Year 3 Multiplication and division

2, 5 and 10 times-tables

MD3S1

Identifying numbers that are answers in the 2, 5 or 10 times-tables

Objective

• Know by heart multiplication facts for the 2, 5 and 10 times-tables.

Prior knowledge and skills

Counting on from zero in 2s, 5s and 10s

Vocabulary

times-table, answer, units, ones, digit, odd, even

Resources

small whiteboards and pens

Main teaching activity

Whole class

Explain to children that they are going to play a game called 'Beat the clock'. On the board there will be a set of numbers, and a stopwatch that will count down from 30 seconds. Children should try to write down on their small whiteboards as many answers in the 2 times-table from the set as possible in 30 seconds.

(Page 1 on whiteboard)



Click on the green button on the stopwatch to start the game.

When the countdown has reached zero, tell children to stop writing and ask:

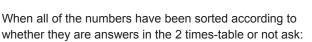
Q How many answers in the 2 times-table did you find? (There are 7 in all.)

Use the whiteboard to confirm which of the numbers on the board are answers in the 2 times-table. Point to each number in the set in turn and ask:

Q Is this number an answer in the 2 times-table?

Children show 'thumbs up' for 'yes' and 'thumbs down' for 'no'. If a number is not an answer in the 2 times-table, drag it out of the oval.

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Q What is the same about all the numbers that are answers in the 2 times-table? (e.g. They are all even numbers; they all have a units digit of 0, 2, 4, 6 or 8.)

What is the same about all the numbers that are not answers in the 2 times-table? (e.g. They are all odd numbers; they all have a units digit of 1, 3, 5, 7 or 9.)

Question 2 will allow you to repeat the activity for answers in the 5 times-table. Question 3 will allow you to repeat the activity for answers in the 10 times-table.

Personal notes

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Year 3 Multiplication and division

The 3 and 4 times-tables

MD3S2

Applying knowledge of the 3 and 4 times-tables

Objective

• Begin to know the 3 and 4 times-tables.

Prior knowledge and skills

• Counting in 3s and 4s from zero

Vocabulary

times-table, answer, times, odd, even

Resources

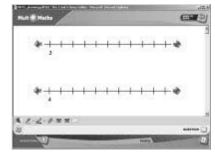
· small whiteboards and pens

Main teaching activity

Whole class

Ask children to show on their small whiteboards an answer in the 3 times-table.

(Page 1 on whiteboard)



Explain that the first number line on the board should show all the answers in the 3 times-table in order, but most of the number labels are missing.

Choose some of children's correct suggestions for answers in the 3 times-table. For each number ask:

Q Where does ... belong on the number line? Why?

Click on the 'Show/hide' button on the toolbar. Invite a few children to click beneath their suggested marker on the number line to check their answer.

Encourage children to explain their reasoning in terms of their knowledge of the 3 times-table, e.g. $4 \times 3 = 12$, so 12 belongs beneath the fourth marker on the number line.

When several of the labels have been revealed, ask children to identify and reveal each of the remaining labels:

Q What number belongs here? How do you know?

When all of the labels have been revealed, ask children to identify patterns in the answers of the 3 times-table:

Q What patterns are there in the answers of the 3 times-table? (They alternate between odd and even.)

Then ask questions about the extended sequence, e.g.

Q What number belongs before 3 on the number line? Why? (Zero because 0×3 comes before 1×3 and $0 \times 3 = 0$.)

What is 12 times 3? How did you decide? (e.g. counting up in 3s, $10 \times 30 = 30$, so $11 \times 3 = 33$ and $12 \times 3 = 36$)

Use the scroll arrows on the number line to confirm answers.

Repeat the activity for the 4 times-table using the second number line on the board.

Personal notes

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Year 3 Multiplication and division

Multiplying by 10 and 100

MD3S3

Using knowledge of multiplying by 10 and 100

Objective

 To multiply by 10/100, shift the digits one/two places to the left.

Prior knowledge and skills

Knowing the multiplication facts for the 10 times-table

Vocabulary

multiply, multiple, times, \times , digit, units, ones, tens, hundreds, 10 times bigger

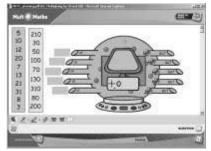
Resources

small whiteboards and pens

Main teaching activity

Whole class

(Page 1 on whiteboard)



Refer to the numbers in the yellow rectangle on the board.

Q What do you notice about all the numbers in the

yellow rectangle? (e.g. They all have zero as their units digit.)

Explain that each number in the blue rectangle, except one of them, has a 'partner' in the yellow rectangle.

Use the pen tool to circle 8 in the blue rectangle and 80 in the yellow rectangle. Tell children that 80 is 8's partner. Repeat for 5 and 50, then ask:

Q How do you think I am deciding on the partners? How did you decide?

Pair further numbers if necessary to prompt children's understanding that a number from the yellow rectangle must be 10 times bigger than its partner in the blue rectangle.

Q Which number in the blue rectangle does not have a partner in the yellow rectangle?

Ask children to help you to pair the other numbers, choosing one from the blue rectangle and one from the yellow rectangle each time. Check each suggested pair using the function machine with the function set to \times 10. (Click on the 'Select' button on the toolbar to turn off the pen tool; click on '+' sign on the machine's control panel and choose ' \times '; click on the zero on the control panel and use the number pad to type in 10; drag a suggested number from the blue rectangle into an input pipe; click on the appropriate output arrow.)

Circle numbers from the yellow rectangle as their partners are identified.

When you have established that 12 is the 'odd number out' because it has no partner in the yellow rectangle ask:

Q What number would 12's partner be? (120)

How did you decide?

What do you need to do to multiply a number by 10? (Shift each of its digits one place to the left and fill the units place with a zero.)

Use the function machine to confirm the answer when 12 is multiplied by 10.

Click on the 'Clear' button on the toolbar to reset the screen. Point to numbers in the rectangles and each time ask children to show the number that is 100 times bigger on their small whiteboards.

Q What do you need to do to multiply a number by 100? (Shift each of its digits 2 places to the left and fill the units and tens places with zero.)

Set the function machine to multiply by 100 and use it to check children's answers.

Personal notes

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Year 3 Multiplication and division

them their colour. Use the pen tool to record the division

Invite teams to take turns to make divisions in this way until no more correct divisions can be made using the remaining

The winning team is the one with the most points at the end

of the game. One point is scored for each square in a team's colour on the grid. Teams score an extra point for each line

sentence in the empty screen space below the missing

number division.

grid numbers.

of three squares.

Personal notes

Dividing by 2, 5 and 10



Choosing three numbers to make a division sentence

Objective

• Derive quickly division facts corresponding to the 2, 5 and 10 times-tables.

Prior knowledge and skills

• Knowledge of 2, 5 and 10 times-tables

Vocabulary

divided by, division sentence, multiplication sentence, times

Resources

small whiteboard and pen for each team

Main teaching activity

Whole class

(Page 1 on whiteboard)

| + = | 12 | 5 | 9 | 2 | | 30 |
|-------------|----|----|----|----|----|----|
| | 8 | 7 | | | 69 | 5 |
| | 3 | 10 | 9 | 40 | 5 | 10 |
| | 6 | Ð | 40 | 4 | 20 | 9 |
| | | | 10 | ż | 8 | |
| | 5 | 90 | 2 | 2 | 16 | 35 |
| · 2 · 0 × × | | | | | | |

Explain that children are going to play a game where they have to generate division sentences using three numbers from the grid on the board each time.

Start by dividing the class into 2 or 3 teams and assign each team a colour from the toolbar (pink, green, blue or yellow). Explain that when a number is used by a team, its grid square will be coloured in that team's colour indicating that the number cannot be used again. The aim of the game is for teams to colour as many grid squares as possible in their own colour. Extra points will be scored by any teams who manage to colour 3 squares in a row (vertical, horizontal or diagonal).

The first team chooses three numbers from the grid to make a division sentence. They record the division sentence on their small whiteboard. Ask:

Q How do you know your division sentence is correct?

Which multiplication sentence helps you to check? (e.g. for $40 \div 5 = 8$, knowing that $8 \times 5 = 40$)

If the team's division is correct, click on the appropriate colour 'Fill' button on the toolbar and invite a child from the team to click on the numbers used from the grid, to colour

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Year 3 Multiplication and division

MD3S5

Sharing and grouping

Using sharing and grouping methods to solve divisions

Objective

 Understand division as grouping (repeated subtraction) or sharing.

Prior knowledge and skills

· Sharing and grouping objects

Vocabulary

divided by, division, equal groups of, share, share equally,

Resources

• small whiteboards and pens

Main teaching activity

Whole class

(Page 1 on whiteboard)



Refer to the division question on the board: $24 \div 3$.

Explain that you want children to find the answer to the division. They can make any jottings they want on their small whiteboards to help them.

After a short time, ask:

Q What is 24 divided by 3? (8)

How did you work it out?

Drag the orange panel into the bin to confirm the answer.

Discuss children's methods which may include:

- counting on in 3s from zero to 24;
- repeatedly subtracting 3 from 24;
- drawing 24 dots in 3 equal groups;
- drawing 24 in groups of 3.

(Page 2 on whiteboard)



Use the 100 square on this page to model the counting on and repeated subtraction methods for solving $24 \div 3$. You can write on the 100 square using the pen tool.

Then return to whiteboard page 1 and ask:

Q How can we use the frogs on the board to demonstrate finding the answer to the division?

Establish that there are two ways to use the frogs to show the answer to the division:

- dragging the frogs into 3 equal groups;
- dragging the frogs into groups of 3.

Invite children to show each method by dragging the frogs.

You could use the groups of frogs created to ask questions about related divisions including those involving remainders, e.g.

Q What would the answer be to $25 \div 3$? Why? (8 remainder 1, e.g. because 25 is one more than 24 and $24 \div 3 = 8$)

What would the answer be to 27 ÷ 3? Why? (9, e.g. because 27 is 3 more than 24, so you can make an extra group of 3.)

Repeat the activity for questions 2 ($49 \div 7$) and 3 ($54 \div 6$). (**Note:** When you return to whiteboard page 1, after using the 100 square on whiteboard page 2, you will need to navigate back to the required question.)

Personal notes

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Year 3 Multiplication and division

Order of multiplying



Making and describing arrays to reinforce that multiplication can be done in any order

Objectives

- Understand the operation of multiplication and the related vocabulary.
- Extend understanding that multiplication can be done in any order.

Prior knowledge and skills

 Understanding the operation of multiplication as describing an array

Vocabulary

array, row, column, lots of, groups of, $\times,$ times, multiply, multiplication, product

Resources

- pegboard and 18 pegs for each pair
- squared paper
- counters

Possible starter

MD3S1 2, 5 and 10 times-tables

Main teaching activity

Whole class

(Page 1 on whiteboard)



Explain that you want to find out how many counters there are on the board.

Q How can we arrange the counters so they can be counted more easily?

Demonstrate children's suggestions by dragging and dropping the counters. Their suggestions may include arranging the counters in groups of, say, 5. Make sure that arranging the counters in arrays is included.

Create an array using all 20 counters, e.g. 4 rows of 5.

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(Clicking on the 'Solid grid' button on the toolbar will display a grid that may help you to create the array.) Discuss the benefits of using it to count the counters. Reinforce that an array is a rectangular grouping where we can count the groups and the number in each group easily.

Q Why is it easier to count the counters when they are organised in rows and columns? (An array represents a multiplication, e.g. 4 rows of 5 counters can be thought of as 4×5 , and $4 \times 5 = 20$.)

Groups

Each pair within each group needs 18 pegs and a pegboard.

Q How can you organise the pegs into an array?

Children record their array on squared paper. They then compare their array with those of other pairs in their group.

Q How would you describe your array? (e.g. It has 2 equal rows and 9 equal columns.)

Are all the rectangles the same?

Ensure that children recognise that, although all the arrays contain 18 pegs, they need not be in identical arrangements. Ask pairs to find and record as many different arrays as they can using exactly 18 pegs. At this stage, arrays in different orientations can be thought of as different, e.g. the array with 2 rows and 9 columns and that with 9 rows and 2 columns.

Q How will you know when you have found all the arrays? (e.g. When they have tried arrays with 1 row, 2 rows, 3 rows ... 18 rows.)

Whole class

(Page 2 on whiteboard)

| 00000 00000 | | |
|----------------|---------|----|
| late of | late of | |
| late of | late of | 15 |

Refer to the arrays of counters on the board.

Q How could you describe each of these arrays?

Discuss the arrays and encourage children to think about the numbers of counters in each row and each column. Describe the left-hand array both as 3 rows of 5 and as 5 columns of 3. Click on the 'Number pad' button on the toolbar and drag digits from the number pad revealed into the boxes below the array to complete the 'lots of' statements in two different ways. Do the same with the right-hand array so that both arrays end up with the same pair of statements (3 lots of 5, 5 lots of 3), although not necessarily in the same order. Establish that 3 lots of 5 and 5 lots of 3 can be written as the multiplications 3×5 and 5×3 . Use the pen tool to record

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Order of multiplying

the multiplications.

Discuss how the two arrays are essentially the same. Clicking on an arrangement and then on the 'Rotate' button on the toolbar will allow you to rotate it by dragging to reinforce that the two arrangements are the same. (Note: If you want to drag a rotated arrangement you will first need to click on the 'Select' button to turn off the rotation tool.) Remind children that multiplication can be done in any order and discuss how the array illustrates that 3×5 will give the same answer as 5×3 . Introduce the term 'product' to describe the answer to a multiplication. Complete the multiplications on the board by recording the products:

Move to question 2 and describe the array in terms of 'lots of' and as multiplications as before. Establish that 4×5 and 5×4 give the same product (20). Use the 'Copy' and 'Paste' buttons on the toolbar to create a copy of the arrangement that can be rotated to reinforce this.

| .g. Turning | am am am am an am am am an am am am an am am am | |
|-------------|--|---------|
| | र्स्त संस् संस स्टे | £ £ £ £ |
| | | |

Repeat the activity for question 3.

Groups

e.

Ask pairs of children within each group to use counters to explore what other numbers can be made into rectangular arrays. Specify that each array must have at least two rows and two columns. Children record their findings as diagrams on squared paper and as pairs of multiplications, e.g.

2 × 5 = 10 5 × 2 = 10

Q Which numbers can be made into arrays? Which numbers cannot?

Ask children to make a list of 'rules' about the numbers that can be made into arrays and those that can't, e.g.

- Even numbers always make an array.
- Odd numbers sometimes make an array.
- If a number is in the 3 times-table, it can make an array with 3 rows or 3 columns.

Groups then test the rules that they found in their pairs using a range of numbers.

Q Before trying a number, can you say whether it will or won't make an array? How did you decide?Do your rules always work? Do you need to change any?

Support: Children investigate groups of 2. They start by putting 2 pegs in the pegboard. Ask:

Q If we get 2 more pegs and add them to the board to make an array, where could we put them?

Help children to make the array for 2 lots of 2, and to record it as the multiplication sentence $2 \times 2 = 4$. They now add 2 more pegs and record the array as a pair of multiplications: $3 \times 2 = 6$ and $2 \times 3 = 6$. Repeat for 4 lots of 2.

Q If you had 6 lots of 2, how many pegs do you think

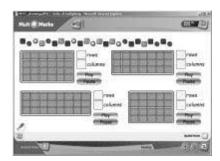
MD3L1

there would be altogether? How did you decide? What if you had 10 lots of 2?

Extension: Children use pegs and pegboards to investigate which numbers can be made into square arrays. They record their findings as diagrams and as multiplications. Establish that each array can only be written as one multiplication, e.g. $3 \times 3 = 9$.

Plenary

(Page 3 on whiteboard)



Refer to the chocolates on the board.

Q How many chocolates are there? (24)

Tell children to imagine that the chocolates need to be packed into a rectangular box. Each section of a box needs to have a chocolate in it.

Q What are the sizes of these boxes?

Use the pen tool to enter the numbers of rows and columns on the board.

Ask children to work in pairs for a few minutes using counters to investigate which of the boxes on the board all the chocolates would fit into.

Q Which of these boxes could you use to pack the chocolates in? (3 rows of 8 and 4 rows of 6)

How did you decide? (e.g. because $8 \times 3 = 24$)

Use the 'Play' buttons to show animations to check each box. (You could click on the 'Pause' button part way through an animation to ask if children have changed their minds; clicking on the 'Play' button will continue the animation.)

You could then ask:

Q Can you think of another box that would work? (e.g. 12 rows of 2, or 2 rows of 12)

Key idea and assessment

Multiplying the same numbers in a different order gives the same answer.

Can children ...

- · use arrays to organise numbers of objects in groups?
- describe an array in terms of rows or columns?
- record two multiplication sentences for a rectangular array, e.g. 4 × 5 = 20 and 5 × 4 = 20?
- use arrays to demonstrate that, e.g. 4 × 5 = 5 × 4?

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Year 3 Multiplication and division

Multiplying by 10



Using place value to multiply by 10

Objective

• To multiply by 10, shift the digits one place to the left.

Prior knowledge and skills

- Knowing what each digit in a 3-digit number represents, including zero as a place holder
- Knowing multiplication facts for the 10 times-table.

Vocabulary

multiply by, times, multiply, hundreds, tens, units, ones, abacus

Resources

- Resource sheets 1 and 2
- 0 to 9 digit cards
- spike abacus

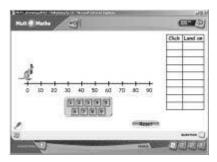
Possible starter

MD3S2 The 3 and 4 times-tables

Main teaching activity

Whole class

(Page 1 on whiteboard)



Refer to the kangaroo on the number line on the board. Explain that, when you click on a number on the number pad, the kangaroo will jump according to a specific rule.

Click on a number and see what happens. Point out how the number you clicked and the number the kangaroo landed on are entered in the table.

Click on the 'Reset' button and then on another number on the number pad. The results will be added to the table. Repeat for a few more jumps, asking:

Q If I click on this number, where do you think the kangaroo will land?

Use the whiteboard to test children's predictions.

Q How did you work out where the kangaroo will land?

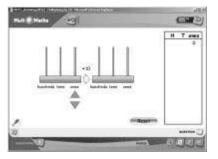
Establish that you need to multiply the number to be clicked on by 10. This can be modelled as repeated addition on the number line by counting on from zero in jumps of 10 the appropriate number of times.

Look at the results in the table.

Q What do you notice?

Establish that in each row, the tens digit of the number in the right-hand column matches the digit in the left-hand column.

(Page 2 on whiteboard)



Explain that you are going to use the abacus to see what happens when numbers are multiplied by 10.

Click on the 'up' arrow beneath the 'ones spike' of the lefthand abacus to set a number of units (e.g. 5).

Q What will we get if we multiply 5 by 10?

What do you think will appear on the second abacus?

Click the ' \times 10' arrow button to confirm the result on the right-hand abacus. Look at the results in the place value chart and make sure that children understand how the written numbers match the beads on each abacus.

Click the 'Reset' button and set a different number on the left-hand abacus. Repeat as before, asking children to say what they think will happen when you multiply by 10. Continue until you have filled the place value chart.

Q What happens to the beads on the abacus when you multiply by 10?

What happens to the digits in the place value chart?

Establish that, when we multiply by 10, the ones digit moves one place to the left and becomes the tens digit. A zero is put into the ones column to act as a place holder.

Clicking on the 'Clear' button on the toolbar will empty the place value chart and allow for further examples, if needed.

Pairs

Give each pair a copy of Resource sheet 1 and a shuffled set of 1 to 9 digit cards. Children take turns to pick a card. They show this number on a left-hand abacus on the Resource sheet by drawing beads, and show the result of multiplying the number by 10 on the corresponding righthand abacus. They then fill in the place value chart to match.

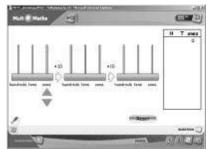
Multiplying by 10

Support: Children use spike abaci to set up the number and multiply it by 10. They copy the results onto their Resource sheets. Whiteboard page 2 could be used to check.

Extension: Children try more numbers, but only recording the results in the place value chart. Ask children to predict what would happen if they multiplied each answer by 10.

Q What do you think would happen if we multiplied the answer by 10? Why?

(Page 3 on whiteboard)



Set a number on the left-hand abacus (e.g. 7).

Q What will we get if we multiply 7 by 10? (70)

Click the first ' \times 10' button to see the result on the middle abacus and in the place value chart.

Q What will we get if we now multiply the 70 by 10? What will happen on the right-hand abacus?

Establish that the result will be 700 and that 7 beads will appear on the hundreds spike of the right-hand abacus. Click the second ' \times 10' button to check.

Look at the three abaci and ask:

Q What happens each time we multiply by 10?

Establish that each time you multiply by 10, the beads move one spike to the left.

Look at the numbers in the place value chart and ask:

Q What happened to the digit 7 each time we multiplied by 10?

Again, establish that each time you multiply by 10, the 7 digit moves one place to the left. Any empty columns to the right of the 7 digit are filled with zeros to act as place holders.

Click 'Reset' and repeat the activity with other numbers, emphasising the movement of the beads and the digits. If the table becomes full and you want to try more numbers, click 'Clear' to empty the place value chart.

Pairs

Children complete questions 1 to 3 on Resource sheet 2.

Q What happens when you multiply by 10? How do you know the digit will move to that column?

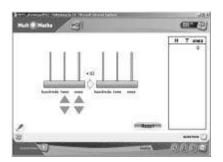
Support: Children may need to use a spike abacus to model the multiplication.

Extension: Children also tackle the challenge questions.

Plenary

Discuss the first few lines of the pattern in Resource sheet 2 question 1, using whiteboard page 3 if necessary. Emphasise the movement of the digits.

(Page 4 on whiteboard)



Use whiteboard page 4 to tackle Resource sheet 2 question 3. Emphasise that, even though the non-zero digit starts in the tens place rather than the ones place, multiplying by 10 causes the same movement of one column to the left.

On the whiteboard, set up the first number from the challenge.

Q What do you think will happen when 14 is multiplied by 10?

Click the ' \times 10' button to establish that both digits move one place to the left. Try with other 2-digit numbers.

Key idea and assessment

When we multiply a number by 10, each digit of the number moves one place to the left.

Can children ...

- multiply single-digit numbers by 10?
- multiply 2-digit multiples of 10 by 10?
- explain the effect of multiplying by 10 on the digits of a number?

Solutions

Resource sheet 2

| 1 | $\begin{array}{c} 1 \rightarrow 10 \\ 2 \rightarrow 20 \end{array}$ | , | | etc. | | |
|----|---|---|-----|------|---|-----|
| 2a | 200 | b | 400 | | | |
| С | 700 | d | 300 | | | |
| е | 10 | f | 5 | | | |
| 3a | 300 | b | 700 | | с | 900 |
| Ch | allenge | | | | | |
| а | 140 | b | 320 | | с | 680 |
| | | | | | | |

Year 3 Multiplication and division

Getting back to the start number



Dividing to reverse the effect of multiplying and vice versa

Objective

· Recognise that division is the inverse of multiplication.

Prior knowledge and skills

Understanding multiplication as repeated addition and division as repeated subtraction

Vocabulary

multiply, repeated addition, lots of, divide, repeated subtraction

Resources

Resource sheet

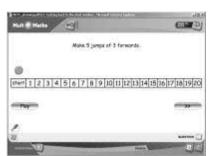
Possible starter

MD3S8 Using multiplication and division facts

Main teaching activity

Whole class

(Page 1 on whiteboard)



Explain that the counter is going to make 5 jumps of 3 along the number track on the board.

Q Which number will the counter reach? (15)

Click on the 'Play' button to make the counter move forwards 5 jumps of 3. (You can pause the count by clicking on the 'Pause' button, and resume it by clicking on 'Play' again.)

Establish that the jumps have been recorded as a repeated addition statement. Ask:

Q What is another way of writing 5 lots of 3?

Establish that a repeated addition can be written as a multiplication. Use the pen tool to record the multiplication next to the addition: $5 \times 3 = 15$.

Point to the missing number 'jumps back' statement.

Q If we want the counter to get back to the start, landing on all the same numbers as it did on the way up, what numbers should we put in here?

Discuss suggestions. Establish that 5 jumps of 3 backwards will work and use the pen tool to complete the statement accordingly.

Click on the 'Play' button and watch the counter move back to the start by jumping back 5 jumps of 3.

Q What is another way of writing the fact that exactly 5 lots of 3 can be taken from 15?

Discuss how the repeated subtraction can be written as a division. Write $15 \div 3 = 5$ next to the repeated subtraction.

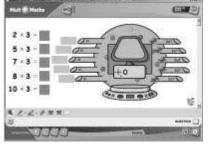
Use the eraser tool to remove your writing from the screen, then click on the '>>' button and work through problem 2 in a similar way. Establish that $12 \div 4$ will 'get you back' from 3 jumps of 4.

Q What do you notice about the way we get back after we have multiplied?

Elicit that, if we have multiplied by a number, to get back we divide by the same number. Division undoes multiplication.

Check this idea by clicking on '>>' and working through problem 3.

(Page 2 on whiteboard)



Note that all the multiplications on the left of the screen are multiplying by 3. Remind children that the answer to a multiplication is called its 'product'. Point to each multiplication in turn and ask:

Q What is the product?

Each time drag the appropriate orange panel into the bin to confirm the answer.

Explain that you are going to enter each product into the function machine. Drag 6 into the first input box of the function machine:



Getting back to the start number

Explain that you want to set the function machine so that it changes the numbers back to their original values. Point to the 6 and ask:

Q What should the machine do to change 6 back to 2?

Set the function machine to match a child's suggestion. (Click on the + sign on the control panel and choose an operation; click on zero on the control panel and use the number pad to type in the required number.) Click on the appropriate output arrow to reveal the answer. When the correct operation has been identified (÷ 3), ask:

Q Will the same operation change 15 back to 5?

Drag 15 into the second input box and reveal the second output to check. Carry on in this way until all output numbers have been checked.

Discuss how dividing by 3 has 'undone' multiplying by 3. Dividing by 3 is the opposite of multiplying by 3.

Q How else could we change 6 back to 2?

Take children's suggestions and at some stage set the function to '- 4', which will 'work' for the first output, changing it back from 6 to 2, but won't 'work' for subsequent numbers. Discuss how ' \div 3' works for all numbers but '- 4' only works for the first.

Work through the other three questions in the same way. In questions 3 and 4 divisions are given, and multiplying will be needed to 'undo' them.

Pairs

Children work on the Resource sheet in pairs, discussing their ideas and ways of finding the answers.

Ask questions such as:

(For question 1)

Q It has taken 3 away 4 times. How can we write that?

(For question 2)

Q The machine is multiplying by 5, and 30 has come out. How can you work out the number that went in?

(For question 3)

Q What do you notice about the first and last numbers? Why does that happen? How does it help you to work out (c)?

Support: Children could use a function machine on whiteboard page 2 to try their ideas for question 2. (To enter an input number, click on an input box and use the number pad produced to type in the required number.)

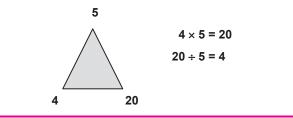
Extension: Children can tackle the challenge.

Q Can you find a different way of completing (b)? ... and another?

Other tasks

You could ask children to:

use three given numbers to create a multiplication and the division that 'undoes it', e.g.



Plenary

Display the Resource sheet pdf on the whiteboard.

Work through some of the questions with children. Invite them to explain how they worked out their answers, particularly when an inverse operation could be used:

Q A number divided by 2 equals 6. How can you work out the number?

Establish that you can multiply 6 by 2.

If children tackled the challenge, ask them for their answers to part **b**. They should notice that any number can be put in the arrows, as long as both numbers are the same.

Q Why can you put any number in the arrows?

Establish that, as dividing is the opposite of multiplying, whatever you do in the first part, the second part will 'undo' it and get you back to the start number. Try a few different numbers with the class.

Key idea and assessment

Division undoes multiplication and multiplication undoes division.

Can children ...

- give the division that undoes a given multiplication?
- · give the multiplication that undoes a given division?

Solutions

Resource sheet

| 1 | 12 ÷ 3 = | 4 (or 12 ÷ | 4 = 3 | 3) |
|----|-----------------|----------------|------------|-------------------|
| 2a | out: 15, | 20 | b | out: 2, 4 |
| | in: 6, 9 | | | in: 12, 18 |
| 3a | 15, 5 | b 4, 20 | C 4 | 4, 4 |
| Ch | allanga | | | |

Challenge

a 24, 4, 4 **b** *n* (any number), 7 × *n*, *n*