Y11 - Using Graphs (F) - KO

What do I need to be able to do?

- Construct & interpret conversion graphs & other real-life straight line graphs
- Construct & interpret piecewise graphs
- Find approximate solutions to graphs
- Interpret & construct distance-time graphs

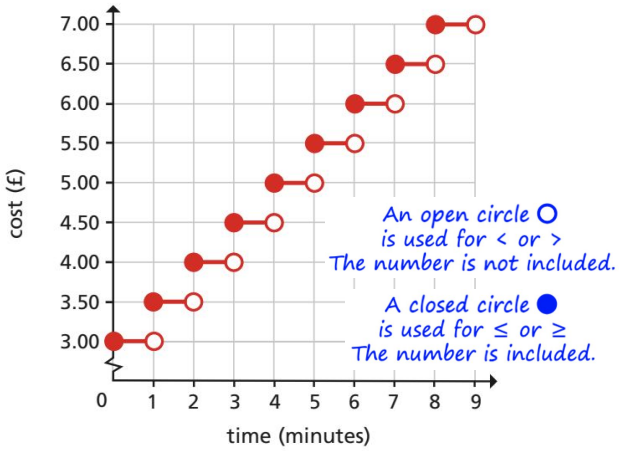
Keywords & definitions:

- **Conversion** - change a value from one form to another
- **Approximate** - a value that is not exact, but is close enough to be used
- **Solution** - where a graph intercepts the x-axis

Piecewise Graphs

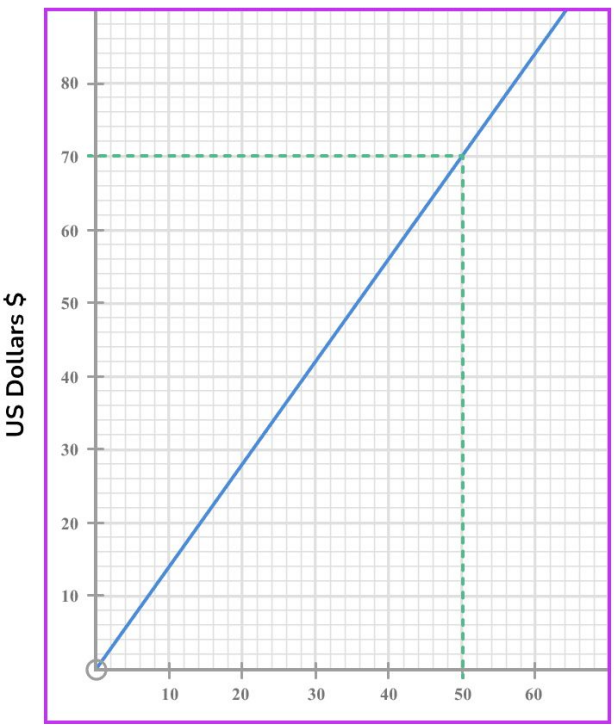
The graph shows the cost of a phone call to the USA.

The cost of a call that is less than a minute long is £3



Conversion Graphs

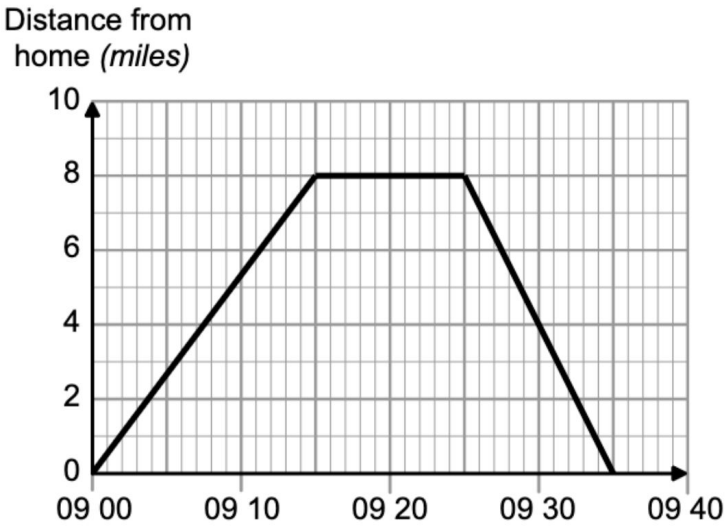
Conversion graphs are straight line graphs that show a relationship between two units and can be used to convert from one to another. They are very useful to solve real-life problems.



£50 ≈ $70

distance-time graphs

A distance-time graph shows how a journey takes place, with the distance from a starting point plotted over time.



The graph shows Lucy's journey from home to the supermarket and back home.

example

a) What time did she arrive at the supermarket?

At 9.15 - when the line goes flat.

b) How long did she stay at the supermarket?

9.15 until 9.25 - 10 minutes

c) At what speed did Lucy travel home?

8 miles in 10 minutes = 48mph

Y11 - Multiplicative Reasoning (F) - KO

What do I need to be able to do?

- Understand the fundamentals of proportional relationships
- Apply mathematical knowledge to concepts of money
- Work with and calculate compound measures

Keywords & definitions:

Proportion - two ratios or fractions being equal
Direct Proportion - when 2 quantities change at the same rate
Inverse Proportion - a relationship between 2 quantities where an increase in one quantity results in a proportional decrease in the other, and vice versa
Best Value - cheapest price per unit or for the same amount
Density - how tightly packed matter is. Measured as mass within a given volume
Speed - how fast something is moving. Measured as distance traveled per time unit
Pressure - measured as the force exerted on a surface per unit area

direct proportion

When two quantities maintain a constant ratio, we say they are in direct proportion. *As one increases, the other increases at the same rate*

If we draw a graph of the values of the two quantities, it is a straight line passing through(0,0) with a positive gradient.

examples

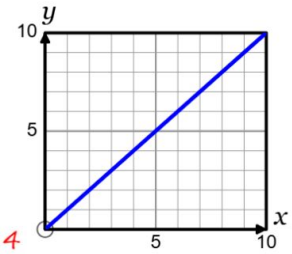
16 yoghurts cost £14.
How much do 20 yoghurts cost?

Draw a table & find the cost of a smaller 'unit'

No. of Yoghurts	Cost (£)
16	14
4	3.50
20	17.50

÷4 ÷4 × 5 × 5

Multiply the smaller unit up to get the cost of 20 yoghurts = £17.50



inverse proportion

If two quantities are inversely proportional, when one of the quantities is *multiplied* by value, the other is *divided* by the same value.

examples

Machines in a factory are being used to make an order of scarves.
With 5 identical machines working, the order will be completed in 30 minutes.

a) How long would it take to complete the order if 10 machines were used?

×2 (5 machines would take 30 minutes
10 machines would take 15 minutes) ÷2

currency conversion

Where necessary, round currency values to 2 decimal places.

examples

£1 = $1.21
Change £250 into dollars.

£1	$1.21
£250	$

×1.21 ×1.21
$302.50

£1 = €1.16
Change €400 into pounds.

£1	€1.16
£	€400

÷1.16 ÷1.16
£344.83

speed

Speed is a measure of the **distance** something travels in a given period of **time**.

Common units for speed:

m/s	km/h	mph
metres per second	kilometres per hour	miles per hour

examples

Ruby walks 20 metres in 4 seconds
Work out Ruby's speed.
Speed = Distance / Time
= 20 / 4
= 5 m/s

Stewart cycles at an average speed of 12 km/h
Work out how far Stewart cycles in 2 hours.
Distance = Speed × Time
= 12 × 2
= 24 km

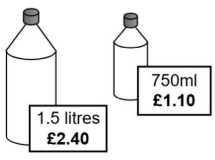
Tina drives at an average speed of 50 mph
How long will it take for Tina to drive 150 miles?
Time = Distance / Speed
= 150 / 50
= 3 hours

value for money

A large bottle of lemonade (1.5 litres) costs £2.40

A small bottle of lemonade (750ml) costs £1.10

Which size bottle gives better value for money?



Large Bottles

Volume in ml	Cost (£)
1500	2.40
750	1.20

÷2

With a large bottle you are paying £1.20 for 750ml. With a small bottle 750ml only costs £1.10, so the small bottle is better value for money.

pressure

Pressure is the amount of force applied to an object per unit of area.

The formula for pressure is $pressure = \frac{force}{area}$.

The units are N/m² or N/cm²

A wooden toy box is resting on a counter.
The box covers an area of 0.4m²
The weight of the box exerts a force of 30 Newtons on the counter.
Work out the pressure on the counter created by the box.

$P = \frac{30}{0.4}$
$= 75\ N/m^2$

density

Density = Mass / Volume

The density of an object is its mass per unit volume.
The units for density are g/cm³ or kg/m³.

examples

A cube has side lengths of 4cm and a mass of 83g.
Work out the density of the cube correct to 2 significant figures.

Density = Mass ÷ Volume
= 83 ÷ 64
= 1.296875
= 1.3 g/cm³ (2 s.f.)

A silver coin has a mass of 6.5g and density 10.5g/cm³.
Work out the volume of the coin to 3 significant figures.

Density = Mass / Volume → Volume = Mass / Density
Volume = 6.5 / 10.5 = 0.619cm³

Retrieval Quiz

Answers