



Presenting data in a graph

In an enquiry you will usually repeat readings to make sure data is reliable. You may calculate the average of your results and plot them on a graph. But this is not always the only way of presenting data on a graph. Only plotting averages may be misleading.

1. Work out the averages of the data sets in Table 1.
2. What can you conclude from the averages?
3. Look at the data sets. Do they agree with this conclusion?

Table 1: Height of plank and ski movement

Lubricant	Formulation	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Average
A	5ml Detergent 10ml Water	21	23	28	24	25	
B	5ml Detergent 8ml Water 2ml Veg. oil	26	36	31	32	30	
C	5ml Detergent 5ml Water 5ml Veg. oil	18	19	19	18	19	
D	5ml Detergent 2ml Water 8ml Veg. oil	22	21	23	18	27	
E	5ml Detergent 10ml Veg. oil	37	33	34	32	19	

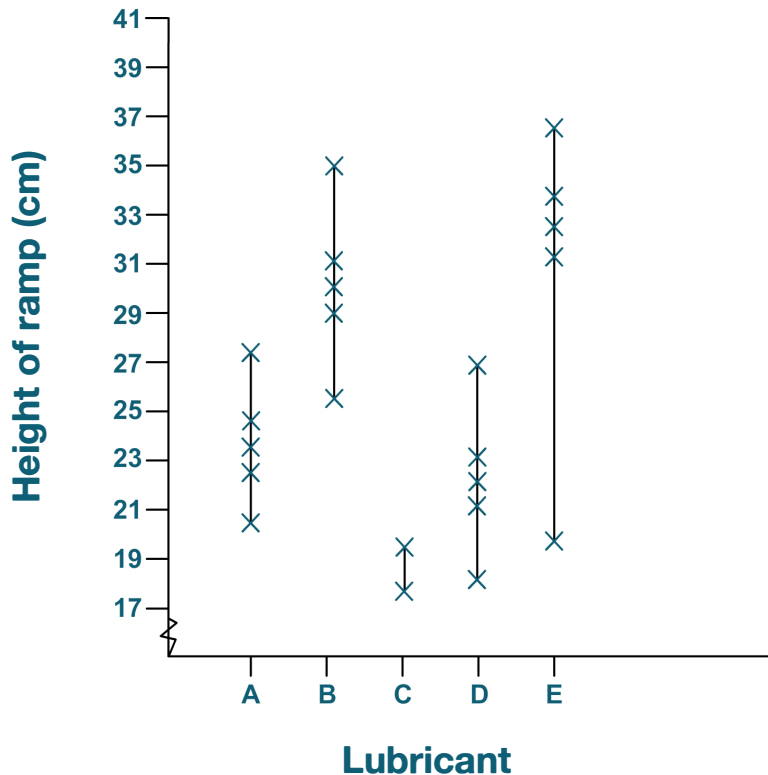
All figures show the height if the ramp in cm when the ski started to move.



Ranges

Another way to draw the graph is to plot all of the results. The range is from the highest to lowest value. It shows the spread of the data. Graph 1 shows the ranges of data from the enquiry.

Graph 1: Height of ramp when ski began to move



What can ranges tell you?

- If the range is small you know that all of the results came in at roughly the same value. This may make you confident that your data is reliable.
- If the range is wide you may want to gather more data and look carefully at your experimental method. Are there any problems with it that cause this wide spread of results?
- Look at the data sets in graph 1. In set A almost all the results are close together. Set B shows a wide spread - you may be suspicious of this data. Set E is difficult. Most of the data points are close together but one seems way off. This result is an outlier. If you have an outlier in your results think carefully about your experiment. Did something happen when you took this reading which may have affected it? e.g. did you wash the ramp as well for the other results? If you can explain the outlier you can ignore it. If you cannot, this result may be important. You would need to collect more data before making a conclusion.
- If ranges for two lubricants overlap you cannot be sure if there is a real difference between the lubricants. A result could appear in either set. You would need to collect more data. If these results are also similar you may conclude that there is not a real difference between the lubricants.



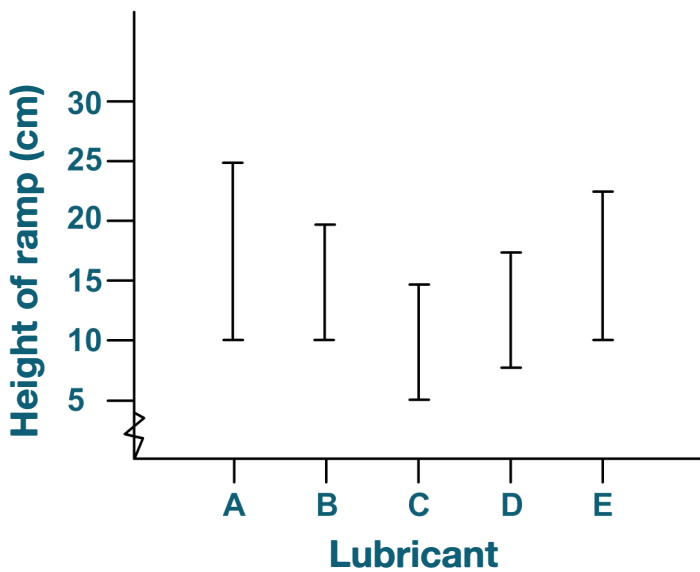


Questions

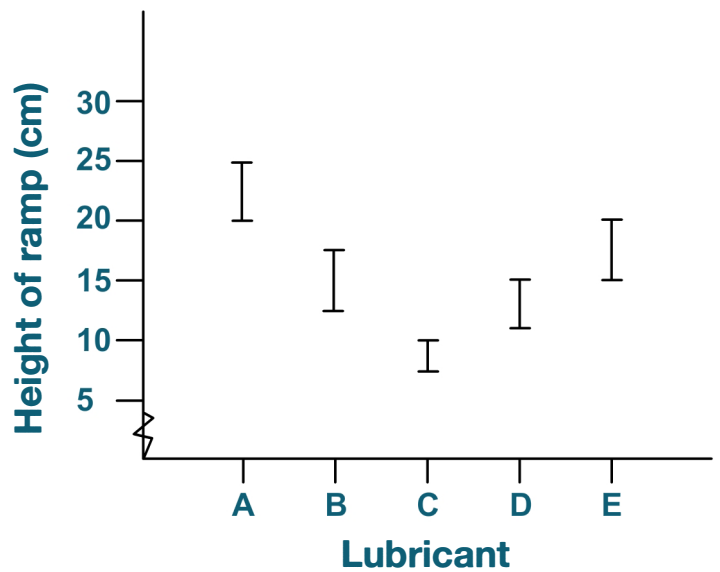
1. Which of the graphs below show a real difference between the lubricants?
2. What conclusions can you draw from these graphs?

Results from four different enquiries

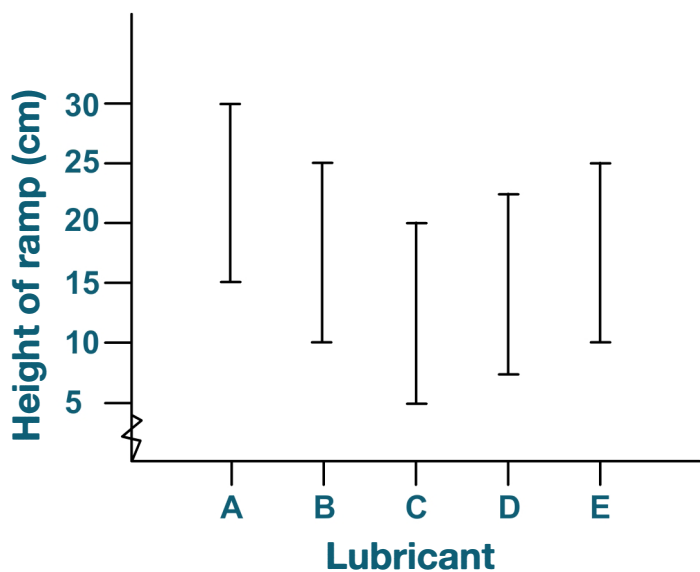
Enquiry 1



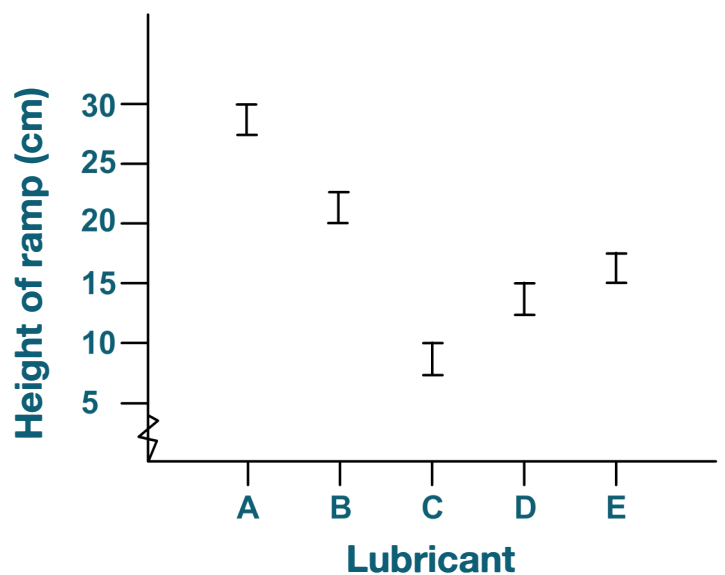
Enquiry 2



Enquiry 3



Enquiry 4



All graphs show height of ramp when ski began to move

3. a. Draw a graph of the following results using range bars. Include all the data (the range) on your graph, and the average points.

Lubricant	Formulation	Reading										Average	
		1	2	3	4	5	6	7	8	9	10		
A	5ml Detergent 10ml Water	34	20	36	40	26	28	37	34	28	35		
B	5ml Detergent 8ml Water 2ml Veg.oil	24	26	26	26	26	25	25	24	24	25		
C	5ml Detergent 5ml Water 5ml Veg. oil	19	19	18	19	19	19	18	18	19	19		
D	5ml Detergent 2ml water 8ml Veg. oil	21	22	22	22	21	20	23	22	23	23		
E	5ml Detergent 10ml Veg.oil	28	29	27	25	41	27	28	28	29	28		

All figures show the height if the ramp in cm when the ski started to move

Answer the following questions:

- Mark any results that you are suspicious about.
- Give reasons for your choices.
- If you were doing this enquiry what would you do to improve your dataset?
- What conclusions can you draw from the existing datasets?
- How confident are you that your conclusions are valid?