NUMBER

Autumn term

Number 1

Topics

- Calculator skills
- Indices
- Standard form

What do I need to be able to do?

- Use the laws of indices to simplify expressions
- Be able to change between standard form and ordinary numbers

Key Vocabulary

Power/Index	Power/index (exponent) of a number says how many times to use the number in a multiplication. It is written as a small number to the right and above the base number
Base	The number that gets multiplied when using a power
Standard (index form)	Another name for "scientific notation", where a number is written in two parts: just the digits with the decimal point placed after the first digit followed by x10 to a power that puts the decimal point back where it should be
Coefficient	A number used to multiply a variable
Term	A term is either a single number or variable, or numbers and variables multiplied together
Expression	Numbers, symbols, and operators grouped together to show the value of something

Career Links

Being able to confidently work with numbers is a great skill to have and has lots of links with a number of careers such as:

- Accountancy/banking
- Insurance
- Engineering
- Construction
- Carpenter

Laws of indices

Multiplication law: When multiplying with the same base (number/letter) we add the powers.

General rule: $a^m \times a^n = a^{m+n}$

$2^5 \times 2^7 = 2^{5+7} = 2^{12}$ $\quad x^3 \times x^8 = x^{3+8} = x^{11}$

When multiplying the terms we add the powers together.

Division law: When dividing with the same base (number/letter) we subtract the powers.

General rule: $a^m \div a^n = a^{m-n}$

$2^{14} \div 2^7 = 2^{14-7} = 2^7$ $\quad x^{10} \div x^8 = x^{10-8} = x^2$

When dividing the terms we subtract the powers together.

Brackets law: When raising a power to another power we multiply the powers together.

General rule: $(a^m)^n = a^{m \times n}$

$(5^4)^2 = 5^{4 \times 2} = 5^8$ $\quad (h^9)^3 = h^{9 \times 3} = h^{27}$

When raising to a power we multiply the powers together.

Ordinary numbers: To change between ordinary numbers and standard form we need to use a power of 10.

$120000 = 1.2 \times 10^5$ — This number need to be bigger than 1 and less than 10 to be in standard form.

$0.005 = 5 \times 10^{-3}$ — Positive power = very big number. Negative power = very small number.

Standard form: To change numbers from standard form back to ordinary numbers we multiply by the power of 10.

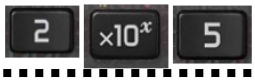
$7.32 \times 10^4 = 73200$

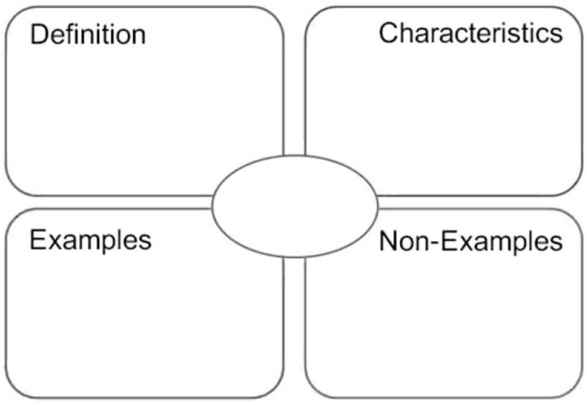
$2.4 \times 10^{-3} = 0.0024$

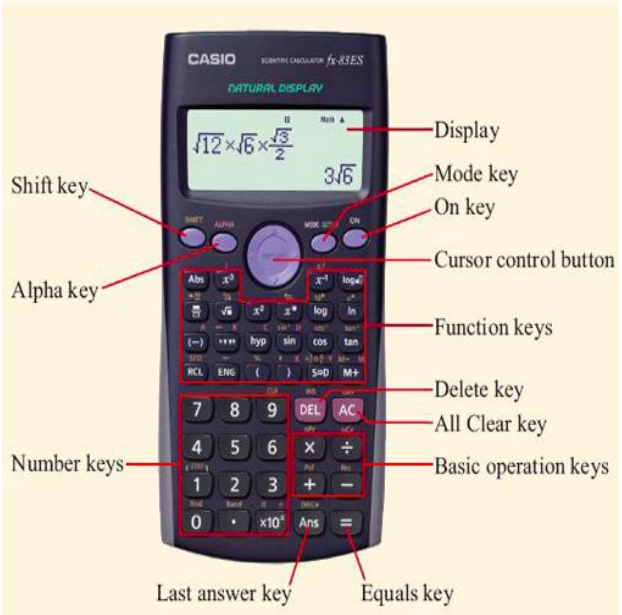
The power tells us how many places to move not how many zeros to add.

You can use this button on your calculator to write numbers in standard form.

For 2×10^5 you would type







NUMBER

Topics

- FDP
- Percentages

Autumn term

FDP

What do I need to be able to do?

- Order decimals and fractions
- Convert between fractions, decimals and percentages
- Find percentages of amounts
- Find percentage increase and decrease
- Use reverse percentages

Career Links

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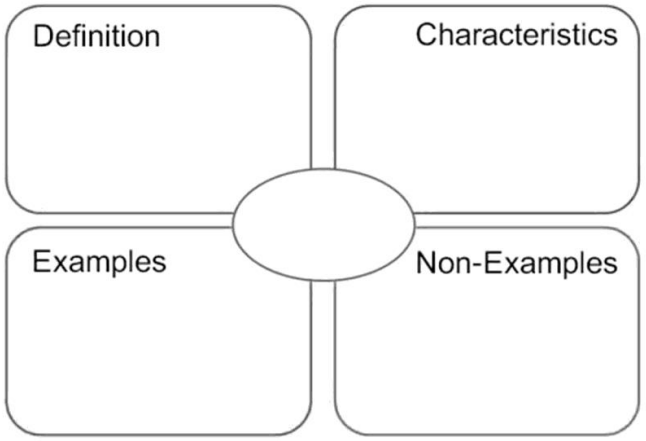
Key Vocabulary

Convert	To change a value or expression from one form to another
Fraction	How many parts of a whole
Decimal	Based on 10
Percentage	Parts per 100
Equivalent	Having the same value
Increase	Make something bigger
Decrease	Make something smaller
Profit	Income minus expenses
Interest rate	How much is pad for the use of money, as a percent



45% of 80: 10% = 80 ÷ 10 = 8 5% = 8 ÷ 2 = 4
40% = 4 x 8 = 32
45% = 40% + 5% = 32 + 4 = 36

5% is half of 10% so we divide by 2.

80% of 120: 80% = 0.80
80% of 120 = 0.80 x 120 = 96

Change the percentage to a decimal and then multiply.

Increase: To calculate a percentage increase we calculate the percentage and add the value on to the original amount.

Decrease: To calculate a percentage decrease we calculate the percentage and subtract the value off the original amount.

Top tips - To convert:

- Percentages to decimals divide by 100.
- Decimals to percentages multiply by 100.
- Percentages to fractions, put over 100.
- Fractions make sure the denominator is 100.

Recurring Decimals to Fractions

1. Let x = recurring decimal.
2. Let n = the number of recurring digits.
3. Multiply the recurring decimal by 10^n.
4. Subtract (1) from (3) to eliminate the recurring part.
5. Solve for x, expressing your answer as a fraction in its simplest form.

Reverse Percentage

A jacket costs £102 after a discount of 15%.
What is the original price of the jacket?

100% – 15% = 85% = 0.85

Original Price ? → x 0.85 → New Price £102

New Price £102 → ÷ 0.85 → Original Price ?

Original price
= £102 ÷ 0.85 = £120

F	D	P
$\frac{1}{100}$	0.01	1%
$\frac{1}{10}$	0.1	10%
$\frac{1}{5}$	0.2	20%
$\frac{1}{4}$	0.25	25%
$\frac{1}{2}$	0.5	50%
$\frac{3}{4}$	0.75	75%

Examples:

$0.\dot{7}$ (one recurring digit)

$x = 0.7777...$

$10x = 7.777...$

$10x - x = 7$

$9x = 7$

$x = \frac{7}{9}$

Year 9 H – Knowledge Organiser

NUMBER

Topics

- Growth and decay
- Compound interest and depreciation

Autumn term

Number 2

What do I need to be able to do?

- Calculate compound interest
- Understand growth and decay

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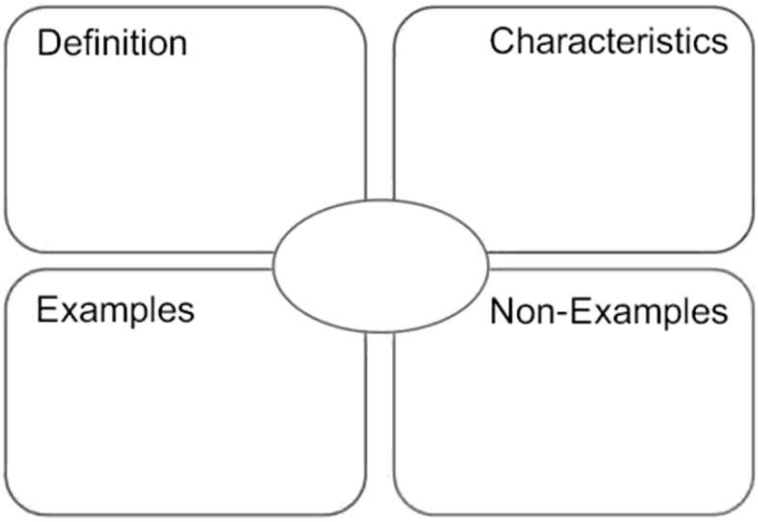
Key Vocabulary

Multiplier	Used to calculate percentages with a calculator
Increase	When an amount goes up
Decrease	When an amount goes down
Simple interest	The amount of interest is fixed over a period of time
Compound interest	The interest earned over time will continue to increase



$$y = ab^t$$

a = initial amount
$0 < b < 1$ = exponential decay
$b > 1$ exponential growth
t = time period

$$y = a(1+r)^t$$

a = initial amount
r = growth rate per time period
t = time period

Simple interest

To calculate simple interest we start by calculating the percentage and multiplying it by the period of time.

Example: £250 is in a bank account which is paying 5% simple interest per year. How much will be in the bank account at the end of 3 years?

5% = 0.05
0.05 x 250 = £12.50

Multiply by 3 because the question asks for 3 years.

3 x £12.50 = £37.50.

Add your answer to the original amount in the question.

£250 + £37.50 = £287.50

Compound interest

To calculate compound interest we use powers as the amount changes at the end of each year.

Example: £250 is in a bank account which is paying 4% compound interest per year. How much will be in the bank account at the end of 5 years?

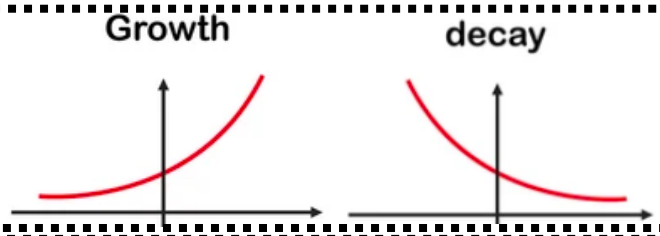
Interest means an increase so 100% + 4% = 104% which as a multiplier is 1.04

4% increase = 1.04

1.04^5 x 250 = £304.16

Power of 5 because the questions asks for 5 years.

This is the final answer



$$12\% = \frac{12}{100} = 0.12$$

Year 9 H – Knowledge Organiser