

Madani Boys School

Mathematics

YEAR 9

KNOWLEDGE ORGANISER

| YEAR 9 | |
|--------|---|
| WEEK | HALF TERM 3 |
| 18 | Percentage Recap |
| 19 | Percentage change & Reverse percentages |
| 20 | Repeated percentage change & depreciation |
| 21 | Simple & Compound Interest |
| 22 | Bank Statements and Financial Maths |
| 23 | Revision and Assessment 3 |



PERCENTAGES

What do I need to be able to do?

You should be able to:

- Find percentages of amounts
- Increase or decrease by a percentage
- Find percentage change
- Find the original amount.
- Express one number as a fraction of another
- Increase or decrease using multipliers
- Work with simple interest
- Work with compound interest

Key Words

- **Percent:** parts per hundred
- **Simple Interest:** interest calculated as a percent of the original amount
- **Compound Interest:** interest calculated on the amount borrowed plus the previous interest
- **Multiplier:** the number that you are multiplying by
- **Increase:** make bigger
- **Decrease:** make smaller

Percentage of an Amount

Find 10% of 300

300 shared into 10 equal parts (300 ÷ 10)

100% of 300 = 300
10% of 300 = 30



Find 30% of 240

100% of 240 = 240
10% of 240 = 24
30% of 240 = 72

A bar model to help visualise it

24 x 3 = 72

Finding 10% is always a good place to start!

Find 81% of 480

100% of 480 = 480
10% of 480 = 48
1% of 480 = 4.8

80% of 480 = 384

81% of 480 = 388.8

100% of 480 = 480

10% of 480 = 48

80% of 480 = 384

80% × 1% = 81% so we need to add 4.8 and 384

Percentage Increase/Decrease

An antique clock has increased in value by 12%. If it's original price was £400, what is the new price?

Method 1

12% increase means we have 112% of the original price. So we are now finding 112% of £400

100% of £400 = £400
10% of £400 = £40
2% of £400 = £8

112% of £400 = £448

Method 2

We need to find 12% of £400

100% of £400 = £400
10% of £400 = £40
2% of £400 = £8

12% of £400 = £48

We are increasing by 12%, so adding 12% on
£400 + £48 = £448

Helpful Percentages

It is helpful to remember the relationships between some percentages to help speed up the process!

50% is half of 100%. To find 50% of something, we can divide it by 2

25% is a quarter of 100%. To find 25% of something, we can divide it by 4

10% is one tenth of 100%. To find 10% of something, we can divide it by 10

20% is one fifth of 100%. To find 20% of something, we can divide it by 5

A useful one to remember
12.5% is one eighth of 100%
(as it is half of 25%)

| 100% | |
|-------|-------|
| 50% | 50% |
| 25% | 25% |
| 20% | 20% |
| 10% | 10% |
| 5% | 5% |
| 2.5% | 2.5% |
| 1.25% | 1.25% |

Percentage Change

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

I bought a phone for £200. A year later it sold for £125. What was the % loss?

£200
£125
Amount lost £75

$\frac{75}{200} \times 100 = 37.5\%$

I bought a house for £180,000. I sold it for £216,000. What was the % profit?

£180,000
£216,000
Profit

Profit = £216,000 - £180,000 = £36,000

$\frac{36,000}{180,000} \times 100 = 20\%$

Expressing One Number as a Percentage of Another

Express 12 as a percentage of 20

$\frac{12}{20} = \frac{60}{100} = 60\%$

Equivalent fractions

37 out of 50 people in a class are Manchester United fans. What percentage of the class support Manchester United?

$\frac{37}{50} = \frac{74}{100} = 74\%$

Equivalent fractions

Multipliers

What multiplier would represent an increase of 15%?

We are finding 100% + 15%, so 115%.

As a decimal this is 1.15

What multiplier would represent a decrease of 15%?

We are finding 100% - 15%, so 85%.

As a decimal this is 0.85

Compound Interest

I put £1000 in a bank account. It earns compound interest of 10% per year. How much will be in the account after 5 years?

INTEREST:

Compound interest means we work out the interest each year and the original amount plus any interest in the account.

- 10% of £1000 = £100. So after year 1, the account will have £1100.
- 10% of £1100 = £110. So after year 2, the amount is £1210 etc.

If we are increasing by 10% each time, this is the same as finding 110% of the amount, or multiplying by 1.1 (see multipliers). So another way we can work this out is:
£1000 × 1.1 × 1.1 × 1.1 × 1.1 × 1.1

Or £1000 × 1.1⁵ = £1610.51

5 years

Know which account to go for

Finding the Original

60% of a number is 48. What is the number?

60% of x = 48
10% of x = 8
100% of x = 80

A bar model to help visualise it

8 8 8 8 8 8 8 8

48

As a quick sense check, our answer should be BIGGER than 48! Always make sure you look back at your answer and make sure it makes sense.

A pair of shoes are on sale for 87.5% off. The sale price is £4950. How much did they cost originally?

87.5% off means we are left with 12.5% so 12.5% = £4950

12.5% of x = £4950
25% of x = £9900
100% of x = £39600

Simple Interest

I put £1000 in a bank account. It earns simple interest of 10% per year. How much will be in the account after 5 years?

INTEREST:

Simple interest means we calculate the interest the initial amount will earn and add that amount on each year.

10% of £1000 = £100

So each year, the account will gain £100 interest

£1000 + (£100 × 5) = £1500

5 years

YEAR 9 — REASONING WITH NUMBER...

Maths & Money

@whisto_maths

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 th Sept | Salary | £1500 | | £1500 |
| 19 th Sept | Mortgage | | £600 | £900 |
| 25 th Sept | Bday Money | £15 | | £915 |

Simple Interest

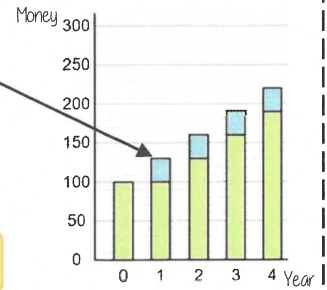
For each year of investment the interest remains the same

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

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

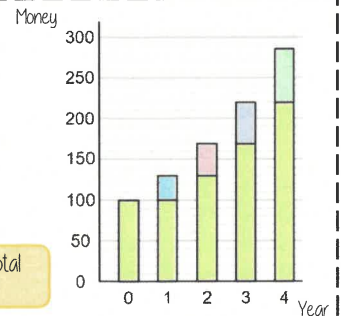
Interest is added to the current value of investment at the end of each year so the next year's interest is greater.

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

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.

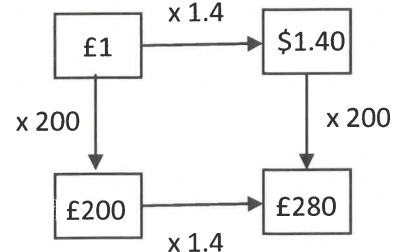
Wages and Taxes

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 |
|-----------------|---------------------|

$$4 = £1.00 \div 2 \quad 5 = £1.20 \div 5$$

$$2 = £0.50 \quad 1 = £0.20$$

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