



# Engineering Gold

## Laboratory Data 1

Professor Peter Styring took over five years to develop the lubricant for his self-waxing skis. He developed over a hundred possible formulations. All of these needed testing in the laboratory before he got as far as the ski slopes. Professor Styring carried out three enquiries.

- In the first enquiry he put the different formulations into a freezer to see if they froze.
- The second enquiry tested the fluidity of the formulations (how easily the liquid flows). He measured the volume of liquid that passed through a thin capillary tube in 30 seconds. Table 1 shows some of his results.
- In his third enquiry Professor Styring made a fake ski slope in his lab to test the self-lubricating skis on.

**Table 1: Lab data on formulations**

Lubricant formulations	Did it freeze?	Volume of formulation collected in 30 seconds (ml)
A	YES	-
B	NO	35.2
C	NO	15.1
D	NO	21.0
E	YES	-
F	YES	-
G	NO	16.5
H	NO	14.2
I	YES	-
J	NO	31.3
K	NO	27.8
L	YES	-
M	NO	12.1
N	YES	-
O	NO	29.6
P	NO	25.3
Q	NO	8.6
R	YES	-
S	YES	-
T	NO	17.6

A group of students repeated Professor Styring's third enquiry using some of their own formulations. Table 2 on the next page shows their results.

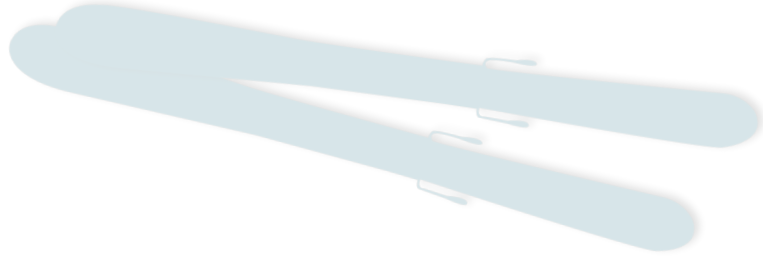


Table 2: Height of plank and ski movement

Lubricant	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Average
A	21	23	28	24	25	
B	26	36	31	32	30	
C	18	19	19	18	19	
D	22	21	23	18	27	
E	37	33	34	32	19	

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



### Questions

1. What does the word fluidity mean?
2. Which formulation had the fastest flow rate?
3. Which formulation had the slowest flow rate?
4. Professor Styring did not carry out the second enquiry on all the formulations. Why?
5. Professor Styring tested seven formulations in the final laboratory enquiry. Which do you think he used? Explain your choice.
6.
  - a. Identify any outliers in the data in Table 2. Draw a circle around them.
  - b. What might have caused these outliers?
  - c. What would you do if you found outliers in one of your enquiries?
7. Complete Table 2 by calculating the average result for each formulation. You must decide whether to include any outliers in your calculation.

