'How To' Guide – Drawing Axes

Axes – These are the horizontal and vertical lines on which a graph is drawn.

'Axes' is the plural of axis.

It is important that they are drawn correctly because it will directly influence the accuracy of the graph.

Bar charts, histograms, line graphs, scatter graphs and time series graphs all require axes to be drawn accurately.

Example

Draw a scatter graph to compare hours of sleep with scores on a science test for the following 7 pupils.

Hours of sleep	Science test score
9	93
5	68
6	77
6	81
7	88
8	91
10	76

Answer

- It is a scatter graph so either data can be on either axis.
- Hours of sleep can go from 0-10 in 1s. No need for a broken axis because all numbers are relatively low. The scale is chosen so it fits on the sheet.
- The lowest science test score is 68. I will use a broken axis and start from 60 rather than 0 because it will space out the graph more.
- The highest science test score is 93 so I will go up to 100 on my scale. So if I go from 60-100, my axis needs to cover 40 marks spread out evenly. I could go up in 1s, 2s, 4s, 5s, 8s or 10s because all of these numbers go into 40 with no remainder.
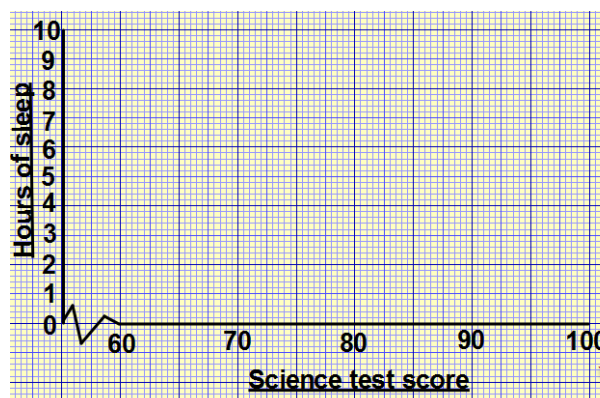
The axes are drawn and the graph is ready to be plotted.

How we teach it

- Make sure a pencil and ruler are used.
- Decide which set of data goes on the y-axis (vertical) and which goes on the x-axis (horizontal).
- Measurement values (e.g. time, weight, height) or categories (e.g. colour, favourite subject) usually go on the x-axis. Frequency usually goes on the y-axis.
- For scatter graphs, it does not matter which axis is used for which set of data.
- Draw one axis at a time. It is sensible to do the y-axis first. Look at the highest and lowest number for the data to go on the y-axis. It has to fit on the page, so you need to make sure whatever number you go up in works.
- The best way to decide is to divide your data by the number of squares that you have available on your graph paper.
- E.g. If your data goes from 0-100 and you have 50 squares available, 100÷50 = 2, so every square is worth 2.
- E.g. If your data goes from 0-192, it would be sensible to round this up to a nicer number for your axes, so do 0-200. If you had 25 squares available, 200÷25 = 8, so every square is worth 8.
- The highest number on your axis must be divisible by how many squares you use. If it isn't, change the number of squares you use.
  E.g. 300 split between 20 squares is 300÷20=15 → fine because each square is then worth 15.
  E.g. 300 split between 40 squares is 300÷40=7.5 → not appropriate because it is a decimal.
- Do the same for the x-axis. Make sure both axes are labelled.

Additional info

- Make sure that the gap between your numbers is the same (consistent).
- Write your numbers on the lines, not inside the squares.
- You do not always need to start from zero. Sometimes it is sensible to use a broken axis. This is especially true is your lowest data value is quite a high number.

- X-axis → Has a broken axis (no need to start at zero). Uses 80 squares to cover 40 marks, so each small square is worth 2 marks.
- Y-axis → Every 5 squares is worth 1 (every square worth 0.2).

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Common mistakes

- Gaps between written numbers are not equal.
- Scaling of numbers not equal (start of going up in 2s, then in 1s etc).
- Not labelling axes. This is important to let the reader understand what is being shown.
- Making a graph too small (therefore hard to read) by not spreading out the axes. It is not always appropriate to go have one square represent 1.
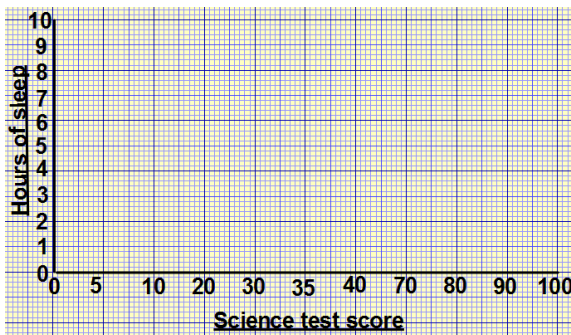- Not using a broken axis and making the graph hard to read.
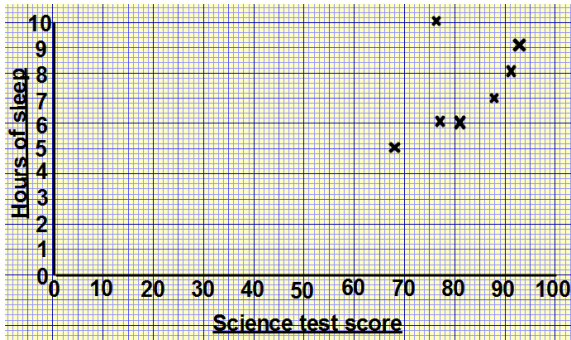
WRONG

A broken axis should have been used for the x-axis.

The lowest piece of data was 68, so it makes no sense to start at zero.

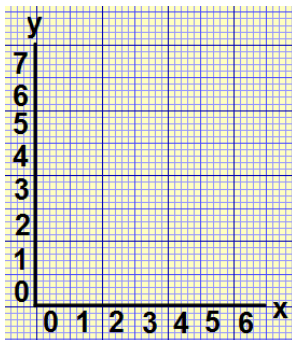It would have been clearer to start at 60.

WRONG

The scaling of numbers on the x-axis is not equal.

It goes up in 5s to start with, then 10s, then a 30 later on.
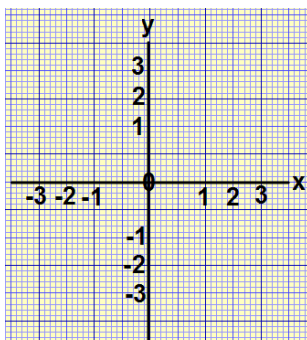
It needs to be consistent all the way along.

WRONG

The axes have been labelled inside the boxes rather than on the lines.

This makes it very unclear as to where each number is.

The numbers should be on the lines so that you can accurately count in between each number correctly.

WRONG

The gaps between numbers are not equal.

The jump from 0 to 1 is 10 small squares, but then after that it is 5 small squares.

You need to be consistent.