A company makes gift boxes. The boxes are always a perfect cube. The smallest gift box has side lengths of 10cm. Larger boxes are available in increments of 10cm up to a maximum side length of 80cm.

Student tasks

1. Without using a calculator, work out the volumes of the first eight sizes of gift box. Copy and complete the table.

Length of box (cm)	10	20	30	40	50	60	70	80
Volume of box (cm^3)								

2. Draw a line graph of the length (x axis) and volume (y axis).

Ribbon is tied around the box as in the picture above. The width of the ribbon is always a third of the width of the side.

3. Using a calculator, work out the area of the ribbon used for each box. Ignore the bow; this is a fake one added later. Round your answers to the nearest integer. Copy and complete the table below. Two answers are completed already.

Length of box (cm)	10	20	30	40	50	60	70	80
Areas of ribbon (cm^2)			2400					17067

4. Draw a line graph of length (x axis) and ribbon area (y axis). Use a suitable scale and plot the points accurately.

It is useful to know the widest point in a gift box. This is the longest diagonal length across the inside of the cube, from corner to corner. Calculate these lengths. Round your answers to the nearest integer. Copy and complete the table below. Two answers are completed already.

Length of box (cm)	10	20	30	40	50	60	70	80
Diagonal length (cm)	17							139

5. Draw a line graph of length ((x axis) and diagonal (y axis). Use a suitable scale and plot the points accurately.

Extension task

The 10cm cube box costs £2 to buy. Each box costs 10% more than the last. Draw a table and graph for the size and cost of the eight boxes.

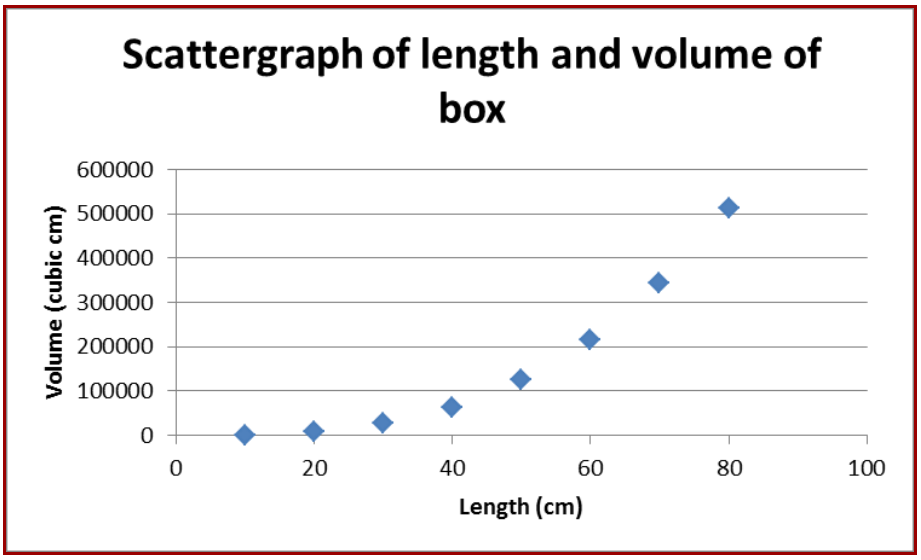
The answers

1. Without using a calculator, work out the volumes of the first eight sizes of gift box. Copy and complete the table.

Length of box (cm)	10	20	30	40	50	60	70	80
Volume of box (cm^3)	1000	8000	27000	64000	125000	216000	343000	512000

2. Draw a line graph of the length (x axis) and volume (y axis).

Ribbon is tied around the box as in the picture above. The width of the ribbon is always a third of the width of the side.

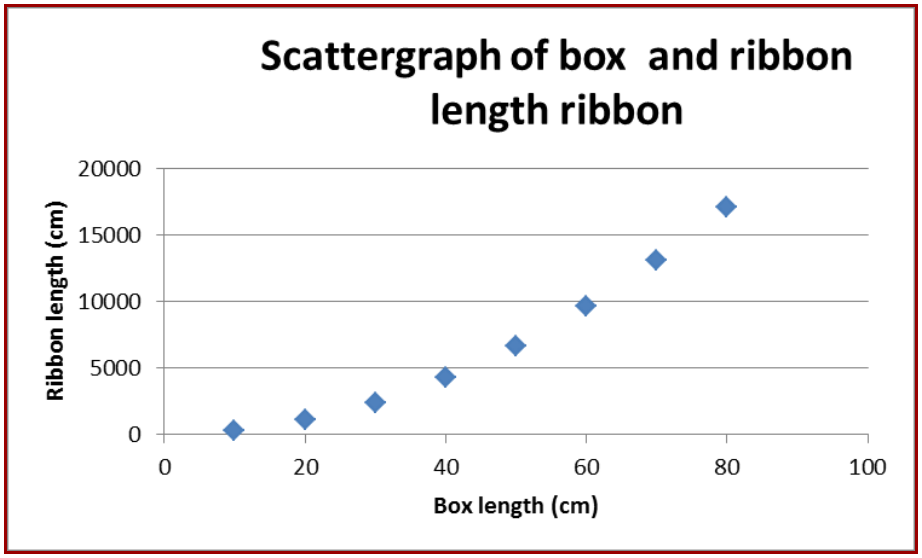


3. Using a calculator, work out the area of the ribbon used for each box. Ignore the bow; this is a fake one added later. Round your answers to the nearest integer. Copy and complete the table below. Two answers are completed already.

Length of box (cm)	10	20	30	40	50	60	70	80
Areas of ribbon (cm^2)	267	1067	2400	4267	6667	9600	13067	17067

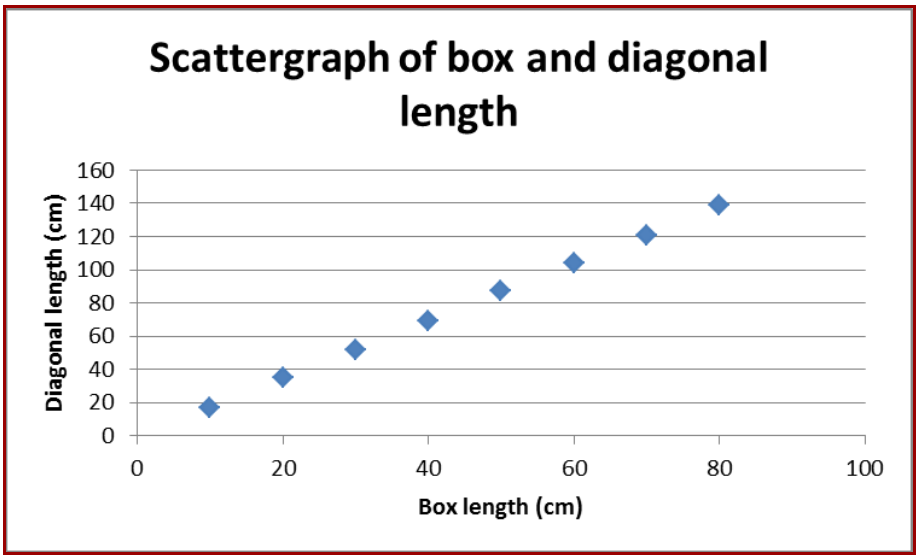
4. Draw a line graph of length (x axis) and ribbon area (y axis). Use a suitable scale and plot the points accurately.

It is useful to know the widest point in a gift box. This is the longest diagonal length across the inside of the cube, from corner to corner. Calculate these lengths. Round your answers to the nearest integer. Copy and complete the table below. Two answers are completed already.



Length of box (cm)	10	20	30	40	50	60	70	80
Diagonal length (cm)	17	35	52	69	87	104	121	139

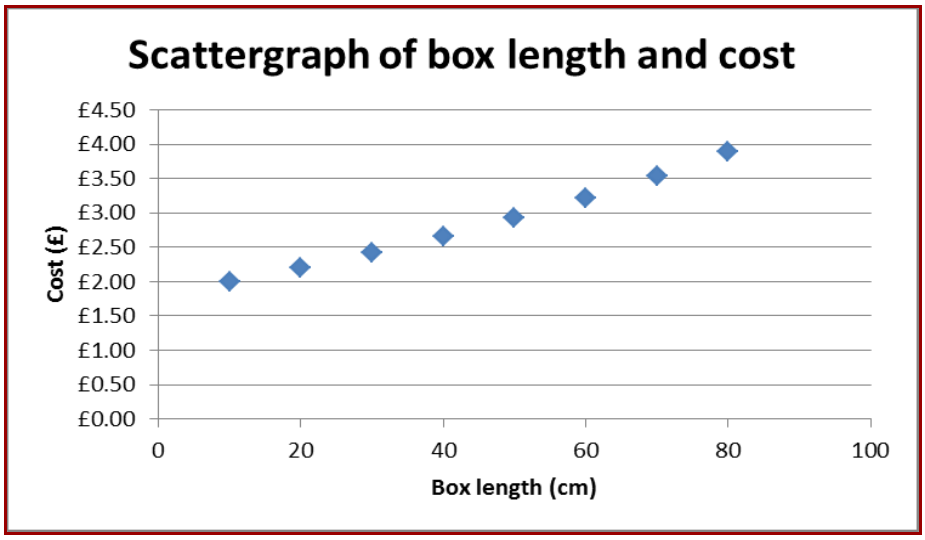
5. Draw a line graph of length (x axis) and diagonal (y axis). Use a suitable scale and plot the points accurately.



Extension task

The 10cm cube box costs £2 to buy. Each box costs 10% more than the last. Draw a table and graph for the size and cost of the eight boxes.

Length of box (cm)	10	20	30	40	50	60	70	80
Cost (£)	2.00	2.20	2.42	2.66	2.93	3.22	3.54	3.90



Students could be asked to explain why the graph does not show a straight line despite the 'regular' 10% increase in price.