

5.12 Scatter Plots and Lines Of Best Fit

Describing Correlation in Scatter Plot Graphs

When describing a relationship, you can assess the correlation (positive, negative, or no-relationship), the strength of the relationship (very strong, strong, or weak) and whether or not the relationship appears to be linear (makes a straight line) or non-linear. From your course pack page 67, complete the following:

Positive correlation:

Negative correlation:

No correlation:

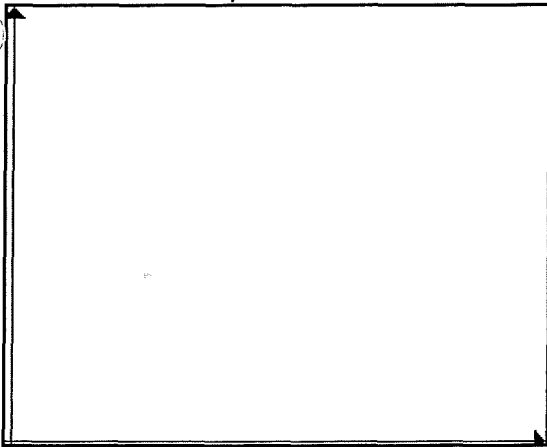
Correlations are strong if:

Correlations are weak if:

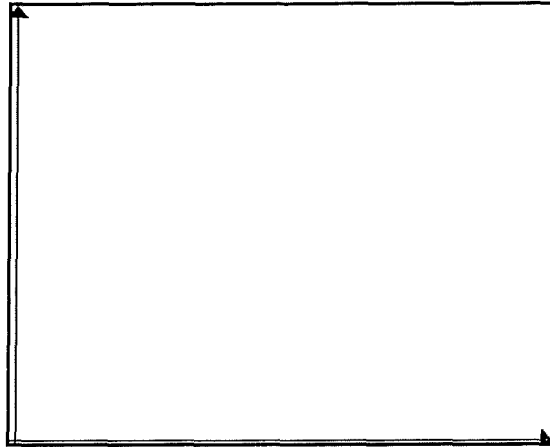
A correlation is linear if:

A correlation is non-linear if:

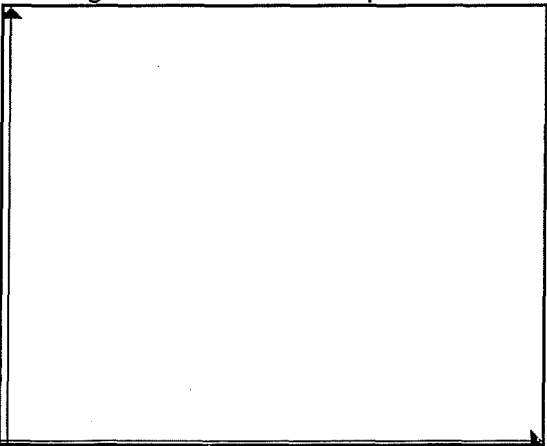
Sketch an example of each:



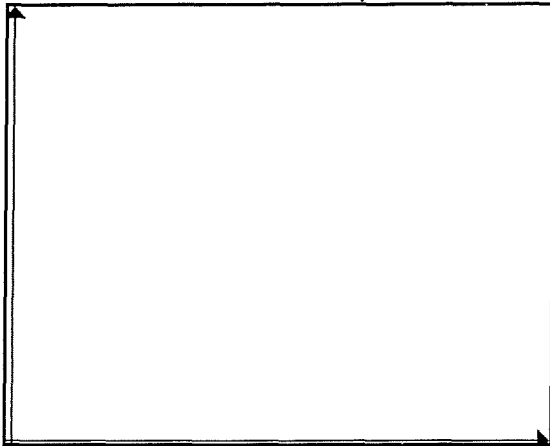
***Strong Linear Relationship**



***Weak Linear Relationship**



***No relationship**



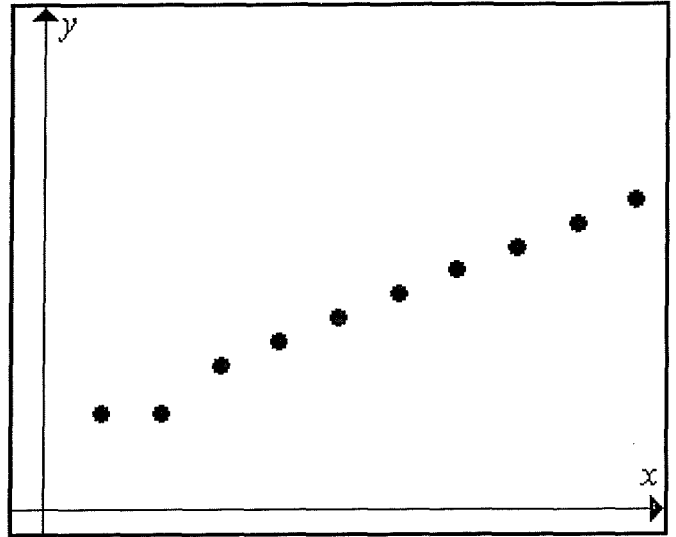
***Non-Linear Relationship**

Describing Correlation in Scatter Plot Graphs

Example # 1

This scatter plot shows the height of a tree over several years.

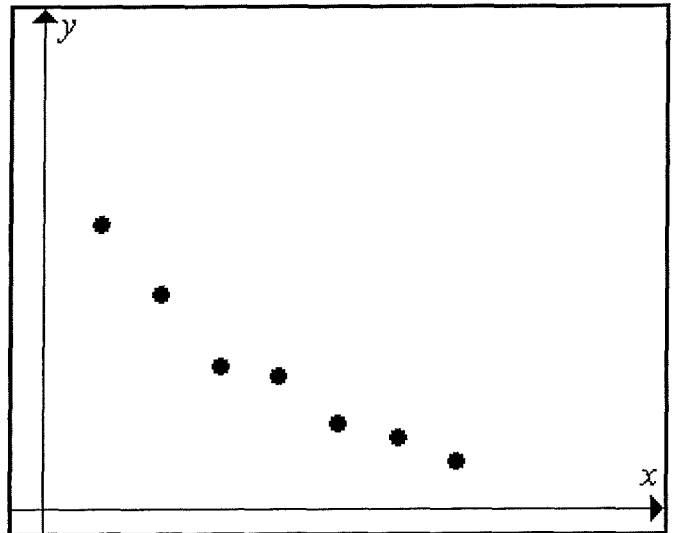
- Label the axes.
- Complete the following sentence: As the number of years _____, the height of the tree increases.
- Describe the correlation.



Example #2

This scatter plot shows the number of trees left in a forest as several loggers are cutting them down over a week.

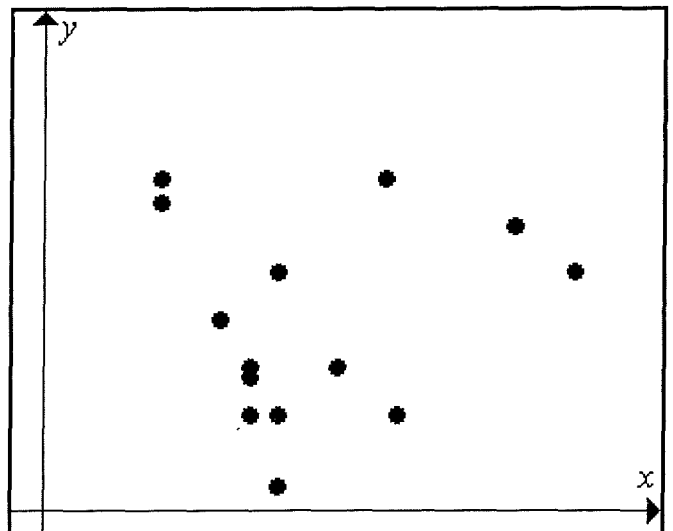
- Label the axes.
- Complete the following sentence: As the number of days increase, the number of trees left _____.
- Describe the correlation.



Example 3

This scatter plot shows the number of questions students did for math homework compared to the length of their shoelaces.

- Describe the correlation.



Will each of the following sets of data show a positive correlation, a negative correlation, or no correlation? Give reasons for your answer.

a) the number of pages left to be typed in your essay and the number of pages already typed?

b) the size of a student's hand and the number of rings the student owns

c) the outside summer temperature and the number of people swimming

d) the depth of Lake Ontario and the amount of rainfall and snowfall for that year

e) the outside winter temperature and the number of centimeters of ice on Island Lake

f) the energy left in your personal radio batteries and the number of hours you have listened to this radio

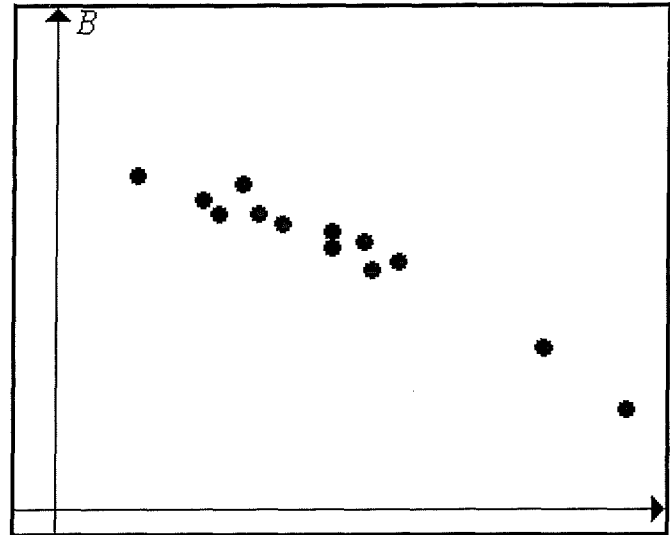
g) your take-home pay and the number of hours you work

h) your math mark and the number of hours of studying you do

The Line of Best Fit

The **line of best fit** is a line that approximates the pattern for the data shown in a scatter plot. The line of best fit should be as close as possible to as many of your data points as possible. One purpose of the line of best fit is to help make predictions.

Use scatter plots A and B below to complete questions 1 to 4.



1. Use a straightedge (clear, if possible) to draw the line of best fit (this assumes the pattern is linear).
2. Describe how you estimated the line of best fit for each scatter plot.
3. State the type of correlation for each graph.
4. Compare your line of best fit with a classmate. Is it important that all your classmates have lines of best fit that are identical?
5. Describe a situation where you could not draw a line of best fit.

A scatter plot is:

- **linear** if the points lie along or close to a *straight* line.
- **non-linear** if the points lie along or close to a *curve*.

A scatter plot has:

- **positive correlation** when the trend is increasing towards the right.
- **negative correlation** when the trend is decreasing towards the right.

The correlation is:

- **very strong** if the points follow a line or curve perfectly.
- **strong** if the points nearly follow a line or curve.
- **weak** if the points are dispersed more widely, but still show a recognizable trend.
- **no correlation** when points are so scattered that no trend is discernable.

Line of Best Fit

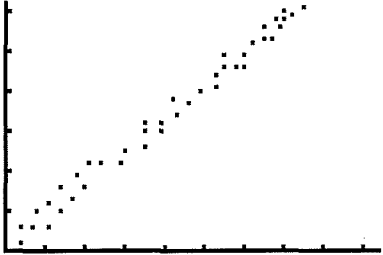
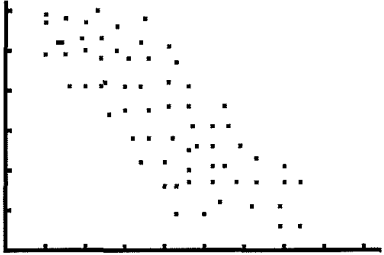
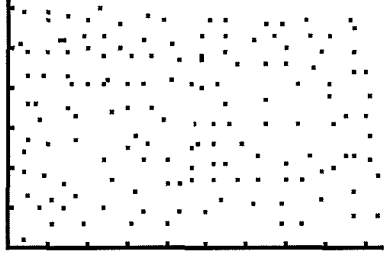
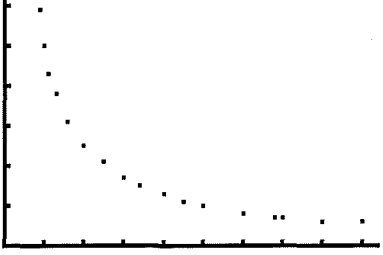
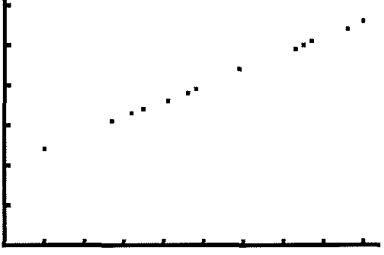
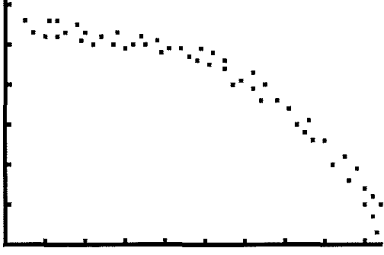
- a (straight) line which follows the trend of linear data most closely so that an equal number of data points lie on either side of the line.

Curve of Best Fit

- a (smooth) curve which follows the trend of non-linear data most closely so that an equal number of data points lie on either side of the line.

Exercise — *In each graph below:*

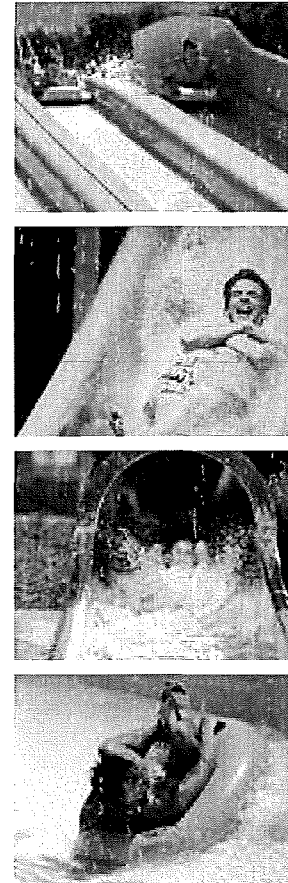
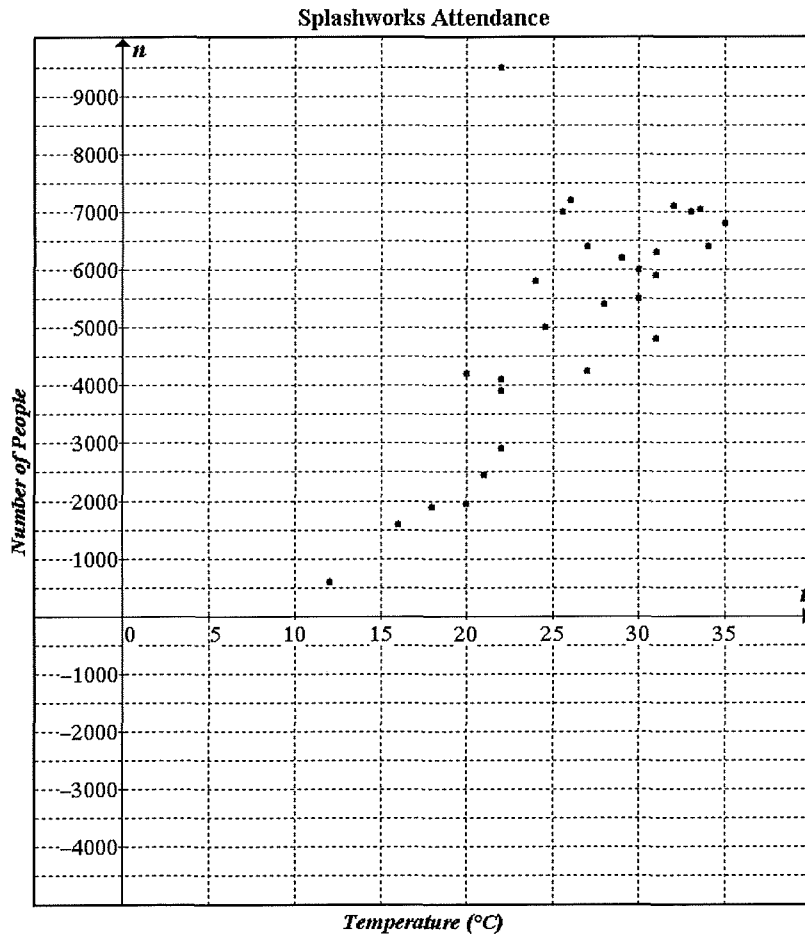
- ① Circle the correct words describing the type of correlation shown. If you circle "none", then that is the only word that need be circled for that graph.
- ② For each graph (unless it has no correlation), draw the line or curve of best fit.

<p>1.</p>  <p>The correlation is... very strong / strong / weak / none linear / non-linear positive / negative</p>	<p>2.</p>  <p>The correlation is... very strong / strong / weak / none linear / non-linear positive / negative</p>	<p>3.</p>  <p>The correlation is... very strong / strong / weak / none linear / non-linear positive / negative</p>
<p>4.</p>  <p>The correlation is... very strong / strong / weak / none linear / non-linear positive / negative</p>	<p>5.</p>  <p>The correlation is... very strong / strong / weak / none linear / non-linear positive / negative</p>	<p>6.</p>  <p>The correlation is... very strong / strong / weak / none linear / non-linear positive / negative</p>

Mathematics 9
Canada's Wonderland Scatter Plot

Date: _____

Last summer Paul had a manager's job at Canada's Wonderland. As part of his job, each day he recorded the day's high temperature and the number of people that visited 'Splashworks'. His data for the month of July is shown on the graph below.



a) Classify the type of correlation that exists between the number of people and the temperature.

b) What is the data entry at (22, 9500) called? _____

c) Draw a line of best fit.

d) Determine the equation for your line of best fit. _____

e) From your equation from part (d):

i) State the vertical intercept. _____. State the slope _____.

ii) What does the vertical intercept represent? _____

iii) Does this value make sense? Justify your answer.

iv) The slope is in units of _____ per _____.

v) What does the horizontal intercept represent? _____

vi) Predict the number of people they can expect if the temperature reaches 38°C. _____