## Overview

### Small Steps

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### NC Objectives

- Recall and use multiplication and division facts for multiplication tables up to $12 \times 12$.
- **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 focus on and visualise making a number ten times bigger. 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 are related.

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

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?

Match the statement to the correct bar model.

5 buses have ten passengers.

8 pots each have ten pencils.

10 chickens lay 5 eggs each.
Multiply by 10

Reasoning and Problem Solving

Always, sometimes, never.

If you draw a number in a place value grid and multiply it by 10, everything moves one column to the left.

Always.

Katya 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
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 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

Use a place value grid and counters to calculate:

\[
\begin{align*}
7 \times 10 & \quad 63 \times 10 & \quad 80 \times 10 \\
7 \times 100 & \quad 63 \times 100 & \quad 80 \times 100 \\
\end{align*}
\]

What do you notice? Write an explanation of this rule.

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

\[
\begin{align*}
75 \times 100 & \quad \bigcirc & \quad 75 \times 10 \\
100 \times 47 & \quad \bigcirc & \quad 47 \times 100 \\
39 \times 100 & \quad \bigcirc & \quad 39 \times 10 \times 10 \\
\end{align*}
\]
Multiply by 100

Reasoning and Problem Solving

Which image does not show multiplying by 100?
Explain your answer.

The part-whole model does not represent multiplying by 100. It is used for addition and subtraction so there should be 100 parts with 3 in each.

The whole is wrong in the part-whole model, it should be 103

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

Using 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.

Varied Fluency

Use place value counters to show the steps that you would take to divide 30 by 10.

10 10 10

Can you do this for a 3-digit number like 210?

100 100 10

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

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, which direction do the digits move?

Ten friends empty a money box that had lots of £1 coins in it. They share the money between them. How much would they have each if the box had:

- 20 £1 coins
- 24 £1 coins
- £100

If each person had 90p, how much money would have been in the box?
Divide by 10

Reasoning and Problem Solving

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

Emma – 53
Jack – 350
Anya – 35
Rio - 3500

Can you work out which clue matches to which child?

- Jack's number is ten times smaller than Rio's.
- Emma's number is not ten times smaller than Jack's or Anya's or Rio's.
- Anya's number is ten times smaller than Jack's.

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Original measurement</th>
<th>After shrinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height of a door</td>
<td>1200 cm</td>
<td>12 cm</td>
</tr>
<tr>
<td>Her height</td>
<td>160 cm</td>
<td>1600 cm</td>
</tr>
<tr>
<td>Length of a book</td>
<td>310 mm</td>
<td>31 mm</td>
</tr>
<tr>
<td>Height of a mug</td>
<td>220 mm</td>
<td>?</td>
</tr>
</tbody>
</table>

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: wrong; should be 120 cm; Alice has divided by 100

Her height: wrong; should be 16 cm; Alice has multiplied by 10


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.

Varied Fluency

Is it possible for £1 to be shared between 100 people? How does this picture explain it?

Match the calculation with the correct answer.

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

Use <, > or = to make the statement correct.

- 3,600 ÷ 10  <  3,600 ÷ 100
- 2,700 ÷ 100  >  270 ÷ 10
- 1,500 ÷ 100  =  150 ÷ 10

Mathematical Talk

How can you use dividing by 10 to support you dividing by 100?

How are multiplying and dividing by 100 related?

Write a multiplication and division fact family using 100 as one of the numbers.
Eva and Whitney are dividing numbers by 10 and 100. There both start with the same 4-digit number.

Both of them give some clues about their answer.

Eva: My number has 8 ones and 2 tens

Whitney: My number has 2 hundreds, 8 tens and 0 ones.

What number did they start with? Who divided by what? Prove it.

They started with 2,800

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

Use the number cards to fill in the missing digits.

\[
\begin{array}{ccccccc}
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\
170 \div 10 &=& \_\_ \\
\_20 \times 10 &=& 3\_00 \\
1,8\_0 \div 10 &=& 1\_6 \\
\_9 \times 100 &=& 5\_00 \\
6\_ &=& 6,400 \div 100
\end{array}
\]

170 ÷ 10 = 17
320 × 10 = 3,200
1860 ÷ 10 = 186
59 × 100 = 5,900
64 = 6,400 ÷ 100
Multiply by 1 and 0

Notes and Guidance

Children explore what happens when you multiply by one using concrete equipment. Linking to this, they look at multiplying by 0 and use stem sentences to describe what has happened.

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 × ___ = 4  
___ = 1 × 7  
0 = ___ × 42

63 × 1 = ___  
___ × 27 = 0  
50 × ___ = 50

Mathematical Talk

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

What do you notice?

What does zero mean?

What does multiplying by 1 mean?

Write a word problem to show multiplying by 1 and multiplying by 0

What’s the same & what’s different between multiplying by 1 and 0?
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 × 0 = ___

Explain why the answer is different.

3 × 0 = 0 is the odd one out because it is the only one with zero as an answer.

Addition and subtraction have an answer of 3 because they started with that amount and added or subtracted nothing.

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

Circle the incorrect calculations and write them correctly.

The incorrect ones are:
5 × 0 = 50
7 × 0 = 7
1 × 1 = 2
0 × 0 = 1
1 × 8 = 9

Example:
5 × 0 = 0 because 5 lots of nothing total zero.
I have 5 bowls, each with nothing in them.
Divide by 1

Notes and Guidance

Children explore what happens to a number when you divide it by 1 or by itself. Using concrete and pictorial representations, children demonstrate how both sharing and grouping can used to divide by 1 or the number 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)

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 for the worded question.
Patsy has £4 in total. She gives away £4 at a time to her friends. How many friends receive £4?

| £1 | £1 | £1 | £1 | £4 |

Draw a bar model for each question and work out the answer.
- Alan baked 7 cookies and shared them 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?

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?
Divide by 1

Reasoning and Problem Solving

Use <, > or = to complete the following:

\[
\begin{align*}
8 & \div 1 & 7 & \div 1 & > \\
6 & \div 6 & 5 & \div 5 & = \\
4 & \div 4 & 4 & \div 1 & <
\end{align*}
\]

Mo says,

25 divided by 1 is equal to 1 divided by 25

No, Mo is incorrect because division is not commutative.

Do you agree?

Explain your answer.

Draw an image for each one to convince me that you are correct.
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 to use concrete and pictorial methods to solve multiplication.

Varied Fluency

Complete the sentences.

There are ____ lots of ____ eggs. There are ____ eggs in total.

____ × ____ = ____

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

____ ÷ ____ = ____

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?

There are 9 baskets. Each basket has 6 apples in. How many apples are there in total? Write a multiplication and division sentence to describe the 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.

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

Gary says,
If
6 × 12 = 72
then
12 ÷ 6 = 72

Is Gary correct?
Explain your answer.

Gary is not correct because 12 ÷ 6 is equal to 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, knowing that the six times tables are double the sum of the three times tables and knowing their derived division facts.

Children should also be able to apply this knowledge to multiplying and dividing by 10 and 100

Mathematical Talk

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

Can you use $3 \times \underline{\hspace{1cm}}$ to work out $6 \times \underline{\hspace{1cm}}$?

Can you use $7 \times 5$ to work out $7 \times 6$?

Which known fact did you use?

Varied Fluency

Complete the number sentences.

\begin{align*}
1 \times 3 &= \underline{\hspace{1cm}} & 1 \times \underline{\hspace{1cm}} &= 6 \\
2 \times \underline{\hspace{1cm}} &= 6 & 2 \times 6 &= \underline{\hspace{1cm}} \\
3 \times 3 &= \underline{\hspace{1cm}} & 3 \times 6 &= \underline{\hspace{1cm}} \\
\end{align*}

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

\begin{align*}
\text{5 times table:} & \quad 5 & 10 & 15 & 20 & 25 & 30 \\
\text{6 times table:} & \quad 6 & 12 & 18 & 24 & 30 & 36 \\
\end{align*}

Can you use your knowledge of the 6 times table to complete the missing values?

\begin{align*}
6 \times 2 &= \underline{\hspace{1cm}} & \underline{\hspace{1cm}} \times 6 &= 12 & 6 \times 2 \times 10 &= \underline{\hspace{1cm}} \\
\underline{\hspace{1cm}} \times 20 &= 120 & 20 \times \underline{\hspace{1cm}} &= 120 & 6 \times 2 \times \underline{\hspace{1cm}} &= 1,200 \\
6 \times \underline{\hspace{1cm}} &= 1,200 & 200 \times 6 &= \underline{\hspace{1cm}} & 10 \times \underline{\hspace{1cm}} \times 6 &= 120 \\
\end{align*}
6 Times Table & 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 | 9 × 6 = 54  
6 × 9 = 54  
6 + 9 = 15  
9 + 6 = 15 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>What are my numbers?</td>
<td></td>
</tr>
<tr>
<td>Can you think of your own problem for a friend to solve?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Choose the correct number or symbol from the cloud to fill in the boxes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 = × 600</td>
</tr>
<tr>
<td>10 ÷ 6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Always, sometimes, never?</th>
<th>Always, because the 6 times table is double the 3 times table. Children may list the times tables.</th>
</tr>
</thead>
<tbody>
<tr>
<td>If a number is a multiple of 6 it will always be a multiple of 3. What do you think?</td>
<td></td>
</tr>
<tr>
<td>Convince me.</td>
<td></td>
</tr>
</tbody>
</table>

| 600 ÷ 10 = 6  
60 = 600 ÷ 10 |
| --- | --- |
Multiply and Divide by 9

Notes and Guidance

Children use their previous knowledge of multiplying and dividing to become more fluent in the nine times table. They apply their knowledge in different contexts.

Mathematical Talk

Can you use concrete or pictorial representations to help you solve the fact?
What other facts can you link to this one?
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 ___.
___ × ___ = ___
___ ÷ ___ = ___

There are ___ lots of ___.
___ × ___ = ___
___ ÷ ___ = ___
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
\[ 9 \times 3 = 27 \]
\[ 27 + 9 = 36 \]

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 the same amount of sweets they are just arranged in a different way.
9 Times Table & Division Facts

Notes and Guidance
Children use known times table facts to become fluent in the nine times table. For example, knowing that the nine times table is one less than the ten times table 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?

\[
\begin{array}{cccccc}
9 & 18 & 27 & \_ & 45 \\
54 & \_ & 72 & 81 & 90 \\
\end{array}
\]

Circle the multiples of 9.

\[
\begin{array}{cccccccc}
54 & 108 & 18 & 24 & 9 & 67 & 72 & 37 \\
\end{array}
\]

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

\[
\begin{array}{cccccc}
1 \times 9 = \_ & \_ \times 1 = 9 & 1 \times 9 \times \_ = 90 \\
\_ \times 9 = 90 & 100 \times \_ = 900 & 9 \times 1 \times 10 = \_ \\
9 \times \_ = 900 & 4 \times 9 = \_ & 9 \times 1 \times \_ = 900 \\
\end{array}
\]

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 & Division Facts

Reasoning and Problem Solving

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

\[ \div \quad 9 \quad 100 \]

\[ 10 \quad 900 \quad = \]

\[ ____ \div ____ = 9 \]

\[ 90 = 900 ____ 10 \]

900 ÷ 100 = 9
90 = 900 ÷ 10

I am thinking of two numbers. The sum of the numbers is 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?

Always, sometimes, never?

All multiples of 9 have digits that have a sum of 9. Prove it!

Always:
Proof by exhaustion

e.g.
2 × 9 = 18
1 + 8 = 9
3 × 9 = 27
2 + 7 = 9
25 × 9 = 225
2 + 2 + 5 = 9

8 and 9
Multiply and Divide by 7

Notes and Guidance

Children use their knowledge of multiplication and division to multiply by 7. They count in 7s, use their knowledge of equal groups and use concrete and pictorial methods to solve multiplication calculations and problems. They explore commutativity and also understand that multiplication and division are inverse operations.

Varied Fluency

- Use a number stick to support counting in sevens. What do you notice?
  - Write down the first five multiples of 7
    - __ __ __ __ __
- Gemima uses number pieces to represent seven times four. She does it in two ways.
  - 4 sevens
  - 4 lots of 7
  - $4 \times 7$
  - 7 fours
  - 7 lots of 4
  - $7 \times 4$
  - Use Gemima’s method to represent 7 times 6 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.
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?

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

Example:
\[7 \times 7 = 49, 5 \times 7 = 35 \text{ and } 2 \times 7 = 14\]

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.
\[80 \times 7 = \_ \quad 60 \times 7 = \_\]
\[70 \times 7 = \_ \quad 50 \times 7 = \_\]

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.

___ \times 10 = ___

There are ___ days in 10 weeks.

___ \times 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 3 + 3

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

True.
False.

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.

Possible answers:
- 2 \times 10
- 5 \times 10
- 7 \times 10
- 2 \times 100
- 5 \times 100
- 7 \times 100

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 in 100 rows? How many girls? How many boys?