AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE MATHEMATICS

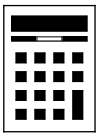
F

Foundation Tier Paper 3 Calculator

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
- a calculator
- mathematical instruments
- the Formulae Sheet (enclosed).



Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

Advice

In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
24–25	
26–27	
28–29	
TOTAL	

Answer **all** questions in the spaces provided.

Do not write outside the box

1 What is $\frac{1}{4}$ as a percentage?

Circle your answer.

[1 mark]

10% 25% 40% 75%

2 Circle the number that is a factor of 10

[1 mark]

7 6 5 4

3 Circle the value of the digit 9 in 0.094

[1 mark]

$\frac{9}{100}$ $\frac{9}{10}$ $\frac{1}{90}$ $\frac{1}{9}$

Do not write outside the box

4 Simplify $4 \times 2c$

Circle your answer.

[1 mark]

$42c$ $16c$ $8c$ $6c$

5 (a) Write a suitable unit for measuring each amount.

One has been done for you.

[2 marks]

	Unit
Distance from London to Manchester	kilometres
Length of a pencil	
Mass of a pound coin	

Turn over for the next question

6

Do not write outside the box

5 (b) Times for the three parts of a journey are

- 20 minutes
- 40 minutes
- 1 hour 30 minutes.

Work out the **total** time for the journey.

Give your answer in hours.

[2 marks]

Answer _____ hours

Do not write outside the box

6 Pens cost 20p each.

Rulers cost 60p each.

Saj buys some pens and some rulers.

He buys 8 rulers.

The total cost is £10

How many pens does he buy?

[3 marks]

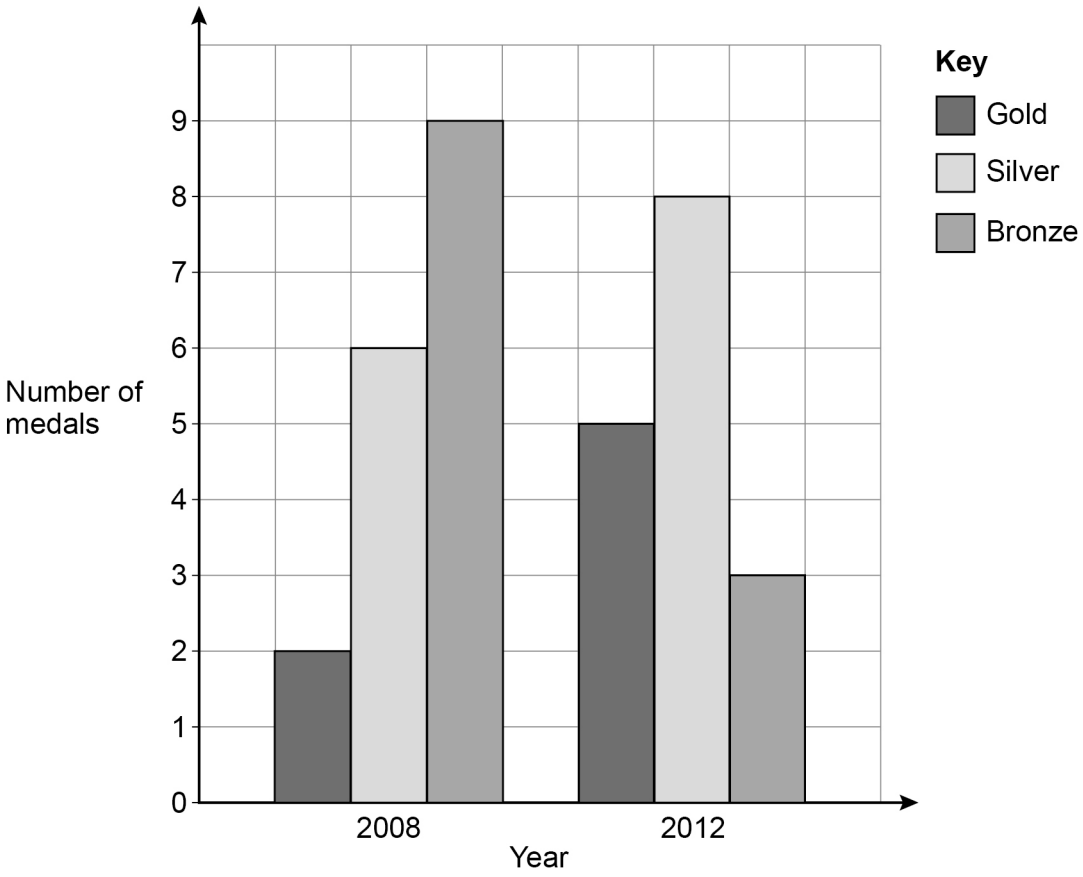
Answer _____

Turn over for the next question

5

Do not write outside the box

7 The bar chart shows the number of medals won by a country at events in 2008 and 2012



7 (a) Complete this statement about the medals won by the country in 2008

[1 mark]

number of Silver medals = _____ × number of Gold medals

Do not write outside the box

7 (b) Show that the country won **more** medals in 2008 than in 2012

[2 marks]

7 (c) At the 2016 event the country won an **equal** number of each type of medal.

Here is a statement about the medals won by the country in 2016

The total number of medals **cannot** be 25

Give a reason why the statement is correct.

[1 mark]

Turn over for the next question

4

Do not write outside the box

8 In this question use 1 litre = 1000 millilitres

A mixture is made using white paint and red paint.

amount of white paint = amount of red paint ÷ 7

5.6 litres of red paint will make **more** than 6 litres of the **mixture**.

How much more?

Give your answer in millilitres.

[4 marks]

Answer _____ ml

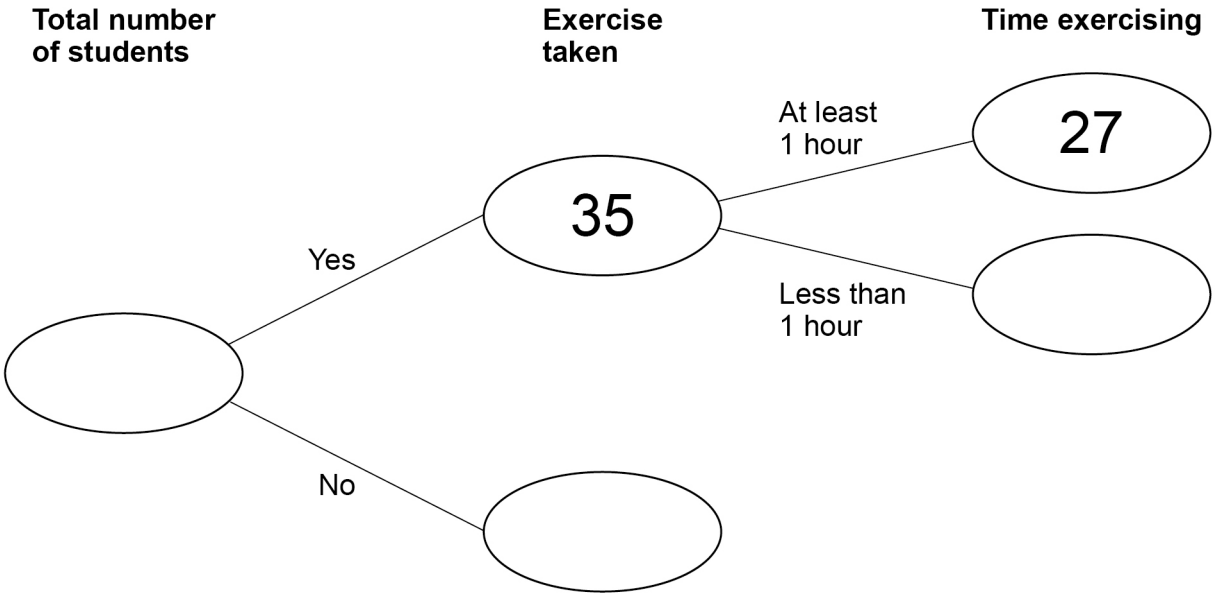
Do not write outside the box

9 Some students were asked about their daily exercise.

9 (a) 12 **more** students answered Yes than answered No.

Complete the frequency tree.

[3 marks]



9 (b) One of the 35 students who answered Yes is chosen at random.

What is the probability that they exercise for at least 1 hour?

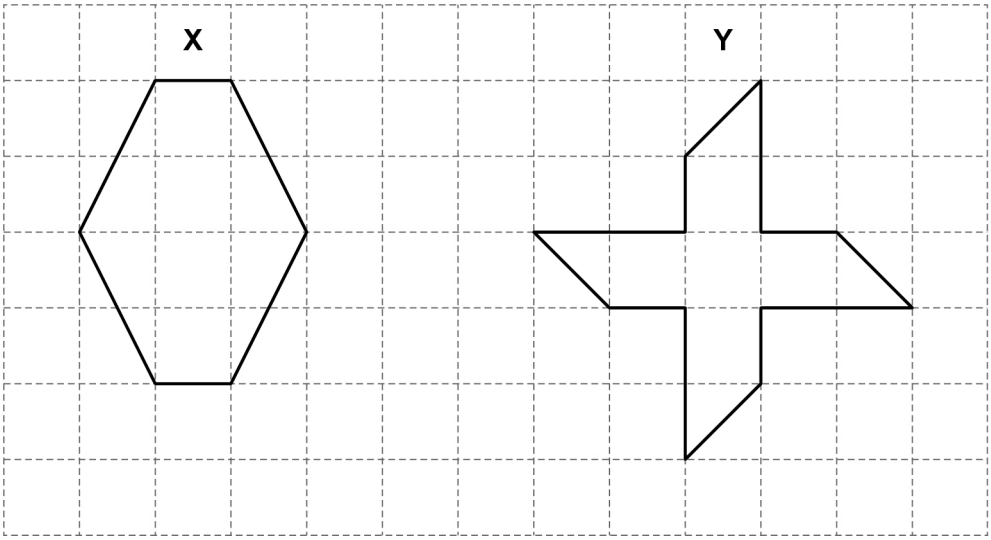
[1 mark]

Answer _____

8

Do not write outside the box

10 Shapes X and Y are shown on a centimetre grid.



10 (a) Circle the name of shape **X**.

[1 mark]

pentagon hexagon octagon decagon

10 (b) Give a reason why shape **Y** is **not** a regular polygon.

[1 mark]

_____

_____

10 (c) Complete these statements.

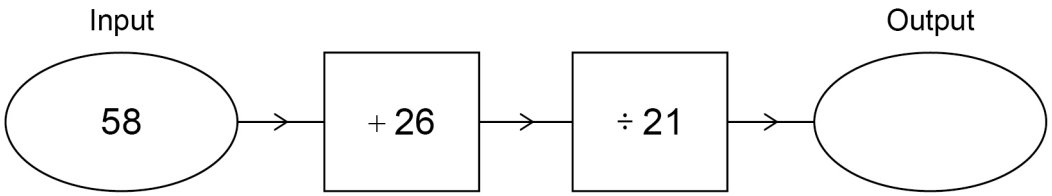
[2 marks]

The number of lines of symmetry of shape **X** is _____

The order of rotational symmetry of shape **Y** is _____

Do not write outside the box

11 (a) Here is a number machine.

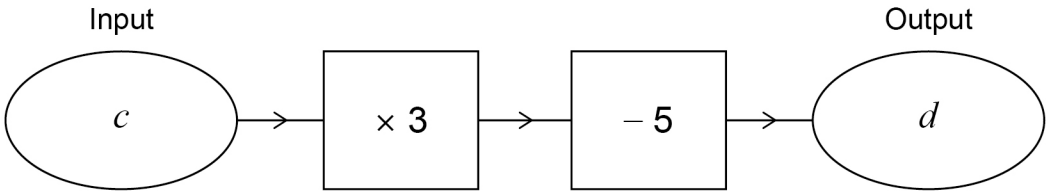


Work out the output.

[1 mark]

Answer _____

11 (b) Here is a different number machine.



Work out a formula for d in terms of c.

[2 marks]

Answer _____

7

Turn over ►

Do not write outside the box

12 (a) Simplify fully $9x + y - 6x + y$

[2 marks]

Answer _____

12 (b) Here are two expressions.

$8a$	$a^2 - b$

When $a = 25$ the expressions have the same value.

Work out the value of b.

[3 marks]

$b =$ _____

Do not write outside the box

12 (c) Simplify $\frac{6w+10}{2}$

Circle your answer.

[1 mark]

$6w + 8$ $3w + 10$ $6w + 5$ $3w + 5$

13 In a bag,

number of green discs : number of blue discs = 20 : 11

Tick **one** box for each statement about the discs in the bag.

[2 marks]

	True	False	Cannot tell
There are more green discs than blue discs.	☐	☐	☐
In total there are 31 discs.	☐	☐	☐

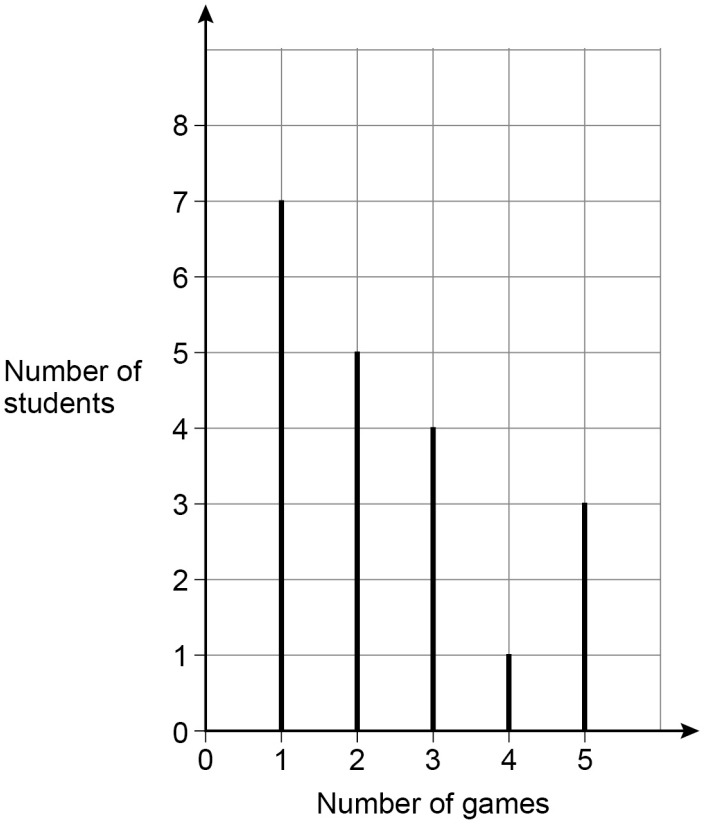
Turn over for the next question

8

Do not write outside the box

14 20 students are asked how many video games they played last month.

The chart shows information about the results.



14 (a) How many students played **more** than 2 games?

[1 mark]

Answer _____

Do not write outside the box

14 (b) Work out the mean number of games played.

Give your answer as a decimal.

[3 marks]

Answer _____

Turn over for the next question

4

Do not write outside the box

15 (a) Work out the multiple of 60 that is closest to 400

[2 marks]

Answer _____

15 (b) Work out the highest common factor (HCF) of 12 and 18

[2 marks]

Answer _____

Do not write outside the box

16 An empty container is a cylinder of radius 3.5 cm and height 40 cm

A tennis ball is a sphere of radius 3.5 cm

Will six of the tennis balls fit in the container?

Tick a box.

Yes ☐ No ☐

Show working to support your answer.

[2 marks]

Turn over for the next question

6

Do not write outside the box

17 (a) Calculate $2^7 \times 5^2$

[1 mark]

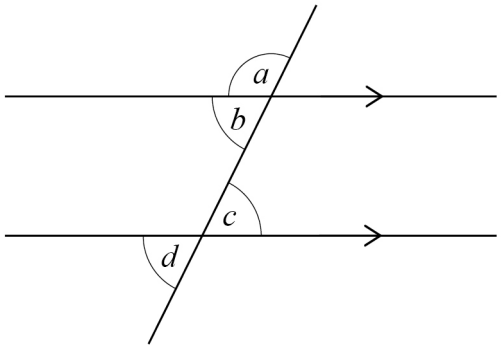
Answer _____

17 (b) Calculate $\sqrt[4]{20\,736}$

[1 mark]

Answer _____

18



Circle the pair of alternate angles.

[1 mark]

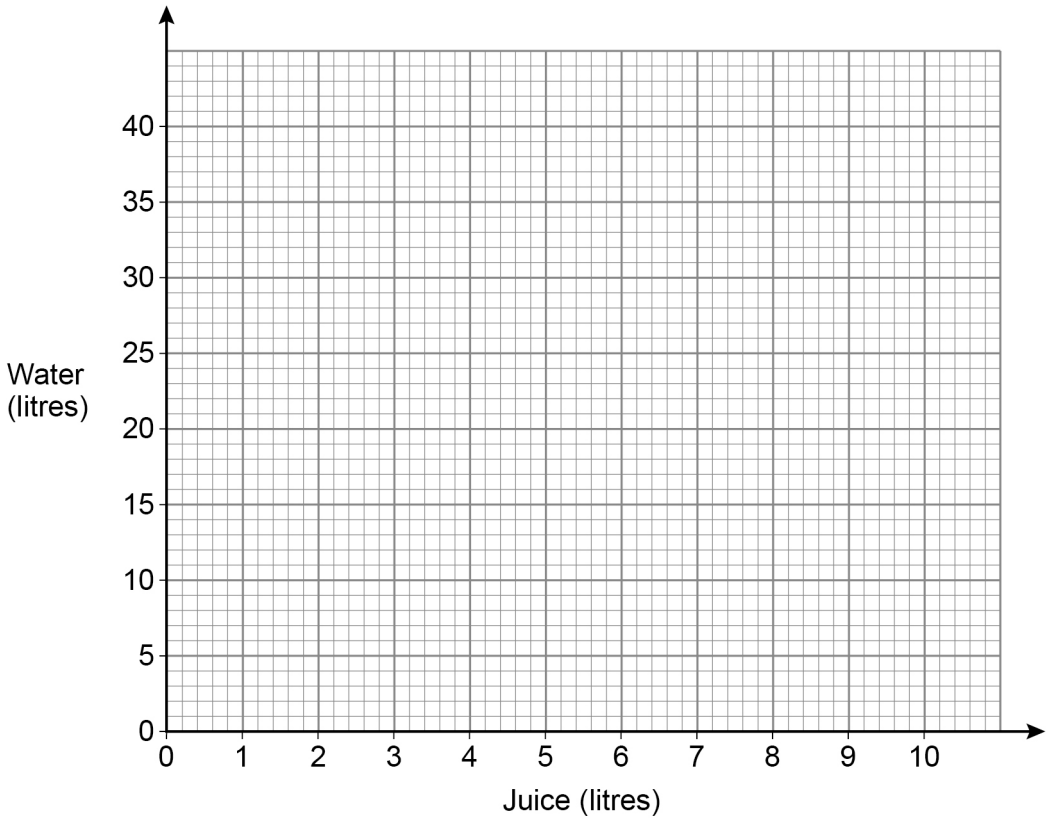
a and b b and c c and d a and d

Do not write outside the box

19 Juice and water are mixed together in the ratio 2 : 7

19 (a) Draw a straight line graph that shows the amounts of juice and water to mix together.
Your graph **must** show up to 10 litres of juice.

[2 marks]



19 (b) How much water needs to be mixed with 5 litres of juice?

[1 mark]

Answer _____ litres

6

Do not write outside the box

20 Adam and Bianca each throw the same biased coin.

Here is some information about their throws.

	Number of throws	**Number of Heads**
Adam	40	14
Bianca	60	20

Bianca says,

''My results give a better estimate of the probability of Heads than Adam's results.''

Is she correct?

Tick a box.

Yes ☐ No ☐

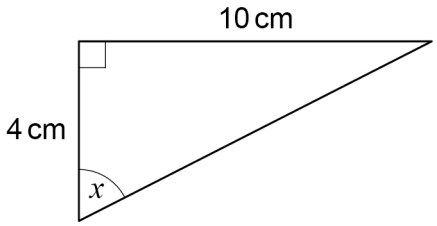
Give a reason for your answer.

[1 mark]

Do not write outside the box

21 Use trigonometry to work out the size of angle x.

Not drawn accurately



[3 marks]

$x =$ _____ °

Turn over for the next question

4

Do not write outside the box

22 Laura works in a shop.

The table shows the number of hours she works on two weekends.

	Saturday	**Sunday**
Weekend 1	3	2
Weekend 2	$5\frac{1}{2}$	$3\frac{1}{2}$

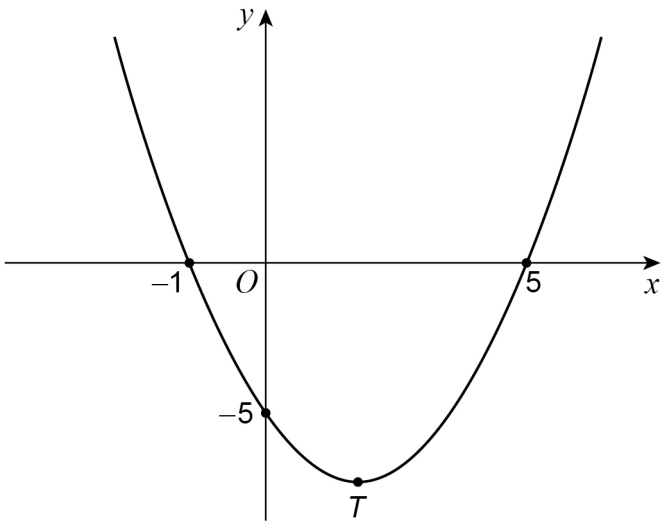
Work out the percentage increase in her **total** hours from Weekend 1 to Weekend 2

[3 marks]

Answer _____ %

Do not write outside the box

23 Here is a sketch of the curve $y = x^2 - 4x - 5$



23 (a) Write down the **two** roots of $x^2 - 4x - 5 = 0$

[1 mark]

Answer _____ and _____

23 (b) Work out the coordinates of *T*, the turning point of the curve.

[2 marks]

Answer (_____ , _____)

6

Turn over ►

Do not write outside the box

24 A is an **arithmetic** progression.

Here are the first four terms.

13 16 19 22

G is a **geometric** progression.

Here are the first four terms.

2 4 8 16

nth term of A = 8th term of G

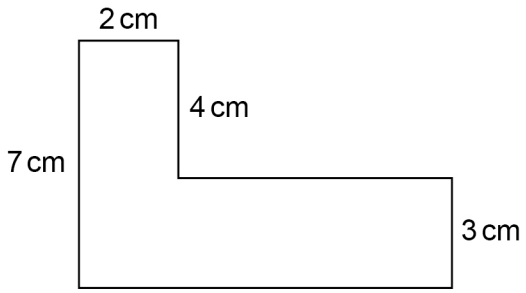
Work out the value of n.

[4 marks]

$n =$ _____

Do not write outside the box

25 The L-shape is made from rectangles.



Not drawn accurately

The area is 44 cm^2

Work out the perimeter.

[3 marks]

Answer _____ cm

26 Work out $3\begin{pmatrix}1\\6\end{pmatrix} + \begin{pmatrix}2\\5\end{pmatrix}$

[1 mark]

Answer ( )

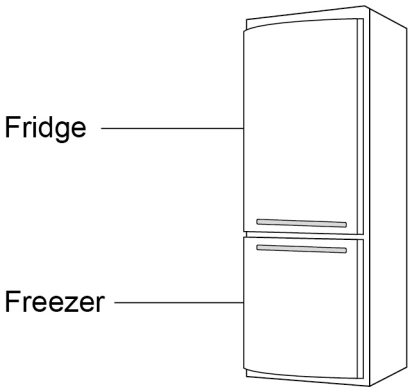
8

Turn over ►

Do not write outside the box

27 Information about two fridge-freezers, A and B, is shown.

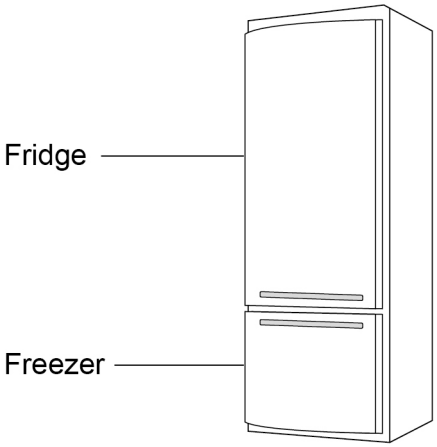
A



Total capacity is 330 litres

fridge capacity : freezer capacity = 3 : 2

B



Fridge capacity is 294 litres

fridge capacity : freezer capacity = 7 : 3

Do not write outside the box

Grace buys one of these fridge-freezers.

She buys the one with the greater **freezer** capacity.

Which one does she buy?

You **must** show your working.

[4 marks]

Answer _____

Turn over for the next question

4

Do not write outside the box

28 Tom and Adil are the two runners in a 200-metre race.

Tom completes the race in 24 seconds.

Adil completes the race at an average speed of 28.8 kilometres per hour.

Who wins the race?

You **must** show your working.

[3 marks]

Answer _____

Do not write outside the box

29 The mass of a baby is 3.6 kilograms to 1 decimal place.

What is the error interval for the mass in kilograms?

Tick **one** box.

[1 mark]

☐ $3.5 \leqslant \text{mass} \leqslant 3.6$

☐ $3.55 \leqslant \text{mass} \leqslant 3.65$

☐ $3.5 \leqslant \text{mass} < 3.6$

☐ $3.55 \leqslant \text{mass} < 3.65$

END OF QUESTIONS

4

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

Do not write outside the box

Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**
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GCSE
MATHEMATICS
8300/3F

Foundation Tier Paper 3 Calculator

Mark scheme

June 2022

Version: 1.0 Final

226G8300/3F/MS

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

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 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. eg accept 0.5 as well as $\frac{1}{2}$
[a, b]	Accept values between a and b inclusive.
[a, b)	Accept values a $\leqslant$ value $<$ b
3.14 …	Accept answers which begin 3.14 eg 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.

Continental notation

Accept a comma used instead of a decimal point (for example, in measurements or currency), provided that it is clear to the examiner that the student intended it to be a decimal point.

Q	Answer	Mark	Comments
1	25%	B1	

Q	Answer	Mark	Comments
2	5	B1	

Q	Answer	Mark	Comments
3	$\frac{9}{100}$	B1	

Q	Answer	Mark	Comments
4	$8c$	B1	

Q	Answer	Mark	Comments
5(a)	centimetres or millimetres or inches	B1	allow abbreviations eg cm, mm, in
	grams or milligrams or ounces	B1	allow abbreviations eg g, mg, oz
	Additional Guidance		
	Mark intention eg condone ou or incorrect spellings		
	Ignore any numbers with correct units		

Q	Answer	Mark	Comments
5(b)	20 + 40 or 60 or 90 or 1 (h) + 1 (h) + 30 (m) or 150 or 2 (h) 30 (m)	M1	
	$2\frac{1}{2}$ or 2.5	A1	oe answer in hours eg two and a half SC1 2.3(0)
	Additional Guidance		
	Ignore rounding attempt to 2 or 3 after correct answer seen eg 2.5 in working with answer 2		M1A1
	2 h 30 min in working with answer 2		M1A0
	1.9(0)		M0

Q	Answer	Mark	Comments
6	8 × (0.)60 or 480 or 4.8(0)	M1	oe
	10 – their 4.8(0) or 5.2(0) or 1000 – their 480 or 520	M1	oe 0.6(0) ⩽ their 4.8(0) < 10 60 ⩽ their 480 < 1000 5.2(0) or 520 implies M2
	26	A1	
	Additional Guidance		
	Up to M2 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts		
	60 ÷ 8 = 7.50 then 10 – 7.50		M0M1A0

Q	Answer	Mark	Comments
7(a)	3	B1	allow answer in words

Q	Answer	Mark	Comments
7(b)	**Alternative method 1**		
	2 + 6 + 9 or 17 (2008) or 5 + 8 + 3 or 16 (2012)	M1	oe
	17 and 16	A1	
	Alternative method 2		
	2 – 5 + 6 – 8 + 9 – 3 or –3 – 2 + 6 or 5 – 2 + 8 – 6 + 3 – 9 or 3 + 2 – 6	M1	oe eg 3 more gold, 2 more silver, 6 fewer bronze
	Indication that there was 1 more medal in 2008	A1	oe indication there was 1 less in 2012
	Additional Guidance		
	17 must not be linked with 2012, 16 must not be linked with 2008		
	Ignore further work after correct answer seen		

Q	Answer	Mark	Comments
7(c)	Valid reason	B1	eg 25 is not a multiple of 3 or 25 ÷ 3 is not a whole number or 8 + 8 + 8 = 24 or 9 + 9 + 9 = 27
	Additional Guidance		
	Ignore incorrect or irrelevant statements alongside correct statements, unless contradictory		
	3 is not a factor of 25		B1
	(25 ÷ 3 =) 8.3(…)		B1
	(25 ÷ 3 =) $8\frac{1}{3}$		B1
	3 × 8 = 24 or 3 × 9 = 27		B1
	It would have to be 8, 8 and 9		B1
	25 divided by 3 is a decimal		B1
	25 can't be (fully) divided by 3 (condone)		B1
	3 doesn't go into 25 (condone)		B1
	25 doesn't fit evenly into 3 (condone)		B1
	The three equal totals would not add up to 25		B1
	None of the equal totals would add up to 25		B0
	There are not 3 whole numbers that add to make 25		B0
	25 is not a factor of 3		B0
	The difference between the possible answers is 3		B0

Q	Answer	Mark	Comments
8	**Alternative method 1**		
	5.6 ÷ 7 or 0.8	M1	oe
	5.6 + their 0.8 or 6.4	M1	oe their 0.8 must not be 0.4 and must be less than 5.6
	their 6.4 – 6 or 0.4	M1dep	oe dep on 2nd M1
	400	A1	SC1 any correct conversion litres to millilitres with M0 scored
	Alternative method 2		
	5.6 × 1000 or 5600 or 6 × 1000 or 6000 or 5.6 ÷ 7 or 0.8	M1	oe
	their 5600 ÷ 7 or their 0.8 × 1000 or 800	M1	oe their 5600 must include the digits 56 consecutively their 0.8 must not be 0.4 and must be less than 5.6
	their 5600 + their 5600 ÷ 7 or their 5600 + their 0.8 × 1000 or 6400	M1dep	oe their 5600 must include the digits 56 consecutively their 0.8 must not be 0.4 and must be less than 5.6 dep on 2nd M1
	400	A1	SC1 any correct conversion litres to millilitres with M0 scored

Additional Guidance continues on the next page

	Additional Guidance	
8 cont	Up to M3 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts	
	Beware of 0.4 or 400 from incorrect working	
	6400 or 0.4 (not from incorrect working)	M1M1M1
	0.9 and 6.5 and 0.5 or 0.9 and 6.5 and 500 (500 implies 0.5)	M0M1M1A0
	560 ÷ 7 and 560 + 80 (560 includes the digits 56 consecutively)	M0M1M1A0
	560 and 80 and 640	M0M1M1A0
	560 and 600 and 80 and 40	M0M1M1A0
	In Alt 2, 0.0056 ÷ 7 (0.0056 includes the digits 56 consecutively)	M0M1

Q	Answer	Mark	Comments
9(a)	8 in Time exercising Less than 1 hour	B1	
	23 in Exercise taken No	B1	
	58 in Total number of students	B1ft	ft 35 + their 23 or 27 + their 8 + their 23
	Additional Guidance		
	8 in Time exercising Less than 1 hour 47 in Exercise taken No 82 in Total number of students		B1 B0 B1ft
	7 in Time exercising Less than 1 hour 25 in Exercise taken No 59 in Total number of students		B0 B0 B1ft

Q	Answer	Mark	Comments
9(b)	$\frac{27}{35}$ or 0.77(…) or 77(. …)%	B1	oe fraction
	Additional Guidance		
	Ignore attempts to simplify or convert after correct fraction seen eg1 $\frac{27}{35}$ seen, answer $\frac{5}{7}$ eg2 $\frac{27}{35}$ seen, answer 7.7%		 B1 B1
	Ignore words if correct answer seen eg1 $\frac{27}{35}$ seen, answer 27 out of 35 eg2 77%, unlikely		 B1 B1
	Answer given as ratio (even if correct answer also seen) eg 27 : 35		 B0
	Answer only in words eg 27 out of 35		 B0
	Only 77 (without %)		B0

Q	Answer	Mark	Comments
10(a)	Hexagon	B1	

Q	Answer	Mark	Comments
10(b)	Valid reason	B1	eg sides are not equal or angles are not equal
	Additional Guidance		
	Ignore incorrect or irrelevant statements alongside correct statements, unless contradictory		
	There are no lines of symmetry		B1
	It has reflex angles		B1
	Regular polygons must have equal sides		B1
	All sides are different (condone)		B1
	Some sides are more than 1 cm		B1
	It doesn't have a line of symmetry		B1
	It doesn't have one line of symmetry		B0

Q	Answer	Mark	Comments
10(c)	2	B1	allow in words
	4	B1	allow in words

Q	Answer	Mark	Comments
11(a)	4	B1	
	Additional Guidance		
	4 in output oval with answer line blank		B1
	4 in output oval with different answer on answer line		B0

Q	Answer	Mark	Comments
11(b)	$d = 3c - 5$ or $d = 3 \times c - 5$	B2	oe eg $d = -5 + 3c$ B1 $d = 3c \ldots$ or $d = 3 \times c \ldots$ or $3c - 5$ or $3 \times c - 5$ SC1 $c = \frac{d+5}{3}$
	Additional Guidance		
	Further incorrect work after a B2 response is B1 eg $d = 3c - 5$ followed by $d = -15c$		B1
	Further incorrect work after a B1 response is B1 eg $3c - 5$ followed by $-15c$		B1
	Condone $3c - 5$ on answer line if $d = 3c - 5$ seen in working		B2
	$3c - 5 = d$		B2
	$d = c \times 3 - 5$		B2
	$d = c3 - 5$		B1
	$c3 - 5$		B0

Q	Answer	Mark	Comments
12(a)	$3x + 2y$	B2	either order B1 $3x$ or $2y$
	Additional Guidance		
	Further incorrect work after a B2 response is B1 eg $3x + 2y$ followed by $5xy$		B1
	Further incorrect work after a B1 response is B1 eg $15x + 2y$ followed by $30xy$		B1

Q	Answer	Mark	Comments
12(b)	8×25 or 200 or 25^2 or 625	M1	oe
	8×25 or 200 and $25^2 - b$ or $625 - b$ **or** $25^2 - 8 \times 25$ or $625 - 200$	M1dep	oe may be seen in an equation
	425	A1	
	Additional Guidance		
	Embedded answer		M1M1A0

Q	Answer	Mark	Comments
12(c)	$3w + 5$	B1	

Q	Answer	Mark	Comments
13	True Cannot tell	B2	B1 one correct
	Additional Guidance		
	A tick and a cross in the same row – mark the tick		
	Allow any unambiguous indication		

Q	Answer	Mark	Comments
14(a)	8	B1	

Q	Answer	Mark	Comments
14(b)	1×7 and 2×5 and 3×4 and 4×1 and 5×3 or 7 and 10 and 12 and 4 and 15 or 48	M1	oe allow one error or omission
	$(7 + 10 + 12 + 4 + 15) \div 20$ or $48 \div 20$ or their $48 \div 20$	M1dep	oe eg $\frac{48}{20}$ or $\frac{12}{5}$ or $2\frac{2}{5}$ without working their 48 must be the correct sum of their products
	2.4	A1	SC1 33.75
	Additional Guidance		
	$48 \div 5$		M1M0
	$1 \times 7 + 2 \times 5 + 3 \times 4 + 4 \times 1 + 5 \times 5$ (5×5 is one error) $58 \div 20 = 2.9$		M1 M1A0
	$8 + 10 + 12 + 4 + 15$ (8 is one error) $49 \div 20 = 2.45$		M1 M1A0
	Answer 2 after 2.4 seen		M1M1A0
	$7 + 10 + 12 + 4 + 15 \div 20$ not recovered		M1M0
	Correct products or values seen but a different method used is a choice of methods eg 7 10 12 4 15 followed by $20 \div 5$ or $20 \div 15$		M0

Q	Answer	Mark	Comments
15(a)	300 or 360 or 480 or 7 (× 60) or 7th or any 3 multiples of 60 that are greater than 60	M1	
	420	A1	
	Additional Guidance		
	420 in working with answer 7 or 7th or 7 × 60		M1A0

Q	Answer	Mark	Comments
15(b)	6	B2	B1 answer 2 or answer 3 or answer 2 (×) 3 or answer 2, 6 or answer 3, 6 or answer 2, 3, 6 or (1) 2 3 4 6 (12) or (1) 2 3 6 9 (18) or (12 =) 2 (×) 2 (×) 3 or 2^2 (×) 3 or (18 =) 2 (×) 3 (×) 3 or 2 (×) 3^2
	Additional Guidance		
	If correct answer 6 is obtained from a list of factors, then the list must contain no errors		
	For use of prime factors, allow in repeated division or a factor tree or a Venn diagram or inclusion of 1		
	List of factors may be seen in factor pairs (allow repeats) eg (1 × 12) 2 × 6 3 × 4		B1

Q	Answer	Mark	Comments
16	2×3.5 or 7	M1	oe implied by 5.7(…) or 5 r 5 or 42
	Ticks No and 5.7(…) or Ticks No and 42	A1	oe eg $\frac{40}{7}$ is less than 6
	Additional Guidance		
	Ignore area and volume calculations		
	Ticks No and 5 r 5		M1A1
	Ticks No and $5\frac{5}{7}$		M1A1
	Ticks No and 2 cm too short		M1A1
	Ticks Yes and 5.7(…)		M1A0
	12×3.5		M1

Q	Answer	Mark	Comments
17(a)	3200	B1	

Q	Answer	Mark	Comments
17(b)	12	B1	

Q	Answer	Mark	Comments
18	b and c	B1	

Q	Answer	Mark	Comments
19(a)	Straight line from (0, 0) to (10, 35)	B2	$\pm \frac{1}{2}$ square B1 one correct point $\pm \frac{1}{2}$ square from (2, 7) to (10, 35) seen or plotted or one correct ratio apart from 2 : 7 or one correct pair of amounts apart from 2 juice 7 water
	Additional Guidance		
	Mark intention		
	If no points plotted, a correct point from (2, 7) to (10, 35) can be implied by a straight line with positive gradient		
	Two points plotted with the same x-coordinate is choice unless the line is drawn through one of the points		
	Condone straight line from (2, 7) to (10, 35)		B2
	(2, 7) seen with graph not drawn or incorrect		B1
	10 : 35 seen with graph not drawn or incorrect		B1
	6 juice 21 water with graph not drawn or incorrect		B1

Q	Answer	Mark	Comments
19(b)	**Alternative method 1 – uses the given ratio**		
	17.5	B1	
	Alternative method 2 – uses their graph		
	Correct water reading for 5 litres of juice from their straight line	B1ft	$\pm \frac{1}{2}$ square
	Additional Guidance		
	17 or 18 from a correct straight line		B1

Q	Answer	Mark	Comments
20	Ticks Yes and valid reason	B1	eg ticks Yes and she has thrown more often
	Additional Guidance		
	Ignore incorrect or irrelevant statements alongside correct statements, unless contradictory		
	Ticks No	B0	
	Ticks Yes and 60 is more than 40	B1	
	Ticks Yes and 60 is 20 more than 40	B1	
	Ticks Yes and 60 is 10 more than 40 (ignore incorrect value 10)	B1	
	Ticks Yes and she has more data to look at	B1	
	Ticks Yes and her number of throws is higher	B1	
	Ticks Yes and Bianca used more throws which gives her a higher chance of getting heads	B1	
	Ticks Yes and Adam has less number of throws and has more heads (ignore irrelevant has more heads)	B1	
	Ticks Yes and Bianca throws more coins	B1	
	Ticks Yes and she threw it 60 times, Adam only 40	B1	
	Ticks Yes and she threw it 60 times, Adam 40	B0	
	Ticks Yes and she threw it 60 times and got 20	B0	
	Ticks Yes and the probability is $\frac{20}{60}$	B0	
	Ticks Yes and because her total is higher	B0	

Q	Answer	Mark	Comments
21	**Alternative method 1**		
	tan identified	M1	oe eg $\tan^{-1}$
	$\tan x = \frac{10}{4}$ or $\tan x = \frac{5}{2}$ or $\tan x = 2.5$	M1dep	oe eg $\tan^{-1}\frac{10}{4}$ or $90 - \tan^{-1}\frac{4}{10}$
	[68, 68.2]	A1	SC1 [21.8, 22]
	Alternative method 2		
	$\sin x = \frac{10}{\sqrt{4^2+10^2}}$ or $\cos x = \frac{4}{\sqrt{4^2+10^2}}$	M2	oe eg $\sin x = \frac{10}{\sqrt{116}}$ or $\sin^{-1}\frac{10}{\sqrt{4^2+10^2}}$ or $\cos x = \frac{4}{\sqrt{116}}$ or $\cos^{-1}\frac{4}{\sqrt{4^2+10^2}}$ or $90 - \sin^{-1}\frac{4}{\sqrt{4^2+10^2}}$ or $90 - \cos^{-1}\frac{10}{\sqrt{4^2+10^2}}$
	[68, 68.2]	A1	SC1 [21.8, 22]
	Additional Guidance		
	Accept 10.77 or 10.8 or $2\sqrt{29}$ for $\sqrt{116}$		
	Tan can be identified by, for example, circling TOA in SOHCAHTOA		
	Answer from accurate drawing		M0M0A0
	$\sin x = \frac{10 \sin 90}{\sqrt{116}}$		M2
	$(x =)$ tan 2.5 or $(x =)$ tan 0.4 or $(x =) \tan\left(\frac{10}{4}\right)^{-1}$ unless recovered		M1M0A0
	$\tan = \frac{10}{4}$ or $\tan = \frac{4}{10}$ or $\tan x = \frac{4}{10}$ with no further correct working		M1M0A0

Q	Answer	Mark	Comments
22	$3 + 2$ or 5 and $5\frac{1}{2} + 3\frac{1}{2}$ or 9 **or** $5\frac{1}{2} - 3$ or $2\frac{1}{2}$ and $3\frac{1}{2} - 2$ or $1\frac{1}{2}$ **or** 4	M1	oe eg $180 + 120$ or 300 and $330 + 210$ or 540 implied by $5\frac{1}{2} + 3\frac{1}{2} - 3 - 2$
	$\frac{9-5}{5}$ or $\frac{2\frac{1}{2}+1\frac{1}{2}}{3+2}$ or $\frac{4}{5}$ or 0.8 or $\frac{5\frac{1}{2}+3\frac{1}{2}}{3+2}$ $(\times 100)$ or $\frac{9}{5}$ $(\times 100)$ or 1.8 $(\times 100)$ or 180	M1dep	oe eg $\frac{5\frac{1}{2}+3\frac{1}{2}-3-2}{3+2}$ eg $\frac{540-300}{300}$ or $\frac{240}{300}$ or $1.8 - 1$
	80	A1	

Additional Guidance

Allow working fully in minutes but units must be consistent in a single calculation	
eg 2 h 30 and 1 h 30	M1
eg $3 + 2 = 5$ and $330 + 210 = 540$	M1
eg $3 + 120$ and $330 + 3\frac{1}{2}$ unless recovered	M0
$3 + 2 = 6$, $5\frac{1}{2} + 3\frac{1}{2} = 9$, $9 - 6 = 3$, $3 = 50\%$	M1M1A0
$3 + 2 = 6$, $5\frac{1}{2} + 3\frac{1}{2} = 9$, answer 50% (3 is implied)	M1M1A0
$9 - 6 = 3$, $3 = 50\%$ (no method shown for 6)	M0M0A0

Q	Answer	Mark	Comments
23(a)	–1 and 5	B1	either order
	Additional Guidance		
	Ignore $x =$ written before answers		
	(–1, 0) or (5, 0)		B0

Q	Answer	Mark	Comments
23(b)	(2, –9)	B2	B1 $x = 2$ or (2, …) or $y = -9$ or (…, –9) or $(x-2)^2 - 9$ B1ft correct y-coordinate for their x-coordinate with $x \neq -1$, 0 or 5 SC1 (–9, 2)
	Additional Guidance		
	If answer line is blank, check diagram for indication of x or y values		
	(3, –9)		B1
	(3, –8)		B1ft
	(1, –8)		B1ft
	(2.5, –8.75)		B1ft
	(0, –5)		B0ft

Q	Answer	Mark	Comments
24	(8th term =) 2^8 or 256	M1	oe may be implied
	Common difference of A indicated as 3	M1	may be implied eg $3n$ … or … + $3(n-1)$
	$3n + 10$ = their 256 or (their 256 – 10) ÷ 3 or (their 256 – 13) ÷ 3 or 81	M1dep	oe equation eg $13 + 3(n-1) = 2^8$ dep on 2nd M1 their 256 may be any number and may be in index form
	82	A1	
	Additional Guidance		
	n + 3 implies 2nd M1		
	Do not award M1 for 256 if it is in a list of powers of 2 unless it is indicated or it is the highest power evaluated		
	Common difference of 3 may be shown on the progression for the 2nd M1		
	10, (13, 16, 19, 22), 25 without common difference of 3 shown does not imply 2nd M1		
	82 from trial and improvement		M3A1
	Embedded answer $3 \times 82 + 10 = 256$		M3A0
	$3n + 10 = 256$ or $3n + 10 = 2^8$ or $3n = 246$		M1M1M1
	$3n - 10 = 256$		M1M1M0
	$3n + 10 = 16$ (2^8 not seen)		M0M1M1
	$3n + 6 = 2^8$		M1M1M0
	256 – 22 = 234, 234 ÷ 3 (indicating common difference of 3)		M1M1M0
	$3n - 8 = 128$ (2^8 not seen)		M0M1M0

Q	Answer	Mark	Comments
25	**Alternative method 1**		
	4×2 or 8	M1	oe may be seen in an equation eg $3 \times x + 4 \times 2 = 44$
	$\frac{44 - 4 \times 2}{3}$ or $\frac{36}{3}$ or 12	M1dep	oe
	38	A1	
	Alternative method 2		
	7×2 or 14	M1	oe may be seen in an equation eg $7 \times 2 + 3 \times y = 44$
	$\frac{44 - 7 \times 2}{3}$ or $\frac{30}{3}$ or 10	M1dep	oe
	38	A1	
	Additional Guidance		
	Up to M2 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts		
	Working for up to M2 may be seen on the diagram		
	Beware of 38 from incorrect working $7 + 3 + 7 + 3 = 20$, $7 + 2 + 7 + 2 = 18$, $20 + 18 = 38$		M0M0A0

Q	Answer	Mark	Comments
26	$\begin{pmatrix} 5 \\ 23 \end{pmatrix}$	B1	
	Additional Guidance		
	Condone $\left(\frac{5}{23}\right)$		B1

Q	Answer	Mark	Comments
27	330 ÷ (3 + 2) or 330 ÷ 5 or 66	M1	oe eg $\frac{330}{5}$
	their 66 × 2 or 132	M1dep	oe $\frac{2}{5}$ × 330 scores M2
	294 ÷ 7 or 42 or 294 ÷ 7 × 3 or 126	M1	oe eg $\frac{294}{7}$ or $\frac{3}{7}$ × 294
	132 and 126 and A	A1	
	Additional Guidance		
	132 and 88.2 and A		M1M1M0A0

Q	Answer	Mark	Comments
28	**Alternative method 1 – compares speeds in m/s**		
	200 ÷ 24 or 8.3(3…)	M1	oe eg $\frac{200}{24}$ or $8\frac{1}{3}$
	28.8 × 1000 ÷ 60 ÷ 60 or 8	M1	oe eg 28 800 ÷ 3600 or 28.8 ÷ 3.6
	8 and 8.3(3…) and Tom	A1	oe eg 8 and $8\frac{1}{3}$ and Tom
	Alternative method 2 – compares speeds in km/h		
	200 ÷ 24 or 8.3(3…)	M1	oe eg $\frac{200}{24}$ or $8\frac{1}{3}$
	their 8.3(3…) ÷ 1000 × 60 × 60 or 30	M1dep	oe eg 0.008 3(3…) × 3600
	30 and Tom	A1	
	Alternative method 3 – time for Adil starting with m/s		
	28.8 × 1000 ÷ 60 ÷ 60 or 8	M1	oe eg 28 800 ÷ 3600
	200 ÷ their 8 or 25	M1dep	oe eg $\frac{200}{8}$
	25 and Tom	A1	oe eg Tom by 1s
	Alternative method 4 – time for Adil starting with km/h		
	$\frac{200 \div 1000}{28.8}$ or [0.0069, 0.007] or $\frac{200}{28.8}$ or [6.9, 7]	M1	oe eg $\frac{0.2}{28.8}$ eg $\frac{125}{18}$
	their [0.0069, 0.007] × 60 × 60 or their [6.9, 7] ÷ 1000 × 60 × 60 or 25	M1dep	oe eg $\frac{0.2}{28.8}$ × 3600
	25 and Tom	A1	oe eg Tom by 1s

Mark scheme and Additional Guidance continue on the next page

Q	Answer	Mark	Comments
28 cont	**Alternative method 5 – distance for Adil in 24s**		
	28 800 × 24 or 691 200 or 28.8 ÷ 60 ÷ 60 or 0.008 or 28.8 × 24 or 691.2	M1	oe eg $\frac{3456}{5}$
	their 691 200 ÷ 60 ÷ 60 or their 0.008 × 1000 × 24 or their 691.2 × 1000 ÷ 60 ÷ 60 or 192	M1dep	oe eg 28 800 × 24 ÷ 3600
	192 and Tom	A1	
	Additional Guidance		
	Up to M2 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts		
	Ignore all units		
	Allow other correct comparisons eg 500 and 480 (this is metres per minute) eg 500 and 480 and Tom		M1M1 M1M1A1
	200 m = 0.2 km, 24 s = 24 ÷ 60 ÷ 60 = $\frac{1}{150}$ hour, 0.2 ÷ $\frac{1}{150}$ = 30 and Tom		M1M1A1
	$\frac{200 \div 1000}{24} = \frac{1}{120}$ (or 0.0083…)		M1

Q	Answer	Mark	Comments
29	$3.55 \leqslant$ mass < 3.65	B1	