

# RATIO

DATE OF SOLUTIONS: 15/05/2018  
MAXIMUM MARK: 78

# SOLUTIONS

GCSE (+ IGCSE) EXAM QUESTION PRACTICE

1. [Edexcel, 2015]

Ratio [2 Marks]

In a school, there is a total of 640 children.  
The ratio of the number of girls to the number of boys is 7 : 9

How many boys are there in this school?

$$\begin{array}{l} \text{G: B} \\ 7:9 \end{array} \quad \begin{array}{l} \text{TOTAL} \\ 16 \end{array}$$
$$\frac{640}{16} = 40 \quad \rightarrow \quad 40 \times 9 = \underline{\underline{360}} \quad \text{(AI)}$$

(M)

In the 2012 Paralympic Games, the total number of gold and silver medals won by Brazil was 35

The ratio of the number of gold medals that Brazil won to the number of silver medals that Brazil won was 3 : 2

How many silver medals were won by Brazil?

$$\begin{array}{l} G : S \\ 3 : 2 \end{array} \quad \begin{array}{l} \text{TOTALS} \\ 5 \\ \updownarrow \\ 35 \end{array} \quad \left| \quad \begin{array}{l} \frac{35}{5} = 7, \quad 7 \times 2 = \underline{\underline{14}} \\ \text{(m)} \end{array} \quad \begin{array}{l} \text{(A)} \\ \underline{\underline{14}} \end{array}$$

Rajesh and Gudi share some money in the ratio 2:5  
Rajesh receives £240

Work out the amount of money that Gudi receives.

$$\begin{array}{l} R : G \\ 2 : 5 \\ \swarrow \\ 240 \end{array}$$
$$1 \text{ PART} = \frac{240}{2} = 120 \quad (B1)$$
$$GUDI = 120 \times 5 = \underline{\underline{600}}$$

£ 600 (A1)

Rafael and Roger played tennis against each other 30 times.

Each of the times they played, either Rafael won or Roger won.

The ratio of the number of times Rafael won to the number of times Roger won is 7:3

(a) Work out the number of times Rafael won.

$$\begin{array}{r}
 \text{Ra : Ro} \\
 7 \quad 3 \\
 \hline
 \text{TOTAL} \\
 10 \\
 \hline
 \frac{30}{10} = 3 \quad \text{(B1)} \\
 \rightarrow 7 \times 3 = \underline{\underline{21}} \\
 \hline
 21 \quad \text{(A1)} \\
 (2)
 \end{array}$$

In a school, there are 75 girls in the tennis squad.

The ratio of the number of boys in the tennis squad to the number of girls in the tennis squad is 4:3

(b) Work out the number of boys in the tennis squad.

$$\begin{array}{r}
 \text{B : G} \\
 4 : 3 \\
 \hline
 \frac{75}{3} = 25 \quad \text{(B1)} \\
 \rightarrow 25 \times 4 = \underline{\underline{100}} \\
 \hline
 100 \quad \text{(A1)} \\
 (2)
 \end{array}$$

[LOTS OF OTHER METHODS ARE POSSIBLE!]

There are 20 students in a class.

12 of the students are girls.  $\longrightarrow$  8 BOYS

Find the ratio of the number of girls to the number of boys.

Give your ratio in the form  $n : 1$

$$\begin{array}{l} G : B \\ = 12 : 8 \end{array} \xrightarrow{\text{(B)}} \left[ \frac{\cdot 2}{8} \right] \xrightarrow{\text{(A)}} \underline{1.5} : 1$$

Green paint can be made by mixing yellow paint and blue paint in the ratio 2 : 3  
Wendy makes 15 litres of green paint.

Work out how many litres of blue paint Wendy uses.

Y : B  
2 : 3

TOTALS

5  
↑  
↓  
15

$$\frac{15}{5} = 3 \rightarrow 3 \times 3 = 9$$

9 (A) litres

A school has 840 pupils and 40 teachers.

- (a) Find the ratio of the number of pupils to the number of teachers.  
Give your ratio in the form  $n : 1$

$$\begin{array}{l}
 P : T \\
 840 : 40 = 21 : 1 \\
 \quad \quad \quad (\div 40)
 \end{array}
 \qquad
 \begin{array}{r}
 \textcircled{B2} \\
 \hline
 21 : 1 \\
 (2)
 \end{array}$$

In Year 11 at the school, the ratio of the number of pupils who study Chemistry to the number of pupils who study Physics is 3 : 2

- (b) 105 pupils in Year 11 study Chemistry.  
Work out the number of pupils in Year 11 who study Physics.

$$\begin{array}{l}
 C : P \\
 3 : 2 \\
 \downarrow \\
 105
 \end{array}
 \qquad
 \begin{array}{l}
 \textcircled{M1} \\
 \frac{105}{3} = 35 \rightarrow 2 \times 35 = \underline{\underline{70}}
 \end{array}
 \qquad
 \begin{array}{r}
 \textcircled{A1} \\
 \hline
 70 \\
 (2)
 \end{array}$$

For the 105 pupils who study Chemistry, the ratio of the number of boys to the number of girls is 4 : 3

- (c) Work out the number of girls in Year 11 who study Chemistry.

$$\begin{array}{l}
 B : G \\
 4 : 3
 \end{array}
 \qquad
 \begin{array}{l}
 \text{TOTALS} \\
 7 \\
 \downarrow \\
 105
 \end{array}
 \left|
 \begin{array}{l}
 \textcircled{M1} \\
 \frac{105}{7} = 15 \rightarrow 15 \times 3 = \underline{\underline{45}}
 \end{array}
 \right.
 \qquad
 \begin{array}{r}
 \textcircled{A1} \\
 \hline
 45 \\
 (2)
 \end{array}$$

The perimeter of a triangle is 90 cm.

The lengths of the sides of the triangle are in the ratios 3 : 5 : 7

Work out the length of the longest side of the triangle.

$$3 : 5 : \textcircled{7}$$

LONGEST

$$\begin{array}{l} \text{TOTALS} \\ 15 \\ \Downarrow \\ 90\text{cm} \end{array}$$

$$\textcircled{m} \left| \frac{90}{15} = 6 \textcircled{BD} \right.$$

↑  
ONE PART

$$6 \times 7 = 42$$

$$\textcircled{A1} \\ \dots\dots\dots 42 \text{ cm}$$



Carlos mixes cement, lime and sand in the ratios 1 : 2 : 9 by weight.

Work out the weight of cement, the weight of lime and the weight of sand in 60 kg of the mixture.

C : L : S	TOTALS
1 : 2 : 9	12
	60 kg

cement ..... 5 ..... kg

lime ..... 10 ..... kg

sand ..... 45 ..... kg

$\frac{60}{12} = 5$  (BI) ← ONE PART  
 (BI) →

CEMENT =  $1 \times 5$   
 LIME =  $2 \times 5$   
 SAND =  $9 \times 5$

(AI)

Bronze is made from copper and tin.

The ratio of the weight of copper to the weight of tin is 3 : 1

4 PARTS

Work out the weight of copper in 280 grams of bronze.

$$1 \text{ PART} = \frac{280}{4}$$

$$= 70$$

(m)

→ COPPER =  $3 \times 70$

↓

$$\underline{\underline{210}} \text{ grams}$$

(A)

Pritam, Sarah and Emily share some money in the ratios 3 : 6 : 4  
Sarah gets \$15 more than Emily.

Work out the amount of money that Pritam gets.

$$\begin{array}{ccc} P & : & S & : & E \\ 3 & : & 6 & : & 4 \end{array}$$

└──────────┘  
\$15

$$\begin{aligned} 1 \text{ PART} &= \frac{15}{2} \\ &= 7.5 \end{aligned}$$

(ml)

PRITAM GETS

$$\begin{aligned} &7.5 \times 3 \quad (\text{ml}) \\ &= \underline{\underline{\$22.50}} \quad (\text{AI}) \end{aligned}$$

- (a) Philip and Nikos share some money in the ratio 3:4  
 Nikos receives £24  
 Work out how much Philip receives.

$$\begin{array}{l} P : N \\ 3 : 4 \\ \updownarrow \\ 24 \end{array}$$

$$\begin{array}{l} \text{TOTALS} \\ 7 \end{array} \quad |$$

$$\frac{24}{4} = 6 \text{ (M1)}, \quad 6 \times 3 = \underline{\underline{18}}$$

$$\pounds \underline{\quad 18 \text{ (A1)}} \quad (2)$$

- (b) James and Suki share £40 in the ratio 3:5  
 Work out how much Suki receives.

$$\begin{array}{l} J : S \\ 3 : 5 \end{array}$$

$$\begin{array}{l} \text{TOTALS} \\ 8 \\ \updownarrow \\ 40 \end{array} \quad |$$

$$\frac{40}{8} = 5 \text{ (M1)}, \quad 5 \times 5 = \underline{\underline{25}}$$

$$\pounds \underline{\quad 25 \text{ (A1)}} \quad (2)$$

The ratio of Mark's age to Reeta's age is 3 : 5

Mark's age is 24 years.

(a) Work out Reeta's age.

$$\begin{array}{l}
 m : R \\
 3 : 5 \\
 \frac{24}{3} = 8 \quad (m) \quad \rightarrow \quad 5 \times 8 = \underline{\underline{40}} \\
 \dots\dots\dots 40 \quad (A) \\
 \dots\dots\dots (2) \quad \text{years}
 \end{array}$$

The ratio of John's age to Zahra's age is 1 : 4

The sum of their ages is 45 years.

(b) Work out Zahra's age.

$$\begin{array}{l}
 J : Z \\
 1 : 4 \\
 \text{TOTAL} \\
 5 \\
 \frac{45}{5} = 9 \quad (m) \quad \rightarrow \quad 4 \times 9 = \underline{\underline{36}} \quad (A)
 \end{array}$$

Two fruit drinks, *Fruto* and *Tropico*, are sold in cartons.

- (a) *Fruto* contains only orange and mango.  
The ratio of orange to mango is 3 : 2  
A carton of *Fruto* contains a total volume of 250 cm<sup>3</sup>.

Find the volume of orange in a carton of *Fruto*.

$$\begin{array}{l} O : M \\ 3 : 2 \end{array}$$

$$\begin{array}{l} \text{TOTAL} \\ 5 \end{array}$$

$$1 \text{ PART} = \frac{250}{5} = 50 \quad (B1)$$

$$\begin{array}{l} \text{ORANGE} = 50 \times 3 \quad (M1) \\ = 150 \end{array} \quad \begin{array}{l} \dots\dots\dots 150 \quad (A1) \\ \dots\dots\dots \text{cm}^3 \\ (3) \end{array}$$

- (b) *Tropico* contains only lemon, lime and grapefruit.  
The ratios of lemon to lime to grapefruit are 1 : 2 : 5  
The volume of grapefruit in a carton of *Tropico* is 200 cm<sup>3</sup>.

Find the total volume of *Tropico* in a carton.

$$LE : LI : GR$$

$$1 : 2 : 5$$



$$200$$

$$\dots\dots\dots 320 \quad (A1) \\ \dots\dots\dots \text{cm}^3 \\ (3)$$

$$\begin{array}{l} 1 \text{ PART} = \frac{200}{5} \\ = 40 \end{array} \quad (B1)$$

$$\begin{array}{l} \text{TOTAL} = 40 \times 8 \quad (M1) \\ = 320 \\ \underline{\underline{\quad}} \end{array}$$

On Trisha's bookshelf, the ratio of paperback books to hardback books is 5 : 3  
The number of paperback books that Trisha has is 130.

- (a) Work out the number of hardback books that Trisha has.

$$\begin{array}{l} P : H \\ 5 : 3 \end{array} \quad \frac{130}{5} = 26$$
$$26 \times 3 = \underline{\underline{78}} \quad (A1)$$

The 130 paperback books are split between fiction and non-fiction in the ratio 2 : 3

- (b) Work out the number of non-fiction books.

$$\begin{array}{l} F : N \\ 2 : 3 \end{array} \quad \begin{array}{l} \text{TOTAL} \\ 5 \end{array} \quad \frac{130}{5} = 26$$
$$26 \times 3 = 78 \quad (A1)$$

Last year in Mathstown High School, the ratio of the number of candidates for IGCSE mathematics to the number of candidates for IGCSE biology was 5 : 2  
The number of candidates for IGCSE mathematics was 80

(a) Work out the number of candidates for IGCSE biology.

$$\begin{array}{l}
 \text{M: B} \\
 5:2 \\
 \downarrow \\
 80
 \end{array}
 \rightarrow
 \begin{array}{l}
 1 \text{ PART} = \frac{80}{5} \\
 = 16
 \end{array}
 \rightarrow
 \begin{array}{l}
 \text{BIOLOGY} = 16 \times 2 \\
 = \underline{\underline{32}} \\
 \dots\dots\dots 32 \quad (\text{A1}) \\
 (2)
 \end{array}$$

The 80 mathematics candidates were divided between Foundation and Higher in the ratio 1 : 3

(b) Work out the number of Foundation candidates.

$$\begin{array}{l}
 \text{F:H} \\
 1:3 \rightarrow \text{TOTAL} = 4 \text{ PARTS} \\
 = 80 \text{ CANDIDATES} \\
 \dots\dots\dots 20 \quad (\text{A1}) \\
 (2)
 \end{array}$$

$$\begin{array}{l}
 \text{ONE PART} = \frac{80}{4} = 20 \quad (\text{B1}) \\
 \text{FOUNDATION} = 1 \times 20 \\
 = \underline{\underline{20}}
 \end{array}$$



In 2004, the ratio of the number of planes in Air China's fleet to the number of planes in Malaysian Airlines' fleet was 6 : 7  
There were 72 planes in Air China's fleet.

Work out the number of planes in Malaysian Airlines' fleet.

$$\begin{array}{l} C : M \\ 6 : 7 \\ \downarrow \\ 72 \end{array} \quad \begin{array}{l} \longrightarrow \text{MALAYSIAN} = 12 \times 7 \\ = 84 \end{array}$$

[1 part =  $\frac{72}{6} = 12$ ] (B1)

..... 84 (A1)

Lisa, Max and Punita share £240 in the ratio 3 : 4 : 8

*This is the total*

How much more money than Lisa does Punita get?

$$\begin{array}{l} L : M : P \\ 3 : 4 : 8 \end{array} \quad \begin{array}{l} \text{TOTAL} \\ 15 \end{array}$$

$$\frac{240}{15}$$

=

16 (B1)

$$\begin{aligned} \text{PUNITA} &= 16 \times 8 \\ &= \underline{\underline{128}} \end{aligned}$$

$$\text{LISA} = 16 \times 3$$

$$= \underline{\underline{48}} \text{ (B1)}$$

$$128 - 48 = \underline{\underline{£80}} \text{ (A1)}$$

The lengths of the sides of a triangle are in the ratios 2 : 6 : 7  
The length of the longest side of the triangle is 24.5 cm.

7  
LONGEST

Work out the perimeter of the triangle.

$$\frac{24.5}{7} = 3.5 \text{ (EACH PART)}$$

$$\therefore \text{TOTAL} = 3.5 \times 15$$

$$\underline{\underline{52.5}} \text{ cm}$$

Plumbers' solder is made from tin and lead.

The ratio of the weight of tin to the weight of lead is 1 : 2

(a) Work out the weight of tin and the weight of lead in 120 grams of plumbers' solder.

T:	L	TOTAL
1:	2	3
/		↓
40	80	120

$$1 \text{ PART} = \frac{120}{3} = 40$$

tin ..... 40 ..... g (A1)  
 lead ..... 80 ..... g (A1)  
 (2)

(b) What weight of plumbers' solder contains 25 grams of tin?

1	:	2	
✓		↓	
25		50	TOTAL = 75

..... 75 ..... g (A1)  
 (1)

Anji mixes sand and cement in the ratio 7 : 2 by weight.  
The total weight of the mixture is 27 kg.

Calculate the weight of sand in the mixture.

S : C  
7 : 2

TOTALS  
9  
↓  
27

$$1 \text{ PART} = \frac{27}{9} = 3 \quad (B1)$$

$$\text{SAND} = 7 \times 3 \quad (M1) \\ = \underline{\underline{21}}$$

..... 21 (A0) kg

Jack, Kate and Lila share some money in the ratios 5 : 9 : 6  
 In total, Jack and Kate receive £56

Work out the amount of money Lila receives.

$$J : K : L$$

$$5 : 9 : 6$$

$$\text{TOTAL PARTS} = 20$$

~~~~~

£56

$$\frac{14}{20}$$

$$= \text{£}56$$

$$\Rightarrow \frac{1}{20} = 4$$

$$\text{Lila} = 4 \times 6$$

$$= \underline{\underline{24}}$$

£ 24

METHOD 2

$$\frac{56}{14} = 4$$

$$, 6 \times 4 = \underline{\underline{24}}$$

(B1)

(B1)

(A1)

(A1)

Flaky pastry is made using flour and fat in the ratio 9:7 by weight.

Cassie makes some flaky pastry.

She uses 175 grams of fat.

(a) Work out the weight of flour Cassie uses.

FL : FAT

9 : 7

175g

$$\frac{175}{7} = 25 \text{ (M)}$$

$$25 \times 9 = \underline{\underline{225}} \text{ g (A)}$$

Sweet pastry is made using flour, fat and sugar in the ratio 27:14:9 by weight.  
 Luke makes some sweet pastry.  
 The total weight of flour, fat and sugar he uses is 400 grams.

(b) Work out the weight of flour Luke uses.

|              |        |
|--------------|--------|
| FL : FAT : S | TOTALS |
| 27 : 14 : 9  | 50     |
|              | 400g   |

(m)  $\frac{400}{50} = 8 \rightarrow 8 \times 27 \rightarrow 216$  grams (A)

(2)

Elisha makes some flaky pastry and some sweet pastry.  
 She uses the same weight of flour for the flaky pastry as she does for the sweet pastry.

(c) Work out the ratio of the weight of fat she uses in the flaky pastry to the weight of fat she uses in the sweet pastry.

|                                                                                                         |                                                                                                                  |
|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <p>FLAKY</p> <p>FL : FAT</p> <p>9 : 7</p> <p><math>\times 3</math></p> <p><u>27 : 21</u></p> <p>(m)</p> | <p>SWEET</p> <p>FL : FAT : S</p> <p>27 : 14 : 9</p> <p>FAT RATIO IS 21 : 14</p> <p>= <u><u>3 : 2</u></u> (A)</p> |
|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|

SAME



Mortar mix is made by mixing cement, sand and quicklime in the ratio 1 : 2 : 3

(a) Work out the volume of sand needed to make  $2.1 \text{ m}^3$  of mortar mix.

$$\begin{array}{l}
 \text{C : S : Q} \\
 1 : 2 : 3 \\
 \downarrow \\
 2.1
 \end{array}
 \quad
 \begin{array}{l}
 \text{TOTAL} \\
 6 \\
 \downarrow \\
 2.1
 \end{array}
 \rightarrow
 \frac{2.1}{6} = 0.35 \text{ (M)}$$

$$\begin{aligned}
 \therefore \text{SAND} &= 2 \times 0.35 \\
 &= \underline{\underline{0.7 \text{ m}^3}} \text{ (A)}
 \end{aligned}$$

Julie has  $0.75 \text{ m}^3$  of quicklime.

She has plenty of sand and cement.

(b) Work out the greatest volume of mortar mix she could make.

$$\begin{array}{l}
 \text{C : S : Q} \\
 1 : 2 : 3 \\
 \downarrow \\
 0.75
 \end{array}
 \quad
 \begin{array}{l}
 \text{TOTAL} \\
 6 \\
 \downarrow \\
 0.75
 \end{array}
 \rightarrow
 \frac{0.75}{3} = 0.25 \text{ (M)}$$

$$\begin{aligned}
 \therefore \text{TOTAL} &= 6 \times 0.25 \\
 &= \underline{\underline{1.5 \text{ m}^3}} \text{ (A)}
 \end{aligned}$$

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The methods used in these solutions, where relevant, are methods which have been successfully used with students. The method shown for a particular question is not always the only method and there is no claim that the method that is used is necessarily the most efficient or ‘best’ method. From time to time, a solution to a question might be updated to show a different method if it is judged that it is a good idea to do so.

Sometimes a method used in these solutions might be unfamiliar to You. If You are able to use a different method to obtain the correct answer then You should consider to keep using your existing method and not change to the method that is used here. However, the choice of method is always up to You and it is often useful if You know more than one method to solve a particular type of problem.

Within these solutions there is an indication of where marks **might** be awarded for each question. B marks, M marks and A marks have been used in a similar, but **not identical**, way that an exam board uses these marks within their mark schemes. This slight difference in the use of these marking symbols has been done for simplicity and convenience. Sometimes B marks, M marks and A marks have been interchanged, when compared to an examiners’ mark scheme and sometimes the marks have been awarded for different aspects of a solution when compared to an examiners’ mark scheme.

B1 - This is an unconditional accuracy mark (the specific number, word or phrase must be seen. This type of mark cannot be given as a result of ‘follow through’).

M1 - This is a method mark. Method marks have been shown in places where they might be awarded for the method that is shown. If You use a different method to get a correct answer, then the same number of method marks would be awarded but it is not practical to show all possible methods, and the way in which marks might be awarded for their use, within these particular solutions. When appropriate, You should seek clarity and download the relevant examiner mark scheme from the exam board’s web site.

A1 - These are accuracy marks. Accuracy marks are typically awarded after method marks. If the correct answer is obtained, then You should normally (but not always) expect to be awarded all of the method marks (provided that You have shown a method) and all of the accuracy marks.

Note that some questions contain the words ‘show that’, ‘show your working out’, or similar. These questions require working out to be shown. Failure to show sufficient working out is likely to result in no marks being awarded, even if the final answer is correct.

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