OCR
Oxford Cambridge and RSA

GCSE

Mathematics

Unit **J560/03**: Foundation Tier Paper 3

General Certificate of Secondary Education

Mark Scheme for November 2017

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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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

1. 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

2. **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.

3. 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.

4. 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.

5. 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.

6. 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**.

7. 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'.

8. 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).

9. 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.

10. 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.

11. 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.

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

13. For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.

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

Question			Answer	Marks	Part marks and guidance	
1	(a)		edges	1	Any clear indication, Eg ringed, others deleted	Condone poor spelling
	(b)		Accept any clear indication	1	Expect arc or mark (eg cross) at CAB	
	(c)		[a] straight line	1	Any clear indication, Eg ringed, others deleted	Condone poor spelling or line
2	(a)		$\frac{3}{7}$ oe	1	Accept equivalent eg $\frac{6}{14}$, $\frac{21}{49}$ or 0.428 to 0.429 or 42.8% to 42.9%	
	(b)		5, 6 and 7 cao	2	**B1** for $\frac{4}{16}$ or $\frac{8}{16}$ seen or At least one from 5, 6 or 7 (condone 4 and/or 8 included)	Allow $\frac{5}{16}$, $\frac{6}{16}$, $\frac{7}{16}$ for **B1**
3	(a)		48	2	**M1** for $6 \times 2 \times 4$	May be in stages
	(b)		8	3	**M2** for $\sqrt{\frac{320}{5}}$ or **M1** for $\frac{320}{5}$ soi 64 or $5k^2 = 320$	
4	(a)	(i)	−12	1		
		(ii)	256	1		
	(b)		10.35 cao	1		
5			−20 2 5	3	**B1** for each If 0 scored **SC1** for $-4 \times$ *their* 5 correct	Middle right box

Question			Answer	Marks	Part marks and guidance	
6	(a)		5 : 2	2	**B1** for 30 [:] 12 oe If 0 scored **SC1** for 5 : 7 or 2 : 5	Condone same units in ratios **B1** for 15 : 6 or 10 : 4 or 2.5 : 1 or 1 : [0].4 may miss ratio signs
	(b)		[0].28	2	**B1** for 250 or [0].7 seen or 2500 and 700 or figs 28 in answer If 0 scored **SC1** for [1:] 3.57[1...]	Condone answer 1 : [0].28 for **B2**
	(c)	(i)	5000	1		
		(ii)	50	2	**M1** for *their* 5000 ÷ 2 ÷ 50 oe	
7	(a)		15 15 90 20 10	4	**B3** for 4 correct or **B2** for 3 correct or **B1** for 2 correct If 0 scored **SC1** for *their* apple = 2 × *their* grapefruit	
	(b)	(i)	80	1		
		(ii)	Orange juice might have run out or 50 is a small sample oe [so may not be representative] These are different men so may make different choices oe Scaling may not produce the exact number	1	Any valid practical reason. Eg running out, (others) being promoted. Any valid statistical reason Eg Choices may be in different proportion [in this group]. Expectation so may be different	Do not accept any suggestion that men may have changed their mind. Mark the best part of the statement and ignore any non-contradictory parts

Question			Answer	Marks	Part marks and guidance	
8	(a)		(Men's average + women's average) ÷ 2 oe	1	Accept half way between the two masses/averages oe or (84 +70) ÷ 2 oe or (84 – 70) ÷2 +70 oe	Allow half way between them or midpoint or added the two and halved May be in stages. Condone missing brackets
	(b)		Correct reason involving distribution of men/women or not all average	1	Saying he is correct scores 0 for reason mark but may score example marks Some may be overweight	Can carry 9 women is not enough May be a combination of both
			Correct example supporting their reason with result ≥ 630	2	8 men [0 women] 7 men 1 woman 6 men and 2 women **M1** for correct calculation supporting their reason wrongly evaluated or correct value ≥ 630 supporting their reason for their example without working or A correct calculation involving a mass and a number of people.	$8 \times 84 = 672$ $7 \times 84 + 1 \times 70 = 658$ $6 \times 84 + 2 \times 70 = 644$ Eg 8 men weigh 672 kg Multiplication or division Eg $84 \times 8 = 672$ or $630 \div 84 = 7.5$ or $630 \div 70 = 9$
9	(a)		(Line 2) [0].25 seen	1		Ignore anything on line 1. Ignore extras in all lines if not wrong or contradictory
			(Line 3) $[\frac{1}{4}] \div 2$ or $\times$ [0].5 oe	1		
			(Line 4) [0].25 + [0].125 = [0].375	1		No FT from **wrong** values above

Question			Answer	Marks	Part marks and guidance	
	(b)		5	**2**	**M1** for 1 ÷ [0].05 [× 200] oe or **B1** for 250 or [0].25 or × 20 or figs 4 or 5 in answer	Condone 250 on answer line
10	**(a)**		7^4	**1**		Condone 7^4= 2401 on answer line
	(b)		× 4 2 × 2 × 2 [=] 2^6	**2**	**B1** for one line correct	
	(c)		1.02×10^3 , 3×10^2 , $8.1 \times 10^{[1]}$, 9.83×10^{-2}	**1**	Accept 1020, 300, 81, [0].0983	Condone error in writing 0.0983 if order correct.
11	**(a)**		4 points plotted and a ruled line joining	**2**	**B1** for 3 points correctly plotted	Line at least between (0, 100) and (150, 25) Use overlay as guide. ½ square accuracy
	(b)	**(i)**	198 to 202	**1**	Do not FT their line	
		(ii)	Battery usage remains the same or Battery can be used right to 0% or Trend or pattern continues	**1**	Accept For every 50 km it uses 25%	
	(c)	**(i)**	$-\frac{1}{2}$ oe or –[0].5	**1**		Ignore units
		(ii)	100	**1**	Accept 0, 100	
	(d)		$-\frac{1}{2}d + 100$	**1**	**FT** *their* **(c)(i)***d* + *their* **(c)(ii)**	Accept any letter for *d* (except *c*)
	(e)	**(i)**	–5	**2**	**FT** *their* **(d)** if linear in *d*. **B1** for correct substitution of 210	Expect $-\frac{1}{2} \times 210 + 100$ Accept any letter for *d* (except *c*)

Question			Answer	Marks	Part marks and guidance	
		(ii)	Impossible [as battery cannot have negative charge] oe	1	**FT** *their* **(i)** only if *their* equation gives negative outcome	
12	(a)		(0, 1)	2	**B1** for (0, ..*g*..) $g \neq 1$ or **M1** for $y = 2x + 1$ or $y - 2 \times 0 = 1$	
	(b)		4	3	**B1** for $c = -2$ or **M1** for $y = 3k - 2$ $k \neq 0$ And **M1** for $10 = 3k - 2$	**B1** soi $3x - 2$ or 3 x number – 2 Allow *x* for *k*
13	(a)		42	2	**M1** for $\frac{1.47 \times 10^7}{3.5 \times 10^5}$ oe If 0 scored **SC1** for figs 42 in answer	Eg. $\frac{14\,700\,000}{350\,000}$
	(b)		$4.2[3\ldots] \times 10^9$	3	**B2** for 4 233 600 000 oe as answer or **M1** for *their* $1.47 \times 10^7 \times 288$ If 0 scored **SC1** for figs 423[...] in answer	Eg. $423.[36] \times 10^7$ *their* 1.47×10^7 converted from info in (a)
	(c)	(i)	6450	3	**B2** for 6447 to 6448 or **M1** for $\frac{1.47 \times 10^7}{(152 \times 15)}$ oe or figs 6447 in answer	May be in stages. NB: $152 \times 15 = 2280$

Question			Answer	Marks	Part marks and guidance	
		(ii)	Each machine makes the same amount of sweets. or There are no breakdowns oe or Machines running at same rate oe or All machines run **for** the same time oe	1		
14	(a)		5.34	4	**B1** for 1.5, 4.5, 7.5, 10.5, 13.5 **M1FT** for 1.5×6 4.5×10 7.5×6 10.5×2 13.5×1 soi 9, 45, 45, 21, 13.5 or 133.5 **M1** for *their* 133.5 ÷ 25	At least 4 midpoints correct FT midpoints or either end of range values consistently used Allow one numerical error Four correct products or 133.5 imply **B1** and **M1**
	(b)		Exact times for each customer are not recorded oe	1		Do not accept, "Because the mid-point is used" or comments on the method used.
15			1500 × 2 ÷ 100 oe 1500 + 30 = 1530 1530 × 1.05 oe leading to 1606.5[0] OR <u>Alternative marking</u> 2% of 1500 = 30 1500 + 30 = 1530 5% of 1530 = 76.5[0] 1530 + 76.5[0] = 1606.5[0]	**M1** **B2** **M1** **B1** **B1** **B1** **B1**	Follow method if **calculations** seen Allow 1500 × [0].02 **B1** for 30 or 1530 (no addition shown) or (1606.50 – 1530)÷1530 × 100 [= 5] or 76.50 ÷ 1530 × 100 [= 5] Follow method if **explanation** seen	**Mark by ONE method only** 1500 × 1.02 = 1530 scores **M1 B2** 30 or 1530 (no working) scores **M0B1** May be seen in stages Non-calculator method must be complete to score **M1** 1% → 1530 ÷ 100 = 15.3 5% → 15.3 × 5 = 76.5 1530 + 76.5 [= 1606.5]

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Part marks and guidance</th><th></th></tr>
<tr><td>16</td><td>(a)</td><td>(i)</td><td>$\frac{1}{5}$ of Bag A's counters [are red]
or
The ratio of red to yellow in Bag B is 1:3</td><td>1</td><td>Accept 1 : 4 = $\frac{1}{5}$

Accept $\frac{1}{4}$ = 1 : 3</td><td>Equivalents may be percentages or decimals
Eg. Bag A: 20% red, Bag B: 25% red.</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Correct answer is any integer multiple of this.
<table><tr><th></th><th>Red</th><th>Yellow</th></tr><tr><td>Bag A</td><td>4</td><td>16</td></tr><tr><td>Bag B</td><td>5</td><td>15</td></tr></table></td><td>3</td><td>B1 for (Bag A) yellow = 4 × red
and A total = B total

B1 for (Bag B) yellow = 3 × red

If 0 scored SC2 for correct figures but transposed horizontally</td><td>Eg ×2 ×3
8 32 12 48
10 30 15 45
×4 ×5
16 64 20 80
20 60 25 75
×6 ×10
24 96 40 160
30 90 50 150</td></tr>
<tr><td></td><td>(b)</td><td></td><td>20 nfww</td><td>3</td><td>B1 for two ratios equivalent to 3:4

M1 for their 15:20 reduced to (15-3):20

<u>Alternative approach</u>

B1 for two fractions equivalent to $\frac{3}{7}$

M1 for their $\frac{15}{35}$ reduced to $\frac{15-3}{32}$</td><td>6:8, 9:12, 12:16, 15:20,…

their 15:20 any ratio but not 3:4

using equivalent fractions:

Eg $\frac{6}{14}$ or $\frac{9}{21}$ or $\frac{12}{28}$ or $\frac{15}{35}$

their $\frac{15}{35}$ any fraction but not $\frac{3}{7}$</td></tr>
</table>

Question			Answer	Marks	Part marks and guidance	
17			3 : 8 cao	4	Using fractions **M1** for $\frac{1}{4}$ [+] $\frac{1}{4}$ [+] $\frac{1}{8}$ **M1** for 1 – *their* $\frac{5}{8}$ **B1** for *their* $\frac{3}{8}$: $\frac{8}{8}$ Using Areas **M1** for un-shaded area = 2×2×1÷2 + 1×1÷2 (=2.5) oe **M1** shaded area = *their* 4 – *their* 2.5 **B1** for *their* (1.5 : 4)	May be on diagram Any side length allowed eg 1 → 0.625 (1) 5 → 15.625 (25) 2 → 2.5 (4) 6 → 22.5 (36) 3 → 5.625 (9) 7 → 30.625 (49) 4 → 10 (16) 8 → 40 (64)
18	(a)		Correct ruled line reaching AB and two pairs of correct arcs	2	**B1** for correct ruled line reaching AB without all arcs or correct ruled line with arcs but short	Tolerance ±2°
	(b)	(i)	Correct ruled line reaching AD through E and two pairs of correct arcs	2	**B1** for correct ruled line reaching AD without all arcs or correct ruled line with arcs but short or perpendicular ruled line from BC to another side	Tolerance ±2°
		(ii)	118 to 122	2	**Strict FT** for all marks. Follow through *their* straight line in **(b)(i)** from entrance to another side **B1** for *their* 11.8 to 12.2 [cm]	Use ruler and measure to 2 mm accuracy

Question			Answer	Marks	Part marks and guidance	
19			$a + b = 110$ oe	**1**		
			$4a + 2b = 360$ oe	**1**	Accept $2a + b = 180$	
			$a = 70$	**1**		Ignore units
			$b = 40$	**1**	**FT** from *their a* or *b* seen correctly substituted in one equation If 0 scored **SC1** for any *a* and *b* (not a = 70 and b = 40) as answer that sum to 110	
20			$2a - 1$ [+ $2a$ +] $2a + 1$	**1**		
			$6a = 250$	**1**	Not from $a + 2a + 3a$	
			$250 \div 6 = 41.6$[...] oe or $250 \div 6$ is not an integer	**1**		
			Alternative			
			81 + 82 + 83 = 246	**1**		First two numerical steps may be in reverse order and other sums may be seen (ignore)
			83 + 84 + 85 = 252	**1**		
			82.3[3...] + 83.3[3...] + 84.3[3...] oe and impossible as not integer oe	**1**	If 0 scored **SC1** for one of $2a - 1$ or $2a + 1$ or 41.6[…] or 83.3[…] seen	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

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Head office
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Facsimile: 01223 552553