

Has difficulty with adding three numbers in a column, except by adding the first two and then the last one

Opportunity for: developing mental images

Resources

- Place value (arrow) cards
- Several cards with + signs (Resource sheet 8)
- Individual whiteboards
- Standard 1–6 dice
- Dice marked 1, 1, 2, 2, 3, 3 (or use hexagonal spinner on Resource sheet 13)

Key vocabulary

| | |
|----------------------|------------------------------|
| add | partition |
| plus | combine |
| column | most significant digit first |
| tens | estimate |
| ones | calculate |
| units | check |
| how many altogether? | |

Teaching activity

Time 15–20 minutes

‘Today we are going to do an activity that will help you when you need to add more than two numbers together, where the numbers might be a bit hard to work out in your head. We’re going to write these additions in columns, like this...’

Show the child one example:

$$\begin{array}{r} 23 \\ + 34 \\ \hline 32 \end{array}$$

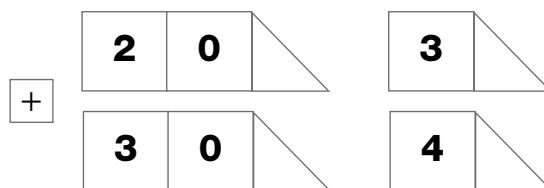
Give the child a set of place value cards.

? Now make thirty-four and twenty-three.

? Tell me how you would add these two numbers together.

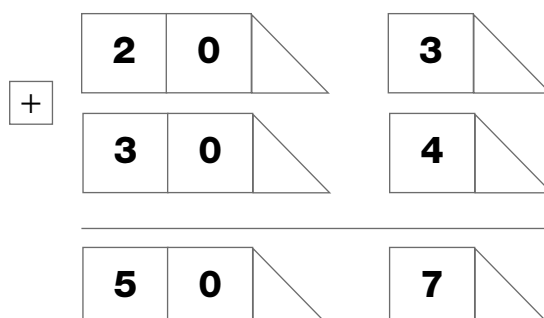
If the child cannot explain, prompt them to partition and recombine using place value cards.

Organise the two-digit numbers shown on the arrow cards and the addition sign cards into a vertical format:



? How can you add the two numbers together now?

Ask the child to put place value cards representing their answer below the cards already on the table in vertical format.



Recombine the 50 and the 7 to show 57 as:



Show $23 + 34 + 32$ using place value cards and addition sign cards:



? How did you find this total using column addition?

Encourage the child to show their total using place value cards, talking through the process of partitioning each number into a multiple of ten and a units part, totalling the tens and units parts and recombining.

? Could you have done that in your head?

? What would you estimate the answer to be? So do you think your answer is right?

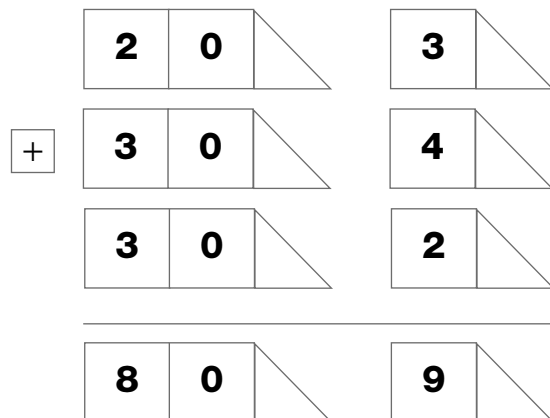


Encourage the child to estimate first, then calculate, then check.

If the child does not demonstrate understanding of adding all the tens parts and all the units parts, repeat with further examples of addition of three two-digit numbers, horizontally.

Remind the child that addition can be written in a vertical format, which can be more efficient.

Take the same three numbers, 23, 34 and 32, and arrange them, using place value cards and addition signs, in an expanded format, sliding them into position from the horizontal layout:



Recombine the 80 and 9 to show 89 as:



Demonstrate the recording of this as:

$$\begin{array}{r}
 20 + 3 \\
 + 30 + 4 \\
 \hline
 30 + 2 \\
 80 + 9 \\
 \hline
 89
 \end{array}$$

Question the child about the match to the written recording of each part of the card layout.

Using the dice (or spinner) marked with 1, 1, 2, 2, 3, 3, ask the child to generate three two-digit numbers, and make each number using place value cards.

? How would the column addition for your three numbers look using place value cards?

Ensure that the child displays the addition in a vertical format, as above (if necessary, moving the cards from the horizontal to the vertical format to show the connection).

? Show how you can write this calculation on your whiteboard.

? Read your calculation to me.

If the child has difficulty recording on their whiteboard, demonstrate with the current example and then repeat with the child generating three new numbers as above and following through the process with place value cards.

Using the standard 1–6 dice, generate three two-digit numbers. The intention is that the three numbers will this time generate an addition calculation requiring crossing of tens boundaries.

Repeat the sequence above using place value cards and addition signs to display an expanded format. Then support the child to record this on their whiteboard, for example:

$$\begin{array}{r} 60 + 5 \\ + 20 + 7 \\ \hline 30 + 4 \\ 110 + 16 \\ 126 \end{array}$$

? What would you like more practice with?

Spotlight 1

Has difficulty with adding three numbers in a column, except by adding the first two and then the last one

Opportunity for: solving real-life problems

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I can add money

Time 15–20 minutes

Resources

- 10p and 1p coins
- Individual whiteboards
- Place value (arrow) cards

Key vocabulary

| | | |
|--------|------------------------------|-----------|
| add | units | estimate |
| plus | how many altogether? | calculate |
| column | partition | check |
| tens | combine | |
| ones | most significant digit first | |

Teaching activity

Explain to the child that this activity is going to help them learn about adding more than two numbers together more efficiently and writing down how they do it.

Ask the child to choose three two-digit numbers and jot them down.

? How can you make each of your three numbers from our collection of 10p and 1p coins?

If the child is finding that hard, relate the numbers to place value cards.

Once the child has done this using 10p and 1p coins, support them in arranging the three piles of coins into expanded addition format, for example:

| | |
|----|---|
| 50 | 6 |
| 60 | 3 |
| 40 | 4 |

Ask the child to record their numbers in expanded format on a whiteboard, and then slide the piles of 10p coins together and the piles of 1p coins together to create two piles of coins.

? How many pence in the 10p pile?

? How many pence in the 1p pile?

| | |
|-----|----|
| 150 | 13 |
|-----|----|

Ask the child to record their total piles of coins on their whiteboard as:

$$\begin{array}{r} 50 + 6 \\ + 60 + 3 \\ 40 + 4 \\ \hline 150 + 13 \end{array}$$

? What is the total?



If the child has difficulty in identifying the total, support them in changing the 13p into a 10p coin and three 1p coins. Add the additional 10p coin to the pile of fifteen, and encourage the child to revisit the question.

Support the child in finishing their recording of this calculation:

$$\begin{array}{r} 50 + 6 \\ + 60 + 3 \\ 40 + 4 \\ \hline 150 + 13 \\ \hline 163 \end{array}$$

Repeat the activity using other groups of three two-digit numbers.

If the child is struggling with this, you could relate the coins to a place value board.

| Tens | Units |
|---|---|
|  |  |
| 5 | 6 |
| 50 | 60 |

? What did you learn today about adding three numbers together?

Spotlight 2

Has difficulty with adding three numbers in a column, except by adding the first two and then the last one

Opportunity for: solving real-life problems

Picture frame

Time 15–20 minutes

Resources

- *Tape measures* (Resource sheet 22)
(Two copies)
- Real picture frame (or framed picture)
- Scissors

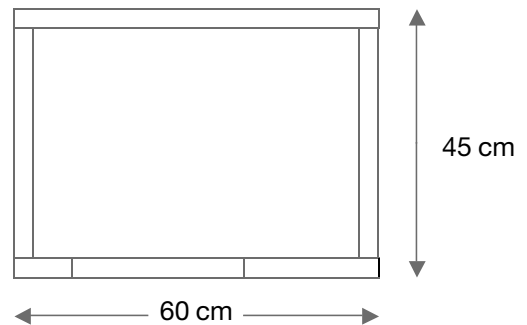
Key vocabulary

| | | |
|--------|------------------------------|-----------|
| add | units | estimate |
| plus | how many altogether? | calculate |
| column | partition | check |
| tens | combine | |
| ones | most significant digit first | |

Teaching activity

Explain to the child that this activity is going to help them learn about adding more than two numbers together more efficiently and writing down how they do it.

Set the scene, explaining that Brian needs a length of 60 cm of wood made from strips of wood to complete the final side of the picture frame he has been making.



There are only short pieces of wood left and he has to select from these to make the rest of his frame, because there is no saw available either! He must use the minimum number of lengths to make the frame.

Use a real picture frame (or framed picture) and tape measures from Resource sheet 21 to illustrate the problem.

Record the lengths of wood available: 20 cm, 23 cm, 13 cm, 21 cm, 19 cm

? Which of these lengths of wood together make a total length of 60 cm?

‘Cut the lengths of wood available from the tape measures on Resource sheet 21.’

? Where is 13 cm on the tape measure?

? Where is 21 cm on the tape measure?

Cut 13 cm from the start of the first tape measure and 21 cm from the start of another.

Ask the child to cut the other three lengths from the start of three further tape measures.

? Which pieces of wood do you think Brian should use to finish off his picture frame?

Support the child, if necessary, in lining up the tape measure strips end on. Identify the tens parts first (to help with a first estimate of the total length of the strips) and then add on the additional units.

If the child has difficulty with this, cut the units parts from the strips to enable the multiples of ten to be matched first and added first.

? Can you write a vertical addition to check your choice?

Support the child in matching the parts of the strips to the parts of the calculation.

$$\begin{array}{r}
 20 \\
 20 + 1 \\
 10 + 9 \\
 \hline
 50 + 10 \\
 60
 \end{array}$$

If time allows, repeat with different total lengths and short lengths from which to select.

? Would you like to show this task to the others in your class and see whether they can solve it?

Let children explore the problem, explaining whether different solutions can be found.



? How do you know which lengths are good ones to choose to make 60 cm?

Spotlight 3

Has difficulty with adding three numbers in a column, except by adding the first two and then the last one

Opportunity for: reasoning about numbers

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Why did that happen?

Time 15–20 minutes

Resources

- *Partitioning* (Resource sheet 23)
- Place value (arrow) cards
- Cards with + signs

Key vocabulary

| | | |
|--------|------------------------------|-----------|
| add | units | estimate |
| plus | how many altogether? | calculate |
| column | partition | check |
| tens | combine | |
| ones | most significant digit first | |

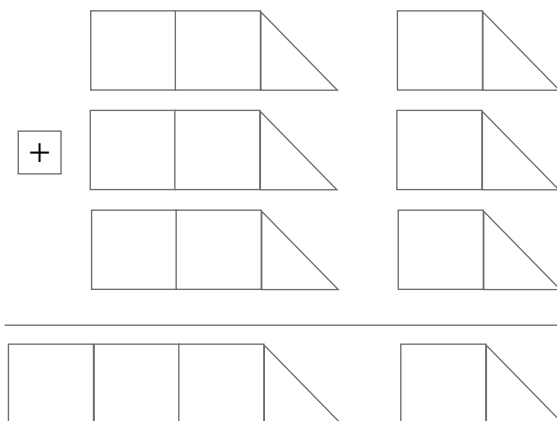
Teaching activity

Explain to the child that this activity is going to help them learn about adding more than two numbers together more efficiently and writing down how they do it.

Ask the child to select three tens place value cards and three units cards and make three two-digit numbers from them, for example 24, 53 and 15.

If you want to make sure the child doesn't have to cross boundaries, you might want to give three numbers rather than letting the child choose, for example 21, 32 and 34.

Ask them to arrange the cards in column format for expanded addition, inserting an addition sign card where necessary (as in the initial teaching activity above). For example:



? How can you add your numbers and find out the place value cards you need to place under the line?

Encourage the child to work as independently as possible but, if they have difficulties, indicate the tens place value cards (and possibly also the hundreds cards) for a first total, followed by the units cards.

Ensure that they recombine to find a final total.

Keep a note of the first total, or you or the child could record the total on *Partitioning* (Resource sheet 23). Ask the child to make three new numbers using the same place value cards. Repeat the activity, asking the child to find the new total.

? What do you notice?

Ask the child to make another three numbers with the original place value cards and carry out the addition again.

When three totals have been obtained from the place value cards, ask:

? Why do the numbers keep adding to the same total?

Focus the child on the fact that the same tens numbers are being used and the same units numbers.

? Will it make a difference to the total if we change the order of the numbers?

? So what do you know about changing the order of numbers when you add?

? Are you surprised by that?

Spotlight 4

Has difficulty with adding three numbers in a column, except by adding the first two and then the last one

Opportunity for: using trial and improvement methods

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What goes in the space?

Time 15–20 minutes

Resources

- *Partitioning* (Resource sheet 23)
- Sticky notes
- Place value (arrow) cards

Key vocabulary

| | | |
|--------|------------------------------|-----------|
| add | units | estimate |
| plus | how many altogether? | calculate |
| column | partition | check |
| tens | combine | |
| ones | most significant digit first | |

Teaching activity

Explain to the child that this activity is going to help them learn about adding more than two numbers together more efficiently and writing down how they do it.

Record the following:

| | | |
|------------------------|---|----------------------|
| 30 | + | 4 |
| + <input type="text"/> | + | 7 |
| 50 | + | <input type="text"/> |
| 90 | + | 14 |
| <input type="text"/> | | |

On individual sticky notes, write 10, 3, 1, 14, 40, 24, 114 and 104.

Display the sticky notes on the table.

Ask the child to select sticky notes to fill in the blanks in the addition. They must explain why they make their choices. Point to each space that the child has covered and ask them:

- ? **Why did you put that number there?**
- ? **What should the total of that column come to altogether?**
- ? **How do you know?**
- ? **Which is the column with the tens? How many more tens do you need?**
- ? **Explain to me how you know that is the missing number.**

If the child is struggling, keep working with them, using place value cards in support.

Repeat the activity using the following calculations, plus sets of sticky notes from which the child can select to fill in the blanks.

| | | | |
|---|----------------------|---|----------------------|
| | 50 | + | 4 |
| + | <input type="text"/> | + | <input type="text"/> |
| | 60 | + | 2 |
| | 110 | + | 15 |
| | <input type="text"/> | | |

Sticky notes: 9, 70, 0, 8, 1, 40, 125 and 145.

Ask the child to explain their choice of number for each position.

| | | | |
|---|----------------------|---|----------------------|
| | 70 | | |
| + | <input type="text"/> | + | 4 |
| | 20 | + | 7 |
| | 120 | + | <input type="text"/> |
| | 131 | | |

Sticky notes: 11, 30, 20, 12, 4, 50, 130, 13 and 120.

Ask the child to explain their choice of number for each position.

If time allows, ask the child to make up another for you to try!

The child could record completed calculations on *Partitioning* (Resource sheet 22), and they could use this recording to help them to make a calculation containing some blanks for a friend back in class.



‘Make a calculation with missing numbers for your friend to solve.’

Spotlight 5: a learning check

Has difficulty with adding three numbers in a column, except by adding the first two and then the last one

Opportunity for: explaining and discussing

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Smallest possible

Time 10–20 minutes

Resources

- *Partitioning* (Resource sheet 23)
- Set of number cards 1–9 from Resource sheet 1 for each pair or player
- At least two children
- Stopwatch
- Place value (arrow) cards

Check: does the child use key vocabulary?

- | | | |
|--------|------------------------------|-----------|
| add | units | estimate |
| plus | how many altogether? | calculate |
| column | partition | check |
| tens | combine | |
| ones | most significant digit first | |

Teaching activity

‘This game, **Smallest possible**, will help you with your adding in columns.’

Children could cooperate in pairs or race in pairs, or individual children could race each other.

How to play

1. Place the number cards face down in a pile.
2. The first player or pair must take two cards, look at them carefully and make the smallest two-digit number that they can. For example, if the cards are 3 and 7, they can make thirty-seven, which is smaller than seventy-three. This will be their first number.
3. Then the other pair takes two cards and make the smallest number that they can.
4. When each pair or player has made three two-digit numbers, the stopwatch should be started and each pair add up their numbers as fast as they can.
5. When they are sure their calculation is right, they should stop the stopwatch and write down their personal best time.
6. They then play again to try to beat their time.



Encourage the children to remember to estimate first and check at the end.

Variations



- You can add more support to the game by using tens and units place value cards face up, rather than number cards, and helping children to write in their numbers on *Partitioning* (Resource sheet 23).
- For a challenge, make the largest numbers possible.

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;
- partition a two-digit number into tens and units to prepare for column addition;
- add three two-digit numbers by adding the tens column first and then the units and be able to recombine the number to make a total;
- check an answer to see if it is reasonable.