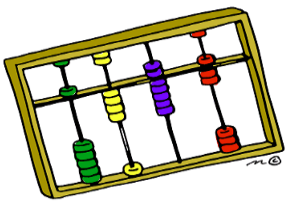
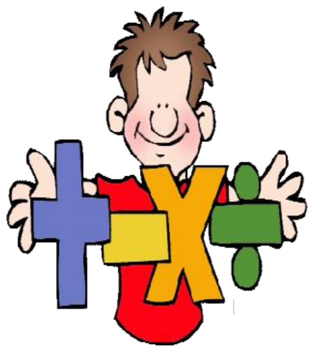
# Ursula Taylor C of E School





# Calculation Policy

This booklet has been produced in affiliation with Lincroft Middle School, working in partnership with 19 schools in the North Bedfordshire Schools Trust.

# Mathematics Calculation Policy

## Introduction and Aims

This booklet has been produced in line with the programmes of study taken from the revised National Curriculum for Mathematics 2014.

Children, where appropriate, will use mental methods as their first port of call, however for calculations that they cannot do in their heads, they will need to use an efficient written method accurately and with confidence. This booklet outlines how to tackle and record mathematical calculations in all four operations (+ - x ÷) in addition to our approach when working with fractions.

The methods are not set with age related expectations; rather it is a guide to the progression of approaches and methods that the children will be introduced to in school from Early Years through to Upper Key Stage 2 (Year 6).

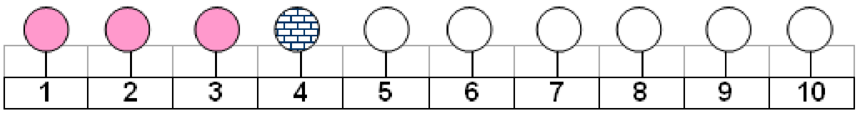
It is hoped that this booklet will allow transparency and the creation of a reliable, efficient and consistent approach to calculations at Ursula Taylor C of E School.

# Addition

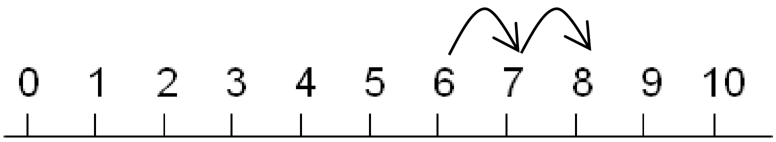
- Practical counting of objects in a group
- Say the number that is one more
- Recognition of numerals
- Match numerals to groups of objects
- Counting two groups of objects to find a total
- Record these groups in preferred way
- Read and understand a number sentence using standard symbols
- Write a number sentence to match two groups of objects
- Begin to understand that addition can be done in any order

  3 + 2 = 2 + 3 a + b = b + a

- Use numbered number line to do practical jumps (e.g. three and one more)



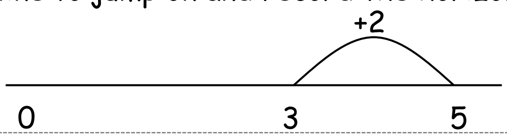

- Record addition jumps on a simple number line (e.g. 6+2)




- Visual aid of a 100 square for adding tens and ones
- Use the same method but increase numbers beyond 10.

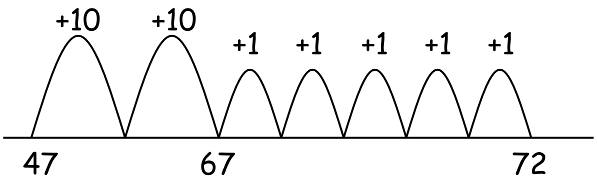
  (The above steps may need to be repeated as larger numbers are introduced)

- Use empty number line to jump on and record the horizontal number sentence to go with it.

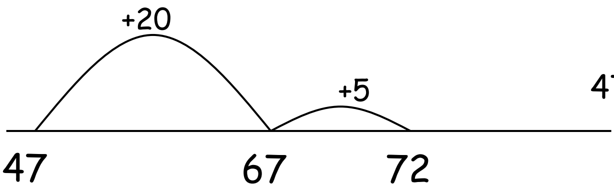



3 + 2 = 5

- Increase to two two-digit numbers or three-digit numbers, using partitioning skills. Extend to adding three numbers together in this way.




47 + 25 = 72




47 + 25 = 72

**Vocabulary**

+
add
addition
plus
and
more
altogether
total
equals
balance
sum
much
increase
same as
make
equals
inverse
near double

Regular number bond practice and recall of facts

Make estimates for calculations

- When the previous methods are secure children may wish to record in one of the ways below as opposed to the number line.

Partitioning (both numbers)
36 + 45 = 30 + 40 + 6 + 5
= 70 + 11
= 81

Partition (one number)
36 + 45 = 36 + 40 + 5
= 76 + 5
= 81

Rounding and adjusting:
36 + 45 = 36 + 50 – 5
= 86 – 5
= 81

- Vertical column addition – adding the most significant digits first.

$$\begin{array}{rr} & 427 \\ + & \underline{328} \\ & 700 \\ & 40 \\ & \underline{15} \\ & 755 \end{array}$$

Understanding that addition is commutative means that the hundreds do not have to be added first, any order of adding will give the same total. It is possible to add with the least significant digits first.

$$\begin{array}{rr} & 427 \\ + & \underline{328} \\ & 15 \\ & 40 \\ & \underline{700} \\ & 755 \end{array}$$

- This makes it possible to record the vertical method more quickly by making a note of multiples of 10 or 100 rather than writing it all out.

$$\begin{array}{rr} & 68 \\ + & \underline{26} \\ & 14 \\ & \underline{80} \\ & 94 \end{array}$$

becomes

$$\begin{array}{rr} & 68 \\ + & \underline{26} \\ & \underline{94} \\ & {\scriptstyle 1} \end{array}$$

(This method would **not normally be used before Year 5**, and even then there is **no hurry** to move to this.)

Pupils can then use either the expanded or compact method with larger numbers or decimals.

$$\begin{array}{rr} & 3968 \\ + & \underline{5493} \\ & 8000 \\ & 1300 \\ & 150 \\ & \underline{11} \\ & 9461 \end{array}$$

$$\begin{array}{rr} & 53.2 \\ + & \underline{4.9} \\ & \underline{58.1} \\ & {\scriptstyle 1} \end{array}$$

$$\begin{array}{rr} & 28.53 \\ + & 9.7 \\ + & \underline{5.32} \\ & \underline{43.55} \\ & {\scriptstyle 2\,1} \end{array}$$

Please note:
- Use of any method is appropriate depending on the type of calculation.
- Practise choosing the most appropriate method for a variety of calculations.
- Apply methods learnt and use confidently in a range of situations

Make estimates for calculations

Regular number bond practice and recall of facts

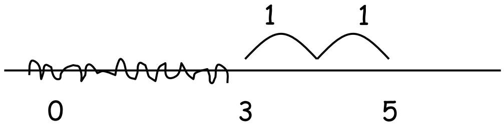
# Subtraction

- Practical situations and discussion some recording of numbers
- Practical counting of objects in a group
- Say the number that is one less than another
- Recognition of numerals and match numerals to groups of objects
- Count a group of objects, take some away and count again
- Record this process in preferred way
- Read and understand a number sentence using standard symbols
- Write a number sentence to match a group of objects with some removed
- Create own number sentence
- Reinforce that subtracting means you are trying to find the <u>difference</u> between the numbers
- Use a hundred square/number line to find the difference between two numbers.
- Write related horizontal number sentence
- Use a numbered number line to do practical jumps.

'Count on' to 'find the difference' between simple numbers.

5 – 3 = ?

We count on from 3 up to 5 to find the difference

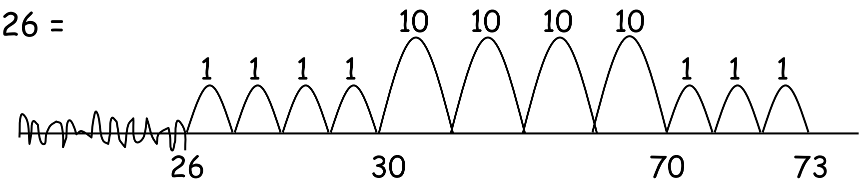



So 5 – 3 = 2

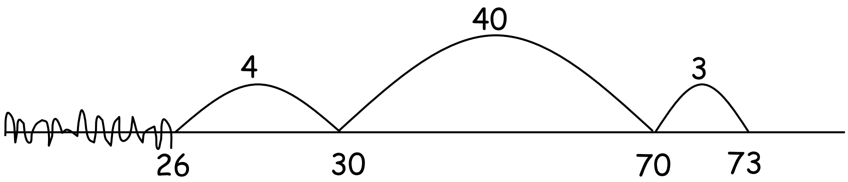
- Reinforce inverse operations and checking of calculations
- Move on to using higher numbers and partitioning.

Write related horizontal number sentence.

73 – 26 =




Or,



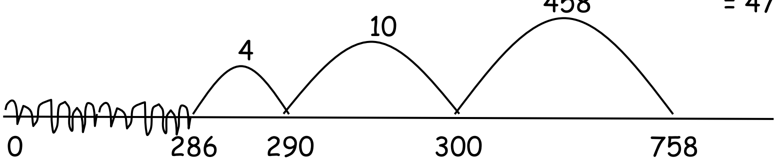

Either counting forwards or backwards

So 73 – 26 = 47

- This method is extended to larger numbers

**758 – 286 =**

The library owns 758 books. 286 of them are out on loan.
How many are on the shelves?




= 472

So 758 – 286 = 472

**Vocabulary**

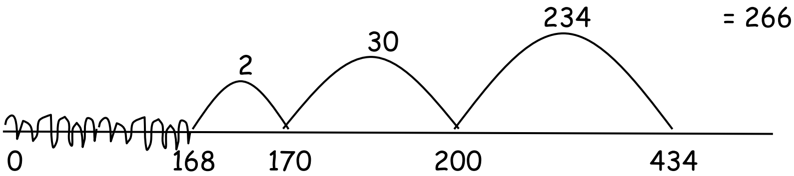
\-

subtract
less than
minus
difference
decrease
between
take away
count on
leave
left over
gone
fewer
half
halve
equals
inverse

Regular number bond practice and recall (with associated facts)

Make estimates for calculations

The number line method may be developed into a vertical method by finding what to add to make the next multiple of 1, 10, 100 etc.



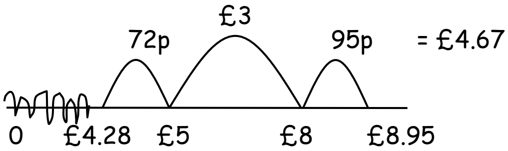

So 434 – 168 = 266

Initially the number line and the vertical method <u>will be recorded side by side</u>.

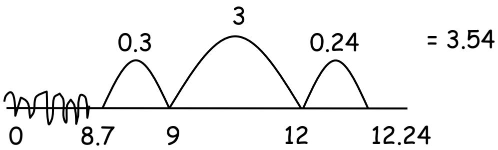
```
  434
- 168
  ---
    2  (170)
   30  (200)
  234  (434)
  ---
  266
```

<u>Other examples</u>

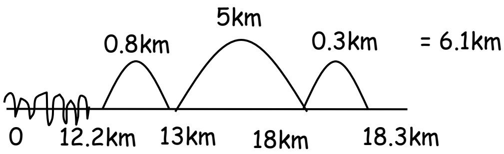
<u>Money</u>
Toby wants to buy a CD costing £8.95, he has already saved up £4.28 towards the cost. How much more money does he need to buy the CD?



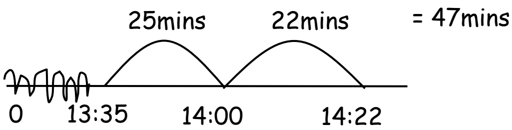

<u>Decimals</u>
At sports day one year, Helen completed her race in 12.24 seconds. Her older brother ran the race 8.7 seconds faster than she did. What was his time?




<u>Distance</u>
The distance from Riseley to Bedford is 12.2km and Riseley to Ampthill is 18.3km. How far is it from Bedford to Ampthill?




<u>Time</u>
James arrived at the train station at 13:35 and his train left at 14:22. How long did he wait at the station for?




Make estimates for calculations

Regular number bond practice and recall (with associated facts)

Please note:

- Use of any method is appropriate depending on the type of calculation.
- Practise choosing the most appropriate method for a variety of calculations.
- Apply methods learnt and use confidently in a range of situations

# Multiplication

- Making equal groups of objects – How many altogether?

- Repeated Addition – three groups of 2
- Lots of 2's 5's 10's
- Add another group

- Drawing objects in groups.

- Match numerals to groups of objects.

- Record numbers, possibly in a horizontal sentence along with drawings

- Use x sign to indicate groups of

- Draw arrays (arrangements of dots/marks)
- Write related horizontal calculations.

* * * * * * * *
* * * * * * * *

8 x 2 = 16

2 x 8 = 16

16 ÷ 2 = 8
16 ÷ 8 = 2

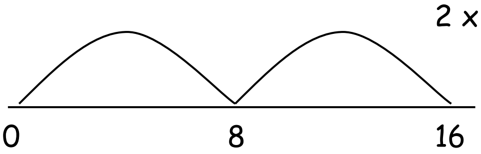
- Regular times table practice begins.

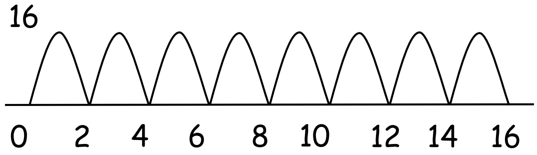
- Make the connection with the inverse and matching division facts

- Use a number line or hundred square to count on in groups of a number.
- Record the horizontal number sentence to go with it.
- Use a number line to jump forward in groups and record the horizontal number sentence to go with it.

8 x 2 = 16

2 x 8 = 16




(I count on in groups of 8/lots of 8) (I count on in groups of 2/lots of 2)

- Write horizontal number sentences and use partitioning

8 x 23 = 8 x 10 + 8 x 10 + 8 x 3
= 80 + 80 + 24
= 184

- This develops into the grid method

| X | 10 | 10 | 3 | |
|---|---|---|---|---|
| 8 | 80 | 80 | 24 | =184 |

leading to

| X | 20 | 3 | |
|---|---|---|---|
| 8 | 160 | 24 | = 184 |

**Vocabulary**

times
groups of
multiply
product
lots of
multiplied by
sets of
multiple of
once
twice
repeated-addition
array
row
column

Make estimates for calculations

Regular number times table practice and recall (with associated facts)

The grid method can then be used for 2-digit by 2-digit multiplication.

66 x 34 =

| X | 60 | 6 |
|---|---|---|
| **30** | 1800 | 180 |
| **4** | 240 | 24 |
| | = 2040 | = 204 |

=**2244**

or

| X | 60 | 6 | |
|---|---|---|---|
| **30** | 1800 | 180 | = 1980 |
| **4** | 240 | 24 | = 264 |
| | | | = 2244 |

This is extended to larger numbers

2035 x 17

| X | 2000 | 30 | 5 | |
|---|---|---|---|---|
| **10** | 20000 | 300 | 50 | |
| **7** | 14000 | 210 | 35 | |
| | = 34000 | = 510 | = 85 | = 34595 |

For multiplication with decimals equivalent calculations can be used

**3.4 x 0.68** (consider 34 x 68 as a similar calculation)

Adjust numbers involved by multiples of 10 or 100 to create an integer sum

3.4 x 0.68 = 2.312

x 10    x 100    ÷ 1000

34 x 68 = 2313

| X | 60 | 8 | |
|---|---|---|---|
| **30** | 1800 | 240 | |
| **4** | 240 | 32 | |
| | = 2040 | = 272 | = 2312 |

Pupils who have firmly grasped the above methods in understanding may be able to move on to the potentially quicker method (dubbed 'the formal' method by the Department for Education) shown below:

66 x 34 =

From this:

| X | 60 | 6 | |
|---|---|---|---|
| **30** | 1800 | 180 | = **1980** |
| **4** | 240 | 24 | = **264** |
| | | | = 2244 |

To this:

```
   66
x  34
 1980
  264
 2244
```

To begin with, the grid may be set out side by side with this method to demonstrate that they are linked.

Please note:

- Use any appropriate method above depending on the type and context of calculation.
- In problem solving situations, practise choosing the most appropriate method for a variety of calculations.
- Apply methods learnt and use confidently in a range of situations
- Ensure ongoing consolidation of times tables and related division facts
- Work towards instant recall of 2, 5, 10, 3, 4, 6, 7, 8, 9 times tables (usually in that order)

Make estimates for calculations

Regular times table practice (with associated division facts)

# Division

- Sharing objects into equal groups
- Repeated subtraction/addition
- Discussion and practical activities
- Drawing objects and splitting into groups
- Match numerals to groups
- Write a horizontal sentence along with drawings of groups of objects
- Use ÷ sign to indicate sharing/grouping
- Draw arrays (arrangements of dots/marks)
- Write related horizontal calculations.

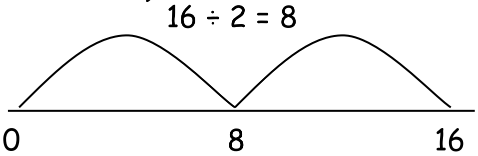
* * * * * * * *
* * * * * * * *   16 ÷ 8 = 2

16 ÷ 2 = 8

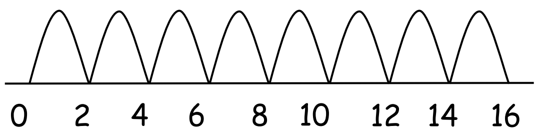
$\left(\begin{array}{l} 2 \times 8 = 16 \\ 8 \times 2 = 16 \end{array}\right)$

- Regular times table practice begins.
- Make the connection with the inverse and matching multiplication facts.
- Use a number line to jump forward in groups from 0 to the number being divided into and record the horizontal number sentence to go with it (without remainders)

16 ÷ 2 = 8




(I start at zero and count in 8s until I get to 16)



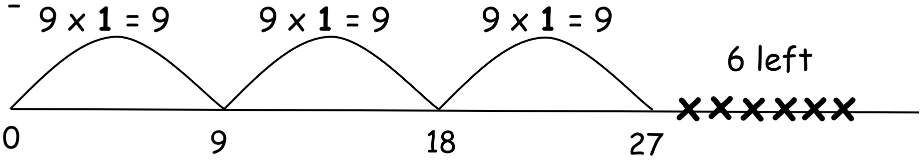

(I start at zero and count in 2's until I get to 16)

Use a number line to jump forward in groups from 0 to the number being divided into and record the horizontal number sentence to go with it.
(with remainders)

**33 ÷ 9** =

So **33 ÷ 9 = 3**

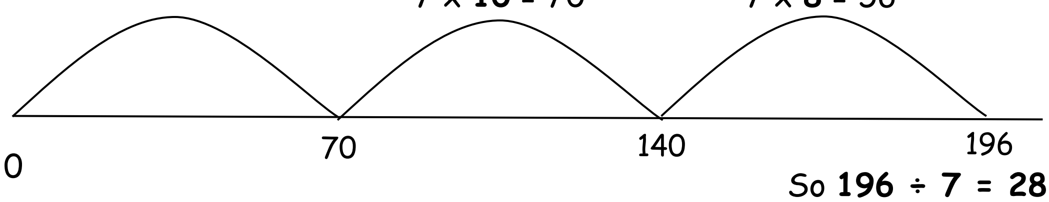
9 x **1** = 9    9 x **1** = 9    9 x **1** = 9




This method can also be used with larger numbers

**196 ÷ 7 =**

7 x **10** = 70    7 x **10** = 70    7 x **8** = 56




So **196 ÷ 7 = 28**

**Vocabulary**

divide
divided by
divided into
how many
each
share
left
left over
group
equally
goes into
remainder
divisible
factor
quotient
inverse

Regular times table practice and recall (with associated facts)

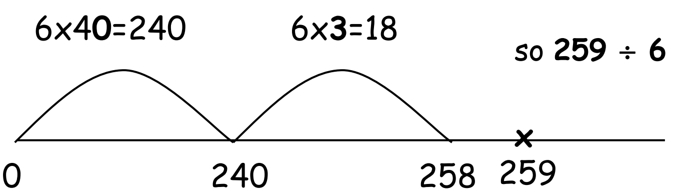
Make estimates for calculations

Place value understanding is needed to count **on** in multiples of the divisor.

For many pupils, the addition of an 'I Know' box can be very beneficial

**I Know**
**6 x 10 = 60**
**6 x 20 = 120**
**6 x 30 = 180**
**6 x 40 = 240**
**6 x 50 = 300**
**(too many)**
**so I will use**
**6 x 40**

**259 ÷ 6 =**




so **259 ÷ 6 = 43 r 1**

A tabular way of recording multiples of the divisor can be used

**874 ÷ 7**

| 7 x | Running Total |
|---|---|
| x 100 = 700 | 700 |
| x 20 = 140 | 840 |
| x 4 = 28 | 868 |
| x 124 | + 6 = 874 |

**I Know**
**7 x 1 = 7** so **7 x 10 = 70**
**7 x 2 = 14** so **7 x 20 = 140**
**7 x 3 = 21** so **7 x 30 = 210**
**7 x 4 = 28** so **7 x 40 = 280**

So **874 ÷ 7 = 124 r 4**

The remainder can be written as a fraction (simplifying fractions where possible and then using equivalent decimals)

$674 \div 6 = 112 \text{ r } 2 = 112\frac{2}{6} = 112\frac{1}{3}$

$3786 \div 4 = 946 \text{ r } 2 = 946\frac{2}{4} = 946\frac{1}{2} = 946.5$

Following changes to the national curriculum in 2015, pupils are now expected to use 'the formal methods' of division in *some* parts of their Key Stage 2 tests. These formal methods are more commonly known as 'the bus stop methods'. Pupils may be moved on to these <u>if</u> they have shown a level of competence and rooted understanding in the division methods shown above:

184 ÷ 8=

```
    2 3
 8|1 8 4
 - 1 6
     2 4
   - 2 4
       0
```

or later:

```
    2 3
 8 1 8²4
```

Make estimates for calculations

Regular times table practice (with associated division facts)

Another example of a more difficult calculation using this method would be:
2331 ÷ 37 =

$$
\begin{array}{r@{\,}r}
 & 63 \\
37 & \overline{)2331} \\
- & \underline{222\downarrow} \\
 & 111 \\
- & \underline{111} \\
 & 0
\end{array}
$$

Start with 233 ÷ 37, since 37 does not go into 2 or 23.

The nearest multiple of 37 to 233 is: **37 x 6 = <u>222</u>**

The remainder is: **233-222 = 11**

Now, 111 ÷ 37 = 3

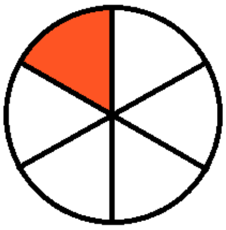
Therefore 2331 ÷ 37 = 63

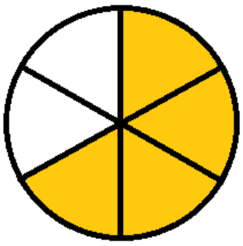
This algorithmic method does nothing to advance pupils' *understanding* of division or place value. It should, therefore, only be used as a time-saving mechanism once the child's understanding of the other methods in this booklet is undoubtedly strong. This will happen at different times for different children.

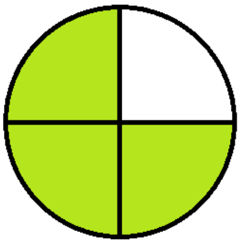
Please note:

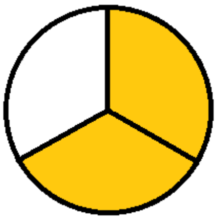
- Use of any method is appropriate depending on the type of calculation.
- Practise choosing the most appropriate method for a variety of calculations.
- Apply methods learnt and use confidently in a range of situations
- Ongoing consolidation of times tables and related division facts
- Instant recall of 2, 5, 10, 3, 4, 6, 7, 8, 9 times tables (usually in that order)

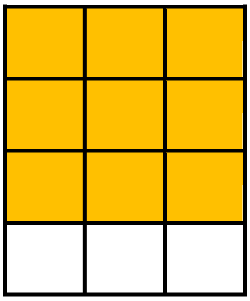
# Fractions Policy

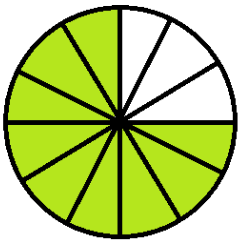


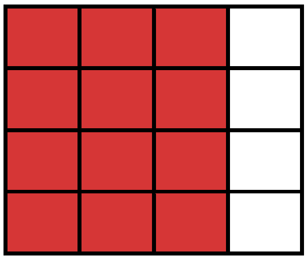












# Fractions

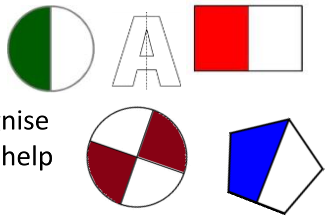
## Pictures and written fractions

Here are four different ways of expressing/explaining a fraction

$\frac{1}{2}$:

- 1 out of 2
- 1 divided by 2
- 1 over 2
- One half

It is important that students recognise these different representations to help them solve problems.



## Numerator and Denominator

**Numerator**
Number of pieces we are talking about

$\frac{N}{D}$

**Denominator**
The Divisor: Number of <u>equal</u> pieces the amount is being divided into

## Fraction Wall to show equivalence

A fraction wall is often shown to help students understand equivalent fractions and to compare the size of two fractions

$\frac{1}{2}$ $\frac{1}{2}$

$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$

$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$

$\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$

$\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$

$\frac{1}{7}$ $\frac{1}{7}$ $\frac{1}{7}$ $\frac{1}{7}$ $\frac{1}{7}$ $\frac{1}{7}$ $\frac{1}{7}$

$\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$

$\frac{1}{9}$ $\frac{1}{9}$ $\frac{1}{9}$ $\frac{1}{9}$ $\frac{1}{9}$ $\frac{1}{9}$ $\frac{1}{9}$ $\frac{1}{9}$ $\frac{1}{9}$

$\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$

$\frac{1}{11}$ $\frac{1}{11}$ $\frac{1}{11}$ $\frac{1}{11}$ $\frac{1}{11}$ $\frac{1}{11}$ $\frac{1}{11}$ $\frac{1}{11}$ $\frac{1}{11}$ $\frac{1}{11}$ $\frac{1}{11}$

$\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{12}$ $\frac{1}{12}$

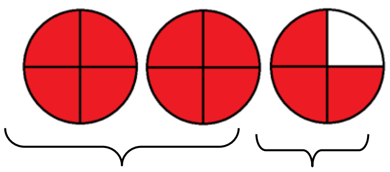
Be prepared to be flexible about fraction, decimal fraction and percentage equivalence.

## Mixed numbers/top heavy/improper/Proper

$\frac{3}{4}$ Is a proper fraction because the numerator is smaller than the denominator

$\frac{11}{4}$ Is an improper fraction because the numerator is bigger than the denominator

Sometimes we call this a top-heavy fraction



2 Wholes or 8 quarters

3 quarters

3 quarters

$2\frac{3}{4}$ This is a mixed number with a whole number and a fraction

$\frac{11}{4}$ This is an improper/Top Heavy Fraction

**Vocabulary**

Proper

Improper

Top Heavy

Mixed

Numerator

Denominator

Equivalent

Common Denominator

Simplify

Integer

Whole Number

Factors

Multiples

Simplify Fully

Cancelling

Divide

Regular times table practice (with associated division facts)

## Finding Equivalent Fractions

It is difficult to compare fractions unless they are alike and have a common denominator. This is a common multiple of all the denominators and is often the lowest common multiple (LCM).

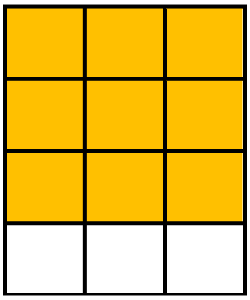
$$\frac{1}{2} \xrightarrow[\times 2]{\times 2} \frac{2}{4} \qquad \frac{3}{4} \xrightarrow[\times 1]{\times 1} \frac{3}{4}$$

When all fractions have a common denominator, numerators can be easily compared.

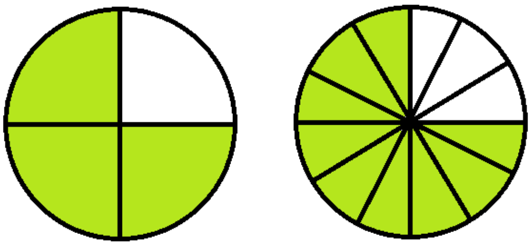
The <u>same</u> amount can be represented by different fractions.

$$\frac{3}{4} \overset{\times 3}{\underset{\times 3}{=}} \frac{9}{12} \qquad \frac{2}{3} \overset{\times 5}{\underset{\times 5}{=}} \frac{10}{15}$$

Using diagrammatic representation and splitting into different sized pieces.



9 out of 12 parts are shaded
<u>or</u> you could say
3 out of 4 rows are shaded



$\frac{3}{4}$ $\frac{9}{12}$

Pictures are used to reinforce proportionality. The <u>same</u> amount of the circle is shaded – but we can represent this with different fractions.

## Simplifying (inverse of equivalence)

Fractions can be simplified by looking for common factors and dividing by these numbers.
It is possible to take different steps depending on which numbers we chose to divide with.

$$\frac{18}{30} \overset{\div 2}{\underset{\div 2}{=}} \frac{9}{15} \overset{\div 3}{\underset{\div 3}{=}} \frac{3}{5}$$

← No more common factors for 3 and 5 so we cannot simplify any further

This example has been simplified in one step → because the largest common factor of 32 and 80 was found to divide by (16 is a factor of both).
The number of steps does not matter – it only speeds up the simplifying process.

$$\frac{32}{80} \overset{\div 16}{\underset{\div 16}{=}} \frac{2}{5}$$

**Vocabulary**

- Proper
- Improper
- Top Heavy
- Mixed
- Numerator
- Denominator
- Equivalent
- Common Denominator
- Simplify
- Integer
- Whole Number
- Factors
- Multiples
- Simplify Fully
- Cancelling
- Divide

Regular times table practice (with associated division facts)

## Ordering / Comparison

Initially a Fraction Wall can be used to compare size

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $\frac{1}{2}$ | $\frac{1}{2}$ | | | | | | | | | | |
| $\frac{1}{3}$ | $\frac{1}{3}$ | $\frac{1}{3}$ | | | | | | | | | |
| $\frac{1}{4}$ | $\frac{1}{4}$ | $\frac{1}{4}$ | $\frac{1}{4}$ | | | | | | | | |
| $\frac{1}{5}$ | $\frac{1}{5}$ | $\frac{1}{5}$ | $\frac{1}{5}$ | $\frac{1}{5}$ | | | | | | | |
| $\frac{1}{6}$ | $\frac{1}{6}$ | $\frac{1}{6}$ | $\frac{1}{6}$ | $\frac{1}{6}$ | $\frac{1}{6}$ | | | | | | |
| $\frac{1}{7}$ | $\frac{1}{7}$ | $\frac{1}{7}$ | $\frac{1}{7}$ | $\frac{1}{7}$ | $\frac{1}{7}$ | $\frac{1}{7}$ | | | | | |
| $\frac{1}{8}$ | $\frac{1}{8}$ | $\frac{1}{8}$ | $\frac{1}{8}$ | $\frac{1}{8}$ | $\frac{1}{8}$ | $\frac{1}{8}$ | $\frac{1}{8}$ | | | | |
| $\frac{1}{9}$ | $\frac{1}{9}$ | $\frac{1}{9}$ | $\frac{1}{9}$ | $\frac{1}{9}$ | $\frac{1}{9}$ | $\frac{1}{9}$ | $\frac{1}{9}$ | $\frac{1}{9}$ | | | |
| $\frac{1}{10}$ | $\frac{1}{10}$ | $\frac{1}{10}$ | $\frac{1}{10}$ | $\frac{1}{10}$ | $\frac{1}{10}$ | $\frac{1}{10}$ | $\frac{1}{10}$ | $\frac{1}{10}$ | $\frac{1}{10}$ | | |
| $\frac{1}{11}$ | $\frac{1}{11}$ | $\frac{1}{11}$ | $\frac{1}{11}$ | $\frac{1}{11}$ | $\frac{1}{11}$ | $\frac{1}{11}$ | $\frac{1}{11}$ | $\frac{1}{11}$ | $\frac{1}{11}$ | $\frac{1}{11}$ | |
| $\frac{1}{12}$ | $\frac{1}{12}$ | $\frac{1}{12}$ | $\frac{1}{12}$ | $\frac{1}{12}$ | $\frac{1}{12}$ | $\frac{1}{12}$ | $\frac{1}{12}$ | $\frac{1}{12}$ | $\frac{1}{12}$ | $\frac{1}{12}$ | $\frac{1}{12}$ |

Then equivalent fractions can be found to compare directly

$$\frac{1}{2} \rightarrow \frac{8}{16} \qquad \frac{3}{4} \rightarrow \frac{12}{16} \qquad \frac{3}{8} \rightarrow \frac{6}{16} \qquad \frac{7}{16} \rightarrow \frac{7}{16}$$

It is then much easier to compare the fractions as they all have the same denominator.

## Fractions of an amount

$\frac{4}{5}$ of 80

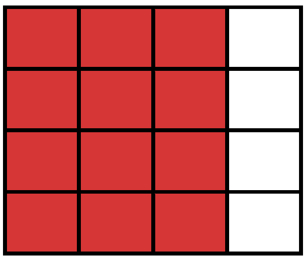
| 16 | 16 | 16 | 16 | 16 |
|---|---|---|---|---|

0 16 32 48 64 80

$\frac{1}{5}$ of 80 = 80 ÷ 5 = 16

so $\frac{4}{5}$ of 80 = 4 x 16 = $\boxed{\phantom{00}}$

$\frac{3}{4}$ of 16



Shade in

3 out of every 4 boxes

$\frac{3}{4}$ of 16 is 12

**Vocabulary**

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Regular times table practice (with associated division facts)

# Adding Fractions

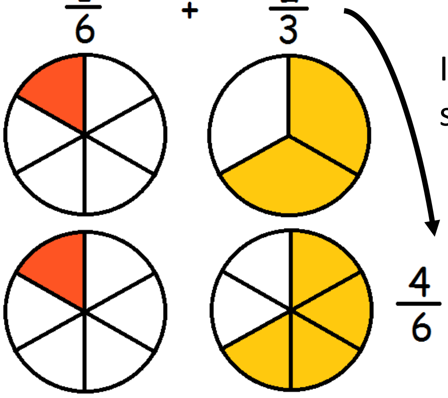
1) Diagrams with common denominators

$$\frac{1}{5} + \frac{3}{5} = \frac{4}{5}$$

1 fifth + 3 fifth = 4 fifths

2) Diagrams to show conversion to equivelant fractions with common denominators

$\frac{1}{6}$ + $\frac{2}{3}$



Is the same as

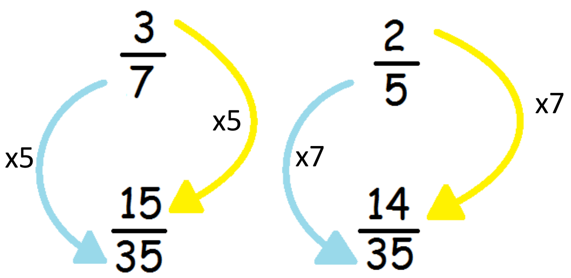
$\frac{1}{6}$ $\frac{4}{6}$

Then … $\frac{1}{6} + \frac{4}{6} = \frac{5}{6}$

3) Finding common denominators

$$\frac{3}{7} + \frac{2}{5}$$

Equivalent fractions with a common denominator can be found in order to be able to add the fractions together.




This calculation becomes … $\frac{14}{35} + \frac{15}{35} = \frac{29}{35}$

If the answer is an improper fraction then it should be simplified as a mixed number.

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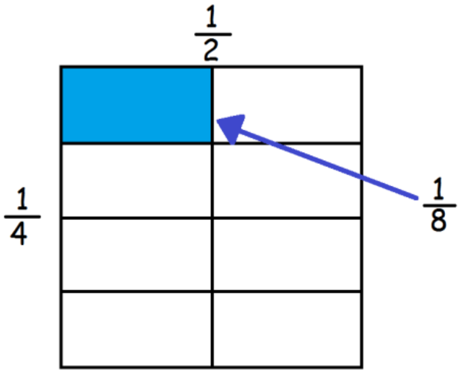
# Multiplying Fractions

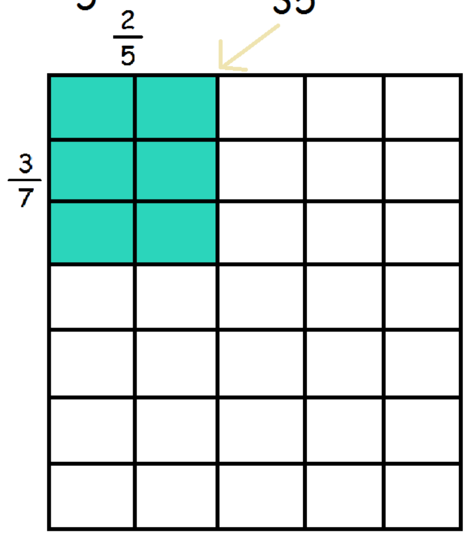
With diagrams

$$\frac{1}{4} \times \frac{1}{2}$$

"a quarter of a half"




$$\frac{3}{7} \times \frac{2}{5} = \frac{6}{35}$$




Without diagrams

$$\frac{2}{15} \times \frac{3}{8} = \frac{2 \times 3}{15 \times 8} = \frac{6}{120} = \frac{3}{60} = \frac{1}{20}$$

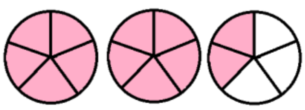
$$\frac{2}{15} \times \frac{3}{8} = \frac{2 \times 3}{15 \times 8}$$

Factors of the denominators:
$3 \times 5 = 15 \quad 2 \times 4 = 8$

$$= \frac{\cancel{2}^{1} \times \cancel{3}^{1}}{\cancel{3}^{1} \times 5 \times \cancel{2}^{1} \times 4} = \frac{1}{5 \times 4} = \frac{1}{20}$$

Cancelling factors where possible before calculating.

With mixed numbers

Remember … $2\frac{2}{5}$ =  $= \frac{12}{5}$

$$2\frac{2}{5} \times 3\frac{4}{7}$$

$$= \frac{12}{5} \times \frac{25}{7}$$

Convert first to avoid $2 \times 3 + \frac{2}{3} \times \frac{4}{7}$ only

$$= \frac{3 \times 4 \times \cancel{5} \times 5}{\cancel{5} \times 7} = \frac{12 \times 5}{7} = \frac{60}{7} = 8\frac{4}{7}$$

$\boxed{\text{cancel}}$

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## Dividing Fractions

$$3 \div \frac{1}{2}$$

***How many $\frac{1}{2}$'s in 3?***

1. How many $\frac{1}{2}$'s are in 1? **There are 2**
2. How many $\frac{1}{2}$'s are in 3? **There are 6**

Use diagrams to help

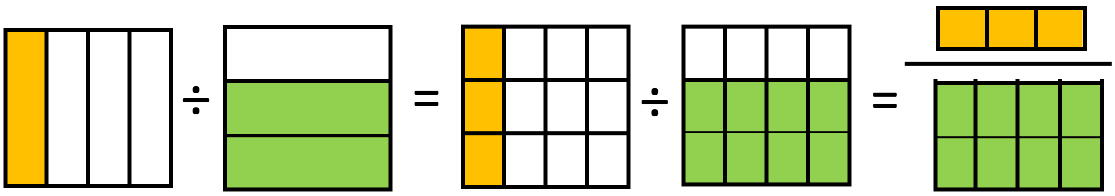
$$\frac{1}{2} \div \frac{1}{8}$$

***How many $\frac{1}{8}$'s in $\frac{1}{2}$ ?***

How many $\frac{1}{8}$'s are in 1 whole? **There are 8**

So ……. how many $\frac{1}{8}$'s are there in $\frac{1}{2}$? **There are 4**

## Dividing Using Common Denominators



$$\frac{1}{4} \div \frac{2}{3} = \frac{3}{12} \div \frac{8}{12} = \frac{3}{8}$$

3 twelfths ÷ 8 twelfths = 3 divided by 8

## Dividing Using The Multiplicative Inverse

Multiplying by $\frac{1}{2}$ is the same as dividing by 2

Dividing by $\frac{1}{3}$ is the same as multiplying by 3

$$\frac{2}{3} \div 4 = \frac{2}{3} \times \frac{1}{4}$$

(Dividing by 4 is the same as multiplying by a quarter)

These are reciprocal/inverse/opposite relationships

opposite/inverse

$$\frac{3}{4} \div \frac{2}{5} = \frac{3}{4} \times \frac{5}{2} = \frac{3 \times 5}{4 \times 2} = \frac{15}{8} = 1\frac{15}{8}$$

reciprocal/inverse

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