GCSE

Mathematics B (Linear)

Component **J567/02:** Mathematics Paper 2 (Foundation)

General Certificate of Secondary Education

Mark Scheme for June 2017

Annotations used in the detailed Mark Scheme.

Annotation	Meaning
✓	Correct
✗	Incorrect
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working (after correct answer obtained), provided method has been completed
M0	Method mark awarded 0
M1	Method mark awarded 1
M2	Method mark awarded 2
A1	Accuracy mark awarded 1
B1	Independent mark awarded 1
B2	Independent mark awarded 2
MR	Misread
SC	Special case
∧	Omission sign

Subject-Specific Marking Instructions

1. **M** marks are for <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.

   -     **cao** means **correct answer only**.
   -     **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).
   -     **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.   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.
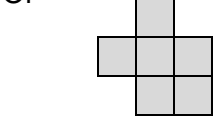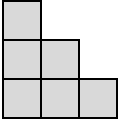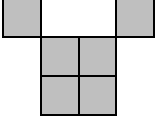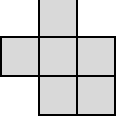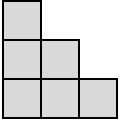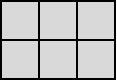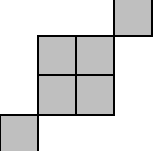
If the correct answer is seen in the working but a completely different answer is seen in the answer space, then accuracy marks for the answer are lost. Method marks would still be awarded. Use the M0, M1, M2 annotations as appropriate and place the annotation ✗ next to the wrong answer.

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.

MARK SCHEME

Question			Answer	Marks	Part marks and guidance	
1	(a)		Hexagon	1		Condone poor spelling
	(b)		Parallelogram	1		
	(c)		Cuboid	1		
2	(a)	(i)	A (−1, 5) B (2, 1)	2	**B1** for each correct coordinate **or SC1** for both coordinates reversed	
		(ii)	D plotted with cross or dot at (−5, 2) If square completed, vertex is D.	1	Allow within circle that has 4 points on overlay as end points of diameters	If no plot but only a letter use centre of letter D
	(b)		(73, 4)	2	**B1** for correct *x* coordinate **B1** for correct *y* coordinate	
3	(a)	(i)	19	1		
		(ii)	4	1		
		(iii)	57	2	Mark final answer **M1** for $2^3 = 8$ **or** $7^2 = 49$ **soi**	
	(b)		5.48	2	**M1** for 5.4 **or** 5.47[7…] **seen**	Crossed out working that has been replaced should not be considered
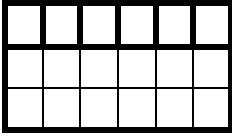
Question			Answer	Marks	Part marks and guidance	
	(c)	(i)	40	1		
		(ii)	5	2	Mark final answer **M1** for 12/3 = 4 **soi** **Or** **SC1** for answer of -5	
4	(a)		3.94	2	Mark final answer **M1** for 7.88 ÷ 2 **or** 1000g = 1kg **soi** or figs 394	
	(b)		2.76	2	Mark final answer **M1** for 1.84 ÷ 100 × 150 **oe**	
	(c)		0.37[p] or 37 p(ence)	2	Mark final answer **M1** for 4.44 ÷ 12 **or** answer 37	
	(d)		62.05	2	Mark final answer **M1** for 0.73 × 85 **oe** **or** [70% =] 59.5[0] **seen** or [3% =] 2.55 **seen**	
5	(a)	(i)	12	1		
		(ii)	6	1		
	(b)		120	2	Mark final answer **B 1** for 15 × 8 **seen**	
6	(a)		4	1		

Question			Answer	Marks	Part marks and guidance	
	(b)		Or Or	1	For a diagram congruent to one of these diagrams	Accept (oe)
	(c)			1	For a diagram congruent to another of these diagrams	
	(d)			1	For a diagram congruent to this diagram	
	(e)			1	For a diagram congruent to this diagram	Accept (oe)
7	(a)	(i)	25 000 or 25 thousand	2	**M1** for putting at least six wages in order **or** answer of 25[.00]	
		(ii)	32 000 or 32 thousand	2	**M1** for (18+20+21+24+26+29+49+69)÷8 **or** 256 ÷ 8 or figs32 **seen** **or SC2** for answers of 25[.00] in **(i) and** 32[.00] in **(ii)** **or** for 2500 in **(i) and** 3200 in **(ii)**	Numbers in a column implies addition
	(b)		**Mean** because it uses **all** the wages (data) **or median** because it is typical of what most employees earn	1	If correct statement is seen ignore subsequent comments Do not accept statements that just give a definition of the mean or the median	See further exemplars
8	(a)		11.4	2	**M1** for 5.7 **seen** or **SC1** for answer 11.2 to 11.6	

Question			Answer	Marks	Part marks and guidance	
	(b)		30 or 0.5 hours clearly indicated	1		
	(c)		2 hrs 39 min to 2 hrs 45 min or 159 to 165 min clearly indicated	2	**M1** for 16:09 to 16:15 or 4:09 to 4:15 **seen** or **SC1** for an answer t such that 2 hours 31 min $\le t <$ 3 hours **oe**	Ignore subsequent working after correct answer seen
9	(a)	(i)	80	1		
		(ii)	46 and 48	1	Mark final answer	Any order is acceptable
	(b)	(i)	39	2	**M1** for 1 + 19 × 2 **oe** or **SC1** for answer 41	
		(ii)	29 and 31 and 33	1	Mark final answer	Any order is acceptable
10	(a)	(i)	[7,] 14, 21, 28 (only)	1		Accept [7], 14, 21, 28 seen in the working with an answer of 4
		(ii)	1002, 1005, 1008	1		
	(b)	(i)	1 ,2, 4, 11, 22, 44 (only)	2	**M1** for four correct factors, ignore others	Accept products of factor pairs Do not accept tree diagrams
		(ii)	2, 11	1	**FT** from all *their* two or more **prime** numbers in part **(b)**	
	(c)	(i)	6666	1	Mark final answer	Ignore dots and commas
		(ii)	3120	1	Mark final answer	Ignore dots and commas
11	(a)		15	1		
	(b)		4	1		
	(c)		30	2	**M1** for 16 + 6 +8	May be seen on on the diagram

Question			Answer	Marks	Part marks and guidance	
	(d)		20	2	**FT** 6 ÷ *their* '30' × 100 correctly evaluated **M1** for 6 ÷ *their* '30' **or** for $\dfrac{6}{their'30'}$ or 0.2[0]	
12	(a)		$\dfrac{3}{5}, \dfrac{13}{20}, \dfrac{7}{10}, \dfrac{3}{4}$	2	**B1** for three fractions in correct position to one another in terms of size Or **M1** for two correct equivalent fractions with the same denominator **seen** or two of 0.6(0), 0.65, 0.7(0), 0.75 **seen**	Accept $\dfrac{12}{20}, \dfrac{13}{20}, \dfrac{14}{20}, \dfrac{15}{20}$ **oe** If correct answer, or 3 fractions for B1, seen in answer spaces ignore working
	(b)	(i)	$\dfrac{3}{10}$ or 0.3 or any *x* such that 0.2 < *x* < 0.4	1	Mark final answer	Accept any fraction or decimal in correct range
		(ii)	$\dfrac{13}{15}$ or $\dfrac{26}{30}$ or $\dfrac{173}{200}$ or $\dfrac{6}{7}$ or $\dfrac{7}{8}$ or $\dfrac{8}{9}$ or $\dfrac{52}{60}$ or $\dfrac{51}{60}$ or $\dfrac{53}{60}$ or $\dfrac{17}{20}$ or any *x* such that 0.833…< *x* < 0.9	2	Mark final answer **M1** for any fraction **seen** equivalent to 5/6 or 9/10 **or** 5/6 = 0.83[3…] **seen**	Accept any fraction or decimal in correct range
13			15.7[…] or $15\dfrac{5}{7}$ or $\dfrac{110}{7}$	2	**M1** for π × 5 **oe** **or** answer 16 **or SC1** for 31.4[…] or $31\dfrac{3}{7}$ or $\dfrac{220}{7}$	
14	(a)	(i)	6 further correct outcomes with no repeats (condone repeats of 2 given outcomes)	2	**M1** for 4 further correct outcomes, ignore repeats	Accept R and B for red and blue R R R B B B R R B B B R R B R B R B B R R R B B

Question			Answer	Marks	Part marks and guidance	
		(ii)	$\frac{2}{8}$ or $\frac{1}{4}$ or 0.25 or 25%	2	**M1** for 2 / *their* 'number of outcomes' Maximum **M1** if table incorrect	Accept 'unlikely' **with** a correct answer on the answer line
		(iii)	1 – *their*'(a)(ii)' providing 0< answer <1	1FT	Strict **FT**	Accept 'likely' **with** a correct answer on the answer line
	(b)		$\frac{2}{4}$ or $\frac{1}{2}$ or 0.5 or 50%	2	**M1** for attempt to list possible outcomes, must have at least two different **or** 2 **and** 4 or 1 **and** 2 **seen**	Accept 'even' **with** a correct answer on the answer line
15	(a)			2	**B1** for 6 by 3 or 6 by 2 rectangle only **Or** **SC1** for 8 by 3, 7 by 3, 5 by 3, or 4 by 3 rectangle with correct internal line	Use overlay Condone clear intention Condone internal lines for B1 More than one rectangle drawn scores zero
	(b)		480 000 or 4.8×10^5	3	**M1** for $\frac{1}{2} \times (40 + 60) \times 80$ **oe** And **M1** for *their* 4000 × 120	Ignore units =4000 *their* 4000 must be from area calculation eg 60 × 80 × 120
16	(a)		18	1		
	(b)		1.25 or $\frac{5}{4}$	1		Accept $\frac{10}{8}$ or $1\frac{1}{4}$ but not $\frac{1}{0.8}$
	(c)		$3^3 \times 5^2$ or 3 × 3 × 3 × 5 × 5	2	**M1** for correct method to find prime factors **soi** leading to at least three correct prime factors	M1 only for 1× 3 × 3 × 3 × 5 × 5 M1 may be implied by 3, 3, 3, 5, 5
17	(a)	(i)	Positive and strong	1	Accept positive and moderate	

Question			Answer	Marks	Part marks and guidance	
		(ii)	Ruled line of best fit	B1		Line passing between (8, 17) to (8, 22) and (20, 54) and (20, 58) Line at least as long as overlay
			10 to 12	B1		
	(b)		20	3	**B1** for 2.25 seen **M1** for 45 ÷ *their* time	Accept figs 45 for 45 Accept 2.25 or 2.15 or 2h 15 or 215 or 135 for *their* time
18	(a)		9	1		

Question			Answer	Marks	Part marks and guidance	
	(b)		2 correct trials of x for $3 < x < 4$ with one outcome less than 20 and one greater than 20	**M2**	**M1** for any correct trial for $3 < x \le 4$	Correct outcome rounded or truncated to at least 3sf, accept trials of any value of x in given range Accept evaluation of $x^3 - 6x - 20$
			$x = 3.4$	**B1**	Independent mark	

x	$x^3 - 6x$
4	40
3.1	11.191
3.2	13.568
3.3	16.137
3.4	18.904
3.5	21.875
3.6	25.056
3.7	28.453
3.8	32.072
3.9	35.919
3.45	20.363
3.44	20.067

Question	Answer	Marks	Answer
19	Length extending above wall = 0.75 m or 75cm or 0.8 m or 80 cm with units and fully correct calculations using at least 2sf or accurate scale drawing seen, expressed correctly and clearly annotated and laid out	5	Length to wall = $\sqrt{0.7^2 + 1.6^2}$ = 1.746… Length above wall = 2.5 – 1.746… = 0.754 Or accurate scale drawing with scale correctly stated
	A Correct answer with some method, units may be incorrect or omitted, answer may be given to more than 2 sf accuracy. **B** Correct calculation/scale drawing to find length of ladder to wall 1.75 m or 175cm or 1.7 m or 170 cm or 1.8 m or 180 cm with units, expressed correctly and clearly annotated and laid out	4-3	**A** Length of ladder to wall found correctly, with unclear method Or accurate scale drawing with scale stated but correct measurements not found **B** Full method to find length extending with errors in calculation $(2.5 - \sqrt{0.7^2 + 1.6^2}$ oe)
	Correct use of Pythagoras to L = $\sqrt{0.7^2 + 1.6^2}$ or $\sqrt{3.05}$ Or accurate scale drawing with no scale stated and correct measurements not found	2-1	Attempt to use Pythagoras (involving two of 0.7,1.6 or 2.5), adding or subtracting squares or use of scale drawing

APPENDIX

Exemplar responses for Q.7(b)

Response	Mark
Mean, it includes each wage	1
Mean it takes all of the wages into account and is more accurate	1
Mean because the median does not take into account the two high wages	1
Mean because the median only describes the middle number and the mean is a mixture of all the numbers together.	1
Mean its all the wages added up then divided by 2 (Same comment without 'all' would score zero.)	1
Mean it's accurate and more trustworthy with adding up all the annual wages and then dividing by how many employees there are	1
Median because no employee earnt anything in £30000 - £40000 bracket 5 of them earnt a wage between £20000 - £30000.	1
Median because 25 000 is roughly what people earn	1
Median More people are earning around £20 to £29 than they did £30 to £39 (condone missing 'thousand')	1
Median 6 out of the 8 employees earn less than the mean annual wage	1
25000 most of the salaries are below 30,000 but the 2 higher salaries increase the mean number (condone 25000 for median)	1
Median the highest frequency wage is in the 20,000s. Or the mode would be the 20 – 30,000 bracket	1
Median it is close to the average of pay within the 20s ie 20, 24, 26, 21, 29. Whereas there are no 30s	1
Median is more accurate towards the actual wages of the employees (as the answer given is within tolerance and represents better.)	1
Median, most are getting paid within the 20000 band ..	1
Mean it is closer to the majority of the answers	0
Mean because its more accurate since you know the annual wage then you divide by how many people there are	0
Mean because the median is just the middle of the earnings	0
Mean because it is closest to the middle figure taking into consideration 18 is the lowest, 69 is the highest.	0
Mean because the exact numbers are used	0
Mean because it gives you a better overall estimate than finding the middle annual wage	0
Mean because the median, which is 25, is not a wage that somebody gets it is just the middle number	0
Mean is the proper average the median is just the middle number	0
Mean this is the total of the wages divided by how many there are	0
Median it is finding the middle wage which is an average of wages in the middle of the high and low	0
Median it is between the lowest and highest wage	0
Median because there is a large difference between the numbers.	0
Median more employees are earning the amount or less (too vague)	0