1:01 Numbers Above One Million

Hundred millions	Ten millions	Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Units
2	3	7	6	4	9	1	0	5

CONCEPT

1 Use numerals to write:

a forty-nine million seven hundred and sixty thousand six hundred and twenty-one

b eighty-three million one hundred and thirty-two thousand five hundred and forty-nine

2 Write the value for each coloured digit.

a 37**4**68901 **b** 2**3**674768 **c** 431**6**9235

d **9**6347607 **e** 6**7**911213 **f** 165**5**273406

3 Arrange each group of numbers in ascending order.

a 26349721 62419637 43296714

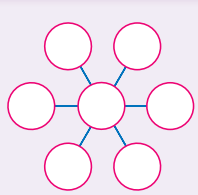
b 65375670 63497624 56811769

c 32693475 41623912 17634658

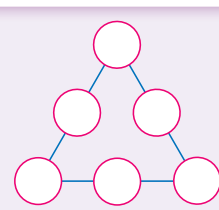
4 Is each number below closer to 30 000 000 or 40 000 000?

a 32645762 **b** 34177624 **c** 36396408

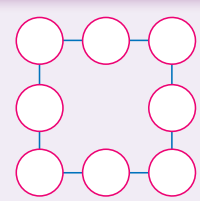
INVESTIGATION



5 **a** Use the digits 1, 2, 3, 4, 5, 6, 7. Write one digit in each space so that all the lines add up to the same sum.



b Use the digits 1, 2, 3, 4, 5, 6. Write one digit in each space so that the sum of the numbers along each side is the same.



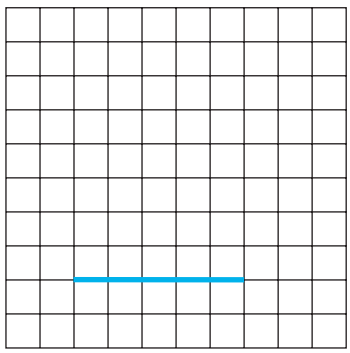
c Use the digits 1, 2, 3, 4, 6, 7, 8, 9. Write one digit in each space so that the sum of the numbers along each side is the same.

Number and place value: Apply place value to partition, rearrange and regroup numbers to at least tens of thousands to assist calculations and solve problems. *[Progression]*

1:02 Square Numbers

1 Draw a square on each coloured side.

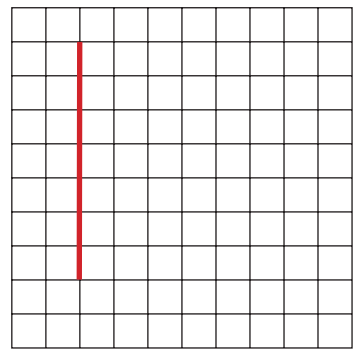
a



Area of blue square

= ☐ small squares

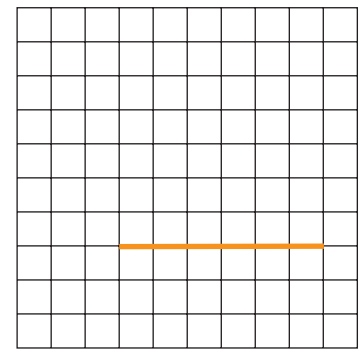
b



Area of red square

= ☐ small squares

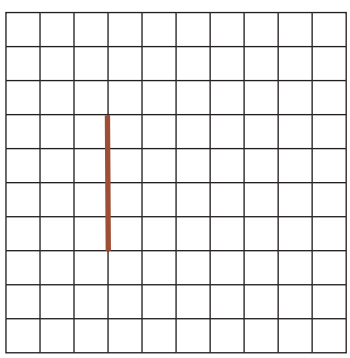
c



Area of orange square

= ☐ small squares

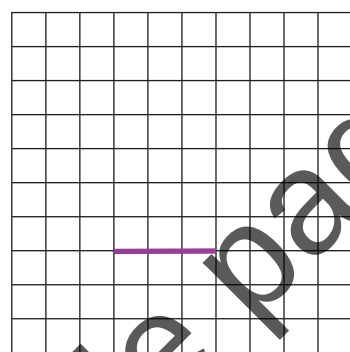
d



Area of brown square

= ☐ small squares

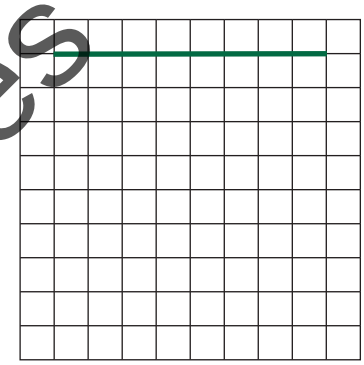
e



Area of purple square

= ☐ small squares

f

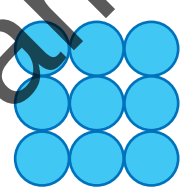


Area of green square

= ☐ small squares

CONCEPT

The result of multiplying a number by itself is called a **square number**.



2 **a** Here we have 3 rows of 3 counters.

$3 \times 3 =$ ☐

b What shape does this array look like?

☐

c Make square arrays using 4, 9, 16 and 25 counters.

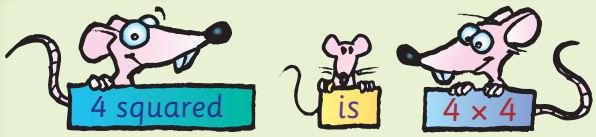
3 List all of the square numbers up to 100.

4 Use place-value blocks or a calculator to find at least seven more square numbers.

ICT

5 Explain why the numbers 1, 4, 9, 16, … are called square numbers.

1:03 Square Numbers

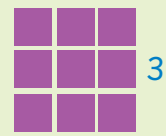


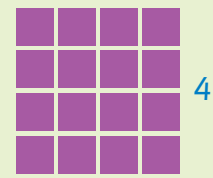
A whole number times itself gives a **square number**.

CONCEPT


1
1 squared


2
2 squared


3
3 squared


4
4 squared

1, 4, 9 and 16 are square numbers.

The number of blocks in a square pattern is a square number.
3 squared is 3 × 3.

1 = 1 × 1

4 = 2 × 2 | 9 = 3 × 3

16 = 4 × 4 | = 5 × 5 | = 6 × 6

1 Use place-value blocks to find these square numbers.

a 5 squared = ☐ **b** 6 squared = ☐ **c** 7 squared = ☐

d 8 squared = ☐ **e** 9 squared = ☐ **f** 10 squared = ☐

g 2 × 2 = ☐ **h** 4 × 4 = ☐ **i** 7 × 7 = ☐ **j** 3 × 3 = ☐

k 6 × 6 = ☐ **l** 10 × 10 = ☐ **m** 1 × 1 = ☐ **n** 8 × 8 = ☐

2 Look carefully at the first ten square numbers below.

1 (+3) 4 (+5) 9 (+7) 16 (+9) 25 ☐ 36 ☐ 49 ☐ 64 ☐ 81 ☐ 100

a Complete the pattern shown here.

b Write down the next two square numbers after 100. ☐, ☐

c Write down the square numbers from those above that are also even.

☐, ☐, ☐, ☐, ☐

Each factor is written only once.

3 Complete:

a 9 = ☐ squared **b** 25 = ☐ squared

c 16 = ☐ squared **d** 36 = ☐ squared

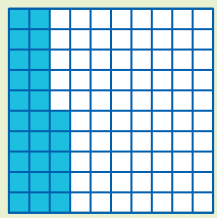
4 Use blocks to find all factors of:

a 25: ☐, ☐ and ☐ **b** 9: ☐, ☐ and ☐ **c** 49: ☐, ☐ and ☐

d 4: ☐, ☐ and ☐ **e** 16: ☐, ☐, ☐, ☐ and ☐

1:04 Percentages

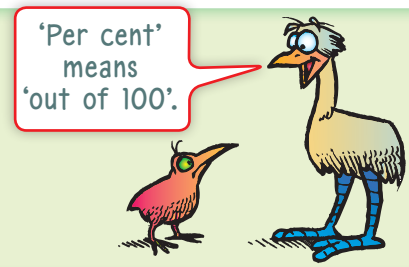
25%



$\frac{25}{100}$

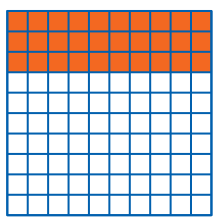
25 hundredths

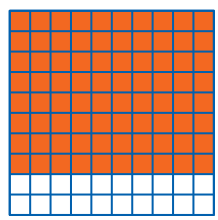
0·25

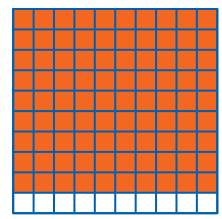


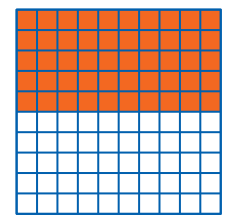
CONCEPT

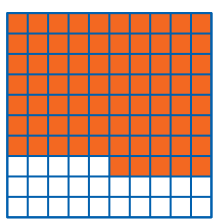
1 What percentage of each square is coloured?

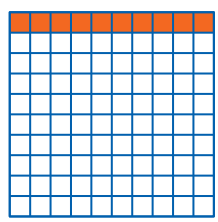
a 

b 

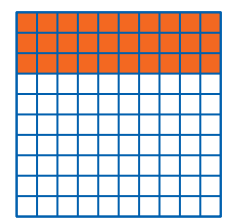
c 

d 

e 

f 

g 

h 

2 What percentage of each square is not coloured in Question 1?

a ____ b ____ c ____ d ____

e ____ f ____ g ____ h ____

3 Complete the following.

a	0·25	$\frac{\square}{100}$ = ___ %	b	0·35	$\frac{\square}{100}$ = ___ %	c	0·65	$\frac{\square}{100}$ = ___ %
d	0·75	$\frac{\square}{100}$ = ___ %	e	0·15	$\frac{\square}{100}$ = ___ %	f	0·55	$\frac{\square}{100}$ = ___ %
g	0·90	$\frac{\square}{100}$ = ___ %	h	0·40	$\frac{\square}{100}$ = ___ %	i	0·80	$\frac{\square}{100}$ = ___ %

Percentages in the Environment

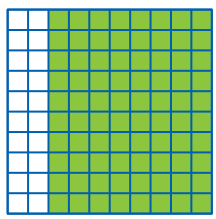
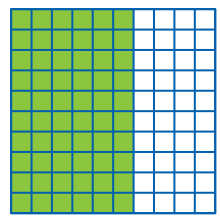
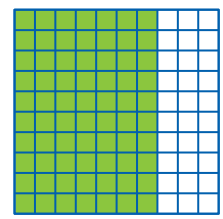
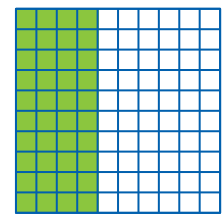
- Collect examples of percentages from newspapers and packets.
- Discuss the different ways in which percentages are used.

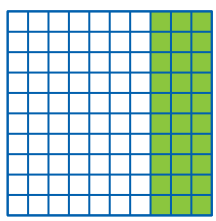
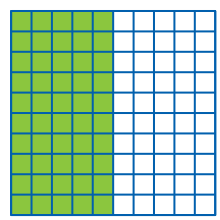
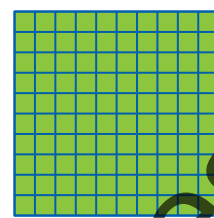
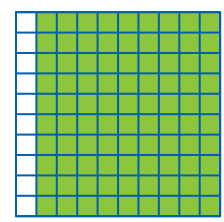
ACTIVITY

Fractions and decimals: Make connections between equivalent fractions, decimals and percentages.

1:05 Percentages

1 What percentage of each square is coloured?

a  b  c  d 

e  f  g  h 

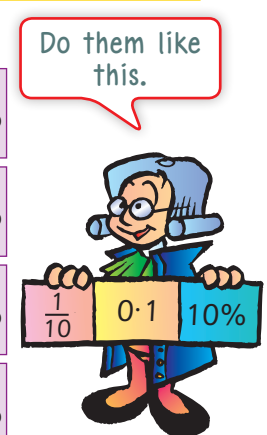
2 What percentage of each square is not coloured in Question 1?

a ☐ b ☐ c ☐ d ☐

e ☐ f ☐ g ☐ h ☐

3 Complete the following.

a	$\frac{25}{100}$	0· ☐☐ %	b	$\frac{55}{100}$	0· ☐☐ %	c	$\frac{75}{100}$	0· ☐☐ %
d	$\frac{95}{100}$	0· ☐☐ %	e	$\frac{65}{100}$	0· ☐☐ %	f	$\frac{45}{100}$	0· ☐☐ %
g	$\frac{9}{10}$	0· ☐☐ %	h	$\frac{3}{10}$	0· ☐☐ %	i	$\frac{7}{10}$	0· ☐☐ %
j	$\frac{4}{10}$	0· ☐☐ %	k	$\frac{5}{10}$	0· ☐☐ %	l	1	☐·0 ☐☐ %



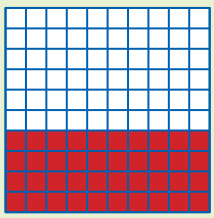
4 Draw lines to connect the equivalent numbers.

a	0·25	45%	b	0·7	55%	c	0·35	85%	d	0·3	65%
	0·5	60%		0·55	70%		0·1	90%		0·65	40%
	0·45	25%		0·8	95%		0·85	10%		0·4	30%
	0·6	50%		0·95	80%		0·9	35%		1	100%

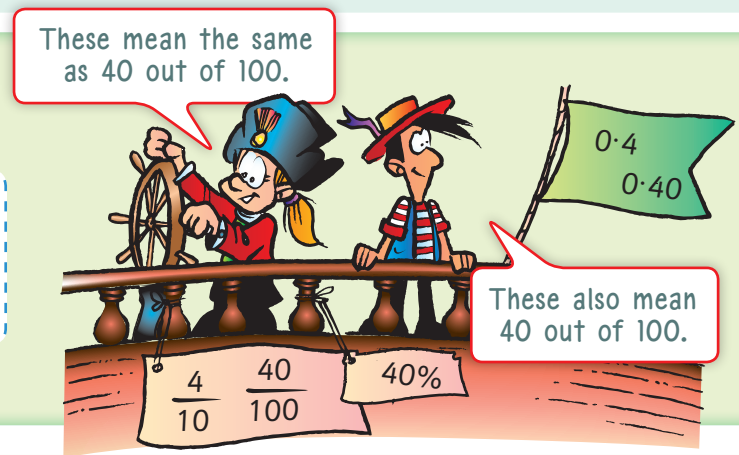
1:06 Percentages

CONCEPT

40 out of 100



We can write a fraction as a decimal or a percentage.



1 Write the percentage equivalent for each common fraction.

a	$\frac{3}{10}$	**b**	$\frac{9}{10}$	**c**	$\frac{75}{100}$	**d**	$\frac{6}{10}$	**e**	$\frac{25}{100}$
f	$\frac{4}{10}$	**g**	$\frac{65}{100}$	**h**	$\frac{35}{100}$	**i**	$\frac{5}{10}$	**j**	$\frac{1}{10}$

2 Write the percentage equivalent for each decimal.

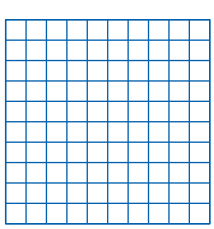
a	0·15	**b**	0·45	**c**	0·85	**d**	0·55	**e**	0·95
f	0·8	**g**	0·2	**h**	0·7	**i**	0·1	**j**	0·05

3 Write the decimal equivalent for each percentage.

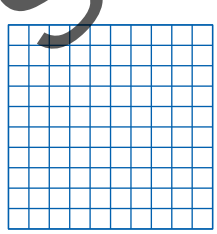
a	25%	**b**	40%	**c**	90%	**d**	75%	**e**	10%
f	35%	**g**	25%	**h**	65%	**i**	5%	**j**	15%

4 For each square, colour and write the equivalent percentage.

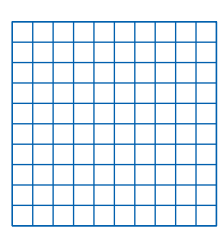
a



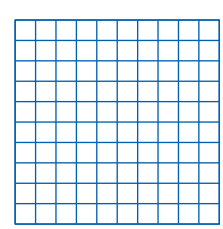
0·3 = % **b**



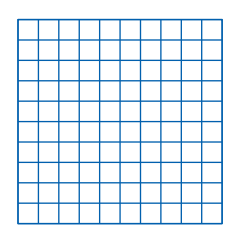
0·15 = % **c**



0·6 = % **d**

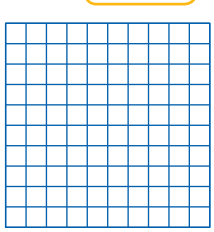


0·95 = % **e**

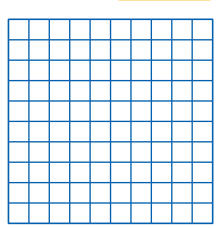


0·5 = %

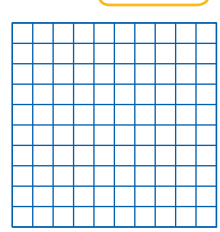
f



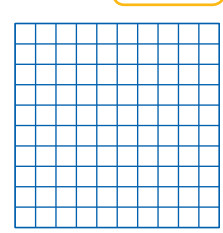
0·89 = % **g**



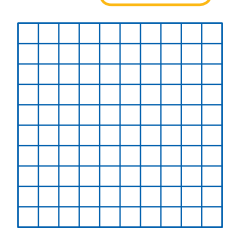
0·46 = % **h**



0·7 = % **i**



0·82 = % **j**



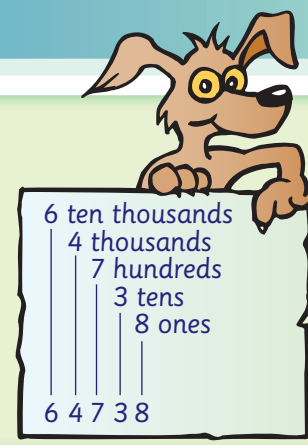
0·05 = %

Fractions and decimals: Make connections between equivalent fractions, decimals and percentages.

1:07 Powers of Ten

Ten thousands 10 000	Thousands 1000	Hundreds 100	Tens 10	Ones 1
$10 \times 10 \times 10 \times 10$ 10^4	$10 \times 10 \times 10$ 10^3	10×10 10^2	10 10^1	1 1
6	4	7	3	8

$64\,738 = (6 \times 10\,000) + (4 \times 1000) + (7 \times 100) + (3 \times 10) + 8$
$= (6 \times 10^4) + (4 \times 10^3) + (7 \times 10^2) + (3 \times 10^1) + 8$



CONCEPT

1 Write the numeral for:

a $(3 \times 10^4) + (7 \times 10^3) + (9 \times 10^2) + (5 \times 10^1) + 2$

b $(9 \times 10^4) + (6 \times 10^3) + (8 \times 10^2) + (3 \times 10^1) + 1$

c $(6 \times 10^4) + (2 \times 10^3) + (4 \times 10^2) + (7 \times 10^1) + 5$

d $(8 \times 10^4) + (9 \times 10^3) + (3 \times 10^2) + (5 \times 10^1) + 4$

2 Write the following in expanded notation using powers of ten.

a 6491

b 27245

c 78319

d 45628

3 Write each number on the place-value chart.

a $(7 \times 10^4) + (9 \times 10^3) + (2 \times 10^2) + (3 \times 10^1) + 4$

b $(4 \times 10^4) + (6 \times 10^3) + (7 \times 10^2) + (9 \times 10^1) + 3$

c $(3 \times 10^4) + (5 \times 10^3) + (6 \times 10^2) + (8 \times 10^1) + 6$

d $(8 \times 10^4) + (3 \times 10^3) + (5 \times 10^2) + (6 \times 10^1) + 2$

Ten thousands	Thousands	Hundreds	Tens	Ones

4 Write the numeral for:

a 60 000 + 4000 + 900 + 50 + 8

b 90 000 + 6000 + 700 + 40 + 3

c 300 000 + 70 000 + 2 000 + 500 + 90 + 8

d 700 000 + 80 000 + 5 000 + 400 + 60 + 1

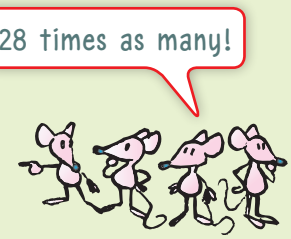
e 100 000 + 50 000 + 9 000 + 300 + 50 + 6

2:42 Multiplication by 2-Digit Numbers

Brad bragged that his stamp collection was 28 times larger than his brother's. His brother had 168 stamps. How many stamps did Brad say he had?

Brad said he had 4704 stamps.

```
  1 6 8
×   2 8
-------
  1 3 4 4   ← (8 × 168)
  3 3 6 0   ← (20 × 168)
-------
  4 7 0 4
```



CONCEPT

1 **a**
```
  4 2 9
×   1 3
-------
```

b
```
  1 5 3
×   2 7
-------
```

c
```
  3 6 2
×   4 5
-------
```

d
```
  2 8 7
×   7 2
-------
```

e
```
  8 0 3
×   7 5
-------
```

f
```
  7 4 0
×   5 6
-------
```

g
```
  9 0 4
×   3 4
-------
```

h
```
  6 1 0
×   8 9
-------
```

i
```
  3 1 1
×   6 8
-------
```

j 17 × 952

×

k 38 × 750

×

l 26 × 5800

×

2 **a** Through air, sound travels at 330 metres each second. How far would it travel in 35 seconds?

Through sea water, sound travels 4 times faster. How far does it travel through sea water in 35 seconds?

b The platform of the Assyrian palace of Sargon covered about 11 hectares and was 15 metres high. It would have taken 8600 people 14 years to construct the platform. If one person could do all this work, how long would it take them?

Estimating the Number of Blocks in a Jar

FUN SPOT

- Take turns to fill (or partly fill) a jar with place-value ones.
- Estimate the number of layers of ones in the jar.
- Look underneath to estimate the number in each layer.
- Multiply, to estimate the number of ones in the jar.
- See whose estimate is closest.

Number and place value: Select and apply efficient mental and written strategies and appropriate digital technologies to solve problems involving all four operations with whole numbers.

2:43 Number Sentences

+ 6 is the opposite of – 6
× 4 is the opposite of ÷ 4

■ – 16 = 7
The opposite of – 16 is + 16.
So ■ = 7 + 16
= 23

▲ ÷ 3 = 13
The opposite of ÷ 3 is × 3.
So ▲ = 13 × 3
= 39

CONCEPT

1 Find the value of the missing number, then write **T** (**true**) or **F** (**false**).

a ■ + 6 = 10 So ■ =
Does 10 – 6 equal ■?

b ■ – 1 = 99 So ■ =
Does 99 + 1 equal ■?

c ▲ + 83 = 91 So ▲ =
Does 91 – 83 equal ▲?

d ▲ – 37 = 28 So ▲ =
Does 28 + 37 equal ▲?

e ■ ÷ 2 = 41 So ■ =
Does 41 × 2 equal ■?

f ■ × 5 = 40 So ■ =
Does 40 ÷ 5 equal ■?

g ▲ ÷ 7 = 11 So ▲ =
Does 11 × 7 equal ▲?

h ▲ × 6 = 126 So ▲ =
Does 126 ÷ 6 equal ▲?

2 Find the value of each missing number.

a 5 + ■ = 12 – 4 So ■ =

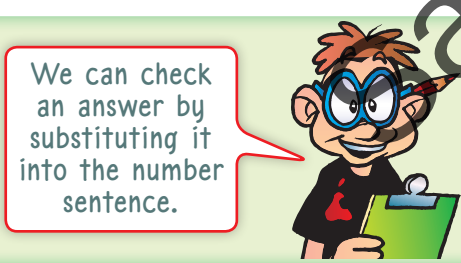
b ■ × 4 = 100 – 16 So ■ =

c ▲ – 7 = 6 × 3 So ▲ =

d ▲ ÷ 3 = 15 – 8 So ▲ =

e ■ – 136 = 9 × 7 So ■ =

f ▲ × 5 = 36 + 14 So ▲ =



If ■ = 23 is a solution to ■ + 98 = 121, then 23 + 98 = 121.

If ▲ = 8 is a solution to 7 × ▲ = ▲ + 48, then 7 × 8 = 8 + 48.

CONCEPT

3 Check the given solution by substituting, then write **T** (**true**) or **F** (**false**).

a If ■ + 14 = 30, then ■ = 10

b If ■ – 37 = 13, then ■ = 50

c If ▲ × 4 = 420, then ▲ = 15

d If ▲ ÷ 7 = 20, then ▲ = 140

e ■ + 8 + 10 = 32, ■ = 14

f ■ × 3 – 4 = 16, ■ = 7

g 16 – ▲ = 8 + 7, ▲ = 1

h 100 ÷ ▲ + 5 = 30, ▲ = 4

i ■ + 8 = 2 × ■, ■ = 8

j 2 × ■ – 35 = ■ – 15, ■ = 20

k (▲ + 4) × 3 + 7 = 22, ▲ = 1

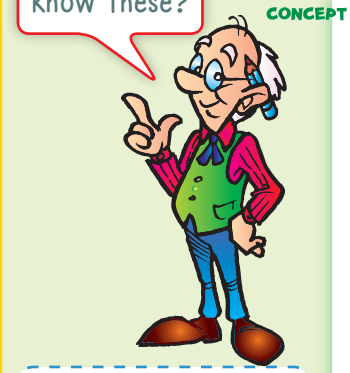
l 4 × ▲ + 1 = 2, ▲ = $\frac{1}{4}$

Patterns and algebra: Continue and create sequences involving whole numbers, fractions and decimals. Describe the rule used to create the sequence. I Explore the use of brackets and order of operations to write number sentences.

2:44 Divisibility and Factors

Divisor	Divisibility Test	Example
2	The number must be even, i.e. it must end in 0, 2, 4, 6 or 8.	73916 is divisible by 2 as it is even (ends in 6).
3	The sum of the digits is divisible by 3.	10203 is divisible by 3 as it has a digit sum divisible by 3 (1 + 0 + 2 + 0 + 3 = 6).
4	The number made by the last two digits must be divisible by 4.	111024 is divisible by 4 as 24 ÷ 4 = 6 (ie 24 is divisible by 4).
5	The last digit must be 5 or 0.	64015 is divisible by 5 as it ends in 5.
8	The number made by the last three digits must be divisible by 8.	11160 is divisible by 8 as 160 ÷ 8 = 20 (i.e. 160 is divisible by 8).
9	The sum of the digits is divisible by 9.	88110 is divisible by 9 as 8 + 8 + 1 + 1 + 0 = 18.
10	The last digit must be 0.	27370 is divisible by 10 as it ends in 0.

CONCEPT



A number is divisible by 6 if it is divisible by 2 and 3.

1 Underline the numbers that are:

a divisible by 2:	154	387	4441	37902	89366	25819
b divisible by 3:	184	732	1092	36304	67313	111 111
c divisible by 4:	614	812	4308	17224	83906	111110
d divisible by 5:	307	415	8400	81194	55504	111110
e divisible by 8:	11008	23000	65832	614016	821104	7184
f divisible by 9:	10070	14301	38246	91422	128700	66811
g divisible by 10:	37015	38400	75830	415004	111010	41875

2 Write down all the factors of:

a 24:

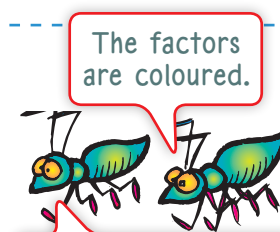
b 40:

c 105:

d 81:

e 120:

The factors of 36
36 ÷ **1** = **36**
36 ÷ **2** = **18**
36 ÷ **3** = **12**
36 ÷ **4** = **9**
36 ÷ 5 = 7 r 1
36 ÷ **6** = 6



Stop when your answer is as big as your divisor.

If a number is divisible by a number, then it is also divisible by the factors of that number.

3 If a number is:

a divisible by 30, it is also divisible by .

b divisible by 24, it is also divisible by .

c divisible by 100, it is also divisible by .

2:45 Estimation with Decimals

4·12 + 84·691 → Rounding → 4 + 85 = 89 ← 89 is our estimate.

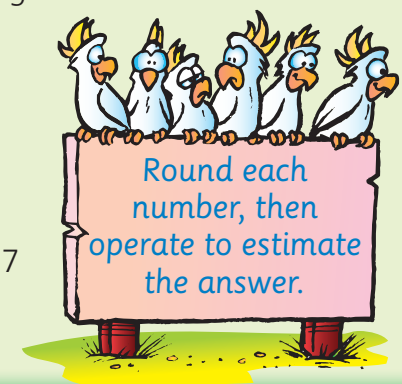
CONCEPT

Both rounded up will give an **overestimate**.

e.g. 2·942 × 8·5

Rounding both up: 3 × 9 = 27

27 is an **overestimate**.



Both rounded down will give an **underestimate**.

e.g. 2·41 × 12·3

Rounding both down: 2 × 12 = 24

24 is an **underestimate**.

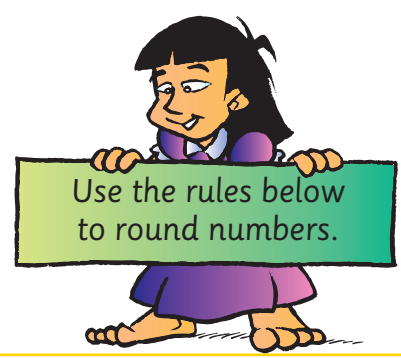
1 Round each decimal to the nearest whole number. Write whether you have rounded up (**U**) or rounded down (**D**).

a	84·3		**b**	13·9		**c**	28·2	
d	47·8		**e**	5·6		**f**	26·4	
g	19·9		**h**	21·7		**i**	33·3	

≒ means 'is approximately equal to'.

2 Mary obtained these answers using a calculator. Use estimation to discover which 3 answers are incorrect. Put a cross next to the wrong answers.

a	4·186 × 5·1 ≒ 41·6	**b**	3·421 × 2·2 ≒ 7·5
c	2·178 × 7·3 ≒ 22·7	**d**	6·492 × 3·3 ≒ 21·4
e	5·512 × 3·5 ≒ 19·29	**f**	7·122 × 5·7 ≒ 40·6
g	2·32 × 6·1 ≒ 14·15	**h**	4·341 × 3·2 ≒ 19·2



3 Mentally round each number to the nearest whole number, then estimate the answer.

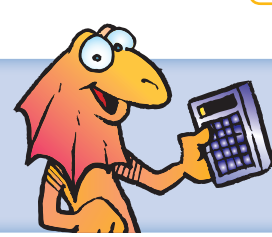
a	29·3 + 8·99 ≒	**b**	30·812 + 6·1 ≒
c	100·65 – 23·4 ≒	**d**	17·3 – 7·012 ≒
e	1·863 × 6·714 ≒	**f**	2·375 × 3·41 ≒
g	9·243 + 5·341 ≒	**h**	8·66 × 4·73 ≒
i	18·657 – 11·62 ≒	**j**	22·831 + 9·22 ≒

Rounding

If the next digit is 5 or more, round up.
e.g. 7·514 → 8.

If the next digit is 4 or less, round down.
e.g. 13·49 → 13.

Use a calculator to check the answers to Questions 2 and 3.



ICT

Fractions and decimals: Add and subtract decimals, with and without digital technologies, and use estimation and rounding to check the reasonableness of answers.

2:46 Using Rounding to Check Answers

We can estimate answers using whole numbers to check the reasonableness of our answers.

CONCEPT

	Round	
32·301	32	↓ Rounded down
+14·440	+14	↓ Rounded down
46·741	46	← **underestimate**

Both numbers were rounded down so this will be an underestimate.

1 Round these numbers to the nearest whole number to estimate. Complete the written algorithms to check that your answers are reasonable.

a

	Round
51·392	
+34·043	+

b

	Round
43·653	
+27·402	+

c

	Round
63·972	
−58·601	−

d

	Round
80·359	
−42·093	−

Will your estimate be an underestimate or an overestimate?

We can use our knowledge of decimals to estimate mentally.

0·4 × 36 is almost 0·5 × 36.
$\frac{1}{2}$ of 36 = 18
0·4 × 36 ≒ 18
18 is a good estimate.

≒ means 'is approximately equal to'.

83·125 ÷ 3·9
≒ 80 ÷ 4
= 20
20 is a good estimate.

Use a calculator to check how close your estimates were.

CONCEPT

In Questions 2 and 3, round numbers to estimate the answer.

2
a 0·6 × 12 ≒ ☐ **b** 42 × 1·843 ≒ ☐ **c** 22 × 1·2 ≒ ☐
d 5·3 × 8 ≒ ☐ **e** 28 × 0·482 ≒ ☐ **f** 3·9 × 7 ≒ ☐
g 10·8 × 7 ≒ ☐ **h** 100 × 3·31 ≒ ☐ **i** 7·12 × 6 ≒ ☐

3
a 59·83 ÷ 3 ≒ ☐ **b** 33·812 ÷ 8 ≒ ☐ **c** 20·9 ÷ 7 ≒ ☐
d 8·205 ÷ 2 ≒ ☐ **e** 15·08 ÷ 5 ≒ ☐
f 17·938 ÷ 2 ≒ ☐ **g** 19·79 ÷ 4 ≒ ☐

Ask: Does the answer make sense?