Variables and Correlations:

1. A student does an experiment to see how the height of an object affects its potential energy. The student raises an object of known mass to various different heights above the floor of the classroom. (i.e. she directly manipulates the height of the object). The student then uses a very fancy and expensive Jouleometre to measure the potential energy of the object (i.e. she measures the energy of the object). The procedure is repeated five times and the average results are shown below.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Height (m) | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | 6.0 | 7.0 |
| Potential Energy (J) | 140 | 260 | 380 | 500 | 620 | 740 | 860 |

A. What is the INDEPENDENT VARIABLE?

B. What is the DEPENDENT VARIABLE?

C. Sketch a scatterplot of the data. Remember, the I.V. is plotted on the x-axis and the D.V. is plotted on the y-axis.

D. What type of correlation is shown by the data?

E. Draw a best fit line/curve.

F. Is there anything about the described experiment that you find strange or dubious?

2. A student does an experiment to see how temperature affects the strength of a magnet. The student heats the magnet to ten pre-determined temperatures (i.e. she directly manipulates the temperature of the magnet), then lowers the magnet into a bucket of iron nails and lifts it back out. She then counts the number of nails lifted by the magnet (i.e. she measures the number of nails lifted by the magnet). The procedure is repeated ten times and the average results are shown below.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Temperature (oC) | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 |
| Number of Nails | 46 | 40 | 38 | 30 | 26 | 21 | 16 | 12 | 7 | 1 | 1 |

A. What is the INDEPENDENT VARIABLE?

B. What is the DEPENDENT VARIABLE?

C. Sketch a scatterplot of the data. Remember, the I.V. is plotted on the x-axis and the D.V. is plotted on the y-axis.

D. What type of correlation is shown by the data?

E. Draw a best fit line/curve.

F. What are some variables that need to be CONTROLLED?

3. A research project measures test scores compared to the hours of sleep test writers had the night before. The experimenters controlled the sleep time for each student and then measured their test scores. The project used data from 250 students and the average results are shown below.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Hours | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Mark | 30 | 32 | 50 | 66 | 70 | 78 | 82 |

A. What is the INDEPENDENT VARIABLE?

B. What is the DEPENDENT VARIABLE?

C. Sketch a scatterplot of the data. Remember, the I.V. is plotted on the x-axis and the D.V. is plotted on the y-axis.

D. What type of correlation is shown by the data?

E. Draw a best fit line/curve.

F. Would you expect the trend to continue as sleep time increased to 16 hours? Explain your thinking.

G. The data for 10, 12 and 14 hours of sleep are shown below.

|  |  |  |  |
| --- | --- | --- | --- |
| Hours | 10 | 12 | 14 |
| Mark | 85 | 60 | 44 |

Add these data points to your graph. Do they follow the same trend?

Why do think this might be so?