White Rose Maths

Autumn - Block 4

Multiplication & Division

Overview

Small Steps

- Multiply by 10
- Multiply by 100
- Divide by 10
- Divide by 100
- Multiply by 1 and 0
- Divide by 1 and itself
- Multiply and divide by 6
- 6 times table and division facts
- Multiply and divide by 9
- 9 times table and division facts
- Multiply and divide by 7
- 7 times table and division facts

NC Objectives

Recall and use multiplication and division facts for multiplication tables up to 12 × 12

Count in multiples of 6, 7, 9, 25 and 1,000

Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers.

Solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by one-digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

Multiply by 10

Notes and Guidance

Children need to be able to visualise and understand making a number ten times bigger and that 'ten times bigger' is the same as 'multiply by 10'

The language of 'ten lots of' is vital to use in this step. The understanding of the commutative law is essential because children need to see calculations such as 10 × 3 and 3 × 10 as equal.

Mathematical Talk

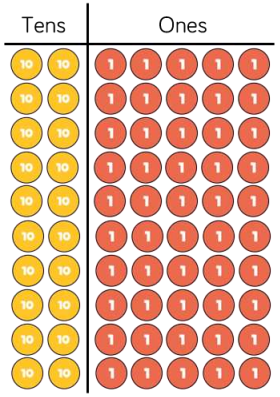
Can you represent these calculations with concrete objects or a drawing?

Can you explain what you did to a partner?

What do you notice when multiplying by 10? Does it always work?

What's the same and what's different about 5 buses with 10 passengers on each and 10 buses with 5 passengers on each?

Varied Fluency



Write the calculation shown by the place value counters.

Each row has ____ tens and ____ ones.

Each row has a value of ____.

There are ____ rows.

The calculation is ____ × ____ = ____.

Use place value counters to calculate:

10 × 3 4 × 10 12 × 10

Match each statement to the correct bar model.

5 buses have ten passengers.

10	10	10	10	10

8 pots each have ten pencils.

5	5	5	5	5	5	5	5	5	5

10 chickens lay 5 eggs each.

10	10	10	10	10	10	10	10

Multiply by 10

Reasoning and Problem Solving

Always, Sometimes, Never

If you write a whole number in a place value grid and multiply it by 10, all the digits move one column to the left.

Always.

Discuss the need for a placeholder after the new rightmost digit.

Annie has multiplied a whole number by 10

Her answer is between 440 and 540

What could her original calculation be?

How many possibilities can you find?

45 × 10
46 × 10
47 × 10
48 × 10
49 × 10
50 × 10
51 × 10
52 × 10
53 × 10

(or the above calculations written as 10 × 45 etc.).

Multiply by 100

Notes and Guidance

Children build on multiplying by 10 and see links between multiplying by 10 and multiplying by 100

Use place value counters and Base 10 to explore what is happening to the value of the digits in the calculation and encourage children to see a rule so they can begin to move away from concrete representations.

Mathematical Talk

How do the Base 10 help us to show multiplying by 100?

Can you think of a time when you would need to multiply by 100?

Will you produce a greater number if you multiply by 100 rather than 10? Why?

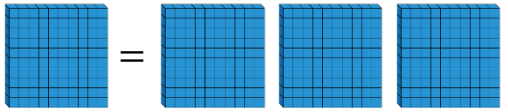
Can you use multiplying by 10 to help you multiply by 100? Explain why.

Varied Fluency

$3 \times$  $=$  $=$ 3 ones $=$ 3

Complete:

$3 \times$ $=$ ___ tens $=$ ___

$3 \times$  $=$ ___ hundreds $=$ ___

Use a place value grid and counters to calculate:

7×10	63×10	80×10
7×100	63×100	80×100

What's the same and what's different comparing multiplying by 10 and 100? Write an explanation of what you notice.

Use $<$, $>$ or $=$ to make the statements correct.

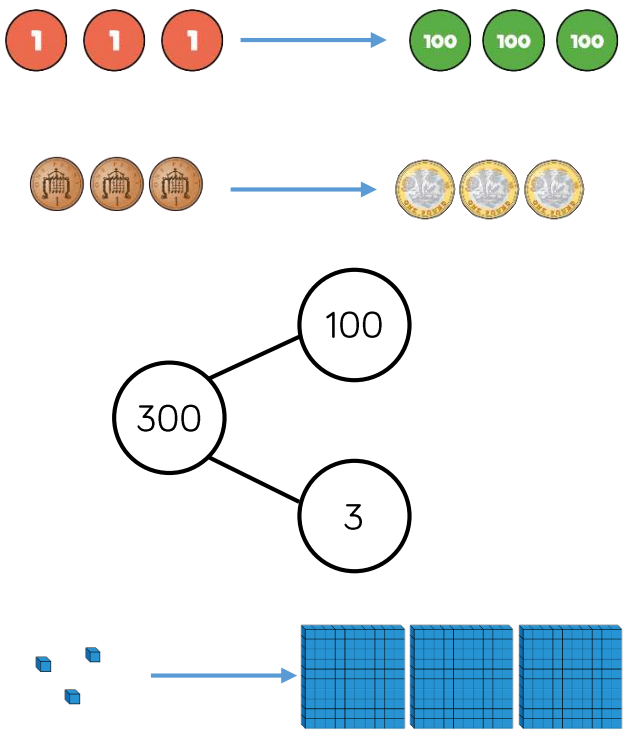
75×100	◯	75×10
39×100	◯	$39 \times 10 \times 10$
460×10	◯	100×47

Multiply by 100

Reasoning and Problem Solving

Which representation does **not** show multiplying by 100?

Explain your answer.



The part-whole model does not represent multiplying by 100

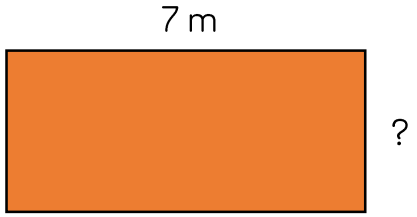
Part-whole models show addition (the aggregation structure) and subtraction (the partitioning structure), so if the whole is 300 and there are two parts, the parts added together should total 300 (e.g. 100 and 200, or 297 and 3). If the parts are 100 and 3, the whole should be 103.

To show multiplying 3 by 100 as a part-whole model, there would need to be 100 parts each with 3 in.

The perimeter of the rectangle is 26 m.

Find the length of the missing side.

Give your answer in cm.



The missing side length is 6 m so in cm it will be:

$6 \times 100 = 600$

The missing length is 600 cm.

Divide by 10

Notes and Guidance

Exploring questions with whole number answers only, children divide by 10
They should use concrete manipulatives and place value charts to see the link between dividing by 10 and the position of the digits before and after the calculation.
Using concrete resources, children should begin to understand the relationship between multiplying and dividing by 10 as the inverse of the other.

Mathematical Talk

What has happened to the value of the digits?

Can you represent the calculation using manipulatives?
Why do we need to exchange tens for ones?

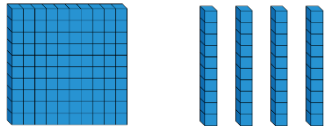
When dividing using a place value chart, in which direction do the digits move?

Varied Fluency

- Use place value counters to show the steps to divide 30 by 10

Can you use the same steps to divide a 3-digit number like 210 by 10?

- Use Base 10 to divide 140 by 10
Explain what you have done.



- Ten friends empty a money box. They share the money equally between them. How much would they have each if the box contained:
  - 20 £1 coins?
  - £120
  - £24?

After emptying the box and sharing the contents equally, each friend has 90 p.
How much money was in the box?

Divide by 10

Reasoning and Problem Solving

Four children are in a race. The numbers on their vests are:

350	35
3,500	53

Use the clues to match each vest number to a child.

- Jack's number is ten times smaller than Mo's.
- Alex's number is not ten times smaller than Jack's or Dora's or Mo's.
- Dora's number is ten times smaller than Jack's.

Alex – 53

Jack – 350

Dora – 35

Mo – 3,500

While in Wonderland, Alice drank a potion and everything shrank. All the items around her became ten times smaller! Are these measurements correct?

Item	Original measurement	After shrinking
Height of a door	220 cm	2,200 cm
Her height	160 cm	16 cm
Length of a book	340 mm	43 mm
Height of a mug	220 mm	?

Can you fill in the missing measurement?

Can you explain what Alice did wrong?

Write a calculation to help you explain each item.

Height of a door
Incorrect – Alice has multiplied by 10.

Her height
Correct

Length of a book
Incorrect – Alice has swapped the order of the digits. When dividing by 10 the order of the digits never changes.

Height of a mug
22 mm.

Divide by 100

Notes and Guidance

Children divide by 100 with whole number answers.

Money and measure is a good real-life context for this, as coins can be used for the concrete stage.

Mathematical Talk

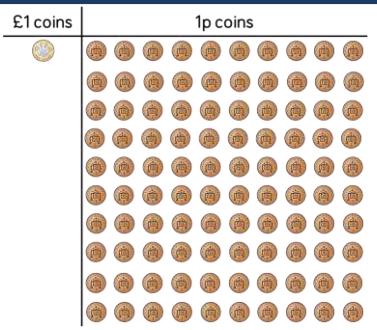
How can you use dividing by 10 to help you divide by 100?

How are multiplying and dividing by 100 related?

Write a multiplication and division fact family using 100 as one of the numbers.

Varied Fluency

- Is it possible for £1 to be shared equally between 100 people?
  How does this picture explain it?
  Can £2 be shared equally between 100 people?
  How much would each person receive?



- Match the calculation with the correct answer.

4,200 ÷ 10	420
4,200 ÷ 100	42
420 ÷ 10	

- Use <, > or = to make each statement correct.

3,600 ÷ 10	◯	3,600 ÷ 100
2,700 ÷ 100	◯	270 ÷ 10
4,200 ÷ 100	◯	430 ÷ 10

Divide by 100

Reasoning and Problem Solving

Eva and Whitney are dividing numbers by 10 and 100
They both start with the same 4-digit number.

They give some clues about their answer.

Eva

My answer has 8 ones and 2 tens.

My answer has 2 hundreds, 8 tens and 0 ones.

Whitney

What number did they both start with?
Who divided by what?

They started with 2,800

Whitney divided by 10 to get 280 and Eva divided by 100 to get 28

Use the digit cards to fill in the missing digits.

1	2	3	4	5	6	7	8	9

170 ÷ 10 = __

__20 × 10 = 3,__00

1,8__0 ÷ 10 = 1__6

__9 × 100 = 5,__00

6__ = 6,400 ÷ 100

170 ÷ 10 = 17

320 × 10 = 3,200

1,860 ÷ 10 = 186

59 × 100 = 5,900

64 = 6,400 ÷ 100

Multiply by 1 and 0

Notes and Guidance

Children explore the result of multiplying by 1, using concrete equipment.

Linked to this, they look at multiplying by 0 and use concrete equipment and pictorial representations of multiplying by 0

Mathematical Talk

Use number pieces to show me 9×1, 3×1, 5×1

What do you notice?

What does 0 mean?

What does multiplying by 1 mean?

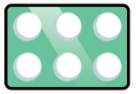
What's the same and what's different about multiplying by 1 and multiplying by 0?

Varied Fluency

Complete the calculation shown by the number pieces.

There are ____ ones.

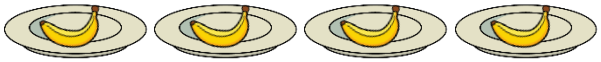
____ × ____ = ____



There is ____ six.

____ × ____ = ____

Complete the sentences.



There are ____ plates. There is ____ banana on each plate.
Altogether there are ____ bananas.

____ × ____ = ____

Complete:

$4 \times \_\_\_\_ = 4$ $\quad$ $\_\_\_\_ = 1 \times 7$ $\quad$ $0 = \_\_\_\_ \times 42$

$63 \times 1 = \_\_\_\_$ $\quad$ $\_\_\_\_ \times 27 = 0$ $\quad$ $50 \times \_\_\_\_ = 50$

Multiply by 1 and 0

Reasoning and Problem Solving

Which answer could be the odd one out?
What makes it the odd one out?

$3 + 0 =$ ___

$3 - 0 =$ ___

$3 \times 0 =$ ___

Explain why the answer is different.

$3 \times 0 = 0$ is the odd one out because it is the only one with 0 as an answer.

The addition and subtraction calculations have an answer of 3 because they started with that amount and added or subtracted 0 (nothing).

3×0 means '3 lots of nothing', so the total is zero.

Circle the incorrect calculations and write them correctly.

$5 \times 0 = 50$

$19 \times 1 = 19$

$7 \times 0 = 7$

$1 \times 1 = 2$

$0 \times 35 = 0$

$0 \times 0 = 1$

$1 \times 8 = 9$

Choose one calculation and create a drawing to show it.

The incorrect calculations are:
$5 \times 0 = 50$
$7 \times 0 = 7$
$1 \times 1 = 2$
$0 \times 0 = 1$
$1 \times 8 = 9$

Corrected calculations:

$5 \times 0 = 0$
$7 \times 0 = 0$
$1 \times 1 = 1$
$0 \times 0 = 0$
$1 \times 8 = 8$

Divide by 1

Notes and Guidance

Children learn what happens to a number when you divide it by 1 or by itself. Using concrete and pictorial representations, children demonstrate how both the sharing and grouping structures of division can be used to divide a number by 1 or itself. Use stem sentence to encourage children to see this e.g.
5 grouped into 5s equals 1 (5 ÷ 5 = 1)
5 grouped into 1s equals 5 (5 ÷ 1 = 5)

Mathematical Talk

What does sharing mean? Give an example.

What does grouping mean? Give an example.

Can you write a worded question where you need to group?

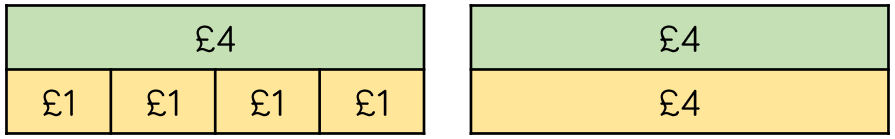
Can you write a worded question where you need to share?

Varied Fluency

Use counters and hands to complete.

- 4 counters **shared** between 4 hands ___ ÷ ___ = ___
- 4 counters **shared** between 1 hand ___ ÷ ___ = ___
- 9 counters **grouped** in 1s ___ ÷ ___ = ___
- 9 counters **grouped** in 9s ___ ÷ ___ = ___

Choose the correct bar model to help you answer this question.
Annie has £4 in total. She gives away £4 at a time to her friends.
How many friends receive £4?



Draw a bar model for each question to help you work out the answer.

- Tommy baked 7 cookies and shared them equally between his 7 friends. How many cookies did each friend receive?
- There are 5 sweets. Children line up and take 5 sweets at a time. How many children have 5 sweets?

Divide by 1

Reasoning and Problem Solving

Use <, > or = to complete the following:

$8 \div 1 \bigcirc 7 \div 1$

$6 \div 6 \bigcirc 5 \div 5$

$4 \div 4 \bigcirc 4 \div 1$

Draw an image for each one to show that you are correct.

>

=

<

Mo says,

25 divided by 1 is equal to 1 divided by 25

Do you agree?

Explain your answer.

No, Mo is incorrect because division is not commutative.

$25 \div 1 = 25$

$1 \div 25 = \frac{1}{25}$

Multiply and Divide by 6

Notes and Guidance

Children draw on their knowledge of times tables facts in order to multiply and divide by 6

They use their knowledge of equal groups in using concrete and pictorial methods to solve multiplication and division problems.

Mathematical Talk

How many equal groups do we have? How many are in each group? How many do we have altogether?

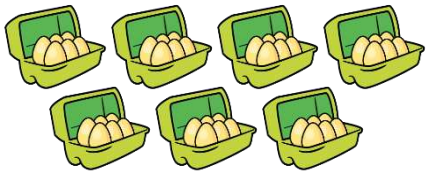
Can you write a number sentence to show this?

Can you represent the problem in a picture?

What does each number in the calculation represent?

Varied Fluency

Complete the sentences.



There are ____ lots of ____ eggs.

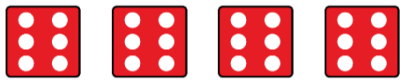
There are ____ eggs in total.

____ × ____ = ____

First there were ____ eggs. Then they were shared into ____ boxes.
Now there are ____ eggs in each box.

____ ÷ ____ = ____

Complete the fact family.



____ × ____ = ____
____ × ____ = ____
____ ÷ ____ = ____
____ ÷ ____ = ____

There are 9 baskets.
Each basket has 6 apples in.
How many apples are there in total?
Write a multiplication sentence to describe this word problem.

Multiply and Divide by 6

Reasoning and Problem Solving

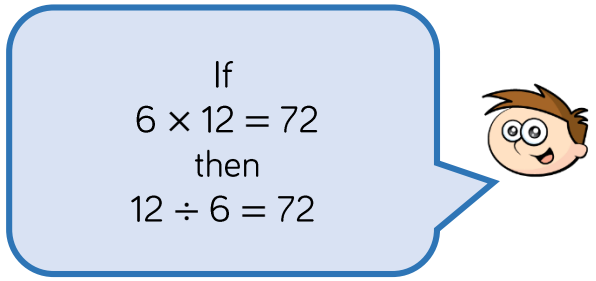
Always, Sometimes, Never

When you multiply any whole number by 6 it will always be an even number.

Explain your answer.

Always, because 6 itself is even and odd × even and even × even will always give an even product.

Teddy says,



Is Teddy correct?
Explain your answer.

Teddy is not correct because 12 ÷ 6 = 2 not 72

He should have written
72 ÷ 6 = 12 or
72 ÷ 12 = 6

6 Times Table & Division Facts

Notes and Guidance

Children use known table facts to become fluent in the six times table.
For example, applying knowledge of the 3 times table by understanding that each multiple of 6 is double the equivalent multiple of 3
Children should also be able to apply this knowledge to multiplying and dividing by 10 and 100 (for example, knowing that $30 \times 6 = 180$ because they know that $3 \times 6 = 18$).

Mathematical Talk

What do you notice about the 3 times table and the 6 times table?

Can you use $3 \times \_\_\_$ to work out $6 \times \_\_\_$?

Can you use 7×5 to work out 7×6?

Which known fact did you use?

Varied Fluency

Complete the number sentences.

$1 \times 3 = \_\_\_$ $\quad$ $1 \times \_\_\_ = 6$

$2 \times \_\_\_ = 6$ $\quad$ $2 \times 6 = \_\_\_$

$3 \times 3 = \_\_\_$ $\quad$ $3 \times 6 = \_\_\_$

What do you notice about the 5 times table and the 6 times table?

5 times table:	5	10	15	20	25	30
6 times table:	6	12	18	24	30	36

Use your knowledge of the 6 times table to complete the missing values?

$6 \times 2 = \_\_\_$ $\quad$ $\_\_\_ \times 6 = 12$ $\quad$ $6 \times 2 \times 10 = \_\_\_$

$\_\_\_ \times 20 = 120$ $\quad$ $20 \times \_\_\_ = 120$ $\quad$ $6 \times 2 \times \_\_\_ = 1{,}200$

$6 \times \_\_\_ = 1{,}200$ $\quad$ $200 \times 6 = \_\_\_$ $\quad$ $10 \times \_\_\_ \times 6 = 120$

6 Times Table and Division Facts

Reasoning and Problem Solving

I am thinking of 2 numbers where the sum of the numbers is 15 and the product is 54

What are my numbers?

Think of your own problem for a friend to solve?

6 and 9 because

$9 \times 6 = 54$
$6 \times 9 = 54$
$6 + 9 = 15$
$9 + 6 = 15$

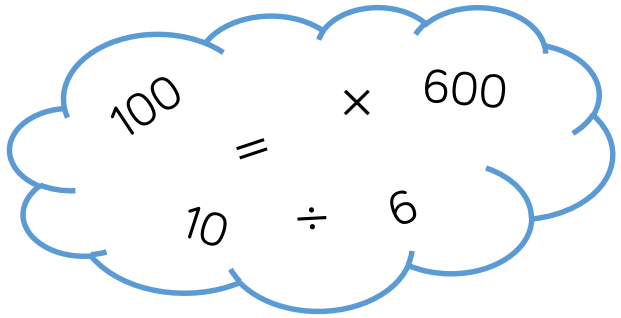
Always, Sometimes, Never

If a number is a multiple of 3 it is also a multiple of 6

Explain why you think this.

Sometimes.
Every even multiple of 3 is a multiple of 6, but the odd multiples of 3 are not multiples of 6

Choose the correct number or symbol from the cloud to fill in the boxes.



___ ÷ ___ = 6

60 = 600 ___ 10

$600 \div 100 = 6$
$60 = 600 \div 10$

Multiply and Divide by 9

Notes and Guidance

Children use their previous knowledge of multiplying and dividing to become fluent in the 9 times table.

They apply their knowledge in different contexts.

Mathematical Talk

Can you use concrete or pictorial representations to help you answer the questions?

What other facts can you link to this fact?

What other times tables will help you with this times table?

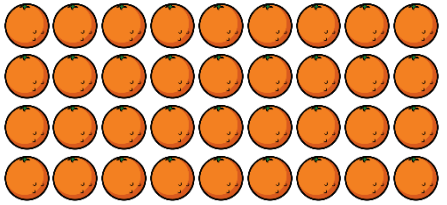
What does each number in the calculation represent?

How many lots of 9 do we have?

How many groups of 9 do we have?

Varied Fluency

Complete the sentences to describe the oranges:

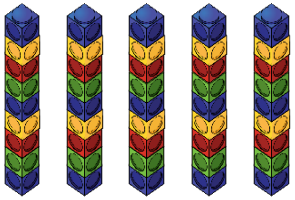


There are ____ lots of 9

There are ____ nines.

4 × ____ = ____

Complete the fact family.



____ × ____ = ____

____ × ____ = ____

____ ÷ ____ = ____

____ ÷ ____ = ____

Complete the sentences.

There are ____ lots of ____.

____ × ____ = ____

____ ÷ ____ = ____

9	9	9

There are ____ lots of ____.

____ × ____ = ____

____ ÷ ____ = ____

3	3	3	3	3	3	3	3	3

What's the same about each question? What's different?

Multiply and Divide by 9

Reasoning and Problem Solving

True or False?

$6 \times 9 = 9 \times 3 \times 2$

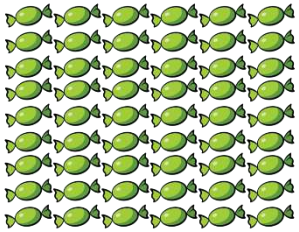
$9 \times 6 = 3 \times 9 + 9$

Explain your answer.

$6 \times 9 = 9 \times 3 \times 2$ is true because $6 \times 9 = 54$ and $9 \times 3 = 27$ $27 \times 2 = 54$

$9 \times 6 = 3 \times 9 + 9$ is false because $6 \times 9 = 54$ and $3 \times 9 = 27$ $27 + 9 = 36$

Amir and Whitney both receive some sweets.

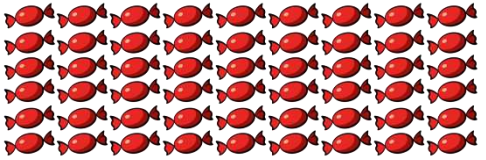


Amir

I have more sweets because I have more rows.

Whitney

I have more sweets because I have more in each row.



Who has more sweets? Explain your reasoning.

They both have 54 sweets, arranged in two different arrays.

9 Times Table & Division Facts

Notes and Guidance

Children use known times table facts to become fluent in the 9 times table.

For example, knowing that each multiple of 9 is one less than the equivalent multiple of 10, and using that knowledge to derive related facts.

Children should also be able to apply the knowledge of the 9 times table when multiplying and dividing by 10 and 100

Mathematical Talk

How did you work out the missing numbers?

What do you notice about the multiples of 9?

What do you notice about the 9 times table and the 10 times table?

Varied Fluency

What are the missing numbers from the 9 times table?

9	18	27	___	45
54	___	72	81	90

Circle the multiples of 9.

54	108	18	24	9	67	72	37

Use your knowledge of the 9 times table to complete the missing values.

$1 \times 9 = \_\_\_$	$\_\_\_ \times 1 = 9$	$1 \times 9 \times \_\_\_ = 90$
$\_\_\_ \times 9 = 90$	$900 = 100 \times \_\_\_$	$9 \times 1 \times 10 = \_\_\_$
$9 \times \_\_\_ = 900$	$4 \times 9 = \_\_\_$	$9 \times 1 \times \_\_\_ = 900$

What do you notice about the 9 times table and the 10 times table?

9 times table:	9	18	27	36	45	54
10 times table:	10	20	30	40	50	60

9 Times Table and Division Facts

Reasoning and Problem Solving

Can you complete the calculations using some of the symbols or numbers in the box?

÷		9		100
	10		900	=

___ ÷ ___ = 9

90 = 900 ___ 10

900 ÷ 100 = 9

90 = 900 ÷ 10

I am thinking of two numbers.
The sum of the numbers in 17.
The product of the numbers is 72.
What are my secret numbers?

Can you choose your own two secret numbers from the 9 times table and create clues for your partner?

8 and 9 because
8 × 9 = 72 or
9 × 8 = 72
and
8 + 9 = 17 or
9 + 8 = 17

Always, Sometimes, Never

All multiples of 9 have digits that have a sum of 9.

Always.

Multiply and Divide by 7

Notes and Guidance

Children use their knowledge of multiplication and division to multiply by 7

They count in 7s, and use their knowledge of equal groups supported by use of concrete and pictorial methods to solve multiplication calculations and problems.

They explore commutativity and also understand that multiplication and division are inverse operations.

Mathematical Talk

How many do we have altogether?

What do you notice?

Can you work out the answers by partitioning 7 into 4 and 3?

Which multiples of 7 do you already know from your other tables?

Varied Fluency

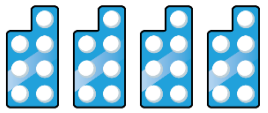
Use a number stick to support counting in sevens.
What do you notice?

Write down the first five multiples of 7

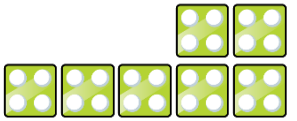
___ ___ ___ ___ ___

Rosie uses number pieces to represent seven times four. She does it in two ways.

4 sevens
4 lots of 7
4 × 7



7 fours
7 lots of 4
7 × 4



Use Rosie's method to represent seven times six in two ways.

Seven children share 56 stickers. How many stickers will they get each?
Use a bar model to solve the problem.

One apple costs 7 pence. How much would 5 apples cost?
Use a bar model to solve the problem.

Multiply and Divide by 7

Reasoning and Problem Solving

Mrs White's class are selling tickets at £2 each for the school play.

The class can sell one ticket for each chair in the hall.

There are 7 rows of chairs in the hall.
Each row contains 9 chairs.

How much money will they make?

Number of tickets (chairs):

$7 \times 9 = 63$

$63 \times £2 = £126$

What do you notice about the pattern when counting in 7s from 0?
Does this continue beyond 7 times 12?

Can you explain why?

In which other times tables will you see the same pattern?

Odd, even pattern because
odd + odd = even.
Then
even + odd = odd,
and this will continue throughout the whole times table.

The same pattern will occur in all other odd multiplication tables (e.g. 1, 3, 5, 9).

7 Times Table & Division Facts

Notes and Guidance

Children apply the facts from the 7 times table (and other previously learned tables) to solve calculations with larger numbers.

They need to spend some time exploring links between multiplication tables and investigating how this can help with mental strategies for calculation.

e.g. $7 \times 7 = 49, 5 \times 7 = 35$ and $2 \times 7 = 14$

Mathematical Talk

If you know the answer to three times seven, how does it help you?

What's the same and what's different about the number facts?

How does your 7 times table help you work out the answers?

Varied Fluency

Complete.

$3 \times 7 = \_\_\_$

$30 \times 7 = \_\_\_$

$300 \times 7 = \_\_\_$

Use your knowledge of the 7 times table to calculate.

$80 \times 7 = \_\_\_$ $\quad\quad$ $\_\_\_ = 60 \times 7$

$70 \times 7 = \_\_\_$ $\quad\quad$ $7 \times 500 = \_\_\_$

How would you use times tables facts to help you calculate how many days there are in 15 weeks? Complete the sentences.

There are ____ days in one week.

____ × 10 = ____
There are ____ days in 10 weeks.

____ × 5 = ____
There are ____ days in 5 weeks.

____ + ____ = ____
There are ____ days in 15 weeks.

7 Times Table & Division Facts

Reasoning and Problem Solving

True or False?

$7 \times 6 = 7 \times 3 \times 2$

$7 \times 6 = 7 \times 7 + 8$

Explain your answer to a friend. Prove using a drawing.

True.

False, because $7 \times 6 = 42$ whereas $7 \times 7 = 49$ then $49 + 8 = 57$

Children could draw a bar model or bundles of straws.

Children were arranged into rows of seven.
There were 5 girls and 2 boys in each row.

Use your times table knowledge to show how many girls would be in 10 rows and in 100 rows.

Show as many number sentences using multiplication and division as you can which are linked to this picture.

How many children in total are there in 200 rows? How many girls? How many boys?

10 rows

$5 \times 10 = 50$ girls

100 rows

$5 \times 100 = 500$ girls

200 rows

Children in total: $7 \times 200 = 1{,}400$

Girls: $5 \times 200 = 1{,}000$

Boys: $2 \times 200 = 400$