YEAR 7
KNOWLEDGE ORGANISERS

BLOCK: APPLICATION OF NUMBER

Solving problems with addition & subtraction

Solving problems with multiplication & division

Fractions & Percentages of amounts

"MATHS OPENS DOORS"

YEAR 7 — APPLICATION OF NUMBER

Solving problems with addition and subtraction

What do I need to be able to do?

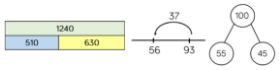
By the end of this unit you should be able to:

- Understand properties of addition/ subtraction
- Use mental strategies for addition/subtraction
- Use formal methods of addition/Subtraction for integers
- Use formal methods of addition/Subtraction for decimals
- Solve problems in context of perimeter
- Solve problems with finance, tables and timetables
- Solve problems with frequency trees
- Solve problems with bar charts and line charts

Keywords

Associative: in addition or multiplication, no matter how the numbers are grouped together the answer will be the same. Subtraction and division are not associative.
Balance: (1) in financial situations, balance means the amount of money in a bank account.
Commutative: a mathematical process is commutative if the numbers may be inputted in any order.
Credit: an amount of money received, or added to the balance of an account
Debit: an amount of money taken out of an account
Perimeter: the distance around the boundary of a 2-d shape
Place holder: we use 0 as a place holder to show that there are none of a particular place in a number.
Polygon: a closed shape made up with three or more straight sides.

Addition/ Subtraction with integers



Modelling methods for addition/ subtraction
- Bar models
- Number lines
- Part/ Whole diagrams

Addition is commutative

6 + 3 = 3 + 6

The order of addition does not change the result

Subtraction the order has to stay the same

$360 - 147 = 360 - 100 - 40 - 7$

- Number lines help for addition and subtraction
- Working in 10's first aids mental addition/ subtraction
- Show your relationships by writing fact families

Formal written methods

	H	T	O
	1	8	7
+	5	4	2

	H	T	O
	4	2	7
−	2	4	9

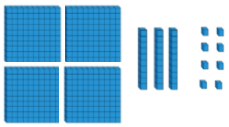
Remember the place value of each column. You may need to move 10 ones to the ones column to be able to subtract

Addition/ Subtraction with decimals

4	.	3	8	
7	.	9	0	+

0 can be used to fill empty places with value

The decimal place acts as the placeholder and aligns the other values



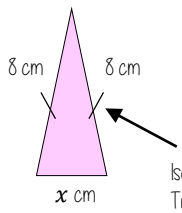
If  represents 1 instead of 100

$5.43 + \frac{8}{10}$

Revisit Fraction — Decimal equivalence
543 ÷ 0.8

Solve problems with perimeter

Perimeter is the length around the outside of a polygon



Isosceles Triangle notation

The triangle has a perimeter of 25cm
Find the length of x

8cm + 8cm + $x$cm = 25cm
16cm + $x$cm = 25cm
$x$cm = 9cm

Solve problems with finance

Profit= Income - Costs

Credit — Money coming into an account

Debit — Money leaving an account

Money uses a two decimal place system.
14.2 on a calculator represents £14.20

Check the units of currency — work in the same unit

Tables and timetables

Distance tables

	London		
211	Cardiff		
556	493	Glasgow	
518	392	177	Belfast

This shows the distance between Glasgow and London.
It is where their row and column intersects

Bus/ Train timetables

Harton	1005	1045	1130
Bridge	1024	1106	1147
Aville	1051	1133	1205
Ware	1117	1202	1233

Each column represents a journey, each row represents the time the 'bus' arrives at that location

TIME CALCUALTIONS — use a number line

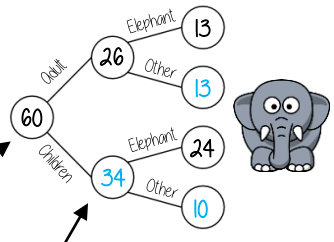
Two-way tables

	H	T
H	HH	HT
T	TH	TT

Where rows and columns intersect is the outcome of that action.

Frequency trees

60 people visited the zoo one Saturday morning.
26 of them were adults. 13 of the adult's favourite animal was an elephant. 24 of the children's favourite animal was an elephant.

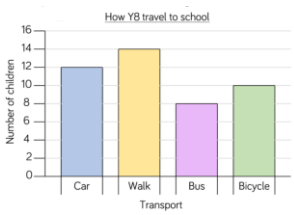


The overall total "60 people"

A frequency tree is made up from part-whole models.
One piece of information leads to another

Probabilities or statements can be taken from the completed trees
e.g. 34 children visited the zoo

Bar and line charts



Use addition/ subtraction methods to extract information from bar charts.

e.g. Difference between the number of students who walked and took the bus.
Walk frequency — bus frequency

When describing changes or making predictions:
- Extract information from your data source
- Make comparisons of difference or sum of values
- Put into the context of the scenario

YEAR 7 – APPLICATION OF NUMBER

Solving problems with multiplication and division

What do I need to be able to do?

By the end of this unit you should be able to:

- Understand and use factors
- Understand and use multiples
- Multiply/ Divide integers and decimals by powers of 10
- Use formal methods to multiply
- Use formal methods to divide
- Understand and use order of operations
- Solve area problems
- Solve problems using the mean

Keywords

Array: an arrangement of objects or numbers in rows and columns
Centi: a prefix meaning one hundredth
Dividend: the amount you want to divide up: dividend÷divisor=quotient
Divisor: the number we divide by: dividend÷divisor=quotient
Factor: a whole number or variable that divides exactly into another number or expression
Kilo: a prefix meaning one thousand
Milli: a prefix meaning one thousandth
Multiple: the result of multiplying a number by an integer
Product: the result when two numbers are multiplied together
Quotient: the result when one number is divided by another: dividend÷divisor=quotient

Factors

Arrays can help represent factors

5 x 2 or 2 x 5

Factors of 10
1, 2, 5, 10

10 x 1 or 1 x 10

The number itself is always a factor

Square numbers have an **ODD number** of factors

Factors of 4
1, 2, 4

Factors of 36
1, 2, 3, 4, 6, 9, 12, 18, 36

Be strategic - Lay factors out in pairs can help you not to miss any

Multiples

4	4	4	4	4

Bar models can represent by something is a multiple. E.g. 20 is a multiple of 4

Lowest Common Multiples — LCM of 9 and 12

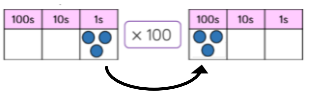
The first time their multiples match

LCM = 36

9	9, 18, 27, 36, 45, 54
12	12, 24, 36, 48, 60

9 18 27 36 45
12 24 36 48

Multiply/ Divide by powers of 10



3 x 100 = 300

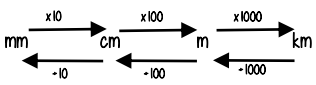
0.03 x 100 = 3

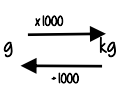
Repeated multiplication and division by powers of 10 is commutative

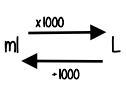
÷ 10 then ÷ 10 → ÷ 100

Metric conversions

Useful Conversions

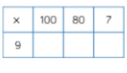




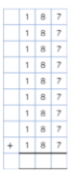


Multiplication methods

Long multiplication (column)



Grid method



Repeated addition

Less effective method especially for bigger multiplication

Estimations: Using estimations allows a 'check' if your answer is reasonable

Multiplication with decimals

Perform multiplications as integers
e.g. 0.2 x 0.3 → 2 x 3

Make **adjustments** to your answer to match the question: 0.2 x 10 = 2
0.3 x 10 = 3
Therefore 6 ÷ 100 = **0.6**

Division methods

3584 ÷ 7 = 512

Short division

$$7 \overline{)\, 3\ {}^{3}5\ 8\ {}^{1}4} \quad 5\ 1\ 2$$

Complex division

÷ 24 = ÷ 6 ÷ 4

Break up the divisor using factors

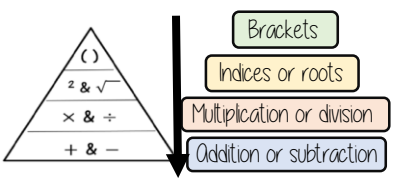
Division with decimals

The placeholder in division methods is essential – the decimal lines up on the dividend and the quotient

24 ÷ 0.02 → 24 ÷ 0.2 → 240 ÷ 2

All give the same solution as represent the same proportion
Multiply the values in proportion until the divisor becomes an integer

Order of operations



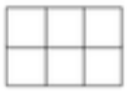
If you have multiple operations from the same tier work from left to right

e.g. 10 – 3 + 5 → 10 - 3 → 7 + 5

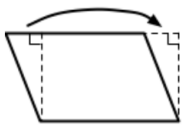
6 x 4 + 8 x 2
24 + 16 = 40

Area problems

Rectangle
Base x Perpendicular height

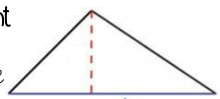


Parallelogram/ Rhombus
Base x Perpendicular height



Triangle
½ x Base x Perpendicular height

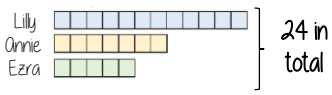
A triangle is half the size of the rectangle it would fit in



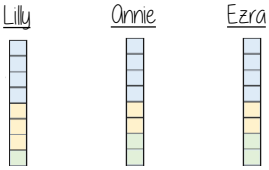
Mean problems

Mean – a measure of average
It gives an idea of the central value

Lilly, Annie and Ezra have the following cubes



Finding the mean amount is the average amount each person would have if shared out equally



The mean number of blocks would be 8 each

YEAR 7 – APPLICATION OF NUMBER

Fractions and percentages of amounts

What do I need to be able to do?

By the end of this unit you should be able to:

- Find a fraction of a given amount
- Use a given fraction to find the whole or other fractions
- Find the percentage of an amount using mental methods
- Find the percentage of a given amount using a calculator

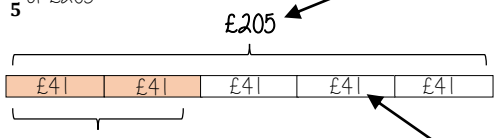
Keywords

Convert: to change a value or expression from one form to another.
Equivalent: having the same value.
Fraction: any part of a group, number or whole.
Percentage: a fraction expressed as a number out of 100. Use the ⁄ symbol
Place value: the value of a digit depending on its place in a number. In our decimal number system, each place is 10 times bigger than the place to its right.
Whole number: a number with no fractional or decimal parts. Also called an **integer**.

Fraction of a given amount

Find $\frac{2}{5}$ of £205

The bar represents the whole amount

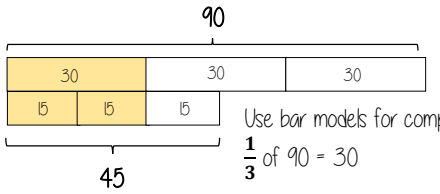


2 out of the 5 equal parts

2 x £41 = **£82**

£205 ÷ 5 = £41

Each part of the bar model represents £41



Use bar models for comparisons

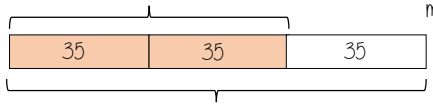
$\frac{1}{3}$ of 90 = 30

$\frac{2}{3}$ of 45 = 30

$\therefore \frac{1}{3}$ of 90 = $\frac{2}{3}$ of 45

Use a fraction of amount

$\frac{2}{3}$ of a value is 70. What is the whole number?



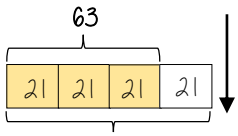
70 ÷ 2 = 35
Each part of the bar model represents 35.

35 x 3 = 105

The whole number is 105

The wording of the question is important to setting up the bar model

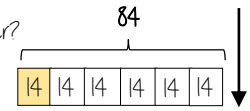
$\frac{3}{4}$ of a number is 63.



Find the whole

What is $\frac{1}{6}$ of the number?

= 14

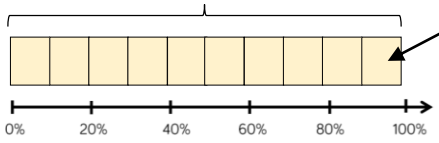


Use the whole to find a given part

Find the percentage of an amount (Mental methods)

The **whole** represents 100⁄

10⁄ = $\frac{1}{10}$ of the whole



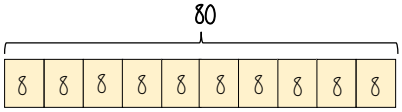
10⁄ = $\frac{1}{10}$ of the whole

50⁄ = $\frac{5}{10}$ = $\frac{1}{2}$ of the whole

20⁄ = $\frac{2}{10}$ = $\frac{1}{5}$ of the whole

5⁄ = $\frac{1}{20}$ of the whole

Find 65⁄ of 80



For bigger percentages it is sometimes easier to take away from 100⁄

Method 1
65⁄ = 10⁄ x 6 + 5⁄
= (8 x 6) + 4
= 52

Method 2
65⁄ = 50⁄ + 10⁄ + 5⁄
= 40 + 8 + 4
= 52

Find the percentage of an amount (Calculator methods)

Using a multiplier

Find 65⁄ of 80

Fraction, decimal, percentage conversion

65⁄ = $\frac{65}{100}$ = 0.65 ← The multiplier

0.65 x 80 = **52**

Using the percent button

Find 65⁄ of 80

This brings up the ⁄ button on screen
You will see 65⁄

Type 65

Press SHIFT ((%)

Press × 80 and then press =

You can also use the calculator to support non calculator methods and find 1⁄ or 10⁄ then add percentages together

"of" can represent 'x' in calculator methods