Rounding inaccurately, particularly when decimals are involved, and having little sense of the size of the numbers involved

Opportunity for: developing mathematical language

Resources

- Cubes
- Empty number lines, one at least three metres long
- 100-square
- Eleven pots large enough to hold the number cards
- Sticky notes
- Number cards 0–100 (Resource sheets 1, 2, 3, 4, 5, 6 and 7)
- Tenths cards (Resource sheet 27)
- Blank slips of paper

Key vocabulary

round up	whole one
round down	multiple of ten/hundred
almost	decimal
nearest ten	tenth
hundred	between
unit	estimate

Teaching activity

Time 15–20 minutes

'We're going to do some work on rounding numbers.'

? **What do you already know about rounding?**

Follow on from what the child says.

With a long empty number line from 0–100 (eleven marks), ask the child to label the zero and the multiples of ten.

> If the child has difficulty with this, do some counting forward and backwards in tens, using a 100-square to reinforce this and maybe putting tens numbers cards (10, 20, etc.) in order.
>
> Then you might want to start this session with a 0–30 number line rather than 0–100.

With a selection of cards to one hundred (you might want to spread these out face up on the table so you can have some control over the numbers selected) ask the child to take one at a time and place it roughly where it goes on the number line, encouraging the child to use a range of language such as 'This number is between eighty and ninety but it is a bit nearer ninety.'

If the child can do this task, after placing a few numbers, move on. If the child is faltering, do a few more numbers.

Then give the child eleven pots and ask them to place them on the multiples of ten they labelled earlier. You could put sticky labels, 10, 20, etc., on the pots.

? **Now round the numbers on the number cards to the nearest multiple of ten. Where will eighty-nine go? Is that nearer to ninety or nearer to eighty?**

The child puts the number card, 89, into the pot labelled 90.

'I rounded up eighty-nine to ninety. Ninety is the nearest multiple of ten to eighty-nine.'

'I'm rounding thirty-four down to thirty because that is the nearest multiple of ten.'

If the child doesn't grasp this, make some cube 'trains'.
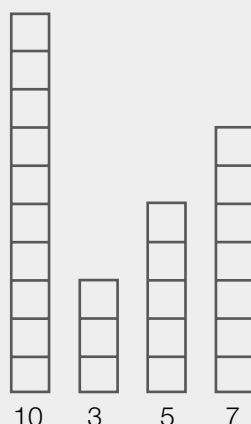
Make 'trains' with ten, three, five and seven cubes. Demonstrate how three is closer to the bottom of the ten 'train', seven is closer to the top, and five is half-way. Repeat until the child is confident.

[?] What do you think will happen with sixty-five?

Explain that for all numbers that end in five, when we are rounding to the nearest multiple of ten, we choose to round up.

[?] Tell me three numbers up to one hundred, that end in five. Which multiple of ten is forty-five rounded to?

[?] How do you know that number card belongs in this pot?

Now re-label the pots with sticky notes that are multiples of a hundred and ask the child to remove all the number cards.

[?] Put these sticky labels onto the right pot so that we have a number line with multiples of one hundred, up to one thousand.

Using the slips of paper, write a few numbers, such as 370 (*rounds up to 400*) and 520 (*rounds down to 500*) and ask the child to place them on the number line, then round them to the nearest hundred.

**[?] Round this number (*write 189*) to the nearest multiple of one hundred.** *(200)*

[?] How do you know it goes in that pot?

[?] What about two hundred and fifty?
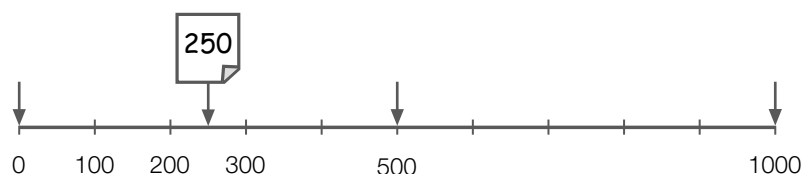
Explain that this is half-way between two hundred and three hundred and we choose to round it up, just like we round twenty-five up to thirty.

To support this you could label midway between the multiples of 100.

225   250   275   325   350

200   300
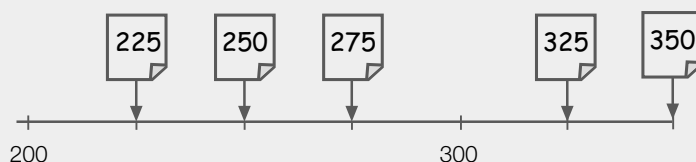
You might also find it helpful to ask the child to count in fifties to establish the pattern.

Repeat the activity with a decimal line, asking the child to label the number line or the pots with 0.1, 0.2, etc. to 1 (or above).

Clarify that half-way is 0.5.

0.1 0.2 0.3 0.4   0.6 0.7 0.8 0.9   1.1 1.2 1.3

0   0.5   1

0·1

$\frac{1}{10}$
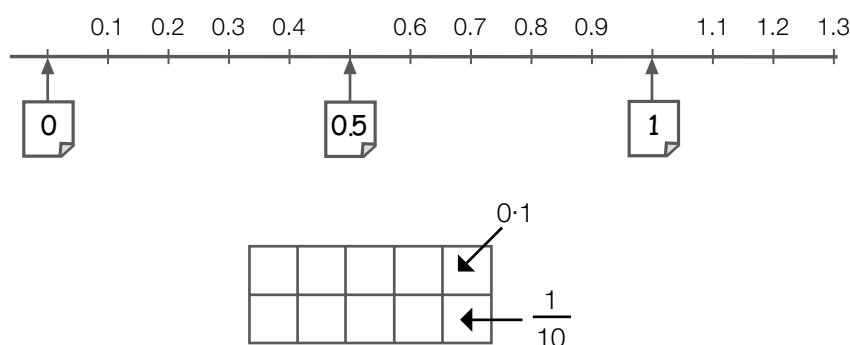
Show a 'ten train' or a piece of paper folded into tenths (as shown above).

? **How much is one cube worth if this 'train' of cubes is one whole one?**

Focus on tenths. Make sure the child can count in tenths from zero at least up to three or four, so that they can see the pattern. Other models for tenths you could use are 1p coins being a tenth of a 10p coin, one straw being a tenth of a bundle of ten straws, and so on. Make it very clear what you assume to be one whole one.

Now ask the child to walk or jump their fingers along the decimal line, counting up from zero in tenths.

? **Is zero point nine closer to one whole one or closer to zero? So how shall we round it, up to one or down to zero?**

You can repeat this session later if the child is unsure.

Use a number line 0–10 and re-label the pots 0–10.

Use slips of paper to write some decimal numbers to round up or down.

? **Shall we round three point six up to four or down to three?**

Again emphasise that numbers ending in five are rounded up.

? **What about five point four? What is that rounded to?** *(Watch out for children applying some rule they have made up about when there is a five!)*

? **Tell me two things you have learned today about rounding.**

Spotlight 1

Rounding inaccurately, particularly when decimals are involved, and having little sense of the size of the numbers involved

Opportunity for: reasoning about numbers

• •

Throw the dice

Time 15–20 minutes

Resources

- Tens number cards (Resource sheet 24)
- Number line 0–100
- Calculator
- Bag
- Two standard 1–6 dice

Key vocabulary

round up	whole one
round down	multiple of ten/hundred
almost	decimal
nearest ten	tenth
hundred	between
unit	estimate

Teaching activity

'Today we are going to play a game, **Throw the dice**, where you have to round numbers to the nearest multiple of ten. Then we are going to do some calculating and I hope you will see how useful rounding can be when we are calculating.' (The game can be adapted, rounding to any numbers.)

1. Put the number cards in a bag or face down on the table.

2. The child takes two (or three) cards, for example 20 and 40.

3. Locate the numbers on a number line.

4. Then the child throws two dice to give two single-digit numbers, for example 2 and 6.

The child can use the dice numbers in any way, and as many times as they want to make any number that will round to either of the two number cards 20 and 40. (The calculator can be used where it is needed; it helps to take off the pressure of calculating correctly and gives you a chance to assess rounding skills.)


```
    20      40      [⁙ dice 2]   [⁙ dice 6]

   2 x 6 = 12
   12 x 2 = 24    This rounds down to 20.

   Make  62 then subtract 2 x 6 = 12 twice
         62 − 12 = 50
         50 − 12 = 38  This rounds to 40.
```

[?] **Explain to me how you know forty-two rounds down to forty.**

[?] **Which other numbers could you have tried to make to round to forty? What about numbers below forty?**

Then move on to some calculating.

'Think of some of the numbers we have used today. Let's take sixty-four and thirty-two. If you were going to add them, you would first make an estimate, so you could round the numbers first to help you estimate.'

? **Look carefully at sixty-four and thirty-two. Round them in your head, then give me an estimate of the answer.**

> 64 rounds down to 60
> 32 rounds down to 30
>
> so 64 + 32 is about
>   60 + 30 = 90
>
> so the answer is a bit more
> than 90, nearly 100.

We rounded these down to sixty and thirty.

If we want to add them we round first so we can make an estimate.

Sixty add thirty equals ninety so the answer is a bit more than ninety, nearly one hundred.

? **Today we did some rounding and then we used rounding to help us with calculating. Tell me how you think rounding helps with calculating?**

Spotlight 2

Rounding inaccurately, particularly when decimals are involved, and having little sense of the size of the numbers involved

Opportunity for: making connections

• •

Decimals

Time 15–20 minutes

Resources

● Cubes, some in 'ten trains'
● Number cards 0–9 (Resource sheet 1)
● Slips of paper
● Empty number line
● Paper decimal points
● Calculator
● Pots

Key vocabulary

round up	multiple of ten/hundred
round down	decimal
almost	tenth
nearest ten	between
hundred	estimate
unit	add
whole one	

Teaching activity

'We're working on decimals today and we are going to round them up or down to the nearest whole number. We are going to use a number line and a calculator to help us.'

Start by asking the child to number an empty number line from zero to five, marking in the halves as well.

? **Can you remember which decimal is a half?**

If they can't remember, help them to key into the calculator one divided by two to make zero point five.

Ask the child to take two number cards and to make a decimal number. For example, 2 and 6 can make 2.6.

[?] If these 'ten trains' are one whole one, show me how to make two point six with cubes?

| 2 | • | 6 |
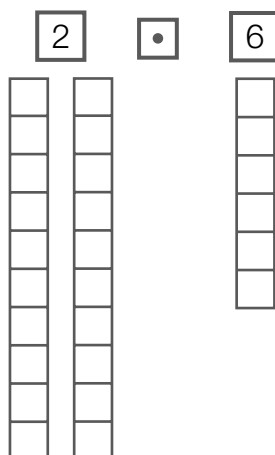
[?] The decimal 2.6 ends in a 6, so shall we round it up or down to the nearest whole number?

+0·1 +0·1 +0·1 +0·1

0   1   2   3

2·6

Help the child to position the number on the number line, showing that it rounds up to three with four small hops of 0.1 each to reach three.

It might help to position the pots on the whole numbers to help the child to make links to earlier activities.

[?] How many little hops on the number line did we make to get from two point six to three? What size are the hops?

You could also encourage the child to add 0.1 to 2.6 on the calculator so that they can get a sense of how much they are adding.

[?] What would you need to add to 2.6 to get to three in one move?

(Key in | 0 | . | 4 | *.)*

You could also show four more cubes added to 2.6 makes three whole ones.

Repeat with other numbers.

[?] What did you do really well today?

[?] Which different ways could you round the number three point five five?

[?] What if you found it to the nearest tenth?

> **?** **What about the nearest whole number?**

> **?** **Are there any other ways?** *(For example the nearest multiple of ten.)*

> **?** **Write another number that would round to three point six.**

Spotlight 3

Rounding inaccurately, particularly when decimals are involved, and having little sense of the size of the numbers involved

Opportunity for: solving real-life problems

. . . .

Rounding money   **Time** 15–20 minutes

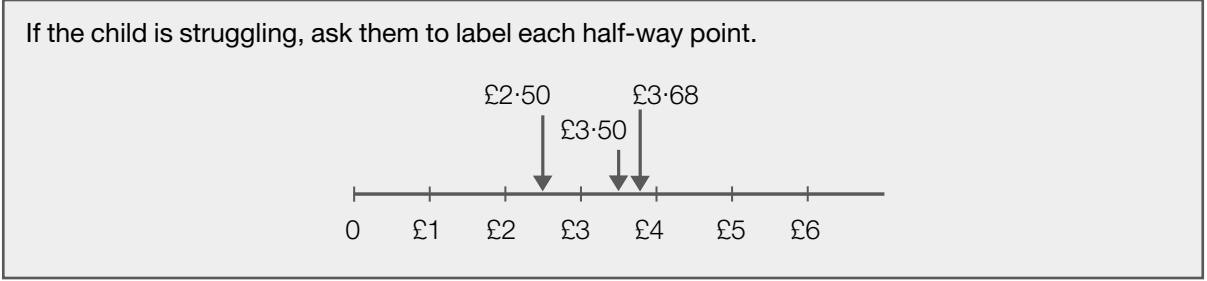| *Resources*	*Key vocabulary*	
● Number line with seven marks	pound	whole one
● Number cards 0–9 (Resource sheet 1)	round up	multiple of ten/hundred
● Slips of paper	round down	decimal
● Pots	almost	tenth
● Paper decimal points	nearest ten	between
● Money	hundred	estimate
	unit	nearest

Teaching activity

'When you see things for sale, have you noticed how prices often end in nine? So a DVD might cost £8.99.'

> **?** **What amount of money is very close to £8.99?**

'We're going to do rounding like that with money.'

Help the child to make a money number line to £6.

> **?** **What amount of money is half-way between £2 and £3?**

If the child is struggling, ask them to label each half-way point.

£2·50   £3·68
£3·50

0   £1   £2   £3   £4   £5   £6

Put the digit cards face up and ask the child to choose three. They must then use a decimal point to make an amount of money less than £6, for example £3.68.

> **?** **Position this amount of money on the number line.**

> **?** **Which amounts of whole pounds does it come between?**

? **Look carefully at the numbers and tell me if you would round it down or up to the nearest pound?** *(Up to £4.)*

? **What if we rounded it to the nearest 10p?** *(It would round up to £3.70.)*

> You could use the pots again, labelled with sticky notes, if that helps the child to make the link to earlier activities.

Repeat with other numbers, trying to get one amount of money rounded to each whole pound.

? **Choose some number cards to make an amount of money that is almost £6.** *(For example, £5.98.)*

Try some practical questions, such as:

? **If you wanted to make a black cloak for dressing up and you needed it about one metre fifteen centimetres long, how much material might you buy?**

? **If you were going to help to build a brick barbeque and you worked out that you would need about thirty-six bricks, how many bricks might you buy if they come in packs of ten?**

? **If your amount of money was about 20p when it was rounded, which amounts of money could it be?**

'Which amounts of money could you round to £11?'

Spotlight 4

Rounding inaccurately, particularly when decimals are involved, and having little sense of the size of the numbers involved

Opportunity for: solving real-life problems

· ·

Stringing along

Time 15–20 minutes

Resources

● Lengths of string (3.7 cm, 37 cm, 370 cm)

● Twelve prepared cards such as 2.2 cm,
4.6 cm, 6.8 cm, 13 cm, 29 cm, 45 cm, 79 cm, 128 cm,
249 cm, 343 cm, 767 cm, 888 cm.

● Several metre rulers and/or table measures marked
in cm and mm

Key vocabulary

|	
round up	decimal
round down	tenth
almost	between
nearest ten	estimate
hundred	measure
unit	longer than
whole one	shorter than
multiple of ten/hundred	

Teaching activity

'We are going to do some measuring today and it will help you to learn more about rounding and about decimals.'

Show the child the three lengths of string. Measure them and discuss and record their lengths.

? **What multiple of 10 cm is 37 cm nearest to?**

> If the child doesn't know, measure the string with the metre ruler, showing how close to 40 cm it is.

37cm
↓

| 10 | 20 | 30 | 40 | 50 |
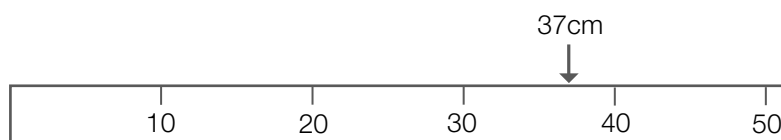
Repeat with the other lengths of string.

Show the child some of the written lengths on cards and choose an easy one to start with, for example 128 cm.

? **What multiple of ten is this number nearest to?**

? **What multiple of one hundred is this number nearest to?**

> If the child is stuck, use metre rulers as number lines, showing that in this case 128 cm is rounded up to 130 cm to the nearest ten cm, but down to 1 metre when it is rounded to the nearest whole metre.
>
> If the child is still confused, draw an empty number line to 400 and use only the cards that will round to no more than 400. Work through the cards slowly, relating each one to the metre sticks and the number lines.

Repeat with other cards, asking the child to round to the nearest ten and hundred each time.

With the cards with tenths on them, ask the child to round them to the nearest whole number. For example, 6.8 cm rounded to the nearest whole number is 7 cm.

If you wanted to make a rope swing from a tree just using one length of rope and an old car tyre, how much rope would you buy if you know the strong branch is about six and a half metres off the ground, but you know you must also allow extra rope for tying knots, tying round the strong branch and tying round the tyre?

Spotlight 5: a learning check

Rounding inaccurately, particularly when decimals are involved, and having little sense of the size of the numbers involved

Opportunity for: explaining and discussing

● ●

Remembering rounding   **Time** 5–15 minutes

Resources	*Check: does the child use key vocabulary?*	
● Tens cards (Resource sheet 24)	round up	whole one
● Number cards 0–10 (Resource sheet 1)	round down	multiple of ten/hundred
● Tenths cards (Resource sheet 27) (optional)	almost	decimal
● Hundreds cards (Resource sheet 25) (optional)	nearest ten	tenth
● Bag	hundred	between
● At least two children	unit	estimate
● Timer		

Teaching activity

'This game, **Remembering rounding**, will help you with rounding, and if you can round well, that will make your calculating much better.'

Put the tens cards face down on the table. These must always be kept in the same place because players must learn where each one is.
Put the digit cards in the bag.
Players can cooperate in pairs or they can play against each other.

How to play

1. Each player takes turns to take two digit cards out of the bag, for example 1 and 7. They make a two-digit number.

2. They then choose two cards from the tens cards that are face down, for example 20 and 60.

3. If one of their two-digit numbers, 17 and 71 in this case, rounds to one of the tens cards, they score one hundred points.

4. If neither of their two-digit numbers rounds to one of the tens cards drawn, they score nothing.

With 1 and 7 I can make ⟨ 17 and 71
Can I round to 20 or 60 ?

Yes, 17 rounds up to 20.

5. The digit cards are put back in the bag. The tens cards are put back exactly where they were on the table.

6. To get more points, they must try to remember where the tens cards are so that they pick the one they want. That way they can always make one of their two-digit numbers round to a multiple of ten.

7. See how long it takes to score one thousand points.

If there is time, they can play again and see if they can beat their personal best time.

Variations

● Play with digit cards and *Tenth cards* (Resource sheet 27) and round them to whole numbers.

● Play by taking three digit cards and round to multiples of a hundred (Resource sheet 25).

Learning outcomes

By the end of this set of activities, children should be able to:

● tackle related learning tasks with increased motivation and confidence;

● use and understand connected mathematical vocabulary;

● round to the nearest ten and hundred;

● round decimals to the nearest whole number;

● begin to see how rounding can be used for estimating and calculating;

● begin to see how rounding can be used to solve real-life problems.