

8300

GCSE MATHEMATICS

Foundation and higher tier – Questions by Topic – Mark Scheme

Ratio, proportion and rates of change

Converting units of length, area, volume, mass and capacity

v1.0

Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied
B	Marks awarded independent of method.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
oe	Or equivalent. Accept answers that are equivalent. e.g. accept 0.5 as well as $\frac{1}{2}$
[a, b]	Accept values between a and b inclusive.
3.14...	Allow answers which begin 3.14 e.g. 3.14, 3.142, 3.1416
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Examiners should consistently apply the following principles

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

Responses which appear to come from incorrect methods

Whenever there is doubt as to whether a student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

Questions which ask students to show working

Instructions on marking will be given but usually marks are not awarded to students who show no working.

Questions which do not ask students to show working

As a general principle, a correct response is awarded full marks.

Misread or miscopy

Students often copy values from a question incorrectly. If the examiner thinks that the student has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

Further work

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

Choice

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

Erased or crossed out work that has been replaced is not awarded marks.

Premature approximation

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Q1.	68 cm		B1	
				[1]
Q2.				
	370		B1	
				[1]
Q3.				
	250 cm		B1	
				[1]
Q4.				
	75		B1	
				[1]
Q5.				
(a)	Alternative method 1			
	15 ÷ 2 or 7.5		M1	
	(their 7.5 × 3 =) 22.5			
	or (their 7.5 × 4 =) 30			
			M1dep	
	4 chosen		A1	
	Alternative Method 2			
	25 × 2 or 50		M1	
	their 50 ÷ 15 or 3.3			
			M1dep	
	4 chosen		A1	
(b)	15 × their 4 or 60			
	or 60 ÷ 25			
	oe		M1	
	2.4			
	oe			
	ft their integer from part (a)		A1ft	
				[5]

Q6.

- (a) $96 \div 8$ or 12
 or $8 \times 12 = 96$
 or 96×5 or 480
 or $96 \div 8 \times 5$

or $8 \div 5$ or 1.6 or $\frac{8}{5}$
 or $5 \div 8$ or 0.625 or $\frac{5}{8}$
 oe

60

M1

A1

Additional Guidance

Build up method must be complete at least as far as, and must include, 96, but allow one error in the build up of 5s (oe) for M1

eg 8 16 24 32 40 48 56 64 72 80 88 96
 5 10 15 20 25 30 35 45 50 55 60 65

M1 A0

(b) $\frac{y}{x} = \frac{5}{8}$ or $\frac{x}{y} = \frac{8}{5}$

or $8y = 5x$

or $\frac{5x}{8}$ or $0.625x$

or $(x =) \frac{8y}{5}$ or $(x =) 1.6y$

or $y = kx$ and $k = \frac{5}{8}$

or $8 \div 5$ incorrectly evaluated and then $y = \frac{x}{\text{their incorrect evaluation}}$
 oe

M1

$y = \frac{5x}{8}$

oe in form $y = f(x)$

e.g. $y = 0.625x$ or $y = \frac{x}{1.6}$ or $y = 5x \div 8$ or $y = x \div (8 \div 5)$ or $y = x \div 8 \times 5$

A1

Additional Guidance

$y = \frac{5}{8} \times x$ or $y = \frac{x}{8} \times 5$ or $y = x \div 1.6$

M1A1

$(y =) \frac{x5}{8}$ or $(y =) x \frac{5}{8}$ or $y = \frac{5}{8}$ of x

M1A0

Condone units for M1 only

Do not ignore further work

e.g. $y = x \div (8 \div 5)$ then $y = x \div 8 \div 5$

M1A0

[4]

Q7.

26

B1

[1]

Q8.

4.5×7 or 45×7 or digits 315

oe

M1

31.5(0) or $31\frac{1}{2}$

A1

[2]

Q9.

(a) $48 \div 8$ or 6 or 0.625

oe

M1

“their $48 \div 8$ ” $\times 5$

or 6×5

or 48×0.625

oe

M1dep

30

A1

(b) Their $30 \div 20$

M1

1.5 (hours) or 90 (minutes)

Ft from their answer to (a)

Allow answer in minutes or hours without units stated. If units are given, they must be correct

A1ft

[5]

Q10.

350

B1 Any indication of 100 cm in 1 m

eg 3.5×100 or relationship stated

B2

[2]

Q11.

$24 \div 8$ or 3

or $5 \div 8$ or 0.625

or $8 \div 5$ or 1.6

or 24×5 or 120

or $24 \div 8 \times 5$

or $24 : 15$

oe eg $\frac{5}{8} \times 24$

M1

15

A1

Additional Guidance

$8 - 5 = 3$

M0

[2]

Q12.

- (a) 3 h 45 min or $9.15 + 3 + 45$
 or
 $9.15 + 4 - 15$ or $1.15 \text{ (pm)} - 15$
 or
 $9\frac{1}{4} + 3\frac{3}{4}$ or 13(.00 am)
 or
 1 (o'clock) or 1(.00 am)

M1

oe
 condone mixed units

13.00 or 1(.00) pm

A1**Additional Guidance**

Condone 13.00 pm

M1A1

$9.15 + 3\frac{3}{4}$ or $12.15 + \frac{3}{4}$ without valid further working

M0A0

- (b)
- Alternative method 1 – working in minutes**

 $4 \times 60 + 10$ or 250

oe

M1

their 250 – 186

oe their 250 must be > 186

M1

64

SC2 69
 SC1 224

A1**Alternative method 2 – working in hours** $186 \div 60$ or 3 h 6 min

oe implied by 3.1 or 1 h 4 min

M1

4 h 10 min – their 3 h 6 min

or 1 h 4 min

oe their 3 h 6 min must be < 4 h 10 min

M1

64

SC2 69
 SC1 224

A1**Additional Guidance**

SC2 comes from incorrect conversion of 3.1 h to 3 h 1 min

SC1 comes from use of 100 min in an hour

[5]**Q13.**

8000

accept eight thousand

B1**[1]**

Q14.

200

accept two hundred

B1

[1]

Q15.

16×3

oe

M1

48

accept 3 : 48 or 48 : 3

A1

[2]

Q16.

15 000 mm³

B1

[1]

Q17.

200 (cm) or 0.25 (m)

or 0.03 (kg) or 2000 (g)

oe

If units seen they must be correct

B1

$\frac{25}{200}$ or $\frac{1}{8}$
or $\frac{30}{2000}$ or $\frac{3}{200}$
or $\frac{11}{100}$

oe

M1

$\frac{250}{2000}$ and $\frac{30}{2000}$ and $\frac{220}{2000}$

oe

Common denominator with at least 2 correct numerators

M1

$\frac{250}{2000}$ and $\frac{30}{2000}$ and $\frac{220}{2000}$

oe

Fractions in comparable form

A1

30 grams (as a fraction of 2 kilograms)

Must see a correct comparison

A1

Additional Guidance

200 g

B0

30 grams as a fraction of 2 kilograms with no other working

B0M0

[5]

Q18.

210

B1

[1]

Q19.

Dan and 20

B1 150 or 2 min 10

$2\frac{10}{60}$ or $2\frac{1}{6}$

or 20 in second gap

B2

Additional Guidance

If answer lines blank, up to 2 marks may be awarded from the working lines

Accept twenty for 20

Accept 2:10

Do not accept 130 for Dan

Condone 20 and Dan

B2

Condone incorrect time notation if recovered

eg $2.30 - 2.10 = 20$, answer Dan and 20 s

B2

Samir and 20

B1

Dan alone does not score a mark

eg Dan and 30 on answer line, with 150 in working

B1

eg Dan and 30 on answer line, no working

B0

eg Dan and 2 min 30 s is more

B0

$2:50 - 1:30 = 20$, answer of Dan and 20

B0

$130 = 2.1(0)$

B0

Unless recovered..... $130\text{ s} = 2.10\text{ min}$, answer of Dan and 20

B2

Accept any two conversions that enable comparisons

eg $130 = 60 + 60 + 10$ and $2.5 = 60 + 60 + 30$

B1

2 min 10 with incorrect units

B1

eg 2 h 10 in working, answer Dan and 20 (recovered)

B2

[2]

Q20.

Method for equating gallons to litres beyond 2 gallons = 9 litres

eg

$$9 \div 2 \text{ or } 4.5$$

$$17 \times 9 \text{ or } 153$$

$$9 \times 2 \text{ or } 18$$

$$9 \times 8 \text{ or } 72$$

$$17 \div 2 \text{ or } 8.5$$

M1

Fully correct method that would lead to the correct answer

eg

$$9 \div 2 \times 17$$

$$\text{their } 4.5 \times 17$$

$$\text{their } 153 \div 2$$

$$\text{their } 18 \times 4 + \text{their } 4.5$$

$$\text{their } 72 + \text{their } 4.5$$

$$\text{their } 8.5 \times 9$$

M1dep

76.5

A1

Additional Guidance

2 gallons = 9 litres

4 gallons = 18 litres

6 gallons = 36 litres (error with working not shown)

8 gallons = 45 litres

$$45 + 45 + 4.5 = 94.5$$

M1M0A0

2 gallons = 9 litres

9 + 9 = 18 so 4 gallons = 18 litres

18 + 9 = 36 so 6 gallons = 36 litres (method correct)

so 8 gallons = 45 litres

$$45 + 45 + 4.5 = 94.5$$

M1M1A0

[3]

Q21.

55 000 cm²

B1

[1]

Q22.

Alternative method 1

3×4.5 or 13.5

or 3×4500 or 13500

oe

M1

their $13.5 \div 10 \times 200$

their $13500 \div 10 \times 200$

or $\frac{1000}{1000}$

oe

M1dep

270

SC1 digits 27

A1

Alternative method 2

$(200 \times 4.5) \div 10$ or 90 (ml)

oe

M1

their 90×3

oe

M1dep

270

SC1 digits 27

A1

Alternative method 3

$200 : 10000$ or $\frac{1}{50}$

and $\frac{1}{50} \times 3$ or 0.06

oe

M1

Their $0.06 \times 4.5 \times 1000$

oe

M1dep

270

SC1 digits 27

A1

Additional Guidance

Students may convert wrongly to millilitres using a factor of 10 (ie 450) then convert back using the same 'wrong' factor to get the correct answer. Allow this, as the method is valid.

However, partial marks cannot be awarded if a wrong conversion factor is used but if digits 27 seen allow SC1

(1 gallon =) 45 millilitres

(3 gallons =) 135 millilitres

$135 \text{ millilitres} \div 10 = 13.5 \text{ litres}$

$13.5 \div 10 \times 200 = 270$

M1, M1dep, A1

(1 gallon =) 45 millilitres

(3 gallons =) 135 millilitres

$135 \div 10 \times 200 = 2700$

SC1

If a ‘build up’ method is used to get millilitres equivalent to 13.5 litres then it must be fully correct to get the M1dep 13.5

M1

$10 = 200, 1 = 20, 3 \times 20 = 80, 0.5 = 10$

M1dep

$200 + 80 + 10 = 290$

A0

13.5

M1

$10 = 200, 1 = 20, 3 = 60, 0.5 = 10$

M0

$200 + 20 + 60 + 10 = 290$

A0

Gallons	1	×3	3	
Litres	4.5	10	13.5	→ 13.5
Lawn feed (ml)		200	× 1.35	→ 270

M1

M1dep

A1

[3]

Q23.

0.3 (m) or 200 (cm)

oe

If units seen they must be correct

B1

$\frac{6}{30}$ or $\frac{30}{200}$ or $\frac{16}{100}$

oe

M1

At least two fractions in comparable form

oe

$\frac{20}{100}$ and $\frac{16}{100}$
eg $\frac{20}{100}$ and $\frac{16}{100}$
or 20% and 15%

M1

All three fractions in comparable form

Common denominator with at least 2 correct numerators

oe

$\frac{40}{200}$ and $\frac{30}{200}$ and $\frac{32}{200}$
Or 20% and 15% and 16%

M1

$\frac{40}{200}$ and $\frac{30}{200}$ and $\frac{32}{200}$

and

A

All three correct, comparable fractions and correct conclusion

A1

Additional Guidance

A with no other working

B0M0

[5]

Q24.

0.8³ or 0.512
or 80 × 80 × 80

oe

M1

512000

A1

[2]

Q25.

0.36 cm²

B1

[1]

Q26.

- (a) 10.8×8 or 86.4 **M1**
- $50 \times 110 \times 35$ or 192 500 **M1**
Must use correct volume formula
- their 192 500 $\div$ 1000 or 192.5 **M1dep**
Dep on 2nd M1
- their 192.5 – their 86.4 **M1dep**
Dep on M1M1M1
- 106.1 or 106 **A1**
- Alternative method 2**
- $10.8 \times 8 \times 1000$ or 86 400 **M1**
oe
- $50 \times 110 \times 35$ or 192 500 **M1**
Must use correct volume formula
- their 192 500 – their 86 400 or 106 100 **M1dep**
Dep on M1M1
- their 106 100 $\div$ 1000 **M1dep**
Dep on M1M1M1
- 106.1 or 106 **A1**
- Additional Guidance**
- 192.5 **2ndM1M1dep**
- 106 100 **M1M1M1dep**
- $50 \times 110 \times 35 = 192\,500 \div 2$ **2ndM0**
- (b) A comment that the answer to part (a) was too low or that the amount saved would be greater **B1**
- Additional Guidance**
- It was more **B1**
- More water saved **B1**
- She underestimated it **B1**
- She underestimated the water saved **B1**
- She's saving more water because she's using more water than the cuboid **B1**
- Greater than 106.1 litres (may need to check value in part (a) if they quote a different value)

More than Eva's assumption	B1
Eva's assumption was not accurate therefore the prediction was wrong	B1
She underestimated the water	B0
Less water used	B0
It was inaccurate	B0
A uses more water than B (only talking about the diagram)	B0
B saves more than A (only talking about the diagram)	B0
Saves a lot of water	B0
More water used	B0
Cuboid smaller than bath	B0
Used more water in the bath than she thought	B0
	[6]

Q27.

Alternative method 1

1.5×1000 or 1500

oe

M1

their 1500 – 650 or 850

oe eg 1000 – 650 + 500

M1dep

850 millilitres

oe eg 850 ml

A1

Alternative method 2

$650 \div 1000$ or 0.65(0)

oe

M1

1.5 – their 0.65(0) or 0.85(0)

oe eg 1 – 0.65 + 0.5

M1dep

0.85(0) litres

oe eg 0.85(0) l

A1

Alternative method 3

1.5×100 or 150

and

$650 \div 10$ or 65

oe

M1

their 150 – their 65 or 85

oe eg 100 – 65 + 50

M1dep

85 centilitres

oe eg 85 cl

A1

Additional Guidance

Ignore incorrect conversion attempt if correct answer has been seen
850 on answer line with 850 ml in working

M1M1A1

$1.5 - 650 = 850$ ml

M1M1A1

$1.5 - 650 = 0.85(0)$ l

M1M1A1

$1.5 - 650 = 850$

M1M1A0

$1.5 - 650 = 0.85(0)$

M1M1A0

Condone incorrect spelling – mark intention

[3]

Q28.

Alternative method 1

$$3115 \div 6.23 \text{ or } 500$$

$$3115 \times 0.028 \text{ or } 87.22$$

M1

$$\text{their } 500 \times 0.028$$

$$\text{their } 87.22 \div 6.23$$

M1dep

14

A1

Alternative method 2

$$6.23 \div 0.028 \text{ or } 222.5$$

$$6.23 \div 3115 \text{ or } 0.002 \text{ or } \frac{1}{500}$$

M1

$$3115 \div \text{their } 222.5$$

$$0.028 \div \text{their } 0.002 \text{ or } 0.028 \div \text{their } \frac{1}{500}$$

M1dep

14

A1

Alternative method 3

$$0.028 \div 6.23 \text{ or } 0.00449(\dots)$$

$$\text{or } 0.0045 \text{ or } \frac{2}{445}$$

M1

$$3115 \times \text{their } 0.00449(\dots)$$

$$\text{or } 3115 \times 0.0045$$

$$\text{or } 3115 \times \text{their } \frac{2}{445}$$

M1dep

14

A1

Additional Guidance

$$500 \times 0.028 \text{ and } 14 \times 0.028$$

M1M1A0

$$500 \times 0.028 \text{ and } 14^3$$

M1M1A0

$$500 \times 0.028^3$$

M1M0

[3]

Q29.

$$1 \text{ cm}^2 = 100 \text{ mm}^2$$

B1