N3.1 Rounding decimals

objectives

- Round positive whole numbers to the nearest 10 or 100, and decimals to the nearest whole number or one decimal place.
- Check whether a result is the right order of magnitude.

starter

Vocabulary
estimate
approximately
halfway
multiple
lies between
less than (<)
round up or down

Resources
four cards, each with a four-digit number (e.g. 5236, 3621, 7060, 9874)

Ask the class to count up to 10 000 in thousands: one thousand, two thousand, three thousand, …, ten thousand. Remind them that the numbers they counted are multiples of 1000, numbers that divide exactly by 1000.

Give one of the cards to each of four pupils. Choose two of them to write their numbers on the board (e.g. 5236, 3621) to make a horizontal addition. Read this aloud together.

5236 + 3621

Ask pupils first to estimate the answer. Point to the first number, 5236.

Q Between which multiples of one thousand does this number lie?

Establish that it lies between 5000 and 6000.

Q Which number is exactly halfway between 5000 and 6000? (5500)
Q Is 5236 more or less than 5500? (less)
Q What is 5236 rounded to the nearest 1000? (5000)

Stress that 5236 is rounded *down* to 5000 because it is more than 5000 but less than 5500.

Repeat by rounding 3621 up to 4000.

Establish that 5236 + 3621 is approximately 5000 + 4000 = 9000. Then complete the addition, setting out the two numbers one below the other in columns, to find the total of 8857. Ask:

Q Is 9000 a good estimate of the total of 8857?

Establish that it is, because 8857 rounded to the nearest 1000 is 9000.

Repeat with the other pair of numbers, this time estimating the difference.

Now write each of the four numbers on the board:

5236, 3621, 7060, 9874

Explain how to round 5236 to the nearest 100 by looking at the tens digit. Ask:

Q Which multiples of one hundred does 5236 lie between?

Establish that it lies between 5200 and 5300.

Q Which number is exactly halfway between 5200 and 5300? (5250)
Q Is 5236 more or less than 5250? (less)
Q What is 5236 rounded to the nearest 1000? (5200)

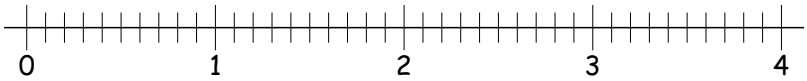
Repeat with the other three numbers.

main activity

Vocabulary
tenths
hundredths

Resources
OHT N3.1a
mini-whiteboards
dice
decimal cards (see Resources N2.8c and N2.8d)

Draw on the board a number line from 0 to 4, marked in tenths, or label the number line on **OHT N3.1a.**



Q How many spaces between nought and one? (ten)

Establish that there are ten equal spaces and that each is one tenth. Count along the line together, starting from nought: nought point one, nought point two, …, three point nine, four. Count back along the line in the same way. Explain that some people might say 'zero' rather than 'nought'.

Write 1.6 on the board. Choose a pupil to come and point to it on the line.

Q Which two whole numbers does it lie between? (1 and 2)
Q Which is the nearest whole number? (2)
Q How far away is 1.6 from 2? (four tenths, zero point four)
Q How far away is 1.6 from 1? (six tenths, zero point six)

Repeat with 2.3, 0.7, 3.1.

Tell the class that there are special arrangements for numbers like 0.5, 1.5, 2.5, 3.5, 4.5, …, which are exactly halfway between two whole numbers. These are always rounded up to the next whole number.

Erase the number line. Write a decimal number such as 26.2 on the board.

Q Does this number round up or round down to the nearest whole number?

Invite a pupil to come to the board, to draw the number line from 26 to 27, and the midpoint of 26.5.

Q Can you use this line to explain to the class how you know that 26.2 rounds down to 26?

Establish that 26.2 is more than 26 but less than 26.5, so it rounds down to 26.

Give out the decimal cards, one per pupil. Choose two pupils to hold up their cards and show the class. The first pupil has to round the second pupil's number to the nearest whole number, then vice versa. Other pupils check. Repeat as many times as possible.

Q Can you tell me a number with tenths and hundredths that lies between 1 and 6?

Establish that a number such as 6.15 would be too big, 0.87 would be too small, and that a number like 4.52 fits the conditions. Write on the board:

$1 < 4.52 < 6$

Play a game of rounding to the nearest whole number. Ask pupils, in pairs, to jot down on their whiteboards a decimal number with tenths and hundredths, lying between 1 and 6. Use a dice to generate a whole number. Any pair whose decimal number rounds to that whole number scores a point. Check pupils' numbers, then repeat. The first pair to score 5 points wins.

Explain that the same principles apply to rounding sums of money and measurements as they do to rounding numbers. Ask:

Q What is five metres forty-three centimetres to the nearest metre?

Q A line is measured as exactly nine millimetres to the nearest millimetre. What is the minimum length that the line could be? (8.5 mm)

Q What is four pounds sixty-one pence to the nearest pound?

Q How many books costing three pounds ninety-nine pence can you buy with twenty pounds?

Work through this problem with the whole class.

The lunches for four friends cost £10.76, £12.32, £8.50 and £11.05.
The friends had only £10 notes in cash.
What should they offer to pay in total for their four meals?

Establish an estimate for the cost of each meal (£11, £12, £9, £11). Encourage pupils to add these numbers up mentally, looking for pairs that are easy to combine, such as £9 and £11. Make sure that pupils recognise that the total of £43 gets rounded up to £50 in the context of the problem.

other tasks

Springboard 7
Unit 10

Unit 10 section 5: Rounding numbers

Unit 10 section 6: Money and 'real life' problems

plenary

Resources
decimal cards as in main activity
mini-whiteboards

Choose two pupils to hold up their decimal cards and show the class. This time ask the class to estimate mentally the sum of the two numbers and to write their estimates on their whiteboards. Choose a pupil to explain how they worked out the estimate. Repeat several times, alternating finding a sum, finding a difference, finding a product.

Remember

- Numbers that end in .5 lie exactly halfway between two whole numbers. It has been agreed that everyone will round up these 'halfway' numbers. For example, 42.5 rounds up to 43.
- It is useful to round decimal numbers to whole numbers in order to work out estimates for calculations with decimals. For example, to estimate 4.8×6.21, round each number to the nearest whole number; the answer is approximately $5 \times 6 = 30$.
- There are exceptions to the 'rules' about rounding up or down after division, depending on the context of a problem. Always think carefully before you decide on an answer.

OHT N3.1a