Accelerating Progress: mathematics

Sample learner resources
(available via the e-portfolio system)

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Accelerating Progress: mathematics
Challenge walk-through 1A1

Keep a record of how you use your time every day for one week.

- Make charts to show the percentage of time you spend on each activity
- Write five statements to compare your data with other people's

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Task 1: Collect your data

- Use the weekly diary to record how you spend your time.
- Stick to five basic activities to keep it simple:
    - Sleeping
    - Eating
    - School
    - Physical activity (eg sport, walking the dog)
    - Working – (eg part-time job, housework, preparing meals)

I spent midnight (00:00) until 6am (06.00) sleeping

I spent an hour eating breakfast 06.00 – 07.00

It's important to provide a key to show what your doing.

I've used different shading to represent different activity. You could use different colours.

I went to the gym on my bike and then on to work, so 07.00 – 08.00 is physical activity.

I don't have school time, so I was at work between 8am and 5pm

From 5pm until 10pm I spent watching TV, with a break for dinner at 6pm. So that's recorded as leisure time , with an hour eating

	Monday	Tuesday	Wednesday	Thursday
00.00-01.00				
01.00-02.00				
02.00-03.00				
03.00-04.00				
04.00-05.00				
05.00-06.00				
06.00-07.00				
07.00-08.00				
08.00-09.00				
09.00-10.00				
10.00-11.00				
11.00-12.00				
12.00-13.00				
13.00-14.00				
14.00-15.00				
15.00-16.00				
16.00-17.00				
17.00-18.00				
18.00-19.00				
19.00-20.00				
20.00-21.00				
21.00-22.00				
22.00-23.00				
23.00-00.00				

key

//// Sleeping

∴ eating

x x x Physical activity

\\\ Working

|||| Relaxing.

Task 2: Organise your data

Now transfer your information into the weekly tally chart and produce a bar chart. You can then use the rest of the table to do the calculations for a pie chart.

Count up your tally marks to get a total. This can be called frequency

This calculates how many degrees represent each hour. So is the same for each line

Multiply by the hours for each activity. Round them to the nearest whole.

You need answers in hours and minutes. 1.7 Hours splits into 1 + 0.7 Hours. 0.7 Hours is 0.7 x 60 mins = 42mins.

So we have 1 Hour 42 mins

Use your weekly diary to count up hours and tally them in the table. Remember to group in sets of 5

| Activity type	Tally of hours	Hours spent on this activity	Angle on pie chart	Mean amount of time spent on this activity per day
Sleeping	IIII IIII IIII IIII IIII IIII IIII IIII IIII IIII IIII I	56	$(360 \div 168) \times 56 = 120$	$56 \div 7 = 8$
School	IIII IIII IIII IIII IIII IIII IIII	35	$(360 \div 168) \times 35 = 75$	$35 \div 7 = 5$
Physical activity	IIII II IIII	12	$(360 \div 168) \times 12 = 26$	$12 \div 7 = 1.7 = 1$ hour $+ 0.7 \times 60 = 1$ hour 42 mins
Eating	IIII IIII IIII	14	$(360 \div 168) \times 14 = 30$	$14 \div 7 = 2$
Relaxing	IIII IIII IIII IIII III IIII IIII IIII IIII	43	$(360 \div 168) \times 43 = 92$	$43 \div 7 = 6.1$
Working	IIII III	8	$(360 \div 168) \times 8 = 17$	$8 \div 7 = 1.1$
Total		168	360°	

There are 168 hours in a week, check yours adds up

There are 360 degrees in a circle, so check it adds up. If not check your rounding off

This is an extra calculation to help us make comparisons.

Mean is hours ÷ Number of days in a week.

Round to 1 decimal place.

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Task 3: Represent your data

Draw a bar graph and pie chart

Amount of Hours Doing Different Activities in a Week.
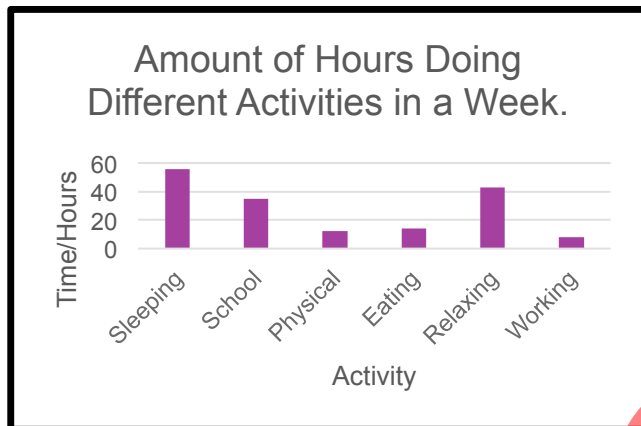
When you draw your bar chart:
- remember to leave equal gaps between bars, because it's discrete data
- remember a title and axis labels

Amount of Hours Doing Different Activities in a Week.
Pie chart represents 168 Hours.
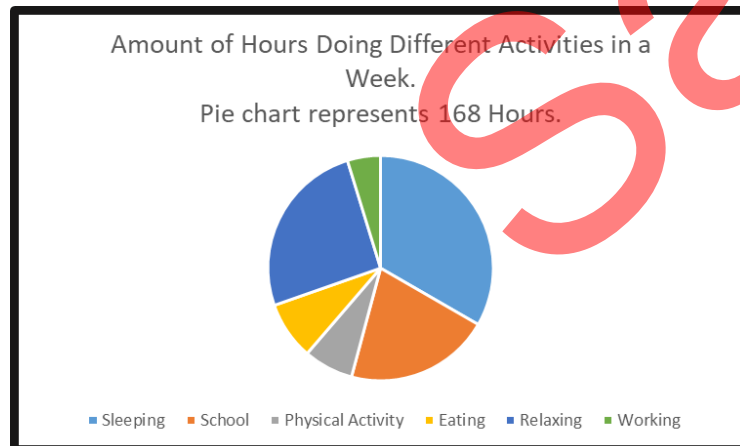
Measure your angles carefully and remember to include a key.

Don't forget a pie chart needs a reference to the quantity represented (ie 168 hours) and a title.

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Task 4: Analyse your data

Now to calculate the percentage of time you spend doing each activity:

Activity type	Tally of hours	Hours spent on this activity
Sleeping	IIII IIII IIII IIII IIII IIII IIII IIII IIII IIII IIII I	56
School	IIII IIII IIII IIII IIII IIII IIII	35
Physical activity	IIII II IIII	12
Eating	IIII IIII IIII	14
Relaxing	IIII IIII IIII IIII III IIII IIII IIII IIII	43
Working	IIII III	8
	Total	168

(56 ÷ 168) x 100 = 33%

This has been rounded to the nearest whole number.

You can do the same for each number of hours.

(Hours ÷ Total) x 100

Task 5: Draw some conclusions

Questions to help with your comparisons:

- What did you spend the **most** time doing and what was the proportion of time spent doing this as a percentage? Time spent ÷ total number of hours in a week × 100 = percentage
- What did you spend the **least** time doing and what was the proportion of time spent doing this as a percentage? Time spent ÷ total number of hours in a week × 100 = percentage
- Compare what you do most with what you do least (e.g. I spent 4 times longer sleeping than I did working)
- Compare your percentages with other people's results (e.g. I spent 10% of my time relaxing, whereas Jamie spent 15% of his time relaxing.)

Use the questions on the resource to complete some statements, like this:

Make sure each statement is backed up by referring to a chart or calculation.

Statement 1	I spent most time sleeping, this made up 33% of my time
Statement 2	My pie chart illustrates that I spent least time working, it is the smallest sector.
Statement 3	
Statement 4	
Statement 5	

Accelerating Progress: mathematics
Weekly tally chart

Name:	Challenge ref. 1A1

Use the tally chart to record how many hours you spent on each activity type for the whole week. Use this data to draw a bar chart and a pie chart. Remember this is discrete data, so you will need to leave gaps between the bars on your bar chart.

Angle on pie chart = 360 ÷ total number of hours in a week × hours spent on this activity (there are 168 hours in a week)
Mean amount of time spent on this activity per day = hours spent on this activity ÷ total number of days (there are 7 days in a week)
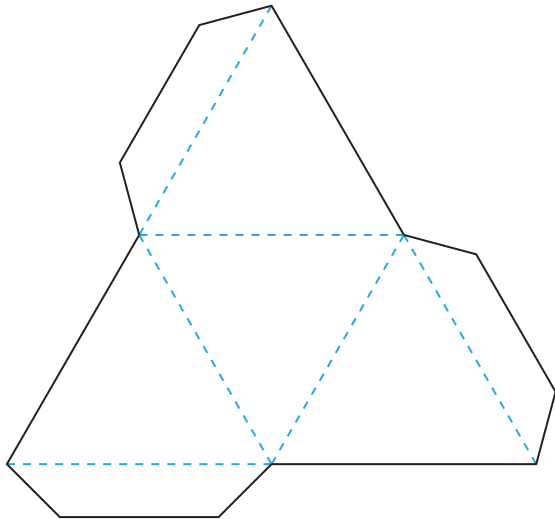
Activity type	Tally of hours	Hours spent on this activity	Angle on pie chart	Mean amount of time spent on this activity per day
Sleeping				
School				
Physical activity				
Eating				
Relaxing				
Working				
Total		**168**	**360º**	**24**

Accelerating Progress: mathematics
Dice nets

Net for a four-sided dice

Net for an eight-sided dice

Net for a six-sided dice
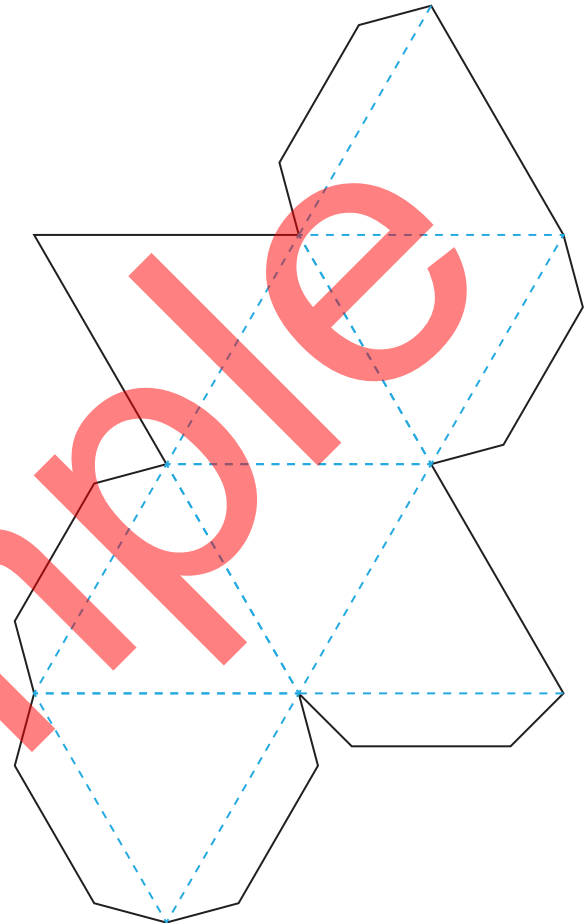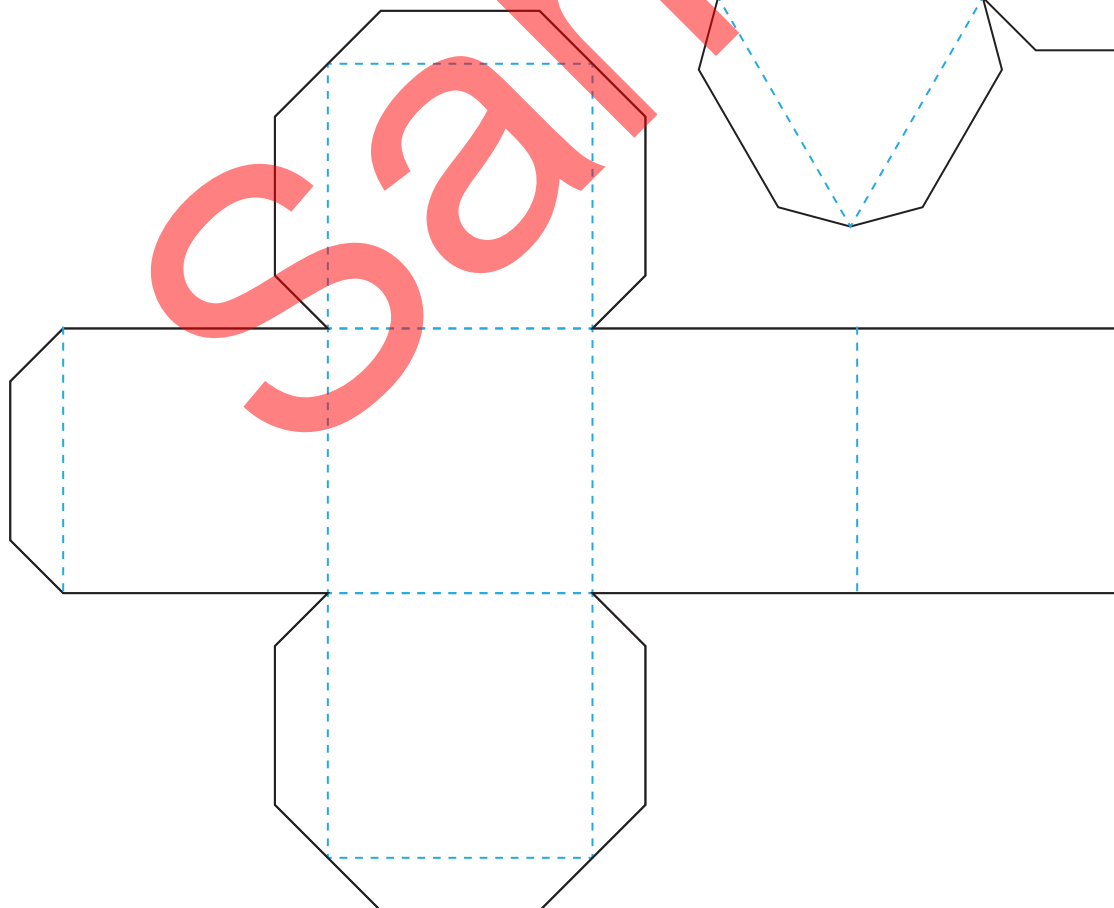
Accelerating Progress: mathematics
Dice scores

Name:	Challenge ref. 1A3

Record your dice scores for two six-sided unbiased dice in the table below. You will need to roll your dice a minimum of 30 times. Make sure you write your relative frequency as a fraction.

Score	Tally	Frequency	Relative frequency
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Investigate the theoretical probability of getting different scores by completing the sample space diagram below.

	+	1	2	3	4	5	6
					Dice 1		
Dice 2	1						
	2						
	3						
	4						
	5						
	6						

Accelerating Progress: mathematics
Comparing bank accounts

Name:	Challenge ref. 2A2

Use the tables below to work out how much you would save over five years in each account.

Account 1: interest rate of 3% per annum

Year	Balance at the start of the year	3% of balance	Balance at the end of the year
Year 1	£	£	£
Year 2	£	£	£
Year 3	£	£	£
Year 4	£	£	£
Year 5	£	£	£

Account 2: interest rate of 5% per annum, with a £2 monthly fee

Year	Balance at the start of the year	5% of balance	Monthly fees	Balance at the end of the year
Year 1	£	£	£	£
Year 2	£	£	£	£
Year 3	£	£	£	£
Year 4	£	£	£	£
Year 5	£	£	£	£

Account 3: no access account with a simple interest rate of 4%

Opening balance	£1000
4% of opening balance	£
Simple interest over 5 years	£
Balance after 5 years	£

Accelerating Progress: mathematics
Currency conversion

Name:	Challenge ref. 3A3

Record the value of £1 in Euros, US Dollars and one other currency. This is called the exchange rate.

£ GBP	€ EUR	$ USD	Other currency
£1.00	€	$	

Use the table below to convert the prices in GBP for five items you might buy while on holiday.

Item	Price in £ GBP	Converted to € EUR	Converted to $ USD	Converted to other currency
	£	€	$	
	£	€	$	
	£	€	$	
	£	€	$	
	£	€	$	

Find the prices of five items you might buy while on holiday in America in US Dollars and convert these prices to GBP, Euros and your other chosen currency.

Item	Price in $ USD	Converted to £ GBP	Converted to € EUR	Converted to other currency
	£	€	$	
	£	€	$	
	£	€	$	
	£	€	$	
	£	€	$	

Accelerating Progress: mathematics
Area and perimeter formulae

Name		Challenge ref. 4A1

| Shape	Diagram	Area	Perimeter (circumference)
Triangle		$A = (b \times h) \div 2$	$P = MN + NP + PM$
Parallelogram		$A = b \times h$	$P = DE + EF + FG + GD$
Rhombus		$A = b \times h$	$P = b + b + b + b$ $P = 4b$
Rectangle		$A = l \times w$	$P = l + w + l + w$ $P = 2l + 2w$
Square		$A = l^2$	$P = l + l + l + l$ $P = 4l$
Trapezoid		$A = ((B + b) \times h) \div 2$	$P = MN + NP + PR + RM$
Circle		$A = \pi r^2$	$C = 2\pi r$ $C = \pi d$

Name		**Challenge ref. 4B2**

Measuring the height of a tree or building

Method two – using trigonometry

You will need to measure an angle of elevation to the tree/building. Purpose built pieces of equipment can be found for this, but you can also make your own from a protractor (the bigger the better).
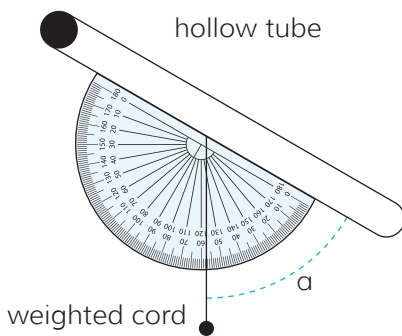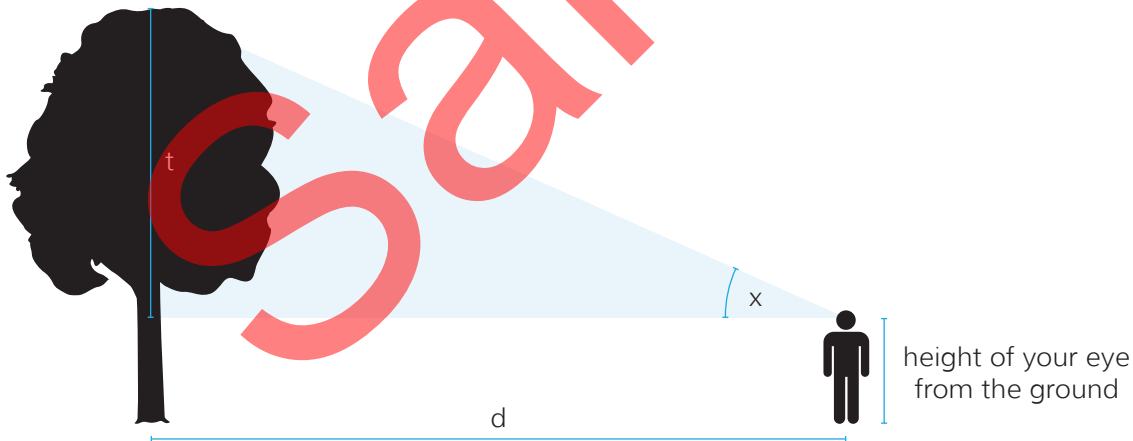

To measure the angle of elevation:

x = 90 − a

Where:

- x is the angle of elevation
- a is the angle measured on the protractor

To calculate the height of the tree:

t = d × TAN (x)

Where:

- t is the height of the tree
- d is the distance from your position to the base of the tree
- remember the height has been calculated from eye level, so the total height of the tree is what you worked out, plus the height of your eye from the ground

Accelerating Progress: mathematics
Straight line graphs
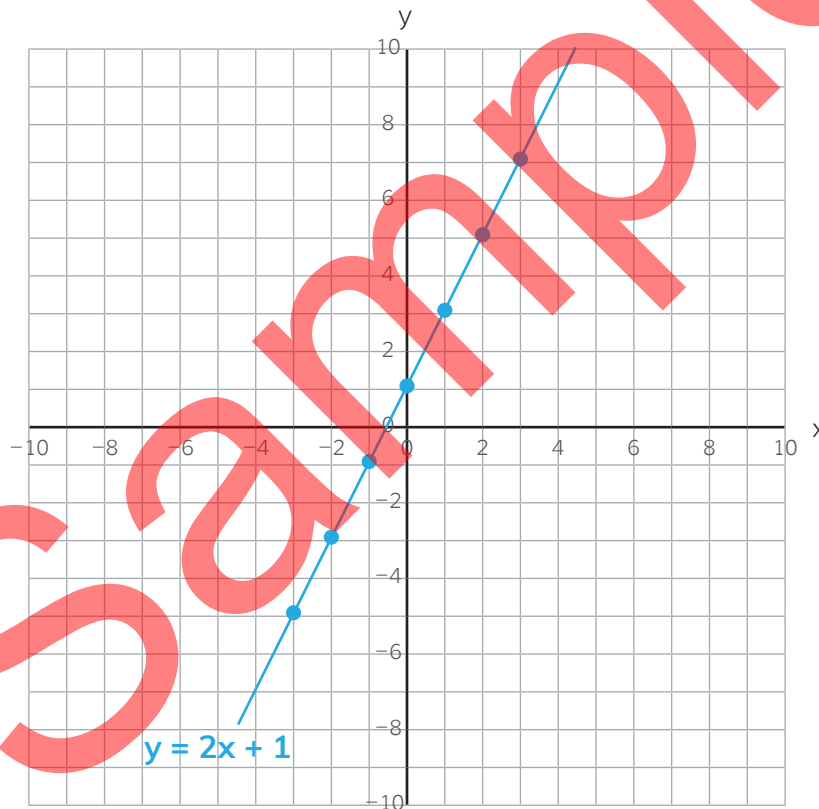
Name		Challenge ref. 5A4

Straight line graphs

Start by working out the values of y for different values of x. For example:

y = 2x + 1

x	−3	−2	−1	0	1	2	3
y	−5	−3	−1	1	3	5	7

You can plot sets of graphs on the same axes – this will help you to spot patterns and rules. Your graph will need to include negative values on both the x and y axes. For example:

y = 2x + 1

Plot the following sets of graphs and look for patterns and rules within the sets

Set 1	Set 2	Set 3
y = 2x + 1	y = 3x + 1	y = 10 − x
y = 2x +2	y = 3x +2	y = 8 − x
y = 2x + 3	y = 3x + 3	y = 5 − x
y = 2x +4	y = 3x +4	y = 6 − x

Accelerating Progress: mathematics
Challenge walk-through 5B1

Investigating bills

- Find three different bills or other fees
- Draw graphs to represent the charges
- Produce formulae to represent the graph
- Produce your own example

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Task 1: Find three different bills or charges

Here are two examples of things brought with a standing charge and then a rate

This is just the units energy is sold in

This means each year

Supplier	Tariff	Avg. kWh unit price (ex VAT)	Annual standing charge (ex VAT)
Energy power	Online fix and save	12.376 pence	£114.28

This is how much you pay for each unit of energy you use

You pay this whatever you use

Calling rates	Connection charge per call	Duration per minute charge		
	Anytime	Day	Evening	Weekend
UK landlines	21p/call	13.5p/min	13.5p/min	13.5p/min
UK mobiles	21p/call	16p/min	16p/min	16p/min

This is a bit more complex, as it depends what time of day you call. You could use just calls in the day if you had an example like this.

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Task 2: Put the charges in a table

Let's use this example:

Supplier	Tariff	Avg. kWh unit price (ex VAT)	Annual standing charge (ex VAT)
Energy power	Online fix and save	12.376 pence	£114.28

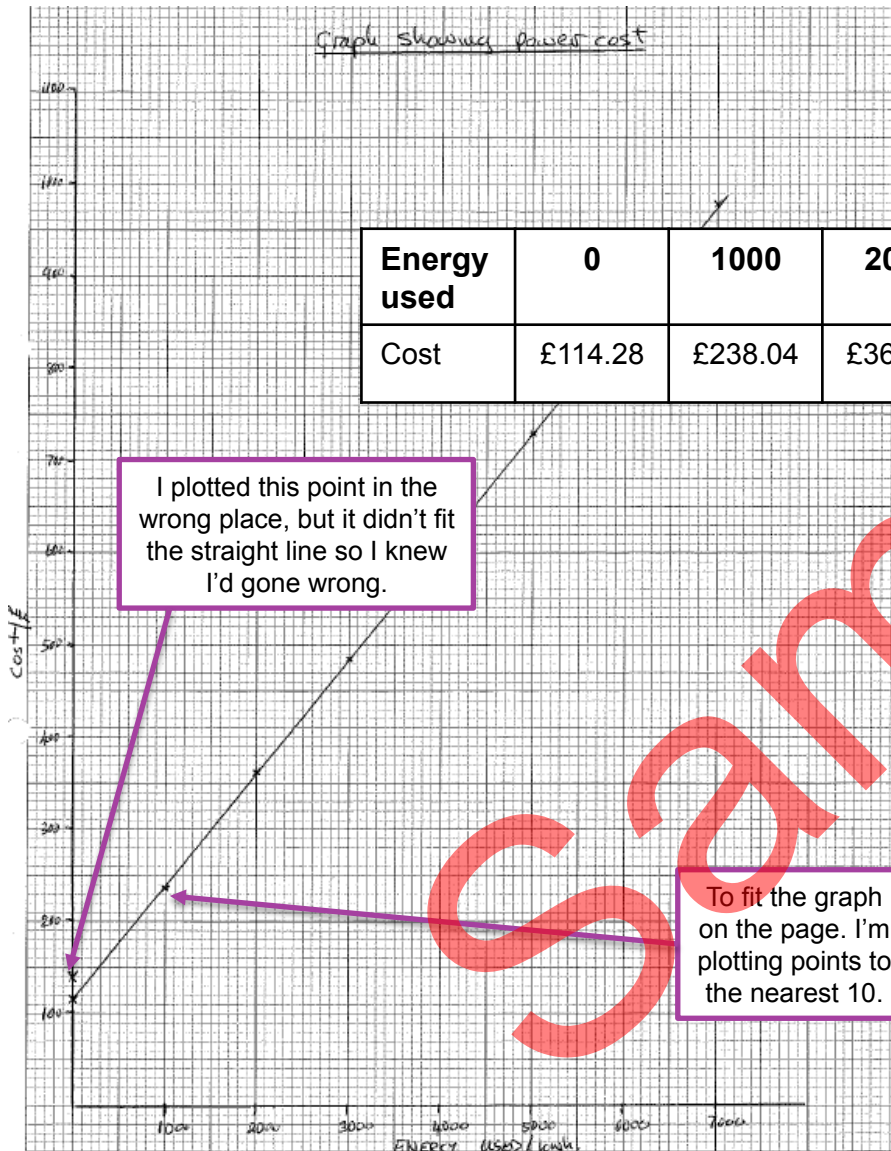Go up in 1000s to make sure there are large changes between steps

=0 × 0.12376 + 114.28

Energy used	0	1000	2000	3000	4000	5000	6000	7000
Cost	£114.28	£238.04	£361.80	£485.56	£609.32	£733.08	£856.84	£980.60

=1000 × 0.12376 + 114.28

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Task 3: Draw your graph from the table

Graph showing power cost

Energy used	0	1000	2000	3000	4000	5000	6000	7000
Cost	£114.28	£238.04	£361.80	£485.56	£609.32	£733.08	£856.84	£980.60

I plotted this point in the wrong place, but it didn't fit the straight line so I knew I'd gone wrong.

To fit the graph on the page. I'm plotting points to the nearest 10.

Now try and get cost calculated for several companies delivering the same thing, so you can compare.

This is power, can you find other power companies?

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Task 4: Write about what you found out

When you compared companies:

- Which was most expensive?

- Was it easy to tell which was cheapest?

- Was one cheaper for a certain amount of use?