

# YEAR 9 — REASONING WITH NUMBER...

# Numbers

@whisto\_maths

## What do I need to be able to do?

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

- Identify integers, real and rational numbers
- Work with directed number
- Solve problems with number
- Find HCF/ LCM
- Add/ Subtract fractions
- Multiply/ Divide fractions
- Write numbers in standard form

## Keywords

**Integer:** a whole number that is positive or negative

**Rational:** a number that can be made by dividing two integers

**Irrational:** a number that cannot be made by dividing two integers

**Inverse operation:** the operation that reverses the action

**Quotient:** the result of a division

**Product:** the result of a multiplication

**Multiples:** found by multiplying any number by positive integers

**Factor:** integers that multiply together to get another number

## Integers, real and rational numbers

**Rational** – root word: ratio

**Real numbers:**  $\frac{2}{3}$  stems from 2 |  $\frac{2}{3}$  of the whole

**Irrational numbers:**  $\sqrt{2}$  the solution is a decimal that never ends and does not repeat

The square root of a negative is not a real number and cannot be found

## HCF/LCM

1 is a common factor of all numbers

Common factors are factors two or more numbers share

**HCF** – Highest common factor

HCF of 18 and 30

18: 1, 2, 3, 6, 9, 18

30: 1, 2, 3, 5, 6, 10, 15, 30

HCF = 6

**LCM** – Lowest common multiple

LCM of 9 and 12

9: 9, 18, 27, 36, 45, 54

12: 12, 24, 36, 48, 60

LCM = 36

The first time their multiples match

## Standard form

Any number between 1 and less than 10  $\rightarrow A \times 10^n$   $\leftarrow$  Any integer

$$6 \times 10^5 + 8 \times 10^5$$

$$= 600000 + 800000$$

$$= 1400000$$

$$= 1.4 \times 10^6$$

$$(1.5 \times 10^5) \div (0.3 \times 10^3)$$

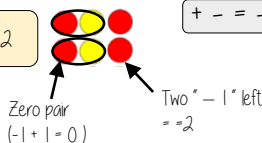
$$15 \div 0.3 \times 10^5 \div 10^3$$

$$= 5 \times 10^2$$

## Directed number

**Addition**

$$2 + -4 = -2$$



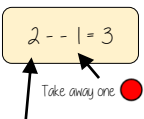
Generalisation

$$+ - = -$$

**Subtraction**

$$2 - -1 = 3$$

Representation for calculation



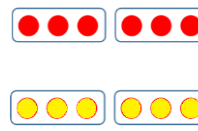
Generalisation

$$- - = +$$

"Subtract" – means take away or remove

Start with the representation of 2

**Multiplication**



$$-2 \times -3 = 6$$

Divisions are the inverse operations



$$a = 5$$

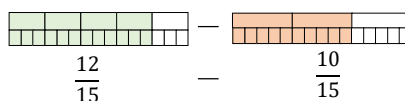
$$b = -4$$

Brackets around negative substitutions helps remove calculation errors

$$2a - b = 2 \times 5 - (-4) = 10 + 4 = 14$$

## Addition/ Subtraction of fractions

$$\frac{4}{5} - \frac{2}{3}$$



$$= \frac{2}{15}$$

Use equivalent fractions to find a common multiple for both denominators

## Multiplication/ Division of fractions

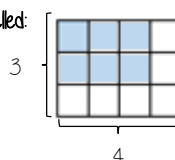
$$\frac{3}{4} \times \frac{2}{3}$$

This many columns

This many rows

$$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$$

Modelled:



Total number of parts in the diagram

Remember to use reciprocals

$$2 \div \frac{3}{4}$$

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

Multiplying by a reciprocal gives the same outcome

Represented



$$= \frac{8}{3}$$

# YEAR 9 — REASONING WITH NUMBER... Using Percentages

@whisto\_maths

## What do I need to be able to do?

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

- Use FDP equivalence
- Calculate percentage increase and decrease
- Express percentage change
- Solve reverse percentage problems
- Solve percentage problems (calculator and non calculator problems)

## Keywords

**Percent:** parts per 100 — written using the % symbol

**Decimal:** a number in our base 10 number system. Numbers to the right of the decimal place are called decimals.

**Fraction:** a fraction represents how many parts of a whole value you have.

**Equivalent:** of equal value.

**Reduce:** to make smaller in value.

**Growth:** to increase/ to grow.

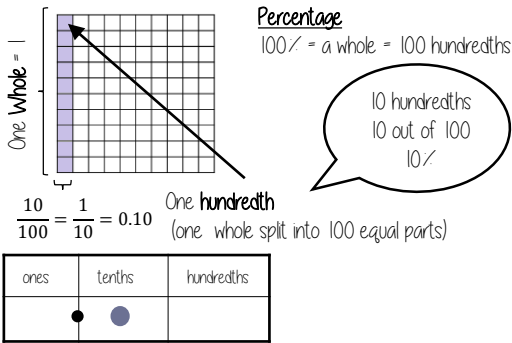
**Integer:** whole number, can be positive, negative or zero.

**Invest:** use money with the goal of it increasing in value over time (usually in a bank).

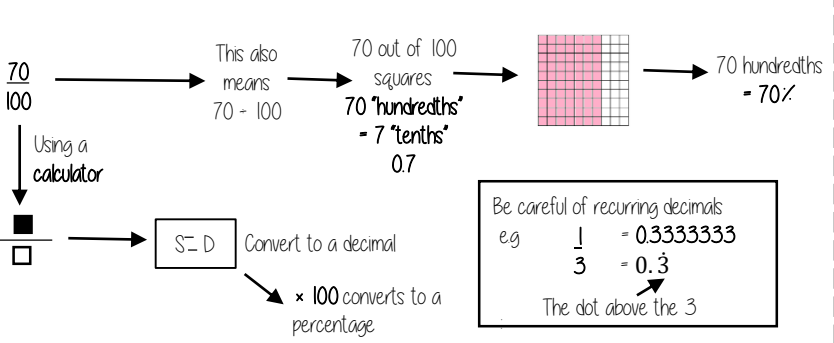
**Multiplier:** the number you are multiplying by

**Profit:** the income take away any expenses/ costs

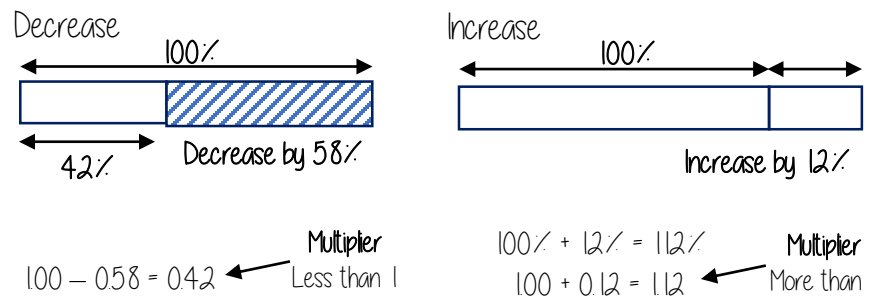
## FDP Equivalence



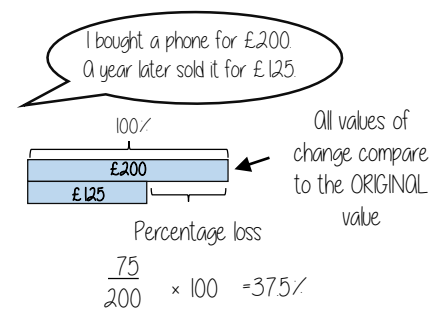
## Converting FDP



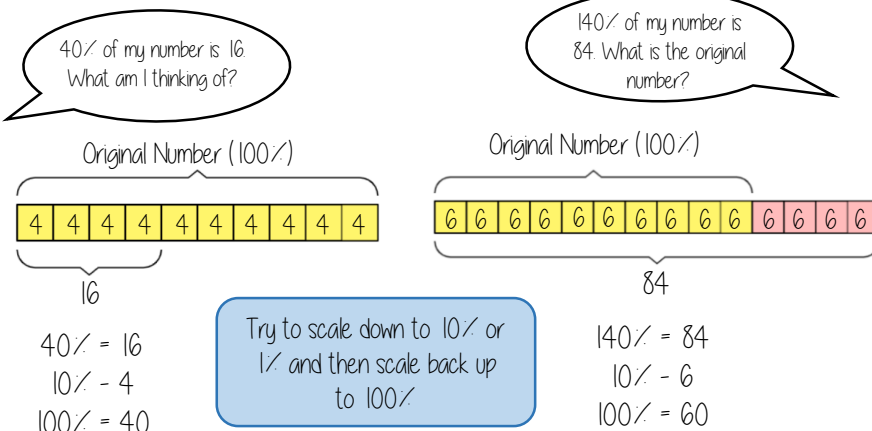
## Percentage Increase/ Decrease



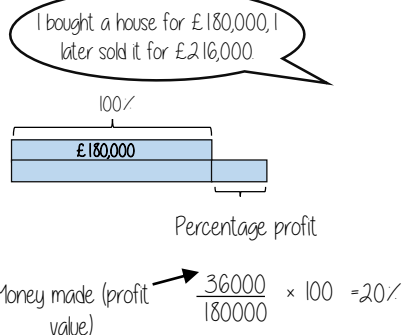
## Percentage change



## Reverse Percentages



$$\frac{\text{Difference in values}}{\text{Original value}} \times 100$$



# YEAR 9 — REASONING WITH NUMBER... Maths & Money

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## What do I need to be able to do?

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

- Solve problems with bills and bank statements
- Calculate simple interest
- Calculate compound interest
- Calculate wages and taxes
- Solve problems with exchange rates
- Solve unit pricing problems

## Keywords

- Credit:** money being placed into a bank account  
**Debit:** money that leaves a bank account  
**Balance:** the amount of money in a bank account  
**Expense:** a cost/ outgoing  
**Deposit:** an initial payment (often a way of securing an item you will later pay for)  
**Multiplier:** a number you are multiplying by (Multiplier more than 1 = increasing, less than 1 = decreasing)  
**Per Annum:** each year  
**Currency:** the type of money a country uses  
**Unitary:** one — the cost of one.

## Bills and Bank Statements

**Bills** — tell you the amount items cost and can show how much money you need to pay.

Some can include a total  
 Look for different units  
 (Is it in pence or pounds)

Menu	Price
Milk	89p
Tea	£1.50

## Bank Statements

Bank statement can have negative balances if the money spent is higher than the money coming into the account

Date	Description	Credit	Debit	Balance
19 <sup>th</sup> Sept	Salary	£1500		£1500
19 <sup>th</sup> Sept	Mortgage		£600	£900
25 <sup>th</sup> Sept	Bday Money	£15		£915

## Simple Interest

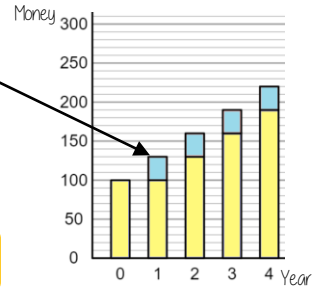
For each year of investment the interest remains the same

$$\frac{\text{Principal amount} \times \text{Interest Rate} \times \text{Years}}{100}$$

Principal amount is the amount invested in the account  
 e.g Invest £100 at 30% simple interest for 4 years

$$\frac{100 \times 30 \times 4}{100} = £120$$

This account earned **£120** interest.  
 At the end of year 4 they have **£220**



## Compound Interest

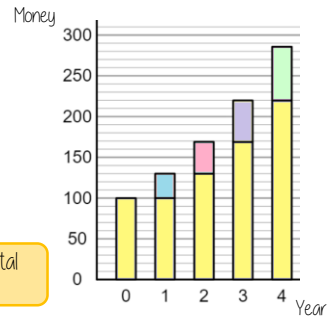
Interest is added to the current value of investment at the end of each year so the next year's interest is greater.

$$\text{Principal amount} \times \text{Multiplier}^{\text{Years}}$$

e.g Invest £100 at 30% compound interest for 4 years

$$100 \times 1.3^4 = £285.61$$

This account has **£285.61** in total at the end of the 4 years.



## Value Added Tax (VAT)

VAT is payable to the government by a business in the UK VAT is 20% and added to items that are bought.

Essential items such as food do not include VAT.

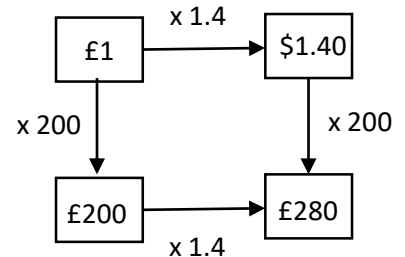
## Wages and Taxes

Salaries fall into tax brackets — which means they pay this much each month from their salary.

Taxable Income	Tax Rate
£12 501 to £50 000	20%
£50 001 to £150 000	40%
over £150 000	45%

Over time:  
 Time and a half — means 1.5 times their hourly rate  
 Double — 2 times their hourly rate

## Exchange Rates



When making estimates it is also useful to use estimates to check if our solution is reasonable.

Use inverse operations to reverse the exchange process

### Common Currencies

United Kingdom	£	Pounds
United States of America	\$	Dollars
Europe	€	Euros

## Unit Pricing

4 Oranges £1	5 cupcakes £1.20
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$$\begin{array}{l} 4 = £1.00 \\ 2 = £0.50 \\ 1 = £0.25 \end{array} \left. \begin{array}{l} \div 2 \\ \div 2 \\ \div 2 \end{array} \right\} \begin{array}{l} 5 = £1.20 \\ 1 = £0.20 \end{array}$$

Cost per Unit

To calculate unit per cost you divide by the cost.

Cupcakes are the best value as one item has the cheapest value

There is a directly proportional relationship between the cost and number of units.