days of the week as the question asked. Students who showed working to get a total of 30 often went on to provide an incorrect answer.

**The average score for this question was 2.02. Students aiming for grade C would be expected to score all 3 marks; students aiming for grade F would also be expected to score at least 2 marks.**

### Question 3 (Total 3 marks)

This lower demand question tested students' ability to understand symmetry of a 2-D shape (specification references **GMe** and **GMd**).

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	2	B1	This mark is awarded for the correct answer only
(b)		M1	This mark is awarded for any two correct lines of symmetry
		A1	This mark is awarded for all four lines of symmetry with no extra incorrect lines

**Examiner's comments:** Part (a) was well attempted with many correct answers. However, a number of students confused line symmetry with rotational symmetry, giving an answer of 0 or 4.

Part (b) was well answered with most students getting at least two correct lines of symmetry and many drawing all 4 lines with no extra lines. A significant number inappropriately used parallel line notation and some students were very careless when drawing their 'straight' lines, as a number of responses seen were drawn freehand.

**The average score for this question was 2.08. Students aiming for grade C would be expected to score 2 or 3 marks; students aiming for grade F would also be expected to score at least 2 marks.**

**Question 4 (Total 3 marks)**

This lower demand question tested students' ability to use arithmetic and carry out problem-solving in context (specification references Na).

Part	Working or answer an examiner might expect to see	Mark	Notes
	$30 \times 8p + 40 \times 4p = 400p$ $30 \times 3p + 40 \times 2p = 170p$	M1	This mark is awarded for a complete method to find the cost for one company
	$400p - 170p = 230p$	M1	This mark is awarded for a complete method to find the cost for both companies and finding the difference
	2.30	A1	This mark is awarded for the correct answer only (converting pence to pounds)

**Examiner's comments:** Many students converted pence to pounds incorrectly, such as writing 8p as £0.8, which led to an incorrect final answer. There were many errors made where one number was used in error such as using 30 calls and 30 texts. The penalty for this was high as the correct method was not seen for either company.

**The average score for this question was 2.34. Students aiming for grade C would be expected to score all 3 marks; students aiming for grade F would also be expected to score at least 2 marks.**

**Question 5 (Total 5 marks)**

This lower demand question tested students' ability to understand and use fractions (specification reference No).

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\frac{7}{10}$	B1	This mark is awarded for the correct answer only
(b)	12 squares shaded	B1	This mark is awarded for 12 squares shaded
(c)	$80 \div 5 (= 16)$  or  $1 - \frac{1}{5} (= \frac{4}{5})$	M1	This mark is awarded for a method to find $\frac{1}{5}$ of the 80 marbles  or  an expression for the marbles Jack has left
	$80 - 16$ or $16 \times 4$ or $\frac{4}{5} \times 80$	M1	This mark is awarded for a method to find out how many marbles Jack now has
	64	A1	This mark is awarded for the correct answer only

**Examiner's comments:** Almost all students gave the correct answers to parts (a) and (b). The most common of the rare incorrect answers to part (a) were  $\frac{3}{7}$  or  $\frac{7}{3}$  or  $\frac{3}{10}$ .

Most students made a start to part (c), dividing 80 by 5 to get 16. However many students stopped at this point rather than going on to work out how many marbles Jack had after giving some away. Some students simply subtracted 0.2 or  $\frac{1}{5}$  from 80.

**The average score for this question was 3.50. Students aiming for grade C would be expected to score all 5 marks; students aiming for grade F would also be expected to score at least 3 marks.**

### Question 6 (Total 4 marks)

This lower demand question tested students' ability to interpret information presented in a range of linear and non-linear graphs (specification references **As**).

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	35	B1	This mark is awarded for the correct answer read from the graph
(b)	$40 - 10 = 30$	B1	This mark is awarded for the correct answer read from the graph
(c)	$35 - 10 (= 25)$ between 1 pm and 3.30 pm or $40 - 15 (= 25)$ between 3.30 pm and 6 pm or $35 + 30 - 15$ (or equivalent)	M1	This mark is awarded for a method to find the number of litres used between 1 pm and 6 pm
	50	A1	This mark is awarded for the correct answer  or  for the student's answer to part (b) + 20

**Examiner's comments:** In part (b) the most common errors were answers of 40 or 10 where students had not found the difference to give the amount of fuel added to the tank.

Students found part (c) a bit more challenging. Many found that one part of the journey was 25 and where this was shown, they scored a mark. However, many did not show working. It was not uncommon to see an answer of 80 (from  $25 + 30 + 25$ ) without working which meant they could not score 1 of the 2 available marks for 25 as part of their sum.

The most common error was to read all end points of the lines on the graph and add them together, for example  $35 + 28 + 10 + 40 + 23 + 15$  or just  $35 + 10 + 40 + 15$ . Other common errors seen were  $35 + 15$  and  $35 - 15$  as students just used the two end number of litres on the graph and  $35 + 30$  where students had used their answers from parts (a) and (b).

**The average score for this question was 2.68. Students aiming for grade C would be expected to score at least 3 marks; students aiming for grade F would also be expected to score at least 2 marks.**

### Question 7 (Total 7 marks)

This lower demand question tested students' ability to use arithmetic and carry out problem-solving in context (specification references **GMo**, **GMs**, **Na**). This question also tests the student's quality of written communication (QWC) in showing working to support an answer.

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	1 kg = 1000 g	M1	This mark is awarded for using the conversion from kg to g
	$(5400\text{g} \div 450) \times 2$	M1	This mark is awarded for a method to find out how many hours it will take to defrost the turkey
	$(12 \times 2 =) 24$	A1	This mark is awarded for the correct answer only
(b)	90 + 30 (= 120) 5.4 × 20 (= 108 or 1h 48 m)	M1	This mark is awarded for a correct first step
	228 minutes or 3h 48m and 6.18 pm or 228 minutes or 3h 48m and 2.12 pm	M1	This mark is awarded for a complete method to find the finish time or new start time (awarded dependent on the previous M1 being awarded)
	Finish time: 6.18 pm or 2.30 pm + 228 minutes or 3h 48m or Start time: 2.12 pm + 228 minutes or 3h 48m to finish at 6.00 pm	A1	
	"Megan is not correct" with supporting working	C1	This mark is awarded for a correct decision based on working (and can only be awarded if the two method marks are awarded)

**Examiner's comments:** Those students who knew how to convert 5.4 kg to 5400g tended to continue to divide this by 450, scoring at least 2 marks in part (a). However, many either gave a final answer of 12 or divided this by 2 rather than multiplying 12 by 2 to get the correct answer of 24. By far the most common error was to say that 5.4 kg was 540 g. Here students then struggled to cope with the 90 g left over after subtracting 450 from 540.

In part (b) those students who started with  $5.4 \times 20$  tended to go on to score at least 3 of the 4 marks. However, many did not do this calculation. They calculated  $5 \times 20$ , ignoring the 0.4 or just said that the initial calculation was 100 minutes or 1 hour 40 minutes, disregarding the extra 0.4 kg. This meant they could only access 1 mark for adding 90 and 30 to their times. Others struggled with calculations involving time confusing 1 hour 48 minutes with 1.48 or 108 minutes with 1.08 hours, and dealing with time as a decimal.

**The average score for this question was 2.76. Students aiming for grade C would be expected to score at least 5 marks; students aiming for grade F would also be expected to score at least 2 marks.**

### Question 8 (Total 2 marks)

This lower demand question tested students' ability to identify coordinates of given points and with given coordinates (specification reference **Ak**).

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	1, 5	B1	This mark is awarded for the correct answer only
(b)	Point D marked at (3, 6)	B1	This mark is awarded for the correct answer only

**Examiner's comments:** Most students got part (a) correct with the main incorrect response being (5, 1).

Part (b) was well answered. The most common incorrect responses were plotting at (2, 6), (4, 6), (0, 2), (0, 3) or (0, 4). Those students who did not gain a mark often forgot about it being a rectangle or did not know that the vertices *ABCD* had to go in order around a shape.

**The average score for this question was 1.75. Students aiming for grade C would be expected to score both marks; students aiming for grade F would also be expected to score at least 1 mark.**

**Question 9 (Total 2 marks)**

This lower demand question tested students' ability to find square roots and cubes (specification references **Nd**, **Ne**, **Nu** and **Nv**).

<b>Part</b>	<b>Working or answer an examiner might expect to see</b>	<b>Mark</b>	<b>Notes</b>
(a)	2.7	B1	This mark is awarded for the correct answer only
(b)	$21 \times 21 \times 21 = 9261$	B1	This mark is awarded for the correct answer only

**Examiner's comments:** Nearly all students demonstrated that they recognised the square root sign and knew how to use it on their calculator. Most students coped with the cube function. Those that did not tended to write an answer of 63.

**The average score for this question was 1.74. Students aiming for grade C would be expected to score both marks; students aiming for grade F would also be expected to score at least 1 mark.**

**Question 10 (Total 6 marks)**

This lower demand question tested students' ability to find the mode and mean (specification references SPh, Na, Nu and Nv).

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	19	B1	This mark is awarded for the correct answer only
(b)	$(20 + 14 + 21 + 19 + 27 + 31 + 19 + 19 + 24 + 21) \div 10$ or $215 \div 10$	M1	This mark is awarded for evidence of adding all 10 numbers and dividing by 10
	21.5	A1	This mark is awarded for the correct answer only
(c)	$320 \times 2.4 (= 768 \text{ megabytes})$ or $1000 \div 2.4 (= 416.6 \text{ or } 416 \text{ photos})$	M1	This mark is awarded for a method to find out how much of the memory space has been used
	$(1000 - 320 \times 2.4) \div 2.4$ or $1000 \div 2.4 - 320$ or $96.6(66\dots)$ or $96.7$ or $97$	M1	This mark is awarded for a method to find out how much of the memory space is left and how many photos that would allow for
	96	A1	This mark is awarded for the correct answer only (how many whole photos)

**Examiner's comments:** The calculation of the mean in part (b) was well done but many students failed to add one of the numbers. As no working was shown in this case or just a number divided by 10 was shown, examiners could not award a method mark as the method was not seen. Others correctly added and then forgot about dividing by 10 or worked out the median or range.

Most students made a good start to part (c) generally for  $320 \times 2.4 = 768$ . However, many went on to divide this by 2.4 before subtracting this from 1000. Many students worked out the space left on the

memory card (232 megabytes) rather than the number of photos that would fit. Those who did do the correct calculation often did not round down their answer to get a final answer of 96.

**The average score for this question was 3.87. Students aiming for grade C would be expected to score at least 5 marks; students aiming for grade F would also be expected to score at least 3 marks.**

**Question 11 (Total 4 marks)**

This lower demand question tested students' ability to generate and recognise sequences of numbers (specification reference **Ai**).

Part	Working or answer an examiner might expect to see	Mark	Notes
	Drawing 	B1	This mark is awarded for the correct answer only
	9	B1	This mark is awarded for the correct answer only
	Yes. For example, "the number of squares is always even (and 50 is even)"	C1	This mark is awarded for the answer "yes" with a reason given
	38	B1	This mark is awarded for the correct answer only

**Examiner's comments:** The most common mistakes in part (a) occurred when students forgot to draw the last shaded rectangle or simply added pattern 1 to pattern 2, etc, and ended with extra rectangles. Many poor drawings were seen where using a ruler would have helped.

The most common incorrect responses in part (b) were 10 and 8.

There was a mixture of responses to part (c). Most students recognised that Sue was right and wrote that the numbers were even and 50 was even or that 50 corresponded to pattern number 25. However, some students were not explicit enough. Just saying the numbers go up in 2s is not sufficient as the starting number could be odd.

In part (d) there was evidence that the students muddled the white squares and the grey rectangles in answering this question. The correct answer of 38 was offered by those students who recognised that the number of white squares was 1 less than the number of grey rectangles, then doubled. Many left their answer as 19 failing to multiply by 2.

**The average score for this question was 1.21. Students aiming for grade C would be expected to score at least 3 marks; students aiming for grade F would also be expected to score at least 2 marks.**

**Question 12 (Total 2 marks)**

This lower demand question tested students' ability to find the probability of an event happening using theoretical probability (specification reference **SPn**).

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\frac{1}{6}$ (or equivalent)	B1	This mark is awarded for the correct answer only
(b)	1	B1	This mark is awarded for the correct answer only

**Examiner's comments:** Part (a) was correctly answered by nearly all students. Their answer was sometimes accompanied by words with 'unlikely' being favoured. Incorrect responses included 1:6 and a word description only.

Part (b) was answered less successfully. The most common correct answers were 6/6 or 100%. Incorrect answers tended to use terms such as certain, very likely or impossible without a numerical answer.

**The average score for this question was 1.21. Students aiming for grade C would be expected to score both marks; students aiming for grade F would also be expected to score at least 1 mark.**

**Question 13 (Total 3 marks)**

This lower to medium demand question tested students' ability to measure and draw lines and angles (specification references **Na**, **GMI**, **GMm**, **GMt** and **GMu**).

Part	Working an or answer examiner might expect to see	Mark	Notes
(a)	127(0) seen	M1	This mark is for an attempt to add the six lengths
	1270	A1	This mark is awarded for the correct answer only
(b)	32 mm or 3.2 cm	B1	This mark is awarded for an answer in the range 30 mm to 34 mm (or in the range 3cm to 3.4 cm)
(c)		M1	This mark is awarded for at least one right angle marked
		M1	This mark is awarded for the 10 cm line or the 12.5 cm line drawn
	Fully correct drawing	A1	This mark is awarded for a fully correct drawing

**Examiner's comments:** Part (a) was well answered with most students writing 1270 for both marks. The most common incorrect answer was 1070 with many students missing one of the 200 mm sides.

In part (b) most students measured the diameter of the hole in cm but unfortunately many of these students did not put the units with their answer or wrote, for example, 3.2 mm, resulting in no marks being scored. Many students measured the radius whilst others tried to calculate the circumference of the circle.

Nearly all students scored a mark for drawing one of the 90° angles in part (c). Drawing *AD* and *BC* tended to be more challenging, although there were a number of fully correct scale drawings.

**The average score for this question was 4.48. Students aiming for grade C would be expected to score all 6 marks; students aiming for grade F would also be expected to score at least 4 marks.**

**Question 14 (Total 4 marks)**

This lower to medium demand question tested students' ability to manipulate algebraic expressions by collecting like terms (specification reference **Ac**).

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$5m$	B1	This mark is awarded for the correct answer only
(b)	$4pr$	B1	This mark is awarded for the correct answer only
(c)	$5x + 2x = 7x, 4y - y = 3y$	B1	This mark is awarded for $7x$ or $3y$ seen
	$7x + 3y$	B1	This mark is awarded for $7x + 3y$ (or equivalent)

**Examiner's comments:** Most of the responses to parts (a) and (b) were correct. The most common errors were  $m^5$  and  $pr^4$ . A large number of students got part (c) correct although many lost the final mark for trying to 'simplify' their answer of  $7x + 3y$  to  $10xy$ . It was not uncommon to see an answer of  $7x - 3y$ . Another common answer was  $7x 3y$  with the addition sign omitted, which scored just 1 mark.

**The average score for this question was 3.07. Students aiming for grade C would be expected to score all 4 marks; students aiming for grade F would also be expected to score at least 3 marks.**

**Question 15 (Total 2 marks)**

This medium demand question tested students' ability to find a missing angle in a triangle (specification references **GMa** and **GMb**).

Part	Working or answer an examiner might expect to see	Mark	Notes
	$ACD = 180 - 90 - 58 (= 32)$ or $CDB = 180 - 58 (= 122)$ or $x = 58 - 37$	M1	This mark is awarded for finding at least one missing angle
	21	A1	This mark is awarded for the correct answer only

**Examiner's comments:** Students should be encouraged to show all calculated angles on the diagram. Many students wrote  $180 - 58 = 122$  or  $180 - 90 - 58 = 32$  in the space provided below the diagram but did not specify which angle they were calculating so no marks could be awarded. Use of three letters to describe angles in working may have gained some marks but was rarely seen.

The most common incorrect response was to put  $32^\circ$  at angle  $ACD$  on the diagram (which scored 1 mark) and then to think that  $CD$  bisected angle  $ACB$  giving a final answer of  $32^\circ$ .

**The average score for this question was 0.94. Students aiming for grade C would be expected to score both marks; students aiming for grade F might score 1 mark here.**

**Question 16 (Total 3 marks)**

This medium demand question tested students' ability to understand and use estimates or measures of probability (specification references **SPn**, **Nh** and **Ni**). This question also tests the student's quality of written communication (QWC) in showing working to support an answer.

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{3}{7}$ or $\frac{5}{12}$	M1	This mark is awarded for finding the probability of taking a black ball from at least one of the bags
	using a common denominator $\frac{3}{7} = \frac{36}{84}$ ; $\frac{5}{12} = \frac{35}{84}$ or writing as decimals $\frac{3}{7} = 0.428571\dots$ and $\frac{5}{12} = 0.416666\dots$	M1	This mark is awarded for a method to compare the two probabilities (and can only be awarded if the first method mark is awarded)
	Bag A gives the greater probability (supported by working)	C1	This mark is awarded for the answer "Bag A" and correct method of comparison with correct figures (and can only be awarded if the second method mark is awarded)

**Examiner's comments:** Many students scored the first mark for one of the two correct fractions. But most of these stopped there, just stating that bag **A** had the greater probability without showing a method to compare their two fractions. A large number of students showed no fractions and gave bag **B** stating that there were more black balls in **B**, not understanding what was required.

**The average score for this question was 0.77. Students aiming for grade C would be expected to score both marks; students aiming for grade F might score 1 mark.**

**Question 17 (Total 3 marks)**

This medium demand question tested students' ability to use information provided to complete a two-way table (specification references **SPf**).

Part	Working or answer an examiner might expect to see	Mark	Notes																
	<table border="1"> <thead> <tr> <th></th> <th>Geography</th> <th>History</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td><b>Boys</b></td> <td><b>34</b></td> <td></td> <td></td> </tr> <tr> <td><b>Girls</b></td> <td></td> <td><b>28</b></td> <td></td> </tr> <tr> <td><b>Total</b></td> <td></td> <td><b>72</b></td> <td><b>148</b></td> </tr> </tbody> </table>		Geography	History	Total	<b>Boys</b>	<b>34</b>			<b>Girls</b>		<b>28</b>		<b>Total</b>		<b>72</b>	<b>148</b>	B1	This mark is awarded for any 2 of the 4 given in the question correctly placed
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**Examiner's comments:** Common errors included 'double adding' the total to get 296 thinking that there were 148 girls and 148 boys or simply poor arithmetic, for example  $42 + 28 = 71$ . Little working out was shown, either for correct or not fully correct answers. Occasionally the table was used as a data collection sheet.

**The average score for this question was 2.48. Students aiming for grade C would be expected to score all 3 marks; students aiming for grade F would also be expected to score at least 2 marks.**

**Question 18 (Total 2 marks)**

This medium demand question tested students' ability to draw an enlargement (specification reference GMI).

Part	Working or answer an examiner might expect to see	Mark	Notes
	Quadrilateral	M1	This mark is awarded for a drawing of a quadrilateral with at least 2 correct sides
	Drawing with enlargement scale factor 2	A1	This mark is awarded for the correct drawing only

**Examiner's comments:** Most students were able to score at least one mark generally for enlarging the vertical and horizontal line correctly.

**The average score for this question was 0.91. Students aiming for grade C would be expected to score both marks; students aiming for grade F might score 1 mark.**

**Question 19 (Total 5 marks)**

This medium demand question tested students' ability to calculate perimeters and areas of shapes made from triangles and rectangles (specification references **GMx, Na**).

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$60 + 60 + 60 (= 180) \div 4$ or $0.75 \times 60$	M1	This mark is awarded for an attempt to work out the length of a side of a square paving stone
	45	A1	This mark is awarded for the correct answer only
(b)	$120 \div 30 (= 4)$ or $720 \div 60 (= 12)$ or $120 \div 60 (= 2)$ or $720 \div 30 (= 24)$ or $720 \times 120 (= 86400)$ or $60 \times 30 (= 1800)$	M1	This mark is awarded for an attempt to find out how many rectangular paving stones would fit the length or width of the path
	$4 \times 12$ or $2 \times 24$ or $86400 \div 1800$	M1	This mark is awarded for an attempt to find out how many rectangular paving stones would be needed for the path (and can only be awarded if the first M1 has been awarded)
	48	A1	This mark is awarded for the correct answer only

**Examiner's comments:** Some students scored a mark for 180 calculated or, more often, seen on the diagram, but few went on to divide this by 4. Some students tried to find the area of one rectangular slab whilst others tried to find the perimeter.

Students tended to be more successful in part (b) where many found 4 and 12 from  $120 \div 30$  and  $720 \div 60$  but most of these students then found the sum of these two numbers writing 16 as their final answer instead of  $4 \times 12 = 48$ .

**The average score for this question was 2.12. Students aiming for grade C would be expected to score at least 4 marks; students aiming for grade F would also be expected to score at least 1 mark.**

**Question 20 (Total 5 marks)**

This medium demand question tested students' ability to interpret stem and leaf diagrams (specification references **SPh** and **SPi**).

Part	Working an or answer examiner might expect to see	Mark	Notes
(a)	31, 34	M1	This mark is awarded for a median value evidenced by 10th and 11th seen
	$(31 + 34) \div 2 = 32.5$	A1	This mark is awarded for the correct answer only
(b)	$47 - 15$ or $15 - 47$	M1	This mark is awarded for an attempt to find the range
	32	A1	This mark is awarded for the correct answer only
(c)	7	B1	This mark is awarded for the correct answer only

**Examiner's comments:** In part (a) most students knew that the median was 'the middle value' but many were unable to do this accurately with 31 or 34 being a common incorrect response, scoring no marks. Others were able to identify 31 and 34 as being the two middle values, scoring 1 mark, but then were unable to score the final mark for an answer of 32.5 whilst a few even gave their final answer as 2.5 or 14 from the 1 and 4 in the middle.

In part (b) nearly all students who knew to use 47 and 15 got the final answer of 32 correct.

Part (c) was well answered by most students, with only a few giving  $\frac{7}{20}$  as an incorrect answer.

**The average score for this question was 2.69. Students aiming for grade C would be expected to score at least 4 marks; students aiming for grade F would also be expected to score at least 2 marks.**

**Question 21 (Total 3 marks)**

This higher demand question tested students' ability to set up and solve simple equations (specification references **Ad** and **GMx**).

Part	Working or answer an examiner might expect to see	Mark	Notes
	$x + x + 4 + x + x + 4$ (or equivalent) or $45 - 8 (= 37)$ or $22.5 - 4 (= 18.5)$	M1	This mark is awarded for an attempt to form an expression for the perimeter of the rectangle
	$x + x + 4 + x + x + 4 = 45$ (or equivalent) or $x + x + 4 = 22.5$ (or equivalent) or $(45 - 8) \div 4$ or $(22.5 - 4) \div 2$	M1	This mark is awarded for setting up an equation allowing $x$ to be found
	9.25 (or equivalent)	A1	This mark is awarded for the correct answer only

**Examiner's comments:** The most common incorrect algebraic method used was for  $2x + 4 = 45$  leading to  $x = 10.5$ ; others wrote  $45 \div 4 = 11.25$ . Neither of these methods scored any marks.

**The average score for this question was 0.88. Students aiming for grade C would be expected to score at least 2 marks; students aiming for grade F might struggle to score any marks on this question.**

**Question 22 (Total 4 marks)**

This higher demand question tested students' arithmetic and problem-solving in context (specification reference **Na**). This question also tests the student's quality of written communication (QWC) in showing working to support an answer.

Part	Working or answer an examiner might expect to see	Mark	Notes
	$400 \div 18, \quad 499 \div 20, \quad 600 \div 26$ or $18 \div 4, \quad 20 \div 4.99, \quad 26 \div 6$	M2	These marks are awarded for a method resulting in values that could be used to compare all three packs  (M1 for a method that would resulting in at least two values that could be used to compare two packs)
	$400 \div 18 = 22(.2)\text{p each}$ $499 \div 20 = 24(.95) \text{ or } 25\text{p each}$ $600 \div 26 = 23(.07\dots)\text{p each}$ or $18 \div 4 = 4.5 \text{ packs per } \pounds$ $20 \div 4.99 = 4(.008\dots) \text{ packs per } \pounds$ $26 \div 6 = 4.3(333\dots) \text{ packs per } \pounds$	A1	This mark is awarded for all fully correct figures suitable for comparison
	The small pack is the best value for money (supported by working)	C1	This mark is awarded for a comparison of values with a correct conclusion from figures used (this mark can only be awarded if the two method marks have been awarded)

**Examiner's comments:** Students who showed their working using the first method tended to score all the marks or scored 3 marks as they wrote  $400 \div 18 = 0.2$  rather than 0.22, whilst those that did not show working but just 0.2, 0.24 and 0.23 could only score 1 mark in total. Students who used the second method often lost the communication mark as they tended to give the medium bag as their final answer as they looked at the smallest of 4.5, 4 and 4.3 rather than the largest.

**The average score for this question was 1.56. Students aiming for grade C would be expected to score at least 3 marks; students aiming for grade F might score 1 mark.**

**Question 23 (Total 7 marks)**

This higher demand question tested students' ability to use and derive formulas (specification references **Af**, **Nm** and **No**).

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$\frac{50}{1.57^2}$ (or equivalent)	M1	This mark is awarded for substituting the figures given into the equation given
	20.3	A1	This mark is awarded for answer in the range 20.2 to 20.3
(b)	$(m =) 1.8^2 \times 21$	M1	This mark is awarded for using the equation to find a value for Tom's mass
	68.04	A1	This mark is awarded for the correct answer only
(c)	$\frac{145}{100} \times 1.80$ (or equivalent)	M2	These marks are awarded for a complete method to find 145% of 1.8  (M1 is awarded for a method to find 45% of 1.8 or for a multiplication factor of 1.45)
	2.61	A1	This mark is awarded for the correct answer only

**Examiner's comments:** Many students did not square  $h$ , writing  $50 \div 1.57 = 31.8$ , scoring no marks. Others rounded prematurely writing  $50 \div 2.46 = 20.32\dots$ . This scored no marks without working as the answer was not within the given range of acceptable answers.

In part (b) there were many trial and improvement methods seen which resulted in an answer of 68 or 68.1 (but not 68.04) which resulted in no marks being awarded. Some were able to write  $21 = m \div 1.82$  but did not then go on to rearrange the equation for  $m$ , also resulting in no marks. Many others just wrote  $1.80 \times 21 = 37.8$  which did not score.

Students tackled part (c) in a variety of ways, the most successful being  $1.45 \times 1.80$  or equivalent. Those who broke down the 45% into 10%, 40% and 5% tended to make errors along the way. Without seeing the method leading to these errors no credit could be given.

It was not uncommon to see  $145 \times 1.80 = 261$  with no further working, which did not show any understanding of percentages.

**The average score for this question was 2.43. Students aiming for grade C would be expected to score at least 4 marks; students aiming for grade F would also be expected to score at least 1 mark.**

**Question 24 (Total 2 marks)**

This higher demand question tested students' ability to produce frequency polygons for grouped data (specification reference **SPg**).

Part	Working or answer an examiner might expect to see	Mark	Notes
	Correct polygon drawn	B2	These marks are awarded for a correct frequency polygon  (B1 is awarded for points plotted at correct midpoints of intervals  or  joining points at correct heights consistently within intervals, including plotting at end values or correct frequency polygon with one point incorrect  or  correct frequency polygon with first and last points joined directly)

**Examiner's comments:** Many correct and accurate frequency polygons were seen. There were, however, many students who only scored one mark, generally for plotting at the end values of the intervals and joining the points. Many lost a mark for the correct plots at the mid-intervals without joining the points or drawing the correct frequency polygon, but also joining the first and last points.

**The average score for this question was 0.60. Students aiming for grade C would be expected to score at least 1 mark; students aiming for grade F might score 1 mark.**

**Question 25 (Total 4 marks)**

This higher demand question tested students' ability to understand and use the angle properties of parallel and intersecting lines, triangles and quadrilaterals (specification references **GMa** and **GMb**). This question also tests the student's quality of written communication (QWC) in showing working to support an answer.

Part	Working or answer an examiner might expect to see	Mark	Notes
	<p>angle <math>DEF = 180^\circ - 70^\circ - 54^\circ (= 56^\circ)</math>  <u>angles on a straight line</u> add up to <u><math>180^\circ</math></u></p> <p>or</p> <p>angle <math>AEB = 70^\circ</math>  <u>vertically opposite angles</u> are equal;</p> <p>or</p> <p>angle <math>EAB = 54^\circ</math>  <u>alternate angles</u> are equal</p> <p>or</p> <p>angle <math>GEB = 180^\circ - 70^\circ (= 110^\circ)</math>  <u>angles on a straight line</u> add up to <u><math>180^\circ</math></u></p>	M1	This mark is awarded for a method to find any angle
	<p><math>x = (54^\circ + 70^\circ = ) 124^\circ</math> (with reasons)</p>	A1	This mark is awarded for a correct answer only (with supporting reasons)
		C2	<p>C2 for full reasons, appropriate to their given method, with no additional reasons</p> <p>(C1 is awarded for one appropriate reason relating to parallel lines)</p> <p>Possible reasons:</p> <p><u>corresponding angles</u> are equal;</p> <p><u>alternate angles</u> are equal</p> <p><u>co-interior (allied) angles</u> add up to <u><math>180</math></u>;</p> <p><u>angles on a straight line</u> add up to <u><math>180</math></u>;</p> <p><u>angles in a triangle</u> add up to <u><math>180</math></u></p> <p><u>vertically opposite angles</u> are equal;</p> <p>the <u>exterior angle</u> of a <u>triangle</u> is equal to the sum of the <u>interior opposite angles</u>;</p> <p><u>angles at a point</u> add up to <u><math>360</math></u></p>

**Examiner’s comments:** Students should be encouraged to show all calculated angles on the diagram. Many students wrote  $180 - 54 - 70 = 56$  in the space provided below the diagram but did not specify which angle they were calculating so no marks could be awarded. Many added 54 and 70 to get 124 which scored no marks unless they also said that  $x = 124$ . However, most that did write  $54 + 70 = 124$  then went on to do  $180 - 124 = 56$  which scored no marks unless they either wrote  $\angle DEF = 56$  or wrote 56 in an appropriate place on the diagram.

Those students who did get an angle correct applying their knowledge of parallel lines often did not write an appropriate reason, e.g.  $\angle EAC = 54^\circ$  with “corresponding angles” was often seen rather than “alternate angles are equal”. Many students did not score any communication marks as they were not able to supply an appropriate reason involving parallel lines (the terms Z or F angle were not acceptable). Those that did often lost the final mark for writing “opposite angles are equal” rather than “vertically opposite angles are equal”.

**The average score for this question was 0.91. Students aiming for grade C would be expected to score at least 2 marks; students aiming for grade F might struggle to score any marks on this question.**

**Question 26 (Total 5 marks)**

This higher demand question tested students' ability to use arithmetic and carry out problem-solving in context (specification references **GMP** and **Na**).

Part	Working or answer an examiner might expect to see	Mark	Notes
	$18 \times 2 \times 5 (= 180)$ or weekly car park charge $3.50 \times 5 (= 17.50)$	M1	This mark is awarded for method to find weekly mileage or weekly car park charge
	$180 \div 45.2 (= 3.9823 \text{ gallons})$ or $18 \div 45.2 (= 0.39823 \text{ gallons})$	M1	This mark is awarded for method to find fuel used in a relevant journey
	$3.9823 \times 4.546 (= 18.1... \text{ litres})$ or $0.39823 \times 4.546 (= 1.81... \text{ litres})$ or $1.369 \times 4.546 (= 6.22... \text{ £ per gallon})$ or $45.2 \div 4.546 (= 9.942 \text{ miles per litre})$	M1	This mark is awarded for a correct use of the conversion factor to convert between gallons and litres
	$18.1... \times 1.369 (= 24.78...)$ or $1.81... \times 1.369 (= 2.478...)$ or $3.9823 \times 6.22... (= 24.78...)$	M1	This mark is awarded for a method to find the cost of a relevant journey
	42.28	A1	This mark is awarded for an answer in the range 42.26 to 42.30

**Examiner's comments:** Most students were able to access the first mark for either  $18 \times 10 (= 180)$  or  $3.50 \times 5 (= 17.50)$  or both. Figures used in calculations must be supported. For example, just stating that 4 (or 2) gallons were used without showing either  $180 \div 45.2$  or  $90 \div 45.2$  was insufficient to gain the method mark for conversion. It was rare to see a final answer within the given range for the final mark.

**The average score for this question was 1.42. Students aiming for grade C would be expected to score 3 marks; students aiming for grade F might score 1 mark.**