Year 7 Knowledge Organisers

Bishop walsh
Catholic School

Autumn Term 1

Applications of Number

Unit 1: Developing Number Sense

Unit 2: Addition & Subtraction

Unit 3: Multiplication & Division

APPLICATIONS OF NUMBER...

Unit 1: Developing Number Sense

What do I need to be able to do?

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

- Know and use mental addition/ subtraction
- Know and use mental multiplication/division
- Know and use mental arithmetic for decimals
- Know and use mental arithmetic for fractions
- Use factors to simplify calculations
- Use estimation to check mental calculations
- Use number facts
- Use algebraic facts

Keywords

Commutative: changing the order of the operations does not change the result
Dividend: the number being divided
Divisor: the number we divide by.
Expression: a maths sentence with a minimum of two numbers and at least one math operation (no equals sign
Equation: a mathematical statement that two things are equal
Quotient: the result of a division

Mental methods for addition/ subtraction

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

Mental methods for multiplication/ division

Multiplication is commutative

2 × 4 = 4 × 2

The order of multiplication does not change the result

Partitioning can help multiplication

24 x 6 = 20 x 6 + 4 x 6
= 120 + 24 = 144

Division is not commutative

Chunking the division can help 4000 ÷ 25 "How many 25's in 100" then how many chunks of that in 4000.

Mental methods for decimals

Multiplying by a decimal <1 will make the original value smaller

e.g x 0.1 = ÷ 10

Methods for multiplication

1.2 x 0.03

1.2 × 3 = 3.6
1.2 × 0.3 = 0.36
1.2 × 0.03 = 0.036

12 × 3 = 36
÷ 10 ÷ 100 ÷ 1000
1.2 × 0.03 = 0.036

Methods for addition

2 + 2 = 4
0.3 + 0.4 = 0.7
4 + 0.7 = 4.7

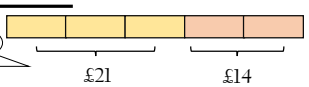
Methods for division 1.5 ÷ 0.05

Multiply by powers of 10 until the divisor becomes an integer

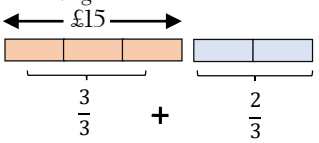
1.5 ÷ 0.05
x100 x100
150 ÷ 5 = 30

Mental methods for fractions

I've spent $\frac{2}{5}$ of my money. I have £21 left



How much did they have to begin with?



Use bar models where possible

What is $\frac{5}{3}$ of £15?

Using factors to simplify calculations

30 x 16

10 x 3 x 4 x 4
10 x 3 x 2 x 8
2 x 5 x 3 x 2 x 2 x 2 x 2
16 x 10 x 3

Multiplication is commutative
Factors can be multiplied in any order

Estimation

Most estimations round to 1 significant figure

Estimations are useful – especially when using fractions and decimals to check if your solution is possible.

210 + 899 < 1200

This is true because even if both numbers were rounded up, they would reach 300 + 900.
The correct estimation would be 200 + 900 = 1100.

Number facts

Use

124 x 5 = 620

For multiplication, each value that is multiplied or divided by powers of 10 needs to happen to the result

620 ÷ 12.4 = 50

For division you must consider the impact of the divisor becoming smaller or bigger.
Smaller – the answer will be bigger (It is being shared into less parts)
Bigger – the answer will be smaller (It is being shared into more parts)

Algebraic facts

2a + 2b = 10

Everything x 2

0.1a + 0.1b = 0.5

Everything ÷ 10

a + b = 5

Add 2 to the total

a + b + 2 = 7

The unknown quantity isn't changing but the variables change what is done to give the result.

Applications of Number...

Unit 2: Addition and Subtraction

What do I need to be able to do?

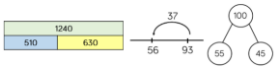
By the end of this unit you should be able to:

- Understand properties of addition/ subtraction
- Use mental strategies for addition/subtraction
- Use formal methods of addition/Subtraction for integers & 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

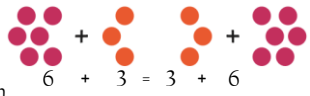
Commutative: changing the order of the operations does not change the result
Inverse: the operation that undoes what was done by the previous operation. (The opposite operation)
Placeholder: a number that occupies a position to give value
Perimeter: the distance/ length around a 2D object
Polygon: a 2D shape made with straight lines
Balance: in financial questions – the amount of money in a bank account
Credit: money that goes into a bank account
Debit: money that leaves a bank account

Addition/ Subtraction with integers



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

Addition is commutative



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 decima

4	.	3	8	
7	.	9	0	+

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

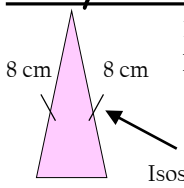
0 can be used to fill empty places with value

If epresents 1 instead of 100

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

Revisit Fraction – Decimal equivalence
5.43 + 0.8

Solve problems with perimeter



Isosceles Triangle notation

Perimeter is the length around the outside of a polygon

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

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

Solve problems with finance

Profit = Income – Costs

Credit – Money going 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

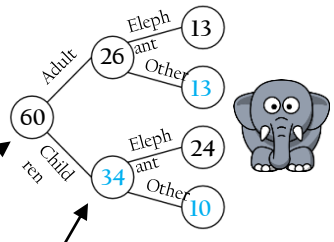
Two-way tables

	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.

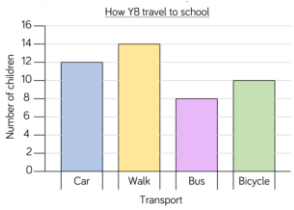


The overall total "60 people"

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

Applications of Number...

Unit 3: 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

Keywords

Array: an arrangement of items to represent concepts in rows or columns
Multiples: found by multiplying any number by positive integers
Factor: integers that multiply together to get another number.
Mili: prefix meaning one thousandth
Centi: prefix meaning one hundredth.
Kilo: prefix meaning multiply by 1000
Quotient: the result of a division
Dividend: the number being divided
Divisor: the number we divide by.

Factors

Arrays can help represent factors

5 x 2 or 2 x 5

10 x 1 or 1 x 10

Factors of 10
1, 2, 5, 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

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

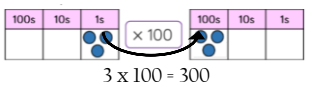
LCM of 9 and 12

LCM = 36

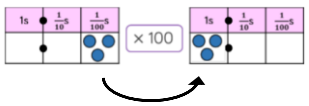
The first time their multiples match

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

mm ⇄ cm ⇄ m ⇄ km (×10, ×100, ×1000 / ÷10, ÷100, ÷1000)

g ⇄ kg (×100 / ÷1000)

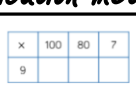
ml ⇄ L (×100 / ÷1000)

Multiplication methods

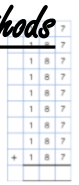
Less effective method especially for bigger multiplication

Long multiplication (column)

Grid method



Repeated addition



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

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

Division methods

3584 ÷ 7 = 512

Short division

```
   5 1 2
7 | 3 ³5 8 ¹4
```

Complex division

÷ 24 = ÷ 6 ÷ 4
Break up the divisor using factors

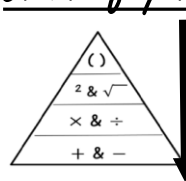
Division with decimals

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

2.4 ÷ 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



Brackets
Indices or roots
Multiplication or division
Addition or subtraction

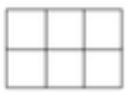
If you have multiple operations from the same tier work from left to right

e.g. 10 − 3 + 5 → 10 − 3 → 7 + 5

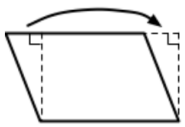
6 x 4 + 8 x 2
24 + 16 = 40

Area problems

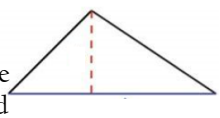
Rectangle
Base x Perpendicular height



Parallelogram/ Rhombus
Base x Perpendicular height



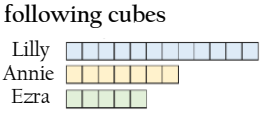
Triangle
½ x Base x Perpendicular height
A triangle is half the size of the rectangle it would fit in



Mean problems

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

Lilly, Annie and Ezra have the following cubes



24 in total

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

Lilly Annie Ezra

The mean number of blocks would be 8 each