Warm Up

Draw 2 scatterplots:
- one that would indicate a strong positive correlation
- one that would indicate a weak negative correlation

Give an example of what each might be representing.
A *scatter plot* is a graph that shows the *relation* between *two* variables.

The points in a scatter plot often show a pattern, or *trend*. From the pattern or trend you can describe the *relationship*. 
Example:
Julie gathered information about her age and height from the markings on the wall in her house.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (cm)</td>
<td>70</td>
<td>82</td>
<td>93</td>
<td>98</td>
<td>106</td>
<td>118</td>
<td>127</td>
<td>135</td>
</tr>
</tbody>
</table>

a) Label the vertical axis.

b) Describe the trend in the data.

As age increases, the height also increases.

Positive correlation.

c) Describe the relationship.
Variables
The *independent variable* is located on the **x** axis.
This variable does not depend on the other variable.

The *dependent variable* is located on the **y** axis.
This variable depends on the other variable.

Independent variable: **age**
Dependent variable: **height**

Note: The independent variable comes first in the table of values.
Line of Best Fit
To be able to make predictions, we need to model the data with a line or a curve of best fit.

Rules for drawing a line of best fit:
1. The line must follow the _________________.
2. The line should ______ through as many points as possible.
3. There should be _______________ of points above and below the line.
4. The line should pass through points all along the line, not just at the ends.
### 3.1.5: Relationships Summary

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Method of Prediction</th>
</tr>
</thead>
<tbody>
<tr>
<td>How tall was Julie when she was 5 years old?</td>
<td>106 cm</td>
<td>use table or the graph</td>
</tr>
<tr>
<td>How tall will Julie be when she is 9 years old?</td>
<td>145 cm</td>
<td>draw the trend line. Find the answer from graph</td>
</tr>
<tr>
<td>How old was Julie at 100 cm tall?</td>
<td>4.1 years old</td>
<td>draw the trend line. Find the answer from graph</td>
</tr>
<tr>
<td>How tall was Julie when she was born?</td>
<td>60 cm</td>
<td>from age = 0 on the graph</td>
</tr>
</tbody>
</table>
3.1.5: Relationships Summary

**Interpolate**
When you interpolate, you are making a prediction within the data.
These predictions are usually **accurate**.

Hint: You are interpolating when the value you are finding is somewhere between the first point and the last point.
3.1.5: Relationships Summary

Extrapolate
When you extrapolate, you are making a prediction outside the data.
It often requires you to extend the line.

These predictions are less reliable.

You are extrapolating when the value you are finding is before the first point or after the last point. This means you may need to extend the line.
3.2.2: Describing Scatter Plots and Lines of Best Fit

Draw a line of best fit for each of the scatter plots that show a linear relationship below. Write two or three key words to describe each relation on the line below the scatter plot. (rises upward to the right, falls downward to the right, no relationship, strong, weak, linear, non-linear)
### 3.2.3: Correlation

A scatter plot shows a **positive** correlation when the pattern rises up to the right. This means that the two quantities increase together.

A scatter plot shows a **negative** correlation when the pattern falls down to the right. This means that as one quantity increases, the other decreases.

A scatter plot shows **zero (no)** correlation when no pattern appears. Hint: If the points are roughly enclosed by a circle, then there is no correlation.

#### Strong or Weak?

If the points nearly form a line, then the correlation is **strong**.

If the points are dispersed more widely, but still form a rough line, then the correlation is **weak**.
Correlation

The correlation coefficient gives us a numerical description of how strong the relationship between two variables is.
The range of the value of r (the correlation coefficient) is from -1 to +1.

From 0 to 1, there is a positive relationship. The closer to 1, the stronger the relationship.

For -1 to 0, there is a negative relationship. The closer to -1, the stronger the relationship.
Test the hypothesis: The older you are, the more money you earn.

Plot the data on the scatter plot below, choosing appropriate scales and labels.

<table>
<thead>
<tr>
<th>Age</th>
<th>Earnings ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>22000</td>
</tr>
<tr>
<td>30</td>
<td>26500</td>
</tr>
<tr>
<td>35</td>
<td>29500</td>
</tr>
<tr>
<td>37</td>
<td>29000</td>
</tr>
<tr>
<td>38</td>
<td>30000</td>
</tr>
<tr>
<td>40</td>
<td>32000</td>
</tr>
<tr>
<td>41</td>
<td>35000</td>
</tr>
<tr>
<td>45</td>
<td>36000</td>
</tr>
<tr>
<td>55</td>
<td>41000</td>
</tr>
<tr>
<td>60</td>
<td>41000</td>
</tr>
<tr>
<td>62</td>
<td>42500</td>
</tr>
<tr>
<td>65</td>
<td>43000</td>
</tr>
<tr>
<td>70</td>
<td>37000</td>
</tr>
<tr>
<td>75</td>
<td>37500</td>
</tr>
</tbody>
</table>

Note: The symbol  is used to signal a “break” in the axis when the scale does not start at zero to avoid a large empty space in one corner of the graph.

1) Draw a line of best fit. Describe the trend in the data.

2) Does the data support the hypothesis? Give reasons to support your answer.
(Refer to the scatter plot.)

3) Explain why the data for ages over 65 do not correspond with the hypothesis.

4) Explain what the point (41, 35000) represents.
Homework

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Solving Using Trend Lines Gizmo activity