

Has difficulty in choosing suitable methods for calculations that cross boundaries: addition

Opportunity for: making connections

Resources

- Place value (arrow) cards
- Empty number lines

Key vocabulary

count on	partition
count back	predict
how many jumps?	estimate
nearest ten/hundred	calculate
boundary	check
pattern	

Teaching activity

Time 15–20 minutes

‘We are going to do some work on adding quite big numbers, so sometimes you need to jot down some notes because you can’t always do the calculation in your head.’

 ‘Let’s think of ways you can predict how many digits there will be in the answer, because that can help us to estimate first before we calculate. Then when we check we will know if our answer is right.’

? If you add six and three how many digits in the answer? (one)

? What changes if you add six and six? How many digits? (two)

? Explain to me what happened there using these place value cards.

‘We crossed through the ten boundary, so there are two digits: one digit in the tens column and one digit in the units column.’

? Predict how many digits there will be in the answer for twenty-two add seven. (two)

? Explain with place value cards what happens if you work out twenty-two add nine.

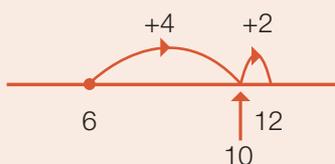
Repeat for three-digit to four-digit numbers, using place value cards. For example:

$400 + 100 \rightarrow$ three-digit number

$400 + 700 \rightarrow$ four-digit number

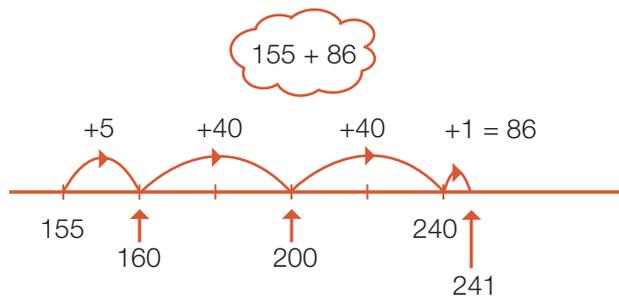
Make sure the child is confident counting through the boundaries (see also 1 Y6 +/-).

You could ask the child to show you how they could record one or more of the previous calculations on a number line.



? Which calculation do you find easier, one hundred and fifty-five add fourteen or one hundred and fifty-five add eighty-six?

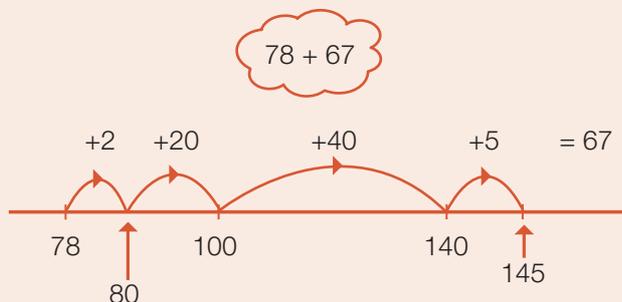
Use the number line to support the child in exploring this.



Guide the child through the counting up, making it clear that counting up to the next multiple of ten can make the number line hops easier, although the child can choose the hops that they find most helpful.

If the child needs more help with this, do a few more examples, such as: $78 + 67$.

? Can you make an estimate? Is the answer more or less than a hundred?

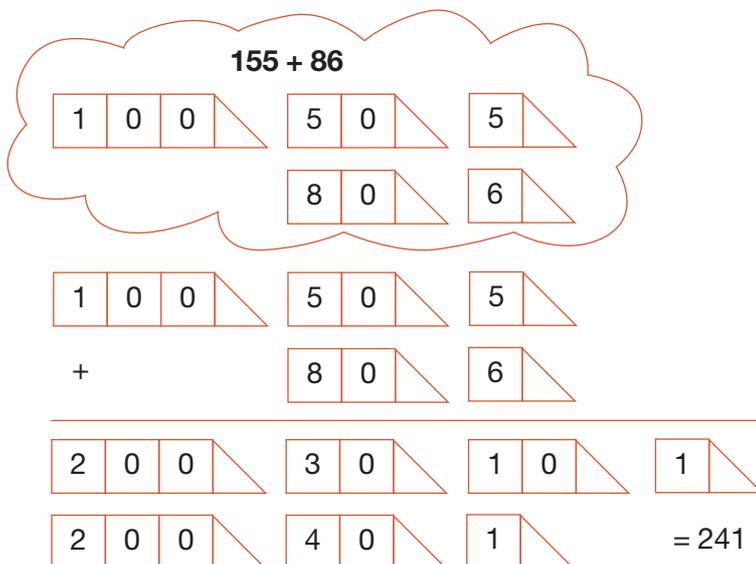


? What is the next multiple of ten to 78? (80)

? How big is the hop to the next multiple of ten? (2)

Remember to check your answer.

‘Let’s go back to one hundred and fifty-five add eighty-six that we worked out on the number line and check it by doing it with place value cards.’



**? Total all the place value cards. Is that answer near your estimate?
Repeat with other numbers.**

? How would you work out two hundred and ninety-five add one hundred and seventy-seven?

 'You can make any jottings you want and use any equipment you want. You decide on the best method for you.'

Observe the child carefully to see what they do.

Remind the child that working out a calculation in two different ways can help to check they are right.

? What would you like more practice with?

 **? Which of these calculations cross boundaries? How do you know?**
112 + 214 186 + 359 341 + 358 268 + 193

 **? Which methods would you choose to work them out?**

Spotlight 1

Has difficulty in choosing suitable methods for calculations that cross boundaries: addition

Opportunity for: seeing patterns



Go on with the pattern

Time 15–20 minutes

Resources

- Place value (arrow) cards

Key vocabulary

- | | |
|---------------------|-----------|
| count on | partition |
| count back | predict |
| how many jumps? | estimate |
| nearest ten/hundred | calculate |
| boundary | check |
| pattern | add |

Teaching activity

‘Sometimes it can help us to understand mathematics more if we look for patterns, so today we are going to look at some patterns and see if you can predict what the next number will be.’

Show a simple addition pattern, for example:

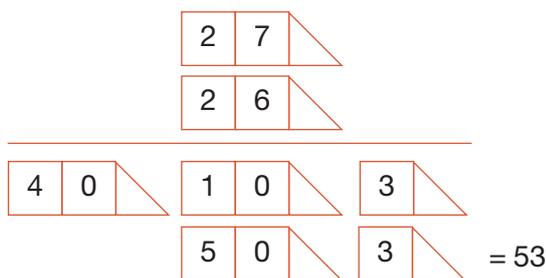
$$\begin{array}{r} 7 + 6 = 13 \\ 17 + 16 = 33 \\ 27 + 26 = 53 \end{array}$$

? Why is seventeen add sixteen, thirty-three and not twenty-three? *(There is one ten in the seventeen and one ten in the sixteen so that is only two tens.)*

? Why is the last answer fifty-three?

? What would the next calculation in the pattern be? Can you predict the answer?

Work out at least one calculation with place value cards.



If the child needs more help, try another similar pattern such as:

$$\begin{array}{r} 8 + 7 = \\ 18 + 17 = \\ 28 + 27 = \end{array}$$

? Now you make up a pattern where the digits in the units column make ten or more so they cross the boundary. Show how your calculations work using the place value cards.



‘Let’s take your calculation pattern back to class to see if the others can predict the next calculation.’

Spotlight 2

Has difficulty in choosing suitable methods for calculations that cross boundaries: addition

Opportunity for: making decisions

How would you do it?

Time 15–20 minutes

Resources

- Place value (arrow) cards
- Empty number lines
- Sorting circles
- Slips of paper

Key vocabulary

count on	partition
count back	predict
how many jumps?	estimate
nearest ten/hundred	calculate
boundary	check
pattern	add

Teaching activity

‘Today we are going to make some decisions about the best way to do some calculations. There are some sorting circles and some calculations written on paper. I’ve labelled some of the sorting circles. You can tell me what to write to label any of the others.’ (Label the sorting circles with methods that the child usually uses successfully.)

I can do these
in my head

$$7 + 4 = \quad 17 + 3 =$$

$$21 + 22 =$$

I can do these
on a number line

$$237 + 176 =$$

$$318 + 196 =$$

If the child needs help with this, you could pick up the calculations one at a time, starting with the ones that you think they can work out in their head.

- ?** Can you do this one in your head?
- ?** Can you work this one out on a number line? Keep focusing on counting up to the nearest ten or hundred.
- ?** Which are the harder ones for you? Why are they harder?

 When the child has sorted some of them (there might be some labelled ‘don’t know!’) help them to make estimates and then to calculate and check them.

- ?** Do you think there might have been another way to do that?
- ?** How could we check that one? (Emphasise that choosing two different methods for the same numbers helps us to check.)
- ?** What have you noticed about the calculations we have been doing today?

Spotlight 3

Has difficulty in choosing suitable methods for calculations that cross boundaries: addition

Opportunity for: solving real-life problems

Pay the bill

Time 15–20 minutes

Resources

- Money
- Number lines
- Place value money board

Key vocabulary

- | | |
|---------------------|-----------|
| count on | partition |
| count back | predict |
| how many jumps? | estimate |
| nearest ten/hundred | calculate |
| boundary | check |
| pattern | |

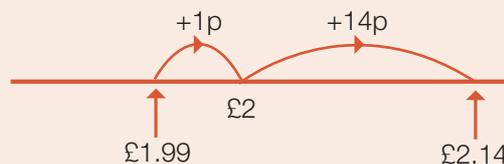
Teaching activity

‘We’re going to add some money amounts today and again we are going to be working out what might be the best ways to do the adding.’

? How would you work out $£1.99 + 15p$?

Observe the child and listen carefully to what they say.

Support this with coins or a place value money board.



Talk through what the child has done. If they haven’t worked it out using counting up to the nearest pound, show them how to do that.

You could write some amounts of money in vertical format, like a bill from a shop for example.



? How could you work these out? Remember to estimate first!

? Which methods do you like to use when the numbers are crossing boundaries? Why?

Spotlight 4

Has difficulty in choosing suitable methods for calculations that cross boundaries: addition

Opportunity for: explaining methods

Bigger numbers

Time 10–20 minutes

Resources

- Place value (arrow) cards
- Base 10 equipment such as straws
- Empty number lines

Key vocabulary

- count on
- count back
- how many jumps?
- nearest ten pence/pound
- boundary
- pattern
- partition
- predict
- estimate
- calculate
- check

Teaching activity

‘Now we are going to do some adding with larger numbers and I want you to explain to me how you do your working out.’

Choose some numbers to add, some of which cross boundaries, and ask the child to choose one to work on first, for example, $4015 + 3200$.

$$\begin{array}{r} 4015 \\ + 3200 \\ \hline \end{array} = \qquad \begin{array}{r} 306 \\ + 121 \\ \hline \end{array} =$$

$$\begin{array}{r} 2010 \\ + 4100 \\ \hline \end{array} = \qquad \begin{array}{r} 169 \\ + 236 \\ \hline \end{array} =$$

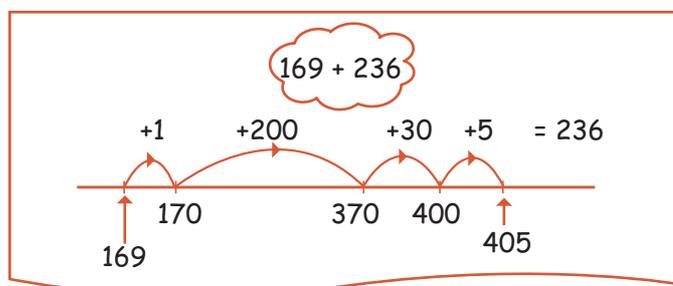
Ask the child to read the numbers, make an estimate of the answer and decide how many digits there might be in the answer.

? How do you think you could work that one out?

Listen and observe.

If the child doesn't choose efficient methods, can't explain methods or doesn't estimate first, encourage them to reflect on their calculating. Encourage them to add using a number line and to use place value cards.

Clarify for the child when they are crossing a boundary, then ask them to talk you through the whole calculation.



? What makes you choose different calculation methods?



? What do you think might be the most efficient way to work out two thousand eight hundred and ninety-nine add two thousand three hundred and seventy-six?

? How could you check it with another method?

Spotlight 5: a learning check

Has difficulty in choosing suitable methods for calculations that cross boundaries: addition

Opportunity for: explaining and discussing



Cross-boundary shout

Time 15–20 minutes

Resources

- At least two children
- Someone to act as ‘banker’
- Empty number lines
- Place value (arrow) cards
- Calculator
- Number cards 0–9 (Resource sheet 1)
- Cubes or rewards
- *Blank loop track* (Resource sheet 21)
- Dice

Check: does the child use key vocabulary?

- | | |
|---------------------|-----------|
| count on | partition |
| count back | predict |
| how many jumps? | estimate |
| nearest ten/hundred | calculate |
| boundary | check |
| pattern | |

Teaching activity

‘This game, **Cross-boundary shout**, will help you with your adding when you have to cross a boundary.’

Pairs can cooperate to play, or players can race each other to read the total.

Choose a total to make, for example 200.

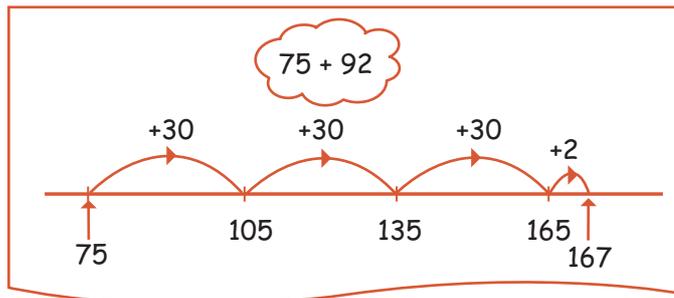
One person acts as ‘banker’. They take the number cards out of the bag, showing them to all players at the same time. The banker can also have a calculator just in case there are disputes about totals. The banker also controls the rewards.

Pairs or players keep their running total on a number line.

Each pair or player starts with five rewards.

How to play

1. The banker takes two number cards from the bag and makes sure everyone sees them at the same time. The first pair or player makes a two-digit number. For example, if the cards are 5 and 7, they can make fifty-seven or seventy-five. They record their chosen number on a number line.
2. The cards are put back in the bag and the banker takes two more cards for the next player.
3. On the second turn for the first player, the banker must be very careful to show all the players the cards at the same time. If any player thinks that the new cards are going to mean that player has to cross a hundred boundary, they shout 'cross boundary'.
For example, if a player had seventy-five on the first go, then 2 and 9 are taken out of the bag, they will be crossing the tens and hundreds boundaries by adding seventy-five and twenty-nine, or the hundreds boundary by adding seventy-five and ninety-two.



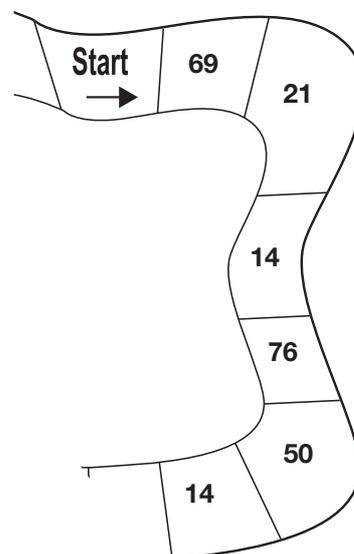
4. The player or pair that shouts first, wins another reward. (Or if they both shout it, they both get a reward.)
5. However, that reward has to be given back if they are wrong and the player can prove they don't cross a boundary.
6. Players must add their numbers together, showing how they do it on a number line and keeping a running total.
7. Play can't continue until everyone is sure the players have calculated correctly at each turn.
8. If at any time a player or the banker thinks a player has not calculated correctly, everyone stops and helps to calculate. If that player really has calculated incorrectly, they lose a reward.

**? What other method could you use to check you are right?**

9. The winner is the first to get to the total, but only if they have more rewards than the others.

Variations

- Play with just picking up one single-digit number and adding it to a running total. Race to see who can get to one hundred first.
- Fill in the spaces on the blank track with numbers to suit the children. Players take turns to throw a standard 1–6 dice and move around the board, landing on numbers and keeping a running total of those numbers they land on. Race to get to three hundred or another suitable target, or race for ten minutes and see who has the largest total.



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;
- make decisions about the most suitable method for calculating when crossing boundaries;
- estimate, calculate and check their work.

Notes:

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