| Pupils should be taught to:	As outcomes, Year 7 pupils should, for example:
Round numbers, including to a given number of decimal places	Use, read and write, spelling correctly: round, nearest, to one decimal place (1 d.p.)… approximately…

Round positive whole numbers to the nearest 10, 100 or 1000, in mathematics and subjects such as science, design and technology, geography… For example:

• What is the volume of the liquid in the measuring cylinder to the nearest 10 ml?
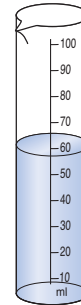
• What is the mass of the flour to the nearest 100 g? Estimate the mass of the flour to the nearest 10g.
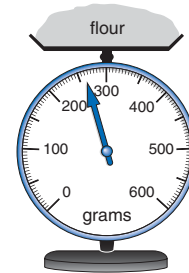
• How long is the rope to:
  a. the nearest 10 cm?   c. the nearest cm?
  b. the nearest 100cm?   d. the nearest mm?

• How many people visited the Dome to the nearest 100? Was the headline correct?

The Daily Record   10 Feb

Nearly 20 thousand people visit Dome

15,437 people visited the Dome yesterday.

In other subjects, round whole numbers to the nearest 10, 100 or 1000 in order to classify them or put them in order. For example:

• In geography, round and then place in order: populations of towns, heights of mountains, weather data…

• In science, round and then place in order: the proportion of lead in the air at different places, the diameters of the planets…

• In design and technology, round and then place in order: the grams of fat in different foods…

As outcomes, Year 8 pupils should, for example:

Use vocabulary from previous year and extend to:
recurring decimal…

Round positive whole numbers to a given power of 10, in mathematics and in other subjects.
For example:

- This chart shows the estimated population of six countries. Write in figures the approximate population of each country.
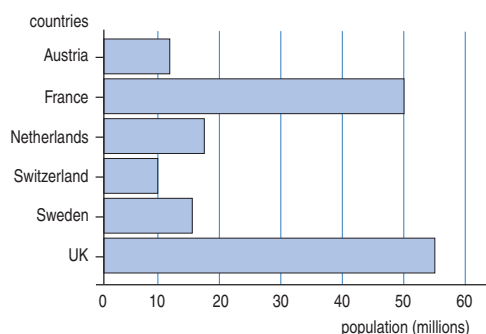
- On the chart above, Sweden is recorded as having an estimated population of 15 million. What is the highest/lowest population that it could actually have?

- There are 1 264 317 people out of work.
  Politician A says: 'We have just over 1 million people out of work.'
  Politician B says: 'We have nearly one and a half million people out of work.'
  Who is more accurate, and why?

As outcomes, Year 9 pupils should, for example:

Use vocabulary from previous years and extend to:
significant figures, upper and lower bounds…
Read and write the 'approximately equal to' sign ($\approx$).

Use rounding to make estimates.

For example:

- The population of the world is about 5300 million.

  The approximate populations of the four largest cities are:

Mexico City	21.5 million
Sao Paulo	19.9 million
Tokyo	19.5 million
New York	15.7 million

  The tenth largest city is Rio de Janeiro with a population of 11.9 million.

  Estimate the percentage of the world's population which lives in the ten largest cities.

- A heavy metal in water kills fish when it reaches levels of more than 4 parts per million.
  A lake contains 4.7 megalitres of water.
  How much heavy metal can be in the water for the fish to be safe, if 1 litre of the heavy metal has a mass of 2.4 kg?

Pupils should be taught to:	As outcomes, Year 7 pupils should, for example:

Round numbers, including to a given number of decimal places (continued)

Round positive whole numbers and decimals.

Know that if a measurement is half way between two numbers it is normally rounded up to the next number. Recognise that in some practical situations, such as a division problem, this may not be appropriate. For example:

- 124 children want to go on a school trip. If each coach holds 49 people, how many coaches are needed?
- I have 52 drawing pins. If each poster for my bedroom needs 6 pins, how many posters can I put up?
- A pupil in technology needs to cut a 1 metre length of wood into three pieces. How long should each piece be?

Link to understanding division (pages 82–5).

Round decimals to the nearest whole number or to one decimal place.

When rounding a decimal to a whole number, know that:
- if there are 5 or more tenths, then the number is rounded up to the next whole number; otherwise, the whole number is left unchanged;
- decimals with more than one decimal place are not first rounded to one decimal place, e.g. 7.48 rounds to 7, not to 7.5 which then rounds to 8.

When rounding a decimal such as 3.96 to one decimal place, know that the answer is 4.0, not 4, because the zero in the first decimal place is significant.

For example:
- 4.48 rounded to the nearest whole number is 4.
- 4.58 rounded to the nearest whole number is 5, and rounded to one decimal place is 4.6.
- 4.97 rounded to the nearest whole number is 5.
- 4.97 rounded to one decimal place is 5.0.

Answer questions such as:

- Round 5.28:
  a. to the nearest whole number;
  b. to one decimal place.

- Here are the winning heights and distances for some women's field events in an international competition.
  Round each height or distance:
  a. to the nearest whole number;
  b. to one decimal place.

Women's events	
High jump	2.09 metres
Long jump	7.48 metres
Shot-put	21.95 metres
Discus throw	76.80 metres
Javelin throw	80.00 metres

See Y456 examples (pages 12–13, 30–1, 56–7).

As outcomes, Year 8 pupils should, for example:	As outcomes, Year 9 pupils should, for example:

Recognise recurring decimals.
Recurring decimals contain an infinitely repeating block of one or more decimal digits.
For example:

- ⅙ = 0.16666…   is written as 0.1̇6̇

- ²⁄₁₁ = 0.181818… is written as 0.1̇8̇

Fractions with denominators containing prime factors other than 2 or 5 will recur if written in decimal form.

Round decimals to the nearest whole number or to one or two decimal places.

For example, know that:
- 3.7452 rounded to the nearest whole number is 4, to one decimal place is 3.7, and to two decimal places is 3.75.
- 2.199 rounded to the nearest whole number is 2, to one decimal place is 2.2, and to two decimal places is 2.20.
- 6.998 rounded to two decimal places is 7.00.

When substituting numbers into expressions and formulae, know that rounding should not be done until the final answer has been computed.

Answer questions such as:

- Round 12.3599 to one decimal place

- Use a **calculator** to do these calculations. Write the answers to two decimal places.
  2 ÷ 3   3 ÷ 16   11 ÷ 9   9 ÷ 11   14 ÷ 17

Round decimals in context, selecting an appropriate number of decimal places to use when, for example:

- using decimal measurements for work on perimeter, area and volume;
- collecting measurements to use as data for statistics;
- calculating summary statistics, such as the mean;
- investigating recurring decimals;
- dividing;
- carrying out science experiments;
- measuring in design and technology or geography…

Round decimals to the nearest whole number or to one, two and three decimal places.

For example, know that:
- 3.0599 rounded to the nearest whole number is 3, rounded to 1 d.p. is 3.1, to 2 d.p. is 3.06, and to 3 d.p. is 3.060.
- 9.953 rounded to the nearest whole number is 10, to 1 d.p. is 10.0, and to 2 d.p. is 9.95.
- ²²⁄₇ is an approximation to π and can be given as 3.14 to 2 d.p. or 3.143 correct to 3 d.p.

Know that rounding should not be done until a final result has been computed.

Answer questions such as:

- Use a **calculator** to evaluate ¹⁄₈₅₀ correct to one decimal place.

Round decimals in context. Select an appropriate number of decimal places to use, knowing at which stage to round when, for example:

- approximating π in circle measurements and calculations;
- making measurements in mathematics and other subjects;
- when presenting results of calculations in geometrical and statistical contexts;
- when substituting decimals into expressions and formulae.

Pupils should be taught to:	As outcomes, Year 7 pupils should, for example:
Round numbers, including to a given number of decimal places or significant figures (continued)	

As outcomes, Year 8 pupils should, for example:	As outcomes, Year 9 pupils should, for example:

Understand upper and lower bounds. For example:

- For **discrete data** such as:

> The population p of Sweden to the nearest million is 15 million.

know that the least population could be 14 500 000 and the greatest population could be 15 499 999; understand that this can be written as:

$$14500000 \le p < 15500000$$

- For **continuous data** such as measurements of distance:

> The distance d km from Exeter to Plymouth is 62 km to the nearest km.

know that the shortest possible distance is 61.5 km and the longest possible distance is 62.5 km, which can be written as:

$$61.5 \le d < 62.5$$

Round numbers to a given number of significant figures. Know, for example, that:

- 5.78 is 5.8 to two significant figures (2 s.f.).
- 34.743 is 35 to 2 s.f. and 34.7 to 3 s.f.
- 5646 is 6000 to 1 s.f., 5600 to 2 s.f. and 5650 to 3 s.f.
- 0.004 36 is 0.004 to 1 s.f. and 0.0044 to 2 s.f.

Know when to insert zeros as place holders to indicate the degree of significance of the number. For example, 1.4007 is 1.40 to 3 s.f.

Use numbers to a given number of significant figures to work out an approximate answer. For example:

- The area of a circle with radius 7 cm is approximately 3×50 cm^2.
Compare this answer with the approximations $\frac{22}{7} \times 7 \times 7$ cm^2 and $3.14 \times 7 \times 7$ cm^2,
and with $\pi \times 7 \times 7$ cm^2 calculated using the π key on a calculator.

Give answers to calculations to an appropriate number of significant figures. For example:

- $\frac{65 + 78}{41 \times 56} \approx 0.0623$ to 3 s.f.

- $5.84 + \frac{3.26 + 4.17}{1.2\overline{3}} \approx 12$ to 2 s.f.