

## NUMBERS AND THE NUMBER SYSTEM

### Pupils should be taught to:

Read and write whole numbers, know what each digit in a number represents, and partition numbers into thousands, hundreds, tens and ones

### As outcomes, Year 4 pupils should, for example:

Use, read and write:

*units or ones, tens, hundreds, thousands...*

*ten thousand, hundred thousand, million...*

*digit, one-digit number, two-digit number, three-digit number,*

*four-digit number... numeral... place value...*

Respond to oral or written questions such as:

- Read these: 785, 1179, 4601, 3002, 8075...

- Find the card with:  
'two thousand, three hundred and sixty' on it;  
'five thousand and seven' on it;  
'six thousand and seventy-six' on it.

- What number needs to go in each box? Explain why.

$$3642 = \square + 600 + 40 + 2$$

$$5967 = 5000 + \square + 60 + 7$$

$$4529 = 4000 + 500 + \square + 9$$

$$1398 = 1000 + 300 + 90 + \square$$

- What does the digit 3 in 3642 represent? The 6? The 4? The 2?  
(*They represent 3000 and 600 and 40 and 2.*)
- What is the figure 4 worth in the number 7451?  
And the 5?
- Write the number that is equivalent to:  
seven thousands, four hundreds, five tens and six ones (units);  
two thousands, nine hundreds and two ones (units);  
five thousands, four hundreds.
- Write in figures:  
four thousand, one hundred and sixty-seven...  
six thousand, four hundred and nine...  
ten thousand, three hundred and fifty...

- Write in words:  
7001, 5090, 8300...

- Which is less: 4 hundreds or 41 tens?

- What needs to be added/subtracted to change:  
4782 to 9782;      3261 to 3961;  
7070 to 5070;      2634 to 2034?

- Make the biggest/smallest number you can with these digits:  
3, 2, 5, 4, 0.  
Write your number in words.

## As outcomes, Year 5 pupils should, for example:

Use, read and write, spelling correctly:  
*units or ones, tens, hundreds, thousands...*  
*ten thousand, hundred thousand, million...*  
*digit, one-digit number, two-digit number, three-digit*  
*number, four-digit number... numeral... place value...*

Respond to oral or written questions such as:

- Read these:     3 010 800,     342 601,  
                  630 002,     2 489 075...
- Find the card with:  
‘sixty-two thousand, six hundred and twenty’ on it;  
‘six hundred and forty-five thousand and nine’  
on it;  
‘fifty-six thousand and seventy-six’ on it.
- What does the digit 3 in 305 642 represent?  
And the 5? And the 6? And the 4? And the 2?
- What is the value of the digit 7 in the number  
79 451? And the 9?
- Write the number that is equivalent to:  
five hundred and forty-seven thousands, four  
hundreds, nine tens and two ones (units);  
ninety-two thousands, four hundreds and six units;  
six million, sixty-five thousands, four hundreds.
- Write in figures:  
two hundred and ninety-four thousand, one  
hundred and sixty-one...  
one hundred and sixty-seven thousand, four  
hundred and nine...  
twenty million, ninety thousand and fifty...  
six million and seven...  
one million, twenty thousand and seventeen...
- Put in your calculator display:  
ninety-nine thousand, five hundred and two;  
two hundred and fifty-two thousand and forty.
- Write in words:  
207 001, 594 090, 5 870 300, 10 345 602...
- Which is less: 4 thousands or 41 hundreds?
- What needs to be added/subtracted to change:  
47 823 to 97 823;             207 070 to 205 070?  
Use your calculator. Make the change in one step.
- Make the biggest/smallest integer you can with  
these digits: 8, 3, 0, 7, 6, 0, 2.  
Write your number in words.

## As outcomes, Year 6 pupils should, for example:

## NUMBERS AND THE NUMBER SYSTEM

### Pupils should be taught to:

Add or subtract 1, 10, 100 or 1000 to/from whole numbers, and count on or back in tens, hundreds or thousands from any whole number up to 10 000

### As outcomes, Year 4 pupils should, for example:

From any three- or four-digit number, count on or back in ones, tens, hundreds or thousands, including crossing boundaries.

Respond to oral questions such as:

- Count on, for example:
  - 6 in ones from 569...
  - 60 in tens from 569...
  - 600 in hundreds from 569...
  - 6000 in thousands from 2300... from 7300...
- Count back, for example:
  - 6 in ones from 732...
  - 60 in tens from 732...
  - 600 in hundreds from 732...
  - 6000 in thousands from 8700...
- Starting with 23, how many tens do you need to add to get more than 100?
- Starting with 374, how many hundreds do you need to add to get more than 1000?

Answer oral or written questions such as:

- What is 1 more than: 3485... 4569... 4599... 4999...?
- What is 1 less than: 2756... 6540... 6500... 6000...?
- What is 10, 100 or 1000 more/less than the numbers above?
- What is 1p, 10p, 100p, 1000p... more/less than 1005p?
- What is 1 ml, 10 ml, 100 ml, 1000 ml... more/less than 3250 ml?
- What is 1 g, 10 g, 100 g, 1000 g... more/less than 1200 g?
- What is 1 m, 10 m, 100 m, 1000 m... more/less than 5000 m?
- Write the correct numbers in the boxes.

6500  $\xrightarrow{\text{1000 more is}}$     $\xrightarrow{\text{1000 less is}}$  2350

As outcomes, Year 5 pupils should, for example:

As outcomes, Year 6 pupils should, for example:

## NUMBERS AND THE NUMBER SYSTEM

### Pupils should be taught to:

Multiply and divide whole numbers, then decimals, by 10, 100 or 1000

### As outcomes, Year 4 pupils should, for example:

Demonstrate understanding of multiplying or dividing a whole number by 10.

Understand that:

- when you multiply a number by 10, the digits move one place to the left;
- when you divide a number by 10, the digits move one place to the right.

For example:

- Multiply by 10 using base-10 apparatus on a ThHTU board. For example, put 26 on the board (2 tens, 6 ones) and label with digit cards. Multiply each piece by 10, make the exchanges to become 2 hundreds, 6 tens, 0 ones, and label again with digit cards. Repeat twice. Describe the pattern.

$$\begin{aligned}26 \times 10 &= 260 \\260 \times 10 &= 2\,600 \\2600 \times 10 &= 26\,000\end{aligned}$$

- Explain this grid (which shows multiplication by 10). Describe what happens when you divide by 10.

1	2	3	4	5	...	9
10	20	30	40	50	...	90
100	200	300	400	500	...	900
1000	2000	3000	4000	5000	...	9000

Extend to multiplying integers less than 1000 by 100.

Respond to oral or written questions such as:

- How many times larger is 260 than 26?
- How many £1 coins are in £15, £150, £1500?  
How many 10p coins?
- Tins of dog food are put in packs of 10.  
One tin costs 42p.  
How much does one pack cost? 10 packs?

Work out mentally the answers to written questions such as:

$$\begin{aligned}6 \times 10 &= \square & 900 \div 10 &= \square \\28 \times 100 &= \square & 50 \div 10 &= \square \\329 \times 10 &= \square & 8000 \div 10 &= \square \\73 \times \square &= 730 & 4000 \div \square &= 400\end{aligned}$$

See also decimal place value (page 28).

## Place value (whole numbers and decimals)

### As outcomes, Year 5 pupils should, for example:

Demonstrate understanding of multiplying or dividing a whole number by 10 or 100.

Understand that:

- when you multiply a number by 10/100, the digits move one/two places to the left;
- when you divide a number by 10/100, the digits move one/two places to the right.

Understand that multiplying by 100 is equivalent to multiplying by 10, and again by 10.

For example:

- Write a single-digit number in the centre of a large sheet of paper. Keep multiplying by 10 and record the result in words and figures, then divide by 10 and by 10 again. Describe the pattern.

six hundred thousand	600 000
sixty thousand	60 000
six thousand	6 000
six hundred	600
sixty	60
six	6
nought point six	0.6
nought point nought six	0.06

Discuss questions like:

- What is 600 times 10? 600 divided by 10?
- What is 600 times 100? 600 divided by 100?
- What is one tenth of 600? Of 60? Of 6?
- What is one hundredth of 6000? Of 600? Of 60?

Observe and comment on the effect of multiplying or dividing by 10 or 100 using a calculator.

Respond to oral or written questions such as:

- How many times larger is 2600 than 26?
- How many £10 notes are in £120, £1200?  
How many £1 coins, 10p coins, 1p coins?
- Tins of dog food at 42p each are put in packs of 10.  
Ten packs are put in a box.  
How much does one box of dog food cost?  
10 boxes? 100 boxes?

Work out mentally the answers to questions such as:

$$\begin{array}{ll} 329 \times 100 = \square & 8000 \div 100 = \square \\ 56 \times \square = 5600 & 7200 \div \square = 72 \\ 420 \times \square = 4200 & 3900 \div \square = 390 \end{array}$$

See also decimal place value (page 29).

### As outcomes, Year 6 pupils should, for example:

Demonstrate understanding of multiplying or dividing a whole number by 10, 100 or 1000.

Understand that:

- when you multiply a number by 10/100/1000, the digits move one/two/three places to the left;
- when you divide a number by 10/100/1000, the digits move one/two/three places to the right.

Understand that multiplying by 1000 is equivalent to multiplying by 10, then by 10, then by 10, or is equivalent to multiplying by 10 and then by 100.

For example:

- Look at a metre stick. Name something about 1 metre in length.  
Now name something about 10 m in length.  
Build up a table, recognising that the table involves multiplying or dividing by 10.

distance to town centre	10 000 m
from the school to the park	1 000 m
length of playground fence	100 m
length of swimming pool	10 m
height of shelves	1 m
length of a pencil	0.1 m
width of a thumb nail	0.01 m
thickness of a 5p coin	0.001 m

Discuss questions like:

- What is about 100 times the width of a thumb nail?
- What is one hundredth of a pencil length?
- What is one thousandth of the length of the fence?
- How many pencils would fit along the pool?
- How many 5p coins would stack under the shelves?

Observe and comment on the effect of multiplying or dividing by 10, 100 or 1000 using a calculator.

Respond quickly to oral questions such as:

- How many times larger is 26 000 than 26?
- How many £100 notes are in £1300, £13 000, £130 000...?  
How many £10 notes, £1 coins, 10p coins, 1p coins?
- Tins of dog food at 42p each are put in packs of 10.  
Ten packs are put in a box.  
Ten boxes are put in a crate.  
How much does 1 crate cost?  
10 crates? 100 crates?

Work out mentally the answers to questions such as:

$$\begin{array}{ll} 0.8 \times 10 = \square & 8 \div 10 = \square \\ 56 \times \square = 56 000 & 72 000 \div \square = 72 \\ 7.3 \times \square = 73 & 4 \div \square = 0.4 \end{array}$$

See also decimal place value (page 29).

## NUMBERS AND THE NUMBER SYSTEM

### Pupils should be taught to:

Use the vocabulary of comparing and ordering numbers, and the symbols  $>$ ,  $<$ ,  $=$ ; give a number lying between two given numbers and order a set of numbers

### As outcomes, Year 4 pupils should, for example:

Use, read and write:

*how many, as many as, the same number as, equal to...*

*more than, fewer than, greater than, less than, smaller than,*

*larger than... most, least, smallest, largest...*

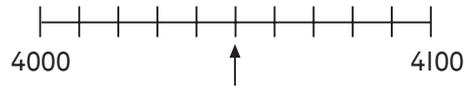
*order, first, last, before, after, next, between, half way between...*

ordinal numbers: *first, second, third, fourth... 1st, 2nd, 3rd, 4th...*

and the  $<$  and  $>$  signs.

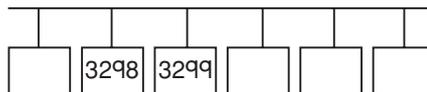
Respond to oral or written questions such as:

- Which is greater: 7216 or 7261?  
Which is longer: 3157 m or 3517 m?
- Jo has walked 4356 metres.  
Ny has walked 4365 metres.  
Who has walked further? How many metres further?
- Indicate on a number line what number is half way between:  
740 and 750      4000 and 4100      2350 and 2380

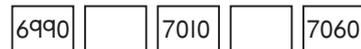


Now try without a number line.

- A melon weighs between 1090 grams and 1110 grams.  
How heavy could it be?
- An oil tank holds between 5900 litres and 6100 litres of oil.  
What could its capacity be?
- My car cost between £6950 and £7050.  
Suggest what it cost.
- This is part of the number line.  
Fill in the missing numbers.



- Here is a row of five cards. Two cards are blank.  
Write a number on each blank card.  
The five numbers must be in order.



- Put these numbers in order, largest/smallest first:  
4521, 2451, 5124, 2154, 5214.
- If  $3160 < \square < 3190$ , what numbers could  $\square$  be?

See also the examples on ordering in:  
negative numbers (page 14), fractions (page 22)  
and decimals (page 28).

**As outcomes, Year 5 pupils should, for example:**

Use, read and write, spelling correctly, the vocabulary from the previous year, and extend to: *ascending/descending order...* and the  $>$  and  $<$  signs.

Respond to oral or written questions such as:

- Which is greater: 17 216 or 17 261?  
Which is longer: 43 157 m or 43 517 m?
- Jo has cycled 14 356 metres.  
Ny has cycled 15 365 metres.  
Who has cycled further?  
How many metres further?
- What number is half way between:  
27 400 and 28 000...      45 670 and 45 680...?
- A journey takes about 2 hours, give or take 10 minutes. How long could the journey be?
- The distance to the crossroads is about 1 km, give or take 100 metres.  
How far away could the crossroads be?
- Use knowledge of place value and number operations to place digits in the best position to make the largest/smallest sum, difference, product or quotient, using either a calculator or a computer program.
- Put these numbers in ascending/descending order: 14 521, 126 451, 25 124, 2154, 15 214.
- If  $16\ 240 \square 16\ 320$ , what numbers could  $\square$  be?

**See also the examples on ordering in: negative numbers (page 15), fractions (page 23) and decimals (page 29).**

**As outcomes, Year 6 pupils should, for example:**

## NUMBERS AND THE NUMBER SYSTEM

### Pupils should be taught to:

Use the vocabulary of estimation and approximation; make and justify estimates and approximations of numbers

### As outcomes, Year 4 pupils should, for example:

Use, read and write:

*guess, estimate, approximate...*

*round, nearest...*

*roughly, nearly, approximately...*

*too many, too few, enough, not enough...*

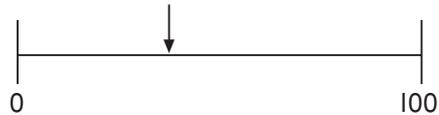
Estimate a number up to about 250, explaining how the estimate was made. For example, estimate how many:

- counters in a big box of them;
- words on one or more pages of a book;
- dots on a piece of dotty paper...

Explain how you worked out each estimate.

Estimate the position of a point on an undivided line: for example, the whole number marked by the arrow.

Explain how you made your decision.



Estimate a simple proportion.

For example:

- This jar holds 100 sweets when it is full. Some have been eaten. About how many are left?

What if the jar held 50 sweets?



- Compare contents of containers and make statements like 'there is about half as much in this one' or 'there is about one and a half times as much in this one'.

See also estimating measures (page 92).

As outcomes, Year 5 pupils should, for example:

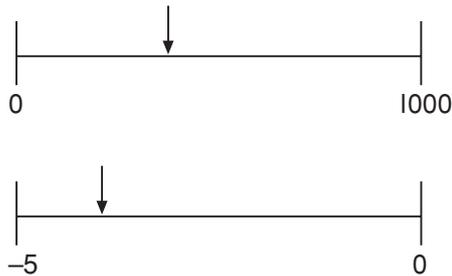
Use, read and write, spelling correctly:  
*guess, estimate, approximate...*  
*round, nearest...*  
*roughly, nearly, approximately...*  
*too many, too few, enough, not enough...*  
 and the symbol for 'is approximately equal to' ( $\approx$ ).

Estimate, for example, how many:

- penny coins will make a straight line 1 metre long;
- slices there are in a loaf of thick-sliced bread;
- how many slices you eat in a day, a week, a year...
- petals there are in a bunch of daisies;
- bricks there are in a wall.

Explain how you worked out each estimate.

Estimate the position of a point on an undivided line:  
 for example, the whole number or decimal marked  
 by each arrow. Explain how you made your decision.



Estimate a proportion: for example,  
 where to cut off one fifth of a piece of rope, or  
 the proportion of dried beans left in a jar.

See also estimating measures (page 93).

As outcomes, Year 6 pupils should, for example:

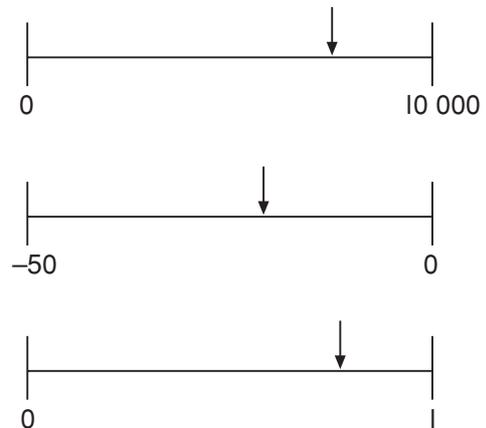
Use, read and write, spelling correctly:  
*guess, estimate, approximate...*  
*round, nearest...*  
*roughly, nearly, approximately...*  
*too many, too few, enough, not enough...*  
 and the symbol for 'is approximately equal to' ( $\approx$ ).

Estimate, for example, how many:

- penny coins will make a straight line 1 kilometre long;
- loaves of sliced bread your class will eat in a lifetime;
- leaves of clover there are in a patch of grass;
- leaves there are on a tree;
- bricks there are in the school building;
- words there are in a book;
- entries there are in a telephone directory.

Explain how you worked out each estimate.

Estimate the position of a point on an undivided line:  
 for example, the whole number or decimal marked  
 by each arrow. Explain how you made your decision.



Estimate a proportion: for example,  
 the fraction of a cake that has been eaten, or  
 the proportion of grains of rice left in a jar.

See also estimating measures (page 93).

## NUMBERS AND THE NUMBER SYSTEM

### Pupils should be taught to:

Round whole numbers to the nearest 10, 100 or 1000

### As outcomes, Year 4 pupils should, for example:

Round any two- or three-digit number to the nearest 10 or 100.  
For example:

- 633 is 630 rounded to the nearest ten.  
837 is 840 rounded to the nearest ten.  
935 is 940 rounded to the nearest ten.
- 433 is 400 rounded to the nearest hundred.  
856 is 900 rounded to the nearest hundred.
- 650 is half way between 600 and 700.  
The nearest hundred to 650 is 700, because we round up when the number is half way between two hundreds.

Write a number between 600 and 700 which is nearer to 700 than to 600.

Round measurements in seconds, minutes, hours, metres, kilometres, miles, kilograms, litres to the nearest 10 or 100 units.  
For example:

- Round these distances from Penzance to the nearest 100 miles, then to the nearest 10 miles.

Aberdeen	660 miles
Edinburgh	542 miles
Fort William	650 miles
Kendal	703 miles
Leeds	375 miles

Estimate calculations by approximating. For example:

- Which of these is the best approximation for  $608 + 297$ ?  
 $600 + 200$     $700 + 300$     $600 + 300$   
 $600 + 97$     $610 + 300$
- Which of these is the best approximation for  $19 \times 6$ ?  
 $99 \times 6$     $20 \times 6$     $9 \times 60$     $20 \times 5$
- Approximate:  $19 \times 16$

See also examples on rounding in:  
rounding up or down after division (page 56),  
rounding measures (page 94) and  
estimating calculations (pages 66 and 68).

### As outcomes, Year 5 pupils should, for example:

Round any two-, three- or four-digit number to the nearest 10, 100 or 1000. For example:

- 5633 is 5630 rounded to the nearest ten.  
9837 is 9840 rounded to the nearest ten.
- 6433 is 6400 rounded to the nearest hundred.  
2856 is 2900 rounded to the nearest hundred.
- 8215 is 8000 rounded to the nearest thousand.  
8760 is 9000 rounded to the nearest thousand.
- 7500 is half way between 7000 and 8000.  
The nearest thousand to 7500 is 8000, because we round up when the number is half way between two thousands.

Write a number between 6000 and 7000 which is nearer to 7000 than to 6000.

Round measurements in days, metres, kilometres, miles, kilograms, litres to the nearest 10, 100 or 1000 units. For example:

- Round these distances from London to the nearest 1000 miles, 100 miles and 10 miles.

Paris	451 miles
Jeddah	5904 miles
New York	6799 miles
Sydney	19 675 miles
Madras	9981 miles

- A cricket team scored 247 runs in the first innings and 196 runs in the second innings. Approximately how many runs did the team score?
- It is 656 kilometres to Glasgow.  
I have driven 448 kilometres.  
About how much further is it?

Estimate calculations. For example:

- Which is the best approximation for  $608 + 96$ ?  
 $600 + 100$     $700 + 100$     $610 + 100$     $600 + 90$
- Which is the best approximation for  $19 \times 26$ ?  
 $99 \times 26$     $20 \times 26$     $19 \times 20$     $20 \times 25$
- Approximate:  $(37 + 54) \div 28$

See also examples on rounding in:  
rounding up or down after division (page 57),  
rounding decimal fractions (page 31),  
rounding measures (page 95) and  
estimating calculations (pages 67 and 69).

### As outcomes, Year 6 pupils should, for example:

Round any whole number to the nearest multiple of 10, 100 or 1000. For example:

Would you estimate these numbers to the nearest 10, 100, 1000, 10 000, 100 000 or 1 000 000?

- the size of a Premier League football crowd;
- the number of people on a full jumbo jet;
- the number of people on a full bus;
- the number of fish in the sea;
- the number of children in a school;
- the number of children in a class;
- the number of people in the world.

Give an example of a number you would estimate to:  
the nearest 10 000... the nearest 1000...  
the nearest 100... the nearest 10... the nearest million.

Round to the nearest 10, 100 or 1000 units measurements such as:

- your height in millimetres;
- the capacity of a large saucepan in millilitres;
- the perimeter of the playground in metres.

Estimate calculations. For example:

- Which is the best approximation for  $40.8 - 29.7$ ?  
 $408 - 297$     $40 - 29$     $41 - 30$     $4.0 - 2.9$
- Which is the best approximation for  $9.18 \times 3.81$ ?  
 $10 \times 3$     $10 \times 4$     $9 \times 3$     $9 \times 4$
- Approximate:  $(409 - 155) \div 73$

See also examples on rounding in:  
rounding up or down after division (page 57),  
rounding decimal fractions (page 31),  
rounding measures (page 95) and  
estimating calculations (page 67 and 69).

## NUMBERS AND THE NUMBER SYSTEM

### Pupils should be taught to:

#### Recognise and order negative numbers

### As outcomes, Year 4 pupils should, for example:

Use, read and write in context:

*integer, positive, negative, minus, above/below zero...*

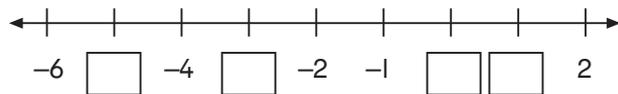
Recognise positive and negative whole numbers (integers) in contexts such as rungs on a ladder, above ground and below ground, on a temperature scale, on a weather chart...

Count back through zero:

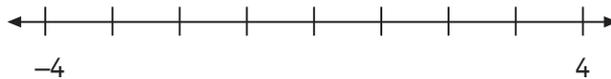
*three, two, one, zero, negative one, negative two...*

Respond to questions such as:

- What integers lie between  $-5$  and  $3$ ?
- Put these shuffled cards from  $-15$  to  $5$  in order.
- Fill in the missing numbers on this part of the number line.



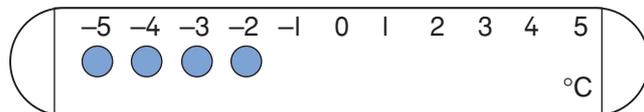
- Draw an arrow to point to  $-2$ .



Use negative numbers in the context of temperature.

For example:

- What temperature does this thermometer show? (*minus  $2^{\circ}\text{C}$* )



- Use a strip thermometer to take readings of:
  - your body temperature;
  - the temperature of the classroom window on a cold day;
  - the temperature of different objects on a freezing day, such as a wall, car body, your hands...
- Which temperature is lower:  $-4^{\circ}\text{C}$  or  $-2^{\circ}\text{C}$ ?
- Put these temperatures in order, lowest first:  
 $2^{\circ}\text{C}$ ,  $-8^{\circ}\text{C}$ ,  $-1^{\circ}\text{C}$ ,  $-6^{\circ}\text{C}$ ,  $-4^{\circ}\text{C}$ .

### As outcomes, Year 5 pupils should, for example:

Use, read and write, spelling correctly:  
*integer, positive, negative, minus, above/below zero...*

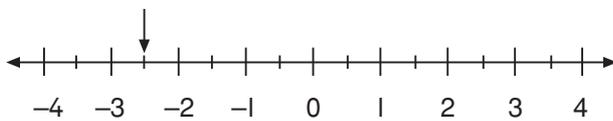
Recognise negative numbers on a calculator.  
Use the constant function to generate sequences of negative numbers.

Count back through zero, for example:  
*seven, three, negative one, negative five...*

Respond to questions such as:

- Put these numbers in order, least first:  
-2, -8, -1, -6, -4.

- What number is the arrow pointing to?



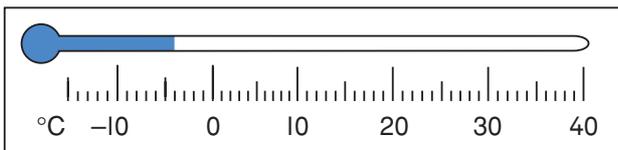
- Here is a row of six cards. Three cards are blank. Write a whole number on each blank card so that the six numbers are in order.



- If  $-7 < \square < -4$ , what integer could  $\square$  be?

Use negative numbers in the context of temperature.  
For example:

- What temperature does this thermometer show?



- The temperature rises by 15 degrees. Mark the new temperature reading on the thermometer.
- The temperature falls from  $11^\circ\text{C}$  to  $-2^\circ\text{C}$ . How many degrees does the temperature fall?
- The temperature is  $6^\circ\text{C}$ . It falls by 8 degrees. What is the temperature now?
- The temperature is  $-3^\circ\text{C}$ . How much must it rise to reach  $5^\circ\text{C}$ ?
- What is the difference in temperature between  $-4^\circ\text{C}$  and  $14^\circ\text{C}$ ?

Use negative numbers in other contexts such as:

- A diver is below the surface of the water at  $-30\text{ m}$ . He goes up 12 metres, then down 4 metres. Where is he now?

### As outcomes, Year 6 pupils should, for example:

Use, read and write, spelling correctly:  
*integer, positive, negative, minus, above/below zero...*

Respond to questions such as:

- Put these integers in order, least first:  
-37, 4, 29, -4, -28.
- In this equation,  $\square$  and  $\triangle$  represent whole numbers.

$$\square + \triangle = 17$$

Make a table of their possible values.  
Is there a pattern?

- Plot these points on a co-ordinate grid:  
(5, 4) (5, 8) (-3, 4) (-3, 8)  
What shape do they make?  
What is the length of its perimeter?

See also plotting co-ordinates (page 109).

Use negative numbers in the context of temperature.  
For example:

- The temperature is  $-5^\circ\text{C}$ . It falls by 6 degrees. What is the temperature now?
- The temperature is  $-11^\circ\text{C}$ . It rises by 2 degrees. What is the temperature now?
- The temperature at the North Pole is  $-20^\circ\text{C}$ . How much must it rise to reach  $-5^\circ\text{C}$ ?
- Draw a line graph to show these temperatures at 9:00 am each day for a week:  
 $-2^\circ\text{C}$ ,  $+3^\circ\text{C}$ ,  $-1^\circ\text{C}$ ...

Use negative numbers in other contexts such as:

- Lena set herself a target of 1 metre for her high jump. She recorded each attempt in centimetres above and below her target.

+2	-3	+2	-2	0	-1
----	----	----	----	---	----

What was her highest (best) jump?  
What was her lowest jump?  
What was her average jump?

## NUMBERS AND THE NUMBER SYSTEM

### Pupils should be taught to:

Recognise and extend number sequences formed by counting on and back in steps of any size, extending beyond zero when counting back

### As outcomes, Year 4 pupils should, for example:

Use, read and write:

*next, consecutive, sequence, predict, continue, rule, relationship... sort, classify, property...*

Count on and back. For example:

- From any number, count on in 2s, 3s, 4s, 5s to about 100, and then back.
- Count back in 4s from 40.  
What happens when you get to zero? Can you go on?  
What happens if you start at 39?
- Count in 25s to 500, then back.

Describe, extend and explain number sequences and patterns. For example, respond to questions like:

- What are the next three numbers in each sequence?  
38, 47, 56, 65...                      135, 137, 139, 141...  
48, 41, 34, 27...                      268, 266, 264...  
Explain the rule.

- Fill in the missing numbers in this sequence.  
Explain the rule.  
□, □, 45, 49, □, 57, 61, □

- Take a  $6 \times 6$  number grid.  
Count on in 4s from 0.  
Shade the numbers you land on.  
What do you notice?

1	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	30
31	32	33	34	35	36

If you went on, would 44 be in your sequence? Or 52?  
How do you know?

What happens if you start at 2?  
Is the pattern the same?

Now try a  $5 \times 5$  or a  $10 \times 10$  number grid.

- What do you notice when you count from zero in:

twos	fours	eights
2	4	8
4	8	16
6	12	24
8	16	32

(4s are double 2s; 8s are double 4s.)

- Count on or back from any number in steps of any single-digit number. Predict what will come next each time.  
What do you notice?

Now try steps of 11.

See also negative numbers (page 14) and adding or subtracting 10, 100 or 1000 (page 4).

**As outcomes, Year 5 pupils should, for example:**

Use, read and write, spelling correctly:  
*next, consecutive, sequence, predict, continue, rule, relationship, formula... classify, property...*

Count on and back. For example:

- From zero, count on in 6s, 7s, 8s, 9s to about 100, and then back.
- Count in 11s to 132, then count back.  
 Can you go on past zero?  
 What happens if you start at 133?
- Count in 25s to 1000, then back.
- Count in steps of 0.1 to 5.0, then back.

Describe, extend and explain number sequences and patterns. For example, respond to questions like:

- Describe and extend this sequence:  
 -40, -37, -34...  
 Explain the rule orally and in writing.
- Fill in the missing numbers in these sequences.  
 Explain the rule orally and in writing.  
 38, 49, □, □, 82  
 □, □, 71, 62, □, 44

- Take a 9 × 9 number grid.  
 Count on in 7s from 0.  
 Circle the numbers you land on.  
 What do you notice?

If you went on, would 100 be in your sequence?  
 Or 105? How do you know?

What happens if you start at a number other than zero?  
 Is the pattern the same?

Now try a 10 × 10 or an 11 × 11 number grid.

- What do you notice when you count from zero in:

threes	sixes	nines
3	6	9
6	12	18
9	18	27
12	24	36

(6s are double 3s; 9s are 3s plus 6s.)

- Count on or back from any number in steps of 19, 21 or 25. Predict what will come next each time.  
 What do you notice?

Do the same using the constant function on a calculator to generate multiples of, say, 55 or 70.

See also negative numbers (page 15).

**As outcomes, Year 6 pupils should, for example:**

Use, read and write, spelling correctly:  
*next, consecutive, sequence, predict, continue, rule, relationship, formula... classify, property...*

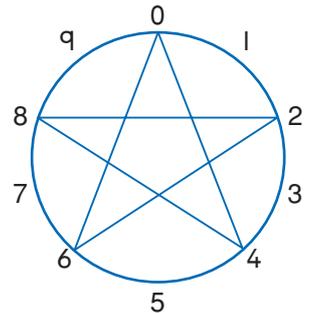
Count on and back. For example:

- From any number, count on in 6s, 7s, 8s, 9s to about 100, and then back.
- Count in 11s, 15s, 19s, 21s, 25s, then back.  
 Can you go on past zero?
- Count in steps of 0.1, 0.5, 0.25 to 10, then back.

Describe, extend and explain number sequences and patterns. For example, respond to questions like:

- Describe and extend this sequence:  
 1, 3, 6, 10, 15, 21... (triangular numbers)  
 Explain the rule orally and in writing.
- Fill in the missing numbers in these sequences.  
 Explain each rule orally and in writing.  
 10, 25, □, □, 70...  
 1, 4, □, □, 25, 36, □...  
 □, □, -61, -42, -23...

- Examine the patterns formed by last digits:  
 for example, when repeatedly adding 4.



How does the pattern change if you start at 1?

- Take a multiplication square. Find and explain as many patterns as possible: for example, the symmetry in the square, the pattern of square numbers, multiples of 3, multiples of 4...

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100

Multiples of 4

See also negative numbers (page 15).

## NUMBERS AND THE NUMBER SYSTEM

### Pupils should be taught to:

Recognise odd and even numbers and make general statements about them

Recognise multiples and know some tests of divisibility

### As outcomes, Year 4 pupils should, for example:

Make general statements about odd or even numbers and/or give examples that match them.

For example, explore and give some examples to satisfy these general statements:

- the last digit of an even number is 0, 2, 4, 6 or 8;
- the last digit of an odd number is 1, 3, 5, 7 or 9;
- after 1, every second number is odd;
- the numbers on both sides of an odd number are even;
- if you add two odd numbers, the answer is even.

Use, read and write:

*multiple, digit...*

Recognise multiples in the 2, 3, 4, 5 and 10 times-tables.

Respond to questions such as:

- Ring the numbers in the box that divide exactly by 4.

3	8	20	27	34	36	48	50
---	---	----	----	----	----	----	----

Which numbers in the box are divisible by both 5 and 2?

- Sean counts his books in fours.  
He has 1 left over.  
He counts his books in fives.  
He has 3 left over.  
How many books has Sean?
- Use a number grid computer program to highlight multiples.  
Use different sizes of grid to explore multiples of 2.  
Describe and explain which grids produce 'diagonal' patterns, and which produce 'vertical' patterns.  
Try multiples of 3.

**As outcomes, Year 5 pupils should, for example:**

Make general statements about odd or even numbers and/or give examples that match them.

For example, explore and give some examples to satisfy these general statements:

- the sum of three even numbers is even;
- the sum of three odd numbers is odd;
- the difference between one odd and one even number is odd;
- the difference between two odd or two even numbers is even.

Use, read and write, spelling correctly:  
*multiple, digit, divisible, divisibility, factor...*

Recognise multiples in the 6, 7, 8, 9 times-tables, and in the 11 times-table to 99.

Respond to questions such as:

- Ring the numbers in the box that are divisible by 7 (or have a factor of 7).

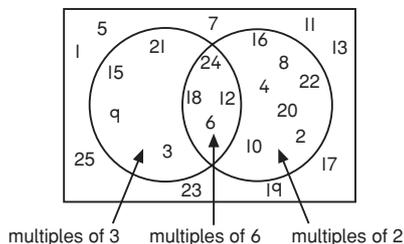
3	18	21	27	36	42	56
---	----	----	----	----	----	----

- A line of counters is set out in a pattern: two white, four blue, two white, four blue...  
What colour is the 49th counter?  
What position in the line is the 11th blue counter?



- Use a number grid computer program to highlight and explore multiples on different sizes of grid. Describe and explain the patterns produced.

Recognise multiples of more than one number: for example, multiples of both 2 and 3.



Recognise that a whole number is divisible by:

- 100 if the last two digits are 00;
- 10 if the last digit is 0;
- 2 if its last digit is 0, 2, 4, 6 or 8;
- 4 if the last two digits are divisible by 4;
- 5 if the last digit is 0 or 5.

Use this knowledge to work out, for example, that the year 2004 is a leap year because 2004 is divisible by 4.

**As outcomes, Year 6 pupils should, for example:**

Make general statements about odd or even numbers and/or give examples that match them.

For example, explore and give some examples to satisfy these general statements:

- the product of two even numbers is even;
- the product of two odd numbers is odd;
- the product of one odd and one even number is even;
- an odd number can be written as twice a number plus one (an example is 21, which is  $2 \times 10 + 1$ ).

Use, read and write, spelling correctly:  
*multiple, digit, divisible, divisibility, factor...*

Recognise multiples to at least  $10 \times 10$ .

Respond to questions such as:

- Ring the numbers in the box that are divisible by 12 (or have a factor of 12).

24	38	42	60	70	84	96
----	----	----	----	----	----	----

- A line of counters is set out in a pattern: five white, four blue, five white, four blue...  
What colour is the 65th counter?  
What position in the line is the 17th blue counter?



- Ring the numbers that are divisible by 7.

210	180	497
-----	-----	-----

Find the smallest number that is a common multiple of two numbers such as:

- 8 and 12
- 12 and 16
- 6 and 15

Recognise that a whole number is divisible by:

- 3 if the sum of its digits is divisible by 3;
- 6 if it is even and is also divisible by 3;
- 8 if half of it is divisible by 4, or if the last three digits are divisible by 8;
- 9 if the sum of its digits is divisible by 9;
- 25 if the last two digits are 00, 25, 50 or 75.

See also tests of divisibility (page 73).

## NUMBERS AND THE NUMBER SYSTEM

Pupils should be taught to:

As outcomes, Year 4 pupils should, for example:

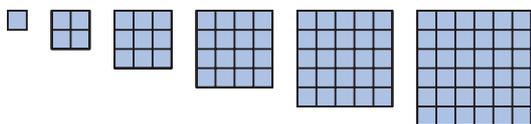
Recognise square numbers

Recognise prime numbers and identify factors

As outcomes, Year 5 pupils should, for example:

Use, read and write, spelling correctly:  
*square number...*  
 Begin to recognise:  $6^2$  as *six squared*.

Recognise 1, 4, 9, 16, 25, 36, 49, 64, 81, 100 as square numbers. Relate to drawings of squares.



Respond to questions such as:

- What is 4 squared?
- What is the square of 6?
- What is  $8^2$ ?
- Which number multiplied by itself gives 36?
- What is the area of a square whose side is 6 cm in length?

Use, read and write, spelling correctly:  
*factor, divisible by...*

Find all the pairs of factors of any number to 100.  
 For example, the pairs of factors of 36 are:  
 1 and 36, 2 and 18, 3 and 12, 4 and 9, 6 and 6.

Use factors, when appropriate, for finding products mentally: for example,  
 $16 \times 12 = 16 \times 3 \times 2 \times 2 = 48 \times 2 \times 2 = 96 \times 2 = 192$

As outcomes, Year 6 pupils should, for example:

Use, read and write, spelling correctly:  
*square number...*  
 Recognise:  $6^2$  as *six squared*.

Recognise squares up to  $12 \times 12$ , and calculate the values of larger squares: for example,  $15^2$ ,  $21^2$ .

Identify two-digit numbers which are the sum of two squares: for example,  $34 = 3^2 + 5^2$ .

Use a calculator to respond to questions such as:

- Find which number, when multiplied by itself, gives 2809.
- Find two consecutive numbers with a product of 9506.
- The area of a square is  $256 \text{ cm}^2$ . What is the length of its side?

Use, read and write, spelling correctly:  
*factor, divisible by, prime, prime factor... factorise...*

Find all the prime factors of any number to 100.  
 For example, the prime factors of 60 are 2, 2, 3 and 5,  
 since  $60 = 2 \times 30 = 2 \times 2 \times 15 = 2 \times 2 \times 3 \times 5$ .

Recognise, for example, that since 60 is a multiple of 12, it is also a multiple of all the factors of 12.

Use factors, when appropriate, for finding products mentally: for example,  
 $32 \times 24 = 32 \times 3 \times 8 = 96 \times 8 = 800 - (4 \times 8) = 768$

Identify numbers with an odd number of factors (squares).

Identify two-digit numbers with only two factors (primes). For example:

- Which of these are prime numbers?  
 11 21 31 41 51 61

Recognise prime numbers to at least 20.

Use a computer program to identify or define a number chosen by the computer, using knowledge of number properties such as being greater or less than a given number, being odd, even, prime, square, a multiple of..., a factor of...

## NUMBERS AND THE NUMBER SYSTEM

### Pupils should be taught to:

Use fraction notation and recognise the equivalence between fractions

### As outcomes, Year 4 pupils should, for example:

Use, read and write:

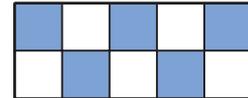
*fraction...*

*half, quarter, eighth... third, sixth...*

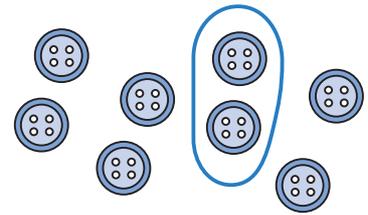
*fifth, tenth, twentieth...*

Use fraction notation: for example, read and write  $\frac{1}{10}$  as one tenth,  $\frac{3}{10}$  as three tenths.

Recognise that five tenths ( $\frac{5}{10}$ ) or one half ( $\frac{1}{2}$ ) is shaded.



Recognise that two eighths ( $\frac{2}{8}$ ) or one quarter ( $\frac{1}{4}$ ) of the set of buttons is ringed.



Recognise that one whole is equivalent to two halves, three thirds, four quarters... For example, build a fraction 'wall' using a computer program and then estimate parts.

Begin to know the equivalence between:

- halves, quarters and eighths: for example,  
 $\frac{2}{8}$  equals  $\frac{1}{4}$ ,  
 $\frac{4}{8}$  equals  $\frac{2}{4}$  or  $\frac{1}{2}$ ,  
 $\frac{6}{8}$  equals  $\frac{3}{4}$ ;
- tenths and fifths: for example,  
 $\frac{2}{10}$  equals  $\frac{1}{5}$ ;
- thirds and sixths: for example,  
 $\frac{2}{6}$  equals  $\frac{1}{3}$ ,  
 $\frac{4}{6}$  equals  $\frac{2}{3}$ .

### Order familiar fractions

Recognise from practical work, for example:

- that one half is more than one quarter and less than three quarters;
- which of these fractions are greater than one half:

$\frac{3}{4}$ ,  $\frac{1}{3}$ ,  $\frac{5}{8}$ ,  $\frac{1}{8}$ ,  $\frac{2}{3}$ ,  $\frac{3}{10}$ ...

**As outcomes, Year 5 pupils should, for example:**

Use, read and write, spelling correctly:  
*fraction, proper/improper fraction, mixed number...  
 numerator, denominator...  
 half, quarter, eighth; third, sixth, ninth, twelfth;  
 fifth, tenth, twentieth, hundredth...  
 equivalent, reduced to, cancel...*

Convert improper fractions to mixed numbers, and vice versa: for example, change  $\frac{37}{10}$  to  $3\frac{7}{10}$ .

Recognise from practical work simple relationships between fractions. For example:

- one quarter is half of one half;
- one eighth is half of one quarter;
- one sixth is half of one third;
- one tenth is half of one fifth;
- one twentieth is half of one tenth.

Recognise patterns in equivalent fractions, such as:

$$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10} = \frac{6}{12} = \frac{7}{14} \dots$$

$$\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12} = \frac{5}{15} = \frac{6}{18} = \frac{7}{21} \dots$$

and similar patterns for  $\frac{1}{4}$ ,  $\frac{1}{5}$  and  $\frac{1}{10}$ .

Start to recognise that:

- $\frac{10}{100}$  is equivalent to  $\frac{1}{10}$ ;
- $\frac{20}{100}$  is equivalent to  $\frac{2}{10}$ ;
- $\frac{50}{100}$  is equivalent to  $\frac{5}{10}$  or  $\frac{1}{2}$ ;
- $\frac{25}{100}$  is equivalent to  $\frac{1}{4}$ ;
- $\frac{75}{100}$  is equivalent to  $\frac{3}{4}$ .

Recognise from practical work that, for example:

- one quarter is more than one eighth;
- one third is more than one ninth;
- two thirds is less than three quarters.

Make a line to 6 showing wholes, thirds, sixths and twelfths.

Answer questions such as:

- Which of these fractions are less than one half?  
 $\frac{1}{10}$ ,  $\frac{1}{20}$ ,  $\frac{2}{5}$ ,  $\frac{7}{10}$ ,  $\frac{11}{20}$ ,  $\frac{69}{100}$ ...
- Mark each of these fractions on a line from 0 to 1 with 20 marked divisions:  
 $\frac{3}{10}$ ,  $\frac{3}{4}$ ,  $\frac{2}{5}$ ,  $\frac{1}{2}$ ,  $\frac{7}{10}$ ,  $\frac{4}{5}$ ,  $\frac{13}{20}$ .  
 Which is the smallest? Which is the largest?
- Place these in order, smallest first:  
 $\frac{1}{2}$ ,  $1\frac{1}{2}$ , 2,  $\frac{1}{4}$ ,  $1\frac{3}{4}$ .

**As outcomes, Year 6 pupils should, for example:**

Use, read and write, spelling correctly, the vocabulary from the previous year, and extend to:  
*thousandth...*

Continue to convert improper fractions to mixed numbers, and vice versa: for example,  $\frac{49}{8}$  to  $6\frac{1}{8}$ .

Recognise from practical work simple relationships between fractions. For example:

- one half is twice as much as one quarter, and three times as much as one sixth;
- one quarter is twice as much as one eighth;
- one tenth is ten times as much as one hundredth.

Recognise that:

- a fraction such as  $\frac{5}{20}$  can be reduced to an equivalent fraction  $\frac{1}{4}$  by dividing both numerator and denominator by the same number (cancel);
- a fraction such as  $\frac{3}{10}$  can be changed to an equivalent fraction  $\frac{30}{100}$  by multiplying both numerator and denominator by the same number.

Recognise equivalent fractions, such as:

$$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10} = \frac{6}{12} = \frac{7}{14} = \frac{8}{16} = \frac{9}{18} = \frac{10}{20} \dots$$

$$\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12} = \frac{5}{15} = \frac{6}{18} = \frac{7}{21} = \frac{8}{24} = \frac{9}{27} = \frac{10}{30} \dots$$

and similar patterns for other unit fractions, relating them to ratios: 1 in every 7, 2 in every 14, and so on.

Answer questions such as:

- Write four more fractions equivalent to:  
 $\frac{4}{5}$ ...                       $\frac{11}{10}$ ...
- Copy and complete:  
 $\frac{\square}{10} = \frac{20}{100}$                        $\frac{6}{21} = \frac{2}{\square}$

Compare or order simple fractions by converting them to a common denominator. For example:

- Suggest a fraction that is greater than one quarter and less than one third.

Answer questions such as:

- Mark each of these fractions on a line from 0 to 1 with 30 marked divisions:  
 $\frac{3}{10}$ ,  $\frac{1}{3}$ ,  $\frac{2}{5}$ ,  $\frac{1}{2}$ ,  $\frac{2}{3}$ ,  $\frac{7}{10}$ ,  $\frac{4}{5}$ ,  $\frac{5}{6}$ .  
 Which is the smallest? Which is the largest?
- Place these in order, smallest first:  
 $2\frac{1}{10}$ ,  $1\frac{3}{10}$ ,  $2\frac{1}{2}$ ,  $1\frac{1}{5}$ ,  $1\frac{3}{4}$ .
- What number is half way between:  
 $5\frac{1}{4}$  and  $5\frac{1}{2}$ ;     $5\frac{1}{3}$  and  $5\frac{2}{3}$ ...?

## NUMBERS AND THE NUMBER SYSTEM

Pupils should be taught to:

Find fractions of numbers or quantities

As outcomes, Year 4 pupils should, for example:

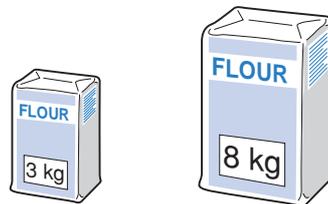
Begin to relate fractions to division. For example:

- understand that finding one half is equivalent to dividing by 2, so that  $\frac{1}{2}$  of 16 is equivalent to  $16 \div 2$ ;
- recognise that when 1 whole cake is divided equally into 4, each person gets one quarter, or  $1 \div 4 = \frac{1}{4}$ .

Find fractions of numbers and quantities.

For example, answer questions such as:

- What is one tenth of: 100, 30, 500...?  
What is one fifth of: 15, 10, 35...?
- What is  $\frac{1}{4}$  of: 8, 16, 40...?  
What is  $\frac{1}{10}$  of: 50, 10, 80...?
- What is one tenth, one quarter, one fifth... of £1?  
Of 1 metre?
- What fraction of £1 is 10p?  
What fraction of 1 metre is 25 cm?
- What fraction of the larger bag of flour is the smaller bag?



- What fraction of the larger shape is the smaller shape?



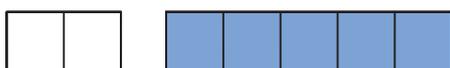
**As outcomes, Year 5 pupils should, for example:**

- Relate fractions to division. For example:
- understand that finding one third is equivalent to dividing by 3, so  $\frac{1}{3}$  of 15 is equivalent to  $15 \div 3$ ;
  - when 3 whole cakes are divided equally into 4, each person gets three quarters, or  $3 \div 4 = \frac{3}{4}$ ;
  - recognise that  $1\frac{2}{3}$  is another way of writing  $12 \div 3$ .

See also remainders (page 57).

Find fractions of numbers and quantities.  
For example, answer questions such as:

- What is one tenth of: 80, 240, 1000...?  
What is one hundredth of: 100, 800, 1000...?
- What is  $\frac{3}{10}$  of: 50, 20, 100...?  
What is  $\frac{3}{4}$  of: 16, 40, 100...?
- Write  $\frac{23}{100}$  of £1 in pence.  
Write  $\frac{7}{10}$  of 1 metre in centimetres.
- What fraction of £1 is 33p? 30p?  
What fraction of 1 metre is 27 cm? 20 cm?
- What fraction of 1 km is 250 m? 200 m?  
What fraction of 1 kg is 500 g? 300 g?  
What fraction of 1 litre is 750 ml? 700 ml?  
What fraction of 1 day is 1 hour, 8 hours, 12 hours?
- I work for 8 hours and sleep for 10 hours.  
What fraction of the day do I work?  
What fraction of the day do I sleep?
- What fraction of the smaller shape is the larger?



**As outcomes, Year 6 pupils should, for example:**

- Relate fractions to division. For example:
- understand that finding one tenth is equivalent to dividing by 10, so  $\frac{1}{10}$  of 95 is equivalent to  $95 \div 10$ ;
  - when 9 whole cakes are divided equally into 4, each person gets nine quarters, or  $9 \div 4 = 2\frac{1}{4}$ ;
  - recognise that  $60 \div 8$  is another way of writing  $\frac{60}{8}$ , which is the same as  $7\frac{4}{8}$ .

Answer questions such as:

- How many halves in:  $1\frac{1}{2}$ ,  $3\frac{1}{2}$ ,  $9\frac{1}{2}$ ...?
- How many quarters in:  $1\frac{1}{4}$ ,  $2\frac{3}{4}$ ,  $5\frac{1}{2}$ ...?
- How many thirds in:  $1\frac{1}{3}$ ,  $3\frac{2}{3}$ ,  $7\frac{1}{3}$ ...?

See also remainders (page 57).

Find fractions of numbers and quantities.  
For example, answer questions such as:

- What is three tenths of: 80, 10, 100...?  
What is seven tenths of: 50, 20, 200...?  
What is nine hundredths of: 100, 400, 1000...?
- What is  $\frac{4}{5}$  of: 50, 35, 100...? 2 litres, 5 metres...?  
What is  $\frac{5}{6}$  of: 12, 48, 300...? 12 km, 30 kg?
- Write  $\frac{3}{10}$  of 2 metres in centimetres.  
Write  $\frac{23}{100}$  of 4 kilograms in grams.  
Write  $\frac{7}{1000}$  of 1 metre in millimetres.
- What fraction of £1 is 35p? 170p?  
What fraction of 1 metre is 140 cm?
- What fraction of 1 km is 253 m?  
What fraction of 1 kg is 397 g?  
What fraction of 1 litre is 413 ml?
- What fraction of one year is:  
one week; one day; June?

Relate fractions to simple proportions.

See ratio and proportion (page 27).

## NUMBERS AND THE NUMBER SYSTEM

### Pupils should be taught to:

Solve simple problems involving ratio and proportion

### As outcomes, Year 4 pupils should, for example:

Use, read and write:  
*in every, for every...*

For example, discuss statements such as:

- In every week I spend 5 days at school.  
So in every 2 weeks I spend 10 days at school,  
and in every 3 weeks I spend 15 days at school.
- For every 2 bags of crisps you buy you get 1 sticker.  
For every 6 bags of crisps you get 3 stickers.  
To get 3 stickers you must buy 6 bags of crisps.
- 1 in every 3 squares is black in this pattern.  
In every 6 squares 2 of them are black.



Make a tile pattern where 1 in every 5 tiles is black.

See also problems involving 'real life' (page 82),  
money (page 84) and measures (page 86).

**As outcomes, Year 5 pupils should, for example:**

Use, read and write, spelling correctly, vocabulary to express simple ratios and proportions:  
*for every... to every... in every... as many as...*

Discuss statements such as:

- John has 1 stamp for every 2 that Mark has.

This means that:

John has half as many stamps as Mark.  
 Mark has twice as many stamps as John.  
 John has one third of the total number of stamps and Mark has two thirds.  
 If John has 4 stamps, Mark has 8 stamps.  
 If Mark has 20 stamps, John has 10 stamps.

Solve simple problems involving 'in every' or 'for every'. For example:

- Chicken must be cooked 50 minutes for every kg. How long does it take to cook a 3 kg chicken?
- At the gym club there are 2 boys for every 3 girls. There are 15 girls at the club. How many boys are there?  
 There are 12 boys at the club. How many girls are there?
- Zara uses 3 tomatoes for every  $\frac{1}{2}$  litre of sauce. How much sauce can she make from 15 tomatoes?  
 How many tomatoes does she need for 1 litre of sauce?
- A mother seal is fed 5 fish for every 2 fish for its baby.  
 Alice fed the mother seal 15 fish. How many fish did its baby get?  
 Alice fed the baby seal 8 fish. How many fish did its mother get?
- For every 50p coin Mum gives to Dad, he gives her five 10p coins.  
 Dad gave Mum twenty-five 10p coins. How many 50p coins did Mum give him?

See also problems involving 'real life' (page 83), money (page 85) and measures (page 87).

**As outcomes, Year 6 pupils should, for example:**

Appreciate that 'two to every three' compares part to part; it is equivalent to 'two in every five', which compares a part to the whole.

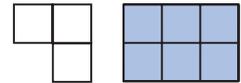
For example:

- Here is a tile pattern.



How many black tiles to white tiles? (1 to every 2)  
 What is the proportion of black tiles in the whole line? ( $\frac{1}{3}$ )

- Compare shapes using statements such as:



there is one small square in the small shape for every two small squares in the larger shape;  
 the larger shape is twice the size of the smaller shape;  
 the smaller shape is half the size of the larger shape.

Respond to questions such as:

How many white to shaded squares? (1 to every 2)  
 What proportion (fraction) of the total number of squares is shaded? ( $\frac{6}{9}$  or  $\frac{2}{3}$ )  
 What fraction of the big shape is the small one? ( $\frac{1}{2}$ )

Solve simple ratio and proportion problems in context. For example:

- Kate shares out 12 sweets. She gives Jim 1 sweet for every 3 sweets she takes. How many sweets does Jim get?
- At the gym club there are 2 boys for every 3 girls. There are 30 children at the club. How many boys are there?
- Dee mixes 1 tin of red paint with 2 tins of white. She needs 9 tins of paint altogether. How many tins of red paint does she need?
- There are 5 toffees to every 2 chocolates in a box of 28 sweets. How many chocolates are there in the box?

See also problems involving 'real life' (page 83), money (page 85) and measures (page 87).

## NUMBERS AND THE NUMBER SYSTEM

### Pupils should be taught to:

Use decimal notation, know what each digit in a decimal fraction represents and order a set of decimal fractions

### As outcomes, Year 4 pupils should, for example:

Use, read and write:

*decimal fraction, decimal, decimal point, decimal place...*

Respond to questions such as:

- What does the digit 6 in 3.6 represent? And the 3?
- What is the figure 4 worth in the number 17.4? And the 7?

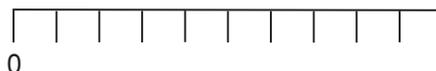
- Write the decimal fraction equivalent to:  
four tenths;      fifty-seven and nine tenths.

- Round to the nearest pound:  
£4.58                      £19.27

- In one step (operation), change:  
4.7 to 4.9...              6.9 to 6.1...

- Count from zero in steps of one tenth.
- Start at 5.1 and count on or back in steps of 0.1.

- Count along this line and back again.



- Place these decimals on a line from 0 to 2:  
0.3, 0.1, 0.9, 0.5, 1.2, 1.9.



- Which is lighter: 3.5 kg or 5.5 kg?      3.72 kg or 3.27 kg?  
Which is less:      £4.50 or £4.05?

- Put in order, largest/smallest first:  
6.2, 5.7, 4.5, 7.6, 5.2;  
99p, £9, 90p, £1.99;  
1.2 m, 2.1 m, 1.5 m, 2.5 m.

Convert pounds to pence, and vice versa. For example:

- Write 578p in £.
- How many pence is £5.98, £5.60, £7.06, £4.00?
- Write in £ the total of ten £1 coins and seven 1p coins. (£10.07)

Write centimetres in metres. For example, write:

125 cm in metres              (1.25 metres).

In the context of word problems, work out calculations involving mixed units of pounds and pence, or metres and centimetres, such as:

£3.86 ± 46p

4 metres ± 65 cm

For example: I cut 65 cm off 4 metres of rope. How much is left?

See also **multiplying and dividing by 10 or 100 (page 6)**.

**As outcomes, Year 5 pupils should, for example:**

Use, read and write, spelling correctly:  
*decimal fraction, decimal, decimal point, decimal place...*

Respond to questions such as:

- What does the digit 6 in 3.64 represent? The 4?
- What is the 4 worth in the number 7.45? The 5?
  
- Write the decimal fraction equivalent to:  
 two tenths and five hundredths;  
 twenty-nine hundredths;  
 fifteen and nine hundredths.
  
- Using a calculator, in one step (operation), change:  
 7.82 to 7.86...      15.35 to 15.75...  
 5.3 to 53...      89 to 8.9...
- Continue the pattern: 1.2, 1.4, 1.6, 1.8...
- Put these in order, largest/smallest first:  
 5.51, 3.75, 7.35, 5.73, 3.77;  
 1.21 m, 2.25 m, 1.25 m, 1.52 m.
- Place these decimals on a line from 6.9 to 7.1:  
 6.93, 6.91, 6.99, 7.01, 7.06.
- Suggest a decimal fraction between 4.1 and 4.2.
  
- Use a computer program to zoom in and out of a number line, and position and order decimals.

Begin to convert halves of a metric unit to a smaller unit, and vice versa. For example, write:

7.5 m in centimetres      (750 centimetres);  
 8.5 cm in millimetres      (85 millimetres);  
 3.5 kg in grams      (3500 grams).

In the context of word problems, work out calculations involving mixed units such as:

3 kilograms  $\pm$  150 grams  
 6.5 metres  $\pm$  40 centimetres

**See also multiplying and dividing by 10, 100 or 1000 (page 7).**

**As outcomes, Year 6 pupils should, for example:**

Use, read and write, spelling correctly:  
*decimal fraction, decimal, decimal point, decimal place...*

Respond to questions such as:

- What does the digit 5 in 3.645 represent? And the 4? And the 6?
  
- Write the decimal fraction equivalent to:  
 two tenths, five hundredths and nine thousandths;  
 eight and seven thousandths;  
 sixteen and twenty-nine thousandths.
  
- Using a calculator, in one step (operation), change:  
 4.7 to 470...      530 to 5.3...  
 0.3 to 0.03...      7 to 0.07...      60 to 0.6...
- Continue the pattern: 1.92, 1.94, 1.96, 1.98...
- Put these in order, largest/smallest first:  
 5.25, 15.3, 5.78, 5.87, 5.2;  
 1.5, 1.375, 1.4, 1.3, 1.35, 1.425;  
 7.765, 7.675, 6.765, 7.756, 6.776;  
 and other sets involving measures.
- Suggest a decimal fraction between 4.17 and 4.18.
  
- Use a computer program to zoom in and out of a number line, and position and order decimals.

Convert a larger metric unit to a smaller.

For example, write:

3.125 km in metres      (3125 metres);  
 1.25 litres in millilitres      (1250 millilitres).

Begin to convert halves, quarters, tenths, hundredths to a larger unit. For example, write:

750 grams in kilograms      (0.75 kilograms);  
 300 millilitres in litres      (0.3 litres);  
 3 centimetres in metres      (0.03 metres).

In the context of word problems, work out calculations involving mixed units such as:

1.3 litres  $\pm$  300 millilitres  
 3565 grams  $\pm$  2.5 kilograms...

**See also multiplying and dividing by 10, 100 or 1000 (page 7).**

## NUMBERS AND THE NUMBER SYSTEM

### Pupils should be taught to:

Round decimal fractions to the nearest whole number or the nearest tenth

Recognise the equivalence between decimals and fractions

### As outcomes, Year 4 pupils should, for example:

Know that, for example:

0.5 is equivalent to  $\frac{1}{2}$ ;

0.25 is equivalent to  $\frac{1}{4}$ ;

0.75 is equivalent to  $\frac{3}{4}$ ;

0.1 is equivalent to  $\frac{1}{10}$ ;

particularly in the context of money and measurement.

**As outcomes, Year 5 pupils should, for example:**

Round decimals with one decimal place to the nearest whole number. For example:

- Round these to the nearest whole number:  
9.7      25.6      148.3
- Round these lengths to the nearest metre:  
1.5 m    6.7 m    4.1 m    8.9 m
- Round these costs to the nearest £:  
£4.27    £12.60    £14.05    £6.50

See also rounding up or down after division (page 57).

Recognise that, for example:

0.07 is equivalent to  $\frac{7}{100}$ ;  
6.35 is equivalent to  $6\frac{35}{100}$ ;

particularly in the context of money and measurement.

Respond to questions such as:

- Which of these decimals is equal to  $\frac{19}{100}$ ?  
1.9      10.19      0.19      19.1
- Write each of these as a decimal fraction:  
 $\frac{27}{100}$        $\frac{3}{100}$        $2\frac{33}{100}$

Enter fractions into a calculator and interpret the display to find the equivalent decimal. Predict the result before confirming.

For example:

$\frac{1}{2}$	one half	0.5
$\frac{1}{4}$	one quarter	0.25
$\frac{3}{4}$	three quarters	0.75
$\frac{1}{10}$	one tenth	0.1
$\frac{1}{5}$	one fifth or two tenths	0.2
$\frac{1}{100}$	one hundredth	0.01
$\frac{75}{100}$	75 hundredths or three quarters	0.75
$\frac{3}{100}$	three hundredths	0.03
$\frac{50}{100}$	fifty hundredths or one half	0.5

Appreciate that a number like 3.6 in a calculator display means £3.60 in the context of money, and that 67p is entered as 0.67 since it is  $\frac{67}{100}$  of £1.

**As outcomes, Year 6 pupils should, for example:**

Round decimals with one or two decimal places to the nearest whole number. For example:

- Round these to the nearest whole number:  
19.7      25.68      148.39

Round decimals with two or more decimal places to the nearest tenth. For example:

- What is 5.28 to the nearest tenth?
- What is 3.82 to one decimal place?

See also rounding up or down after division (page 57).

Recognise that, for example:

0.007 is equivalent to  $\frac{7}{1000}$ ;  
6.305 is equivalent to  $6\frac{305}{1000}$ ;

particularly in the context of measurement.

Respond to questions such as:

- Which of these decimals is equal to  $\frac{193}{100}$ ?  
1.93      10.193      0.193      19.13
- Write each of these decimals as a fraction:  
0.27      2.1      7.03      0.08

Continue to enter fractions into a calculator and interpret the display to find the equivalent decimal. Predict the result before confirming.

For example:

$\frac{1}{1000}$	one thousandth	0.001
$\frac{1}{8}$	one eighth	0.125
$\frac{1}{3}$	one third	0.3333333
$\frac{2}{3}$	two thirds	0.6666666

Use a calculator to compare fractions. For example:

- Which of these two fractions is less?  
 $\frac{7}{8}$  or  $\frac{4}{5}$        $\frac{3}{4}$  or  $\frac{11}{14}$
- Place these fractions in order:  
 $\frac{7}{20}$ ,  $\frac{6}{15}$ ,  $\frac{13}{40}$ ,  $\frac{8}{25}$

## NUMBERS AND THE NUMBER SYSTEM

### Pupils should be taught to:

Understand percentage as the number of parts in every 100, recognise the equivalence between percentages and fractions and decimals, and find simple percentages of numbers or quantities

### As outcomes, Year 4 pupils should, for example:

**As outcomes, Year 5 pupils should, for example:**

Understand, read and write, spelling correctly: *percentage, per cent, %...*

Recognise the % sign on clothes labels, in sales, on food packets...

Recognise what percentage of 100 Multilink cubes are red, yellow, blue, green...

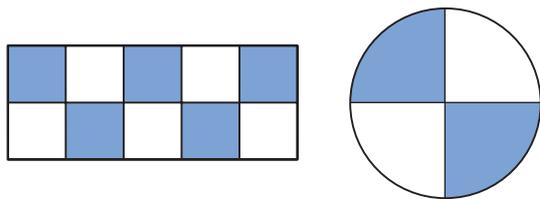
Know that:

one whole = 100%      one quarter = 25%  
 one half = 50%      one tenth = 10%

Know that:

10% = 0.1 =  $\frac{1}{10}$       25% = 0.25 =  $\frac{1}{4}$   
 20% = 0.2 =  $\frac{1}{5}$       50% = 0.5 =  $\frac{1}{2}$   
 1% = 0.01 =  $\frac{1}{100}$       75% = 0.75 =  $\frac{3}{4}$

Identify a percentage of a shape: for example, what percentage of each shape is shaded?



**Without a calculator answer questions such as:**

- Find:  
 25% of £100      30% of £1      70% of 100 cm  
 10% of £40      10% of 5 kg      10% of 3 metres
- 35% of the children in a class are boys. What percentage are girls?
- 70% of the children in a school stay for lunch. What percentage do not stay?
- Richard got 40 marks out of 80 in his maths test. Sarah got 45%. Who did better: Richard or Sarah?

Find percentages by using halving and quartering. For example, to find 75% of £300:

50% is one half = £150  
 25% is one quarter = £75  
 75% is three quarters = £225

**As outcomes, Year 6 pupils should, for example:**

Understand, read and write: *percentage, per cent, %, discount, profit, loss... proportion...*

Identify the proportion of wool, cotton, polyester... in clothes by examining labels.

Work out, for example, what proportion of the pupils in the class are girls, aged 11, have brown eyes...

Know that, for example:

- 43% = 0.43 =  $\frac{43}{100}$
- 33% and 67% are roughly one third and two thirds.

Answer questions such as:

- Which of these percentages is equivalent to 0.26?  
 0.26%      2.6%      26%      260%
- Ring each number that is more than one half:  
 $\frac{3}{4}$       37%       $\frac{3}{8}$       0.34       $\frac{3}{6}$       70%      0.55
- Calculate as percentages, rounding up or down:  
 6 out of 9      14 out of 70      8 out of 40

**Without a calculator answer questions such as:**

- Find:  
 25% of £300      30% of £5      70% of 300 cm  
 60% of £40      70% of 5 kg      40% of 3 metres
- A school party of 50 is at the Tower of London. 52% are girls. 10% are adults. How many are boys?
- A football team played 15 games. They won 60%. How many games did they lose?
- Amy scored 60 out of 80. Kim scored 148 out of 200. Who did better: Amy or Kim?
- A coat costs £35. It has a 10% discount in a sale. What is its sale price?
- 10 red sweets are 25% of the total in a jar. How many sweets altogether are in the jar?

Find percentages by using halving and quartering. For example, to find 12.5% of £36 000:

50% = £18 000  
 25% = £9 000  
 12.5% = £4 500

**With a calculator answer questions such as:**

- Find 20% of £362.      Find 75% of 850.
- Calculate as percentages, rounding up or down to the nearest whole number:  
 27 out of 42      36 out of 70