

3 DECIMALS AND ROUNDING



In slalom racing only one skier can be on the slope at any time, so each racer is timed, as the winner can't be decided by watching them cross the finish line. The timing has to be very accurate because only fractions of a second separate competitors, so results are given to 2 decimal places.

Objectives

In this chapter you will:

- work with decimals
- give values to a suitable degree of accuracy
- work out an approximate answer to a calculation quickly in your head.

Before you start

You need to:

- know about digits and place value
- understand decimal places
- be able to do simple arithmetic in your head.

3.1 Understanding place value

Objective

- You can use decimals to achieve greater accuracy than whole numbers can give.

Why do this?

You need to understand place value, including decimals, in order to carry out tasks such as shopping, measuring and timing.

Get Ready

- Write out these numbers in words:

a 273

b 4076

c 3753

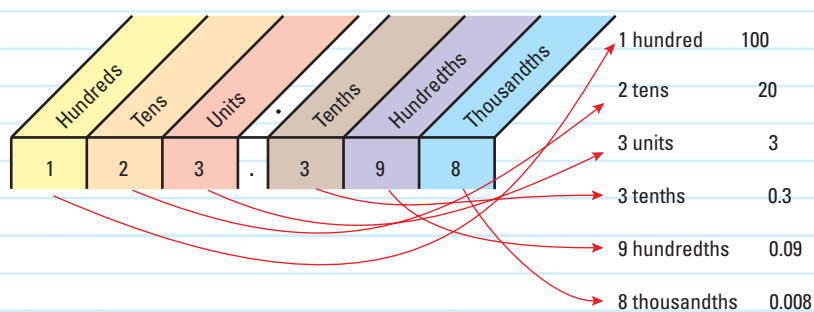
Key Point

- In a decimal number, the decimal point separates the whole number from the part that is smaller than 1.

Example 1

A Formula One Grand Prix driver has his lap time recorded as 123.398 seconds.

Put 123.398 in a place value diagram.



You can better understand what 123.398 seconds means by drawing a decimal place value diagram.

Read the whole number and then read the decimal digits in order: one hundred and twenty-three point three nine eight.

Example 2

Write down the place value of the underlined digit in each number.

a 32.8b 0.385c 10.03d 4.290

a 2 units

b 5 thousandths

c 0 tenths

d 9 hundredths

Exercise 3A

Questions in this chapter are targeted at the grades indicated.

- Draw a place value diagram like the one in Example 1 and write in these numbers.

a 41.6

b 4.16

c 734.6

d 1.463

e 0.643

f 1.005

g 5.01

h 0.086

- What is the place value of the underlined digit in each number?

a 25.4b 2.54c 25.46d 3.546e 18.07f 9.669g 216.031h 2.1357i 9.102j 3.336k 2.591l 0.027

G

3.2 Writing decimal numbers in order of size

Objective

- You understand the importance of place value in determining size.

Why do this?

You need to order decimal numbers to identify the winner of a race.

Get Ready

1. Write down the value of the 1 in each of these.

a 0.102

b 0.418

c 1.002

d 10.07

e 42.001

Key Point

- To put decimal numbers in order of size, first compare the whole number parts, then the digits in the tenths place, then the digits in the hundredths place, and so on.



Example 3

Write these numbers in order of size, starting with the largest: 3.069, 5.2, 3.4, 3.08, 3.0901.

Step 1: Look at the whole-number parts.

5 is bigger than 3, so 5.2 is the biggest number.

3.069, 3.4, 3.08, 3.0901 remain unordered.

Step 2: Look at the tenths place.

4 is bigger than 0 so 3.4 comes next.

3.069, 3.08, 3.0901 remain unordered.

Step 3: Look at the hundredths place.

Here the digits are 6, 8 and 9.

The order is 5.2, 3.4, 3.0901, 3.08, 3.069.



Exercise 3B

- 1 The table gives the price of packets of dried apricots in different shops.

Shop	Stall	Corner	Market	Main	Store	Super
Price	£1.29	£1.18	£1.09	£1.31	£1.20	£1.13

Write the list of prices in order. Start with the lowest price.

- 2 Rearrange these decimal numbers in order of size. Start with the largest.

a 0.62, 0.71, 0.68, 0.76, 0.9

b 3.4, 3.12, 3.75, 2.13, 2.09

c 0.42, 0.065, 0.407, 0.3, 0.09

d 3.0, 6.52, 6.08, 3.58, 3.7

e 0.06, 0.13, 0.009, 0.105, 0.024

f 2.09, 1.08, 2.2, 1.3, 1.16, 1.1087

- 3 The fastest lap times, in seconds, of six drivers were:

Ascarina	53.072	Bertollini	53.207
Rascini	52.037	Alloway	54.320
Silverman	53.702	Killim	53.027

Write down the drivers' times in order. Start with the fastest.

3.3 Adding and subtracting decimals

Objective

- You can add and subtract decimals in the same way as whole numbers.

Why do this?

You add and subtract decimals when paying for your shopping.

Get Ready

1. Work out

a $24 + 37$

b $109 - 64$

Key Point

- When adding and subtracting decimals you need the decimal points in line so that the place values match.



Example 4

Two children weigh 24.5 kg and 35.75 kg. What is their combined weight?

Combined weight is $24.5 \text{ kg} + 35.75 \text{ kg}$.

Keep digits in their columns as in a place value diagram.

$$\begin{array}{r} 24.5 \\ 35.75 \\ \hline \end{array}$$

Put the decimal points under each other.

Then add:

$$\begin{array}{r} 24.5 \\ + 35.75 \\ \hline 60.25 \\ \text{11} \end{array}$$

Decimal point in the answer should be in line.



Exercise 3C

Work these out, showing all your working.

1 $1.5 + 4.6$

2 $3 + 0.25$

3 $26.7 + 42.2$

4 $25.7 + 0.32$

5 $0.1 + 0.9$

6 $16.1 + 2.625$

7 $9.9 + 9.9$

8 $10 + 1.001$

9 $0.005 + 1.909$

10 $117 + 1.17$

11 $6.3 + 17.2 + 8.47$

12 $13.08 + 9.3 + 6.33$

13 $0.612 + 3.81 + 14.7$

14 $8.6 + 3.66 + 6.066$

15 $7 + 3.842 + 0.222$

16 $23.43 + 5.36 + 2.216$

17 $3.07 + 12 + 0.0276$

18 $5.02 + 31.5 + 142.065$



Example 5

Fiona buys a kettle costing £12.55. She pays with a £20 note.
How much change should she receive?

$$\begin{array}{r} £20 - £12.55 \\ \quad \quad \quad \overset{12}{\cancel{20}} \overset{90}{\cancel{00}} \\ - 12.55 \\ \hline 7.45 \end{array}$$

She receives £7.45 in change.

You need to write 20 as 20.00.

Shopkeepers often give change by counting on:

$$£12.55 + £0.05 = £12.60$$

$$£12.60 + £0.40 = £13.00$$

$$£13.00 + £7 = £20.00$$

Change is

$$£7 + 40p + 5p = £7.45$$



Example 6

Bill earns £124.65 per week but needs to pay £33.40 in tax and national insurance.
How much does he take home?

$$\begin{array}{r} £124.65 - £33.40 \\ \quad \quad \quad \overset{1}{\cancel{124}} \overset{65}{\cancel{65}} \\ - 33.40 \\ \hline 91.25 \end{array}$$

Bill takes home £91.25.

Remember to put the decimal points under each other.



Exercise 3D

1 Work out these money calculations, showing all your working.

a £19.90 – £13.70

b £5.84 – £1.70

c £23.50 – £9.40

d £100.70 – £3.40

e £0.59 – £0.48

f £1 – £0.65

g £16.90 – £10.71

h £21.64 – £10.50

i £2.50 – £1.60

j £5.84 – £1.77

k £23.50 – £9.47

l £14 – £0.75

2 Work out these calculations, showing all your working.

a 6.125 – 4.9

b 14.01 – 2.361

c 3.29 – 1.036

d 204.06 – 35.48

3.4 Multiplying decimals



Objective

- You can use the rule about the total number of decimal places in the answer.



Why do this?

In the supermarket meat is weighed in kilograms and priced in pounds and pence. To work out the price of 1.5 kg you would use decimal multiplication.



Get Ready

1. Work out

a 464×4

b 857×25

c 68×42

Key Point

- When multiplying, the total number of decimal places in the answer is the same as the total number of decimal places in the question.

Example 7

Find the cost of 5 books at £4.64 each.

$$\begin{array}{r} 464 \\ \times 5 \\ \hline 2320 \\ \text{32} \end{array}$$

Multiply the numbers together, ignoring the decimals.

$$5 \times 4.64$$

0 d.p. + 2 d.p. = 2 d.p.

Count the total number of decimal places (d.p.) in the numbers you are multiplying.

The answer must have 2 d.p.
So the cost is £23.20.

The answer must have the same number of decimal places.

Example 8

Work out 7.59×3.8 .

$$\begin{array}{r} 759 \\ \times 38 \\ \hline 6072 \\ 22770 \\ \hline 28842 \\ \text{1} \end{array}$$

$$7.59 \times 3.8$$

2 d.p. + 1 d.p. = 3 d.p.

The answer must have 3 d.p. so it is 28.842.

Exercise 3E

Work these out, showing all your working.

1 Find the cost of:

- a 6 books at £2.25 each
c 8 ice creams at £0.65 each

- b 4 tins of biscuits at £1.37 each
d 1.5 kilos of pears at £0.80 per kilo.

2 Work out

- a 0.045×100 b 0.45×100 c 4.5×100
d 0.0203×100 e 0.203×100 f 2.03×100

What do you notice about your answers to question 2?

3

- a 7.6×4 b 0.76×4 c 0.76×0.4
d 2.25×5 e 2.25×0.5 f 0.225×0.5
g 22.5×0.05 h 2.25×0.005 i 0.225×0.005

G

F

F

- 4 a 6.42×10 b 64.2×10 c 0.642×10
 d 56.23×10 e 5.623×10 f $0.056\,23 \times 10$

Look carefully at your answers to question 4.
 What do you notice?

- 5 Work out
 a 24.6×7 kg b 3.15×0.03 seconds c 0.12×0.12 m
 d 0.2×0.2 miles e 1.5×0.6 l f 0.03×0.04 hours
- 6 A book costs £4.65. Work out the cost of buying:
 a 25 copies b 36 copies c 55 copies.
- 7 It costs £7.85 for one person to enter the Fun Beach. How much does it cost for:
 a 15 people b 25 people c 43 people?
- 8 A bucket holds 4.55 litres of water. How much water is contained in:
 a 15 buckets b 25 buckets c 65 buckets?

3.5 Squares and square roots, cubes and cube roots

Objectives

- You can extend your understanding of square and cube numbers.
- You understand that finding the square root of a number is the opposite of squaring.
- You understand that finding the cube root is the opposite of cubing.

Why do this?

Surveyors, engineers and architects use square and cube numbers in their jobs.

Get Ready

1. Work out:
 a 3×3 b 6×6 c 11×11 d $4 \times 4 \times 4$

Key Points

- Squares** are the result of multiplying any number by itself.
- $4 \times 4 = 16$, so we say that 4 is a **square root** of 16; it is a number which multiplied by itself gives 16. You can write the square root of 16 as $\sqrt{16}$.
- Notice that $-4 \times -4 = 16$, so -4 is also a square root of 16.
- Finding a square root of a number is the opposite (inverse) of squaring. A square root of 64 (written $\sqrt{64}$) is 8, since $8^2 = 64$.
- You need to know the squares of numbers up to 15×15 and their corresponding square roots.
- Cubes** come from multiplying any number by itself and then multiplying the result by the original number again.
- You need to know the cubes of 2, 3, 4, 5 and 10.
- $2 \times 2 \times 2 = 8$, so we say that 2 is a **cube root** of 8; it is a number which multiplied by itself, then multiplied by itself again, gives 8. You can write the cube root of 8 as $\sqrt[3]{8}$.
- Finding a cube root is the opposite (inverse) of cubing.

**Example 9**Find: **a** the square of 2.4 **b** 1.2^3

a The square of 2.4 = $2.4 \times 2.4 = 5.76$

b $1.2^3 = 1.2 \times 1.2 \times 1.2 = 1.728$

**Exercise 3F****1** Work out the square of the following numbers.

a 3.1

b 4.2

c 5.3

d 2.03

e 0.4

2 Work out the cube of the following numbers.

a 1.5

b 2.5

c 3.2

d 0.2

e 0.5

E

3.6 Dividing decimals

**Objective**

- You can adjust decimal division so that you divide by a whole number.

**Why do this?**

You divide decimals whenever you work out how many calls at a certain price you can make for a £20 top up on your mobile phone.

**Get Ready****1.** Work out

a $123 \div 3$

b $585 \div 9$

c $162 \div 27$

**Key Point**

- To divide decimals, multiply both numbers by 10, 100, 1000 etc. until you are dividing with a whole number.

**Example 10**

Five friends win £216.35 in a charity lottery. They share the money equally.
How much do they each get?

$216.35 \div 5$

*Because 5 is a whole number, divide straight away.*

$$\begin{array}{r} 43.27 \\ 5 \overline{)216.35} \end{array}$$

*Put the decimal points in line.*

Example 11 1.2 metres of fabric costs £1.56. What is the cost per metre?

$$1.56 \div 1.2$$

$$1.2 \times 10 = 12$$

$$1.56 \times 10 = 15.6$$

The division becomes $15.6 \div 12$

$$\begin{array}{r} 1.3 \\ 12 \overline{)15.6} \end{array}$$

The answer is 1.3 or £1.30.

This is not a whole number.
To change 1.2 to a whole number multiply by 10.

Do the same to 1.56.



ResultsPlus
Examiner's Tip

If the number you are dividing by is not a whole number, change it to a whole number. Remember to do the same to the number that is divided.

Example 12 Divide 58.2 by 0.03.

$$\begin{array}{r} \times 100 \\ 58.2 \\ \hline 0.03 \end{array} = \begin{array}{r} 5820 \\ \hline 3 \end{array}$$

$\times 100$

To make 0.03 a whole number, multiply it by 100. So multiply both 58.2 and 0.03 by 100.

$$\begin{array}{r} 1940 \\ 3 \overline{)5820} \end{array}$$

Exercise 3G

Work out questions 1–3.

- | | | | | |
|----------|---|--|---|---------------------------------------|
| 1 | a $34.5 \div 10$
e $2.701 \div 10$
i $65 \div 1000$ | b $3.45 \div 10$
f $0.2071 \div 10$ | c $0.345 \div 10$
g $65 \div 10$ | d $2071 \div 10$
h $65 \div 100$ |
| 2 | a $64.48 \div 4$
e $35.189 \div 7$ | b $3.165 \div 5$
f $0.0368 \div 8$ | c $133.56 \div 9$ | d $205.326 \div 6$ |
| 3 | a $15 \div 2$
e $14.4 \div 12$ | b $23 \div 4$
f $17 \div 20$ | c $9 \div 8$
g $310 \div 50$ | d $3.5 \div 2$
h $16.2 \div 9$ |
| 4 | Seven people share £107.80 equally. How much does each person get? | | | |
| 5 | A 5 kilogram cheese is cut into 8 equal pieces. How much does each piece weigh? | | | |
| 6 | Work out | | | |
| | a $7.75 \div 0.5$
e $1.284 \div 1.2$ | b $7.92 \div 0.6$
f $15.5 \div 2.5$ | c $0.84 \div 0.04$
g $1.242 \div 0.03$ | d $7.7 \div 2.2$
h $51.2 \div 1.6$ |

3.7 Rounding decimal numbers

Objective

- You can write numbers to a suitable degree of accuracy.

Why do this?

You can use rounding when adding up a bill in a restaurant to check that it is roughly correct.

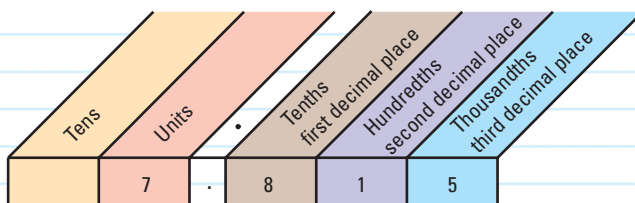
Get Ready

- How many decimal places are there in 2.0106?
- How many digits are there in 2.0106?
- Work out in your head: **a** 7×8 **b** $15 - 3 \times 4$

Key Points

- To round a decimal to the nearest whole number, look at the digit in the tenths column (the first decimal place). If it is 5 or more, round the whole number up.
- To round a decimal to one decimal place (1 d.p.), look at the second decimal place. If it is 5 or more, round up the first decimal place. If it is less than 5, leave it and any further decimal places out.
- To round (or correct) to a given number of decimal places (d.p.), count that number of decimal places from the decimal point. Look at the next digit on. If it is 5 or more, you need to round up. Otherwise, leave off this digit and any that follow it.

Example 13 Round 7.815 to the nearest whole number.



7 is in the units column.
8 is in the first decimal place.
1 is in the second decimal place.
5 is in the third decimal place.
8 in the first decimal place is more than 5 so you round up.

7.815 rounded to the nearest whole number is 8.

Example 14 Round the following numbers to one decimal place (1 d.p.).

- a** 25.27 **b** 25.72 **c** 25.55 **d** 25.528

a 25.3. ← The second decimal place is 7, which is 5 or more, so round the 2 up to 3.

b 25.7. ← The second decimal place is 2, which is less than 5, so leave the digit out.

c 25.6. ← The second decimal place is 5, so round the 5 in the first decimal place up to 6.

d 25.5. ← The second decimal place is 2, which is less than 5, so leave this and any further digit in the decimal places out.

Exercise 3H

1 Round these numbers to the nearest whole number.

- | | | | |
|---------|----------|----------|----------|
| a 7.8 | b 13.29 | c 14.361 | d 5.802 |
| e 10.59 | f 19.62 | g 0.771 | h 20.499 |
| i 0.89 | j 100.09 | k 19.55 | l 1.99 |

2 Round these numbers to one decimal place (1 d.p.).

- | | | | |
|-----------|----------|----------|----------|
| a 3.6061 | b 5.3391 | c 0.0901 | d 9.347 |
| e 10.6515 | f 7.989 | g 2.0616 | h 0.4999 |
| i 2.45 | j 125.67 | k 0.05 | l 9.890 |

3 Round:

- | | |
|---------------------------------|------------------------------------|
| a 13.6 mm to the nearest mm | b 80.09 m to the nearest m |
| c 0.907 kg to the nearest kg | d £204.49 to the nearest £ |
| e 3.601 lb to the nearest lb | f 0.299 tonne to the nearest tonne |
| g 10.5001 g to the nearest gram | h 8.066 min to the nearest minute. |

Example 15 Round these numbers **i** to 3 d.p. **ii** to 2 d.p.

- a 4.4315 b 7.3962

a **i** 4.4315 rounded to 3 d.p. is 4.432.

ii 4.4315 rounded to 2 d.p. is 4.43.

b **i** 7.3962 to 3 d.p. is 7.396

ii 7.3962 to 2 d.p. is 7.40

In the number 4.4315 the next digit after the 3rd d.p. is 5, so round up and the 1 becomes 2.

In the number 4.4315 the next digit after the 2nd d.p. is 1, so you can round down and the 3 remains the same.

The 6 makes the 9 round up to 10 and this changes the 3 to a 4.



ResultsPlus Examiner's Tip

The final zero is important because 2 d.p. means that two decimal digits need to be shown.
e.g. The number 5.4926 would be written 5.50 to 2 d.p.

Exercise 3I

In questions **1** to **4** round the numbers: **i** to 3 d.p. **ii** to 2 d.p.

- | | | | |
|-----------------------|---------------|--------------|------------|
| 1 a 4.2264 | b 9.7868 | c 0.4157 | d 0.058 38 |
| 2 a 10.5167 | b 7.5034 | c 21.7295 | d 9.088 95 |
| 3 a 15.5978 | b 0.4081 | c 7.2466 | d 6.050 77 |
| 4 a 29.1582 cm | b 0.054 86 kg | c 13.3785 km | d £5.9976 |

5 Round each number to the number of decimal places given in brackets.

- | | | |
|-------------------|-------------------|---------------------|
| a 5.6166 (3 d.p.) | b 0.0112 (1 d.p.) | c 0.923 98 (4 d.p.) |
| d 0.8639 (1 d.p.) | e 9.6619 (1 d.p.) | f 1.0076 (2 d.p.) |

3.8 Rounding to 1 significant figure

Objective

- You can write amounts to a suitable degree of accuracy using significant figures.

Why do this?

You can understand an approximate answer more easily. A local newspaper reported that 50 000 people had attended a rock concert. The true number was 47 231 but 50 000 made a better story and was easier to understand.

Get Ready

1. **a** Is 22 nearer to 20 or 30? **b** Is 46 nearer to 40 or 50? **c** Is 155 nearer to 100 or 200?

Key Point

- To write a number to 1 **significant figure** (1 s.f.) look at the place value of the first (highest valued) non-zero digit and round the number to this place value.

Example 16 Write these numbers to 1 significant figure (1 s.f.).

a 32 **b** 452 **c** 0.0878

a 32 to 1 significant figure is 30.

The first digit is in the tens column, so you need to round to the nearest ten. 32 to the nearest ten is 30.

b 452 to 1 significant figure is 500.

The first digit is in the hundreds column, so round to the nearest hundred.

c 0.0878 to 1 significant figure is 0.09.

The first digit is in the hundredths column, so round to the nearest hundredth.

Exercise 3J

- 1 Write down these numbers to 1 significant figure (1 s.f.).

a 41 **b** 709 **c** 287 **d** 0.348 **e** 21 899
f 0.007 41 **g** 973 **h** 4.6 **i** 13.309 **j** 19.07

- 2 England won 110 medals in the 2006 Commonwealth Games. Write this number to 1 significant figure (1 s.f.).

- 3 The number of spectators at a rugby match final was 34 862. Write this number to 1 s.f.

E

3.10 Estimating

Objective

- You can get a rough idea of the answer by working with each of the numbers to 1 significant figure.

Why do this?

When you shop for food, having a rough idea of how much you are spending means you can keep to a budget.

Get Ready

For each of the following, round the numbers to 1 s.f., then add them.

- $338 + 286$
- $711 + 479$
- $0.543 + 0.265$

Key Point

- To get an **estimate** for an answer, you first round each number to 1 significant figure. Then you can usually do the calculation in your head.

Example 18 Estimate the answer to $289 \times \frac{96}{184}$

Rounding each of the numbers to 1 significant figure gives

$$300 \times \frac{100}{200}$$

This works out as 150, which is a suitable estimate.

Exercise 3L

- Showing your rounding, work out estimates for:

a $65 \times \frac{57}{31}$

b $\frac{206 \times 311}{154}$

c $\frac{9 \times 31 \times 97}{304}$

d $\frac{200}{12 \times 99}$

e $\frac{498}{11 \times 51}$

f $\frac{103 \times 87}{21 \times 32}$

- A football grandstand has 48 rows of seats.
Each row has 102 seats.
Work out an estimate for the total number of seats.

- A carton of peaches contains 48 tins.
Work out an estimate for the total number of tins in 73 cartons.

- Hazel is buying 28 paving stones.
Each paving stone costs £4.85.
Work out an estimate for her total cost.

- Work out estimates for each of the following calculations.

a $17.3 \times \frac{0.21}{4.1}$

b $5.67 \times \frac{27.8}{0.86}$

c $\frac{873}{23.1} \times 0.476$

D

C

3.11 Manipulating decimals

Objective

- You can use one calculation to find the answer to another.

Why do this?

If you knew that \$1.50 was worth £1 then you could use this to work out how much 10p was worth.

Get Ready

- Work out **a** 20×3 **b** 200×3 **c** 2000×3
- Work out **a** $300 \div 10$ **b** $30 \div 10$ **c** $3 \div 10$

Key Point

- You can use the answer from one calculation to help you find the answer to a second calculation.

Example 19 Given that $3.8 \times 5.2 = 19.76$, find the values of each of the following.

- a** 38×5.2 **b** 380×0.52

$$\begin{aligned} \text{a } 38 \times 5.2 &= 3.8 \times 10 \times 5.2 \\ &= (3.8 \times 5.2) \times 10 \\ &= 19.76 \times 10 \\ &= 197.6 \end{aligned}$$

$$38 = 3.8 \times 10$$

Rearrange the terms and substitute the known answer.

You can check the answer by estimating.
 38×5.2 is roughly 40×5 , which is 200.

$$\begin{aligned} \text{b } 380 \times 0.52 &= 3.8 \times 100 \times 5.2 \div 10 \\ &= (3.8 \times 5.2) \times 100 \div 10 \\ &= 19.76 \times 10 \\ &= 197.6 \end{aligned}$$

$$380 = 3.8 \times 100 \text{ and } 0.52 = 5.2 \div 10$$

Rearrange the terms and substitute the known answer.

You can check the answer by estimating.
 380×0.52 is roughly 400×0.5 , which is 200.

Example 20 Given that $\frac{40.8}{8.5} = 4.8$, find the value of each of the following.

- a** $\frac{408}{8.5}$ **b** $\frac{40.8}{85}$

$$\begin{aligned} \text{a } \frac{408}{8.5} &= \frac{40.8 \times 10}{8.5} \\ &= \left(\frac{40.8}{8.5}\right) \times 10 \\ &= 4.8 \times 10 \\ &= 48 \end{aligned}$$

$$408 = 40.8 \times 10$$

Rearrange the terms and substitute the known answer.

You can check the answer by estimating.
 $408 \div 8.5$ is roughly $400 \div 8$, which is 50.

$$\begin{aligned} \text{b } \frac{40.8}{85} &= \frac{40.8}{8.5 \times 10} \\ &= \left(\frac{40.8}{8.5}\right) \div 10 \\ &= 4.8 \div 10 \\ &= 0.48 \end{aligned}$$

$$85 = 8.5 \times 10$$

Rearrange the terms and substitute the known answer.
Multiplying the bottom number by 10 is the same as dividing the top number by 10.

You can check the answer by estimating.
 $40.8 \div 85$ is roughly $40 \div 80$, which is 0.5.



Exercise 3M

- 1 Given that $6.4 \times 2.8 = 17.92$, work out
- a 64×28 b 640×2.8 c 0.64×28
- 2 Given that $\frac{18.3}{1.25} = 14.64$, work out
- a $\frac{183}{1.25}$ b $\frac{1.83}{1.25}$ c $\frac{0.183}{1.25}$
- 3 Given that $13.2 \times 5.5 = 72.6$, work out
- a 132×5.5 b 1.32×0.55 c 0.132×55
- 4 Given that $\frac{30.4}{4.75} = 6.4$, work out
- a $\frac{30.4}{47.5}$ b $\frac{3.04}{4.75}$ c $\frac{304}{4.75}$

D

Chapter review

- In a decimal number, the decimal point separates the whole number from the part that is smaller than 1.
- To put decimal numbers in order of size, first compare the whole number parts, then the digits in the tenths place, then the digits in the hundredths place, and so on.
- When adding and subtracting decimals, you need the decimal points in line so that the place values match.
- When multiplying, the total number of decimal places in the answer is the same as the sum of the decimal places in the question.
- **Squares** are the result of multiplying any number by itself.
- Finding a **square root** of a number is the opposite (inverse) of squaring.
- **Cubes** come from multiplying any number by itself and then multiplying the result by the original number again.
- Finding a **cube root** is the inverse of cubing.
- To divide decimals, multiply both numbers by 10, 100, 1000 etc. until you are dividing with a whole number.
- To round a decimal to the nearest whole number, look at the digit in the tenths column (the first decimal place). If it is 5 or more, round the whole number up.
- To round a decimal to one decimal place (1 d.p.), look at the second decimal place. If it is 5 or more, round up the first decimal place. If it is less than 5, leave it and any further decimal places out.
- To round (or correct) to a given number of decimal places (d.p.), count that number of decimal places from the decimal point. Look at the next digit on. If it is 5 or more, you need to round up. Otherwise, leave off this digit and any that follow it.
- To write a number to 1 **significant figure**, look at the place value of the first (highest valued) non-zero digit and round the number to this place value.
- To round numbers to a given number of significant figures, you count that number of digits from the first non-zero digit. If the next digit is 5 or more then you round up.
- To get an **estimate** for an answer, you first round each number to 1 significant figure. Then you can usually do the calculation in your head.
- You can use the answer from one calculation to help you find the answer to a second calculation.



Review exercise

- 1 Put these decimal numbers in order of size. Start with the smallest.

a 4.85, 5.9, 5.16, 4.09, 5.23
 b 0.34, 0.07, 0.37, 0.021, 0.4
 c 5, 7.23, 5.01, 7.07, 5.007
 d 1.001, 0.23, 1.08, 1.14, 0.06

- 2 A new cereal gives these weights of vitamins and minerals per 100 g.

Fibre	1.5 g	Iron	0.014 g	Vitamin B6	0.002 g
Thiamin B1	0.0014 g	Riboflavin	0.0015 g	Sodium	0.02 g

Write down these weights in order. Start with the lowest.

- 3 Work out

a $3.4 + 5.1$ b $12.3 + 6.27$ c $0.046 + 0.0712$
 d $5.68 + 3.093 + 2.3702$ e $75.3 - 16.9$ f $20.3 - 4.72$
 g $50 - 3.6$ h $0.03 - 0.0182$

- 4 Diana is packing to go on holiday. The baggage allowance is 20 kg. Her suitcase weighs 2.6 kg. In it she packs her clothes weighing 11.3 kg, her shoes weighing 3.7 kg and her toiletries weighing 2.3 kg. Is her packed suitcase within the 20 kg limit?

- 5 An empty container weighs 27.1 kg. When filled, it weighs 238.7 kg. What is the weight of the contents?

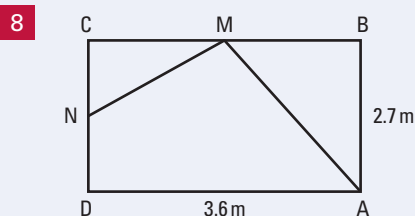
- 6 Work out:

a 2.34×5 b 0.24×6
 c 0.3×0.4 d 25.6×1.6
 e $15.3 \div 3$ f $81.4 \div 4$

ResultsPlus
Exam Question Report

86% of students answered part d of this question poorly. The most common error using a long multiplication method was to add 1536 and 256.

- 7 In 2008, 355 024 candidates took Edexcel GCSE Mathematics. Write the number of candidates to 2 significant figures.



N is the midpoint of CD. M is the midpoint of CB. Work out the difference in length between N to C to M and M to B to A.

- 9 Copy and complete the numbers in the boxes.

a $6.24 \times 100 = 0.624 \times \square$ b $5.08 \div 10 = 0.508 \times \square$
 c $0.455 \div 100 = 4.55 \div \square$ d $1.52 \times 1000 = 152 \div \square$

10

Rob's Café Price List

Cup of tea	75p	Roll	£1.70
Cup of coffee	85p	Sandwich	£1.35
Can of cola	75p		

Joe buys a can of cola and a roll at Rob's café.

a Work out the total cost.

Susan buys two cups of tea and one sandwich.

b Work out the total cost.

Kim buys a cup of coffee and a roll.

She pays with a £5 note.

c How much change should she get?

Specimen paper 2009

11

Josh has two parcels of weights 2.8 kg and 1.35 kg on a trolley. The greatest total weight the trolley can carry is 5 kg. Work out the largest weight of parcel that Josh could add to the trolley.

12

A car travels 17.2 kilometres on 1 litre of fuel. How far will it travel on 8.5 litres of fuel?

13

Angela has £15.76.

She buys as many bottles of drink costing £1.20 each as she can.

How many does she buy and how much money does she have left?

14

a $51.3 \div 0.9$

b $0.0412 \div 0.4$

c $30 \div 0.05$

15

Round these numbers to 1 decimal place.

a 23.48

b 1.7502

c 0.3479

d 150.03

16

Round these numbers to the number of decimal places given in brackets.

a 7.263 (2)

b 73.0448 (2)

c 0.041 68 (3)

d 0.7208 (3)

17

Round these numbers to the number of significant figures given in brackets.

a 8317 (2)

b 20 056 (3)

c 0.546 72 (1)

d 20.873 (3)

18

Work out an estimate for the total cost of 36 books costing £7.97 each.

19

A packet of 18 slices of bacon costs £5.80.

Work out an estimate for the cost of each slice of bacon.

20

Here are the rates of pay in a company.

Grade	Basic Pay for an hour's work	Overtime pay for an hour's work
Operative	£5.40	£8.10
Technician	£7.50	£11.25
Supervisor	£9.00	£13.50
Driver	£7.20	£10.80

Lily has a part-time job as an operative.

Last week Lily earned basic pay for 24 hours and overtime pay for 3 hours.

a Work out Lily's total pay for last week.

b If Lily had been paid as a technician, work out how much extra pay she would have received.

June 2008 adapted



ResultsPlus

Exam Question Report

82% of students did very well on this type of question. They were awarded method marks for explaining clearly how their answer had been achieved.



F

A03

E

A03

A02

A02

A02



E

- 21 Sam earns £5.95 for each hour that he works. The table shows the hours he worked one week. Work out an estimate for the amount of money that Sam earned that week.

Day	1	2	3	4	5
Hours worked	5	6	6	5	7



D

- 22 For each of these calculations, work out an estimated answer.

a $\frac{823 \times 4872}{3261}$

b $\frac{3.6 \times 4.5}{9.8}$

c $\frac{2.4 \times 7.9}{3.9 \times 2.3}$



ResultsPlus
Exam Question Report

89% of students answered this type of question poorly.

- 23 Using the information that $4.8 \times 34 = 163.2$ write down the value of

a 48×34

b 4.8×3.4

c $163.2 \div 48$

June 2008

- 24 Use the information that $322 \times 48 = 15\,456$ to find the value of

a 3.22×4.8

b 0.322×0.48

c $15\,456 \div 4.8$

- 25 Sasha works for a company. She gets paid expenses of 40p for each mile she drives during work. Last year she worked for 48 weeks. Her total expenses for driving for the year were £2116.80. Work out an estimate for the average number of miles Sasha drove during work each week last year.



June 2009 Specimen Paper

C

- 26 Rashid and his 3 friends order 3 pizzas and 2 bottles of cola. They split the cost equally. How much do they each pay?

Pizza	£2.70
Cola	£1.56



- 27 Compare the labels from the Henry Turbowash and the Henry Ecowash.
- a Why do you think that the Turbowash has a better energy rating?
- b If you do 200 washes a year, how much energy (in kWh) do you save by buying the Turbowash rather than the Ecowash? If the electricity charges are 12p per kWh, how much do you save per year?
- c The Turbowash is £50 more expensive. Is it better value for money?

Henry Turbowash

Energy		Washing machine
Manufacturer Model		
More efficient		
A		A
B		
C		
D		
E		
F		
G		
Less efficient		
Energy consumption kWh/cycle		0.95
<small>Based on standard test results for 60°C cotton cycle</small>		
<small>Actual energy consumption will depend on how the appliance is used</small>		
Washing performance	A B C D E F	
<small>A higher G Lower</small>		
Spin drying performance	A B C D E F	
<small>A higher G Lower</small>		
Spin speed (rpm)	1400	
Capacity (cotton) kg	5.0	
Water consumption /	5.5	
Noise (dB(A)re 1 pW)	Washing 5.2 Spinning 7.0	
Further information is contained in product brochures		

Henry Ecowash

Energy		Washing machine
Manufacturer Model		
More efficient		
A		B
B		
C		
D		
E		
F		
G		
Less efficient		
Energy consumption kWh/cycle		1.75
<small>Based on standard test results for 60°C cotton cycle</small>		
<small>Actual energy consumption will depend on how the appliance is used</small>		
Washing performance	A B C D E F	
<small>A higher G Lower</small>		
Spin drying performance	A B C D E F	
<small>A higher G Lower</small>		
Spin speed (rpm)	1400	
Capacity (cotton) kg	5.0	
Water consumption /	5.5	
Noise (dB(A)re 1 pW)	Washing 5.2 Spinning 7.0	
Further information is contained in product brochures		

