Unit C: Usage of Graphics in Agricultural Economics

Lesson 3: Understanding the Relationship of Data, Graphics, and Statistics

Terms

- Correlation
- Erratic
- Gradual
- Interpretation
- Mean
- Median
- Mode
- Negative Correlation
- Peak
- Plateau
- Positive Correlation
- Outlier
- Range
- Rapid
- Steady
- Steep
- Strong Correlation
- Valley
- Weak Correlation

Making Conclusions with Data

I. Logical conclusions can be made using data collected by an individual or provided by an organization. These conclusions can be used to assist business owners in making decisions by tracking past profits, forecasting future prices, and utilizing other information related to the business.

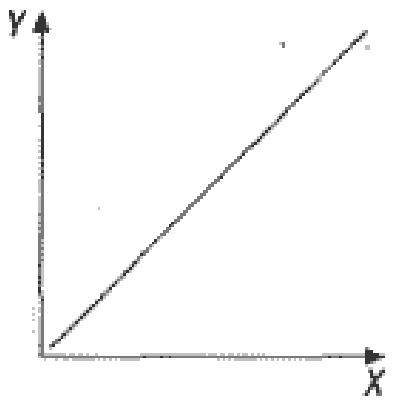
Making Conclusions with Data

A. For most individuals, conclusions are most easily made with data that is illustrated in graphics. Data in written text or tables can be transferred into graphics or studied by the reader to make accurate conclusions.

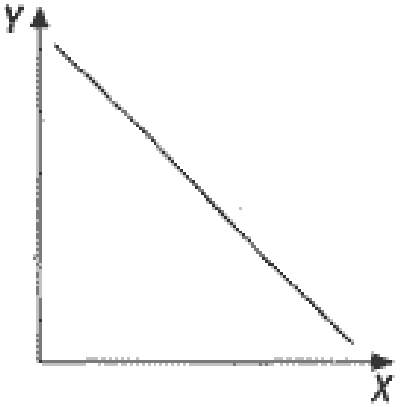
B. To make conclusions, data and graphics are interpreted. Correlations may be found to assist in making conclusions. ***Interpretation*** of data and graphics is completed by identifying trends and patterns. A ***correlation*** describes the relationship between two variables.

Making Conclusions with Data

1. Line graphs easily show increasing or decreasing trends. These trends are seen by the change in the line or lines.
   a. An increase occurs when the increase of one variable causes the increase of the other variable
   b. A decrease occurs when the increase of one variable causes the decrease of the other variable.



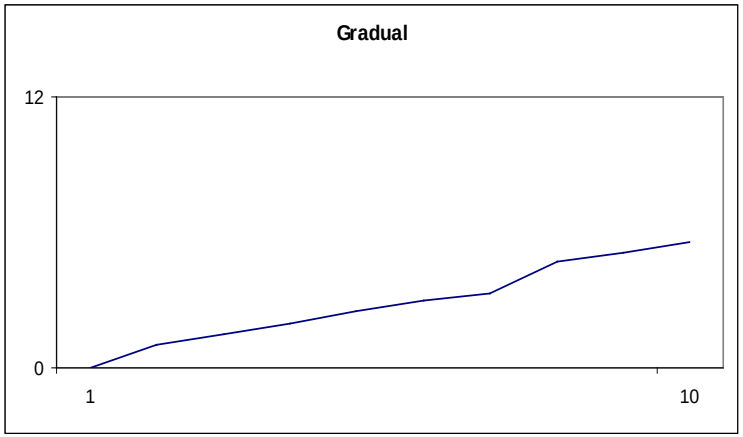
Increase

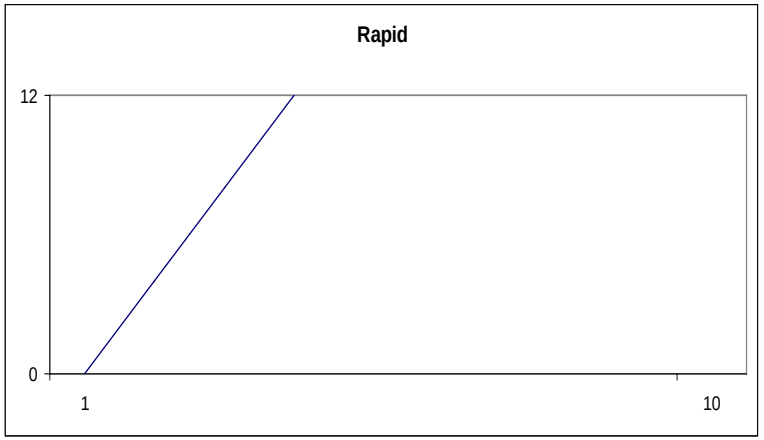


Decrease

Making Conclusions with Data

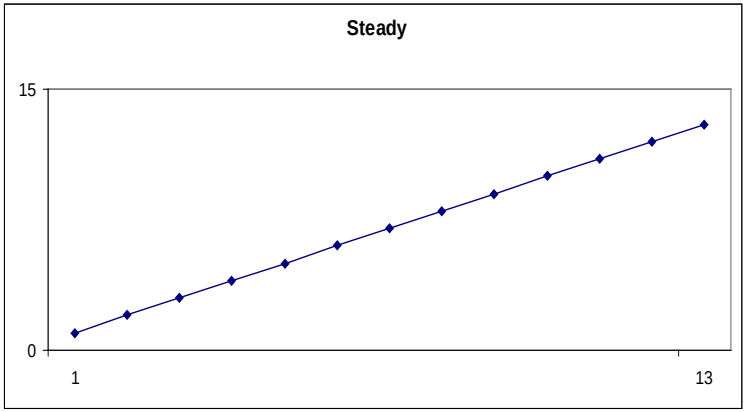
2. These trends, or changes, may occur ***gradually*** or ***rapidly***. The way these trends change may also occur ***steadily*** or ***erratically***.
   a. A gradual change is one that occurs slowly.
   b. A rapid change is one that occurs very quickly.



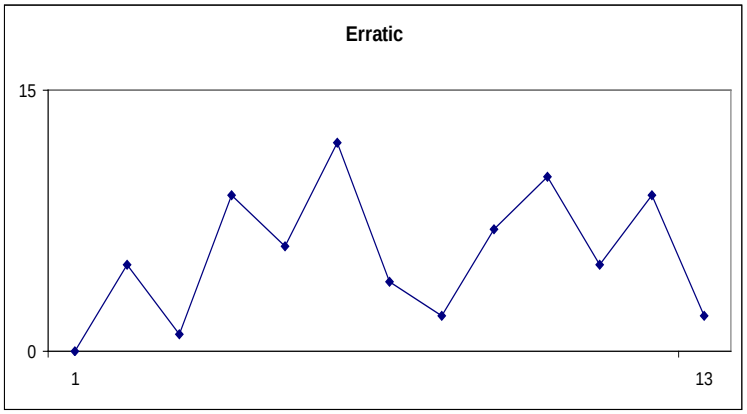


Making Conclusions with Data

c. A steady change is one that occurs at the same rate constantly.

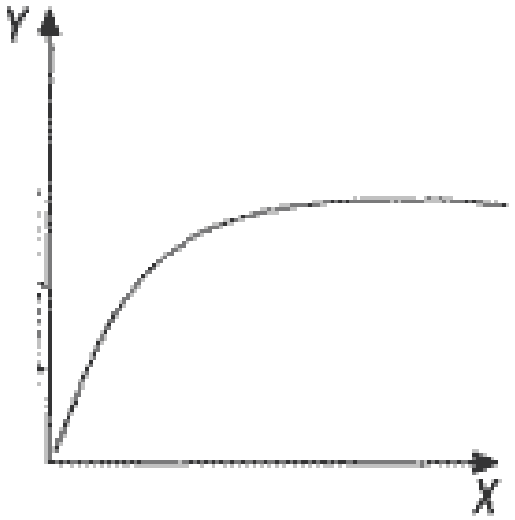


d. An erratic change is one that occurs at no regular rate.



Making Conclusions with Data

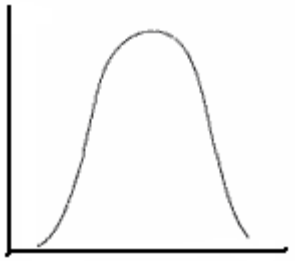
e. Trends can also be found on line graphs to show other characteristics.
   i. A ***plateau*** occurs when one variable begins to effect a change in another variable, but later has no effect. This will be seen as a line that has made a constant change, but then levels off.



Plateau

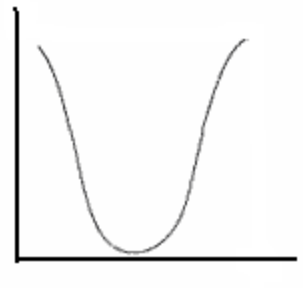
Making Conclusions with Data

ii. A ***peak*** occurs when the increase in one variable causes an increase, then a decline in the other variable.



Peak

iii. A ***valley*** occurs when the increase in one variable causes a decrease, then an increase in the other variable.

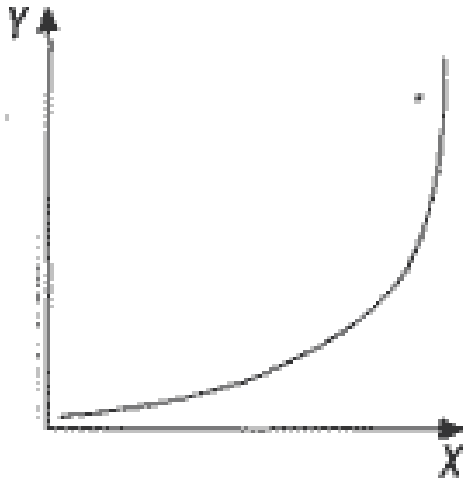


Valley

Making Conclusions with Data

iv. A trend may also change constantly but then become ***steep***. When this happens, the line is changing gradually, but suddenly becomes perpendicular or nearly perpendicular. This change occurs because the change in one variable suddenly affected the other variable differently. The trend becomes steep because a slight change in one variable greatly affects the other variable.

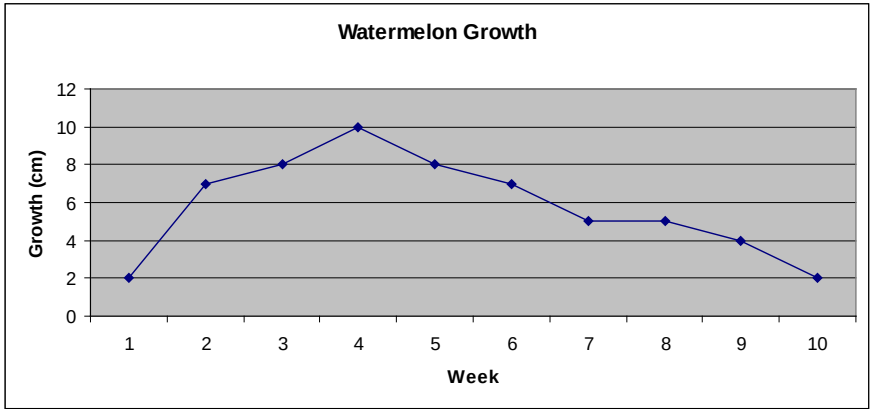
f. Some bar graphs also show these types of trends.



Steep Increase

Making Conclusions with Data

g. Example Problem:
The length of a watermelon vine was recorded for 10 weeks after the seed had germinated.



Describe the data illustrated in the graphic.

What conclusions can be made from this data?

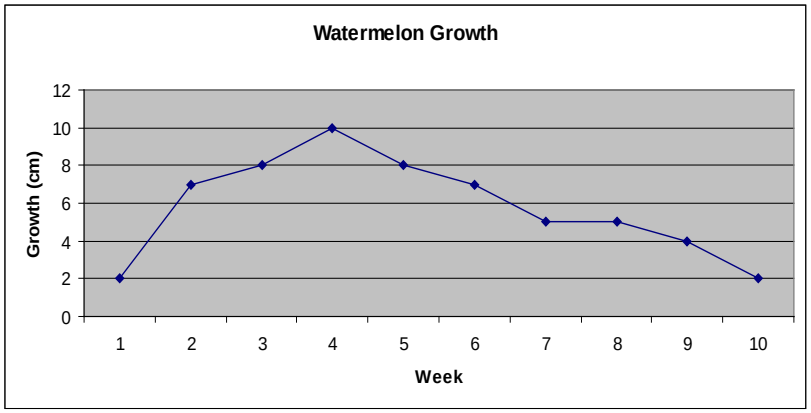
Making Conclusions with Data

Describe the data illustrated in the graphic.

The length of the watermelon vine increased rapidly and peaked at 10 cm of growth during week 4. The growth then gradually slowed to only 2 cm in week 10.

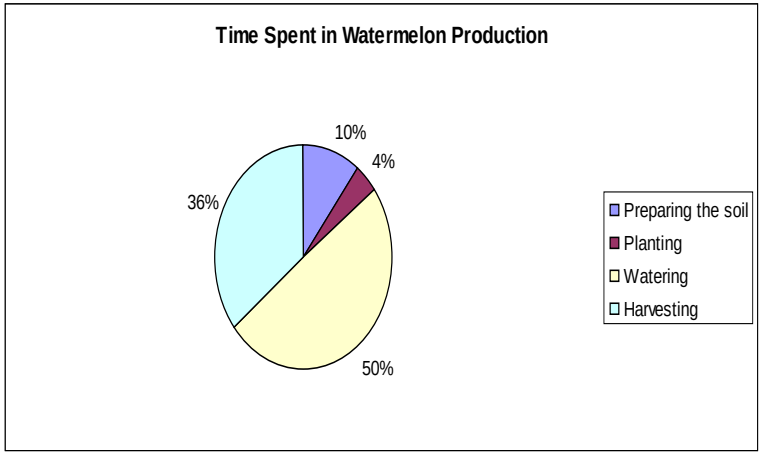
What conclusions can be made from this data?

This watermelon vine grew rapidly in the first 4 weeks, then growth steadily slowed down during weeks 5-10.



Making Conclusions with Data

2. Pie charts and cosmographs easily compare the parts that make up the total subject.
   a. These graphics show which parts make up the smallest and largest portions of the total.

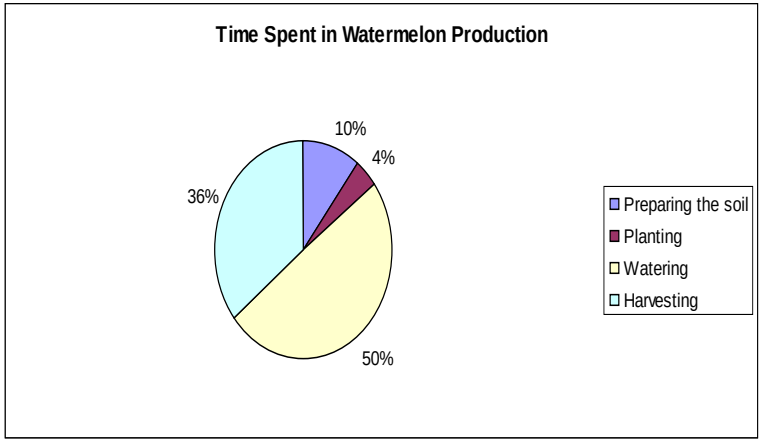


Making Conclusions with Data

b. Example Problem:
Records were kept for the hours of labor that were spent on a watermelon operation.

Describe the data illustrated in the graphic.

What conclusions can be made from this data?



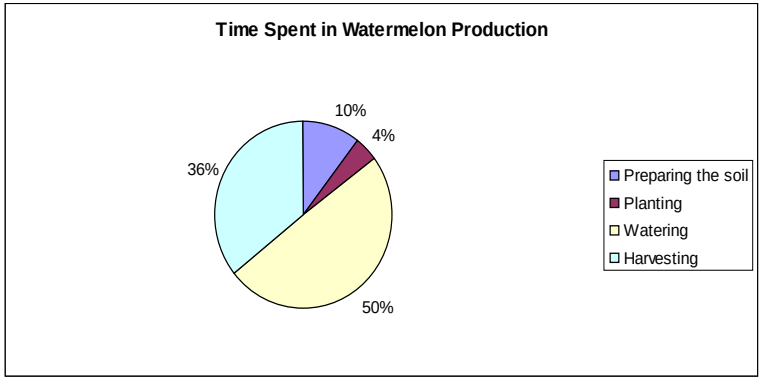
Making Conclusions with Data

Describe the data illustrated in the graphic.

The most time was spent watering while the least time was spent planting on the watermelon enterprise.

What conclusions can be made from this data?

Half (50%) of the labor in the watermelon operation is used for watering the plants. Harvesting the watermelons also requires a significant amount of labor (36%). Some time must be spent preparing the soil (10%). The least amount of labor is used to plant the seeds (4%).

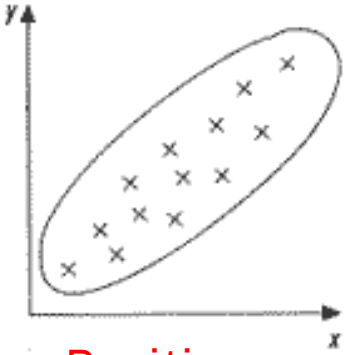


Making Conclusions with Data

3. Scatter plots easily show the relationship between two variables.
   a. Correlations are easily viewed on scatter plots.

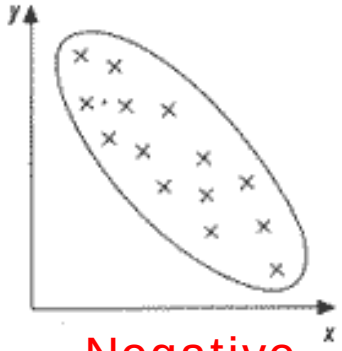
Making Conclusions with Data

i. A ***positive correlation*** exists between two variables when the increase in one variable causes an increase in the other variable.



Positive Correlation

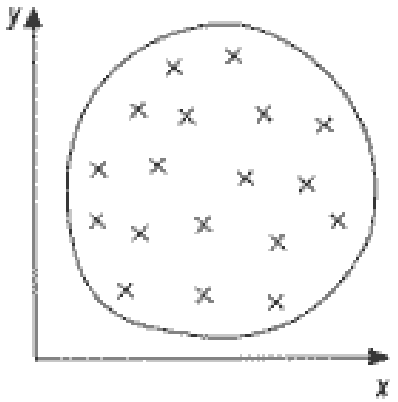
ii. A ***negative correlation*** exists between two variables when the increase in one variable causes an decrease in the other variable.



Negative Correlation

Making Conclusions with Data

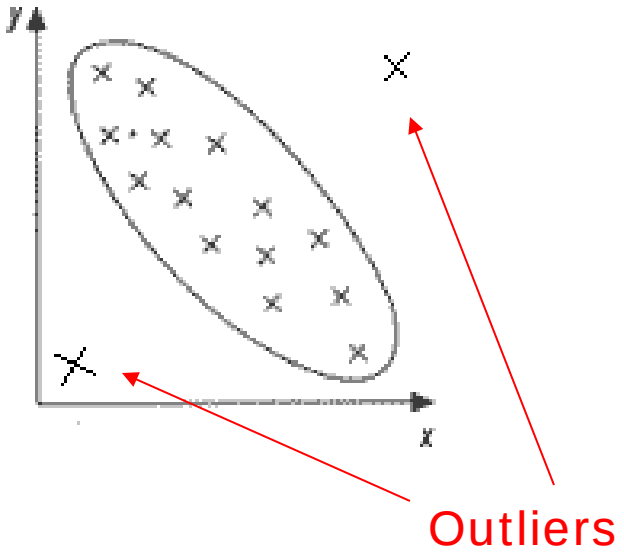
iii. Occasionally, two variables will have no correlation when the change in one variable does not cause a specific change in the other variable.



No Correlation

Making Conclusions with Data

b. One basic way to determine the correlation, is to draw a circle or oval around the majority of the points.
   i. ***Outliers*** are data that are obviously different in value than other data and should not be included within the circle. Outliers are sometimes caused by an error when recording the data or are an uncommon occurrence.
   ii. If outliers are included, the correlation or statistics can often be misleading.



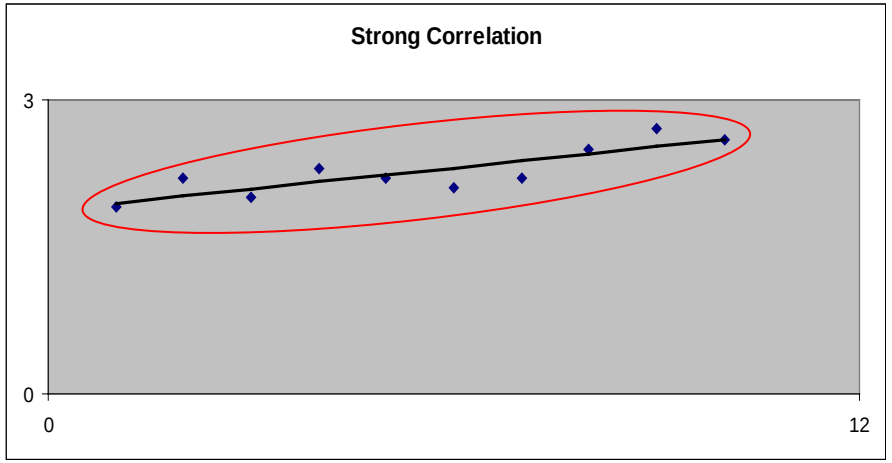
Making Conclusions with Data

c. When the shape has been drawn around the points, it should be examined to determine if a positive, negative, or no correlation exists.

d. If a positive or negative correlation exists, it may be a strong or weak correlation.

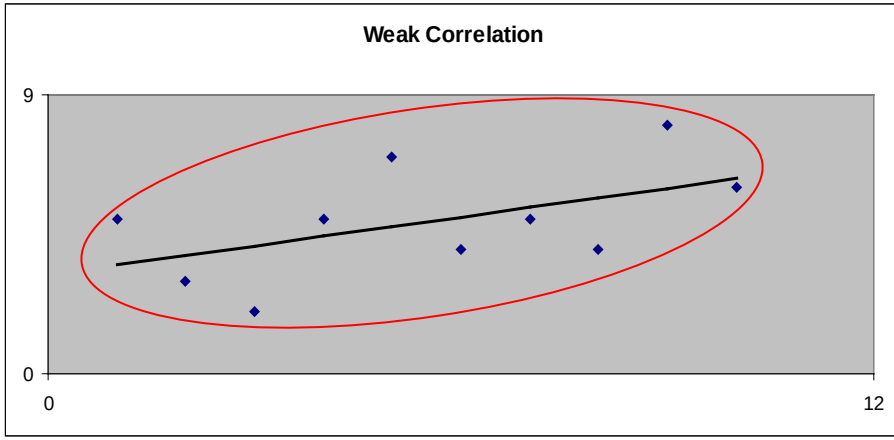
Making Conclusions with Data

i. A ***strong correlation*** is one that shows a close relationship between two variables. This type of correlation will appear as a very narrow oval. Another way to identify a strong correlation is by drawing a straight best fit line through the points, all points will lie closely to that line.



Making Conclusions with Data

ii. A ***weak correlation*** is one that shows a some relationship between two variables, but the relationship is not as strong. This correlation will appear as a wide oval, almost circular in shape. If a best fit line is drawn through the points, some points will lie close to the line, but others will not.



Making Conclusions with Data

e. When best fit lines are drawn on scatter plots, conclusions can be made similar to those made on line graphs

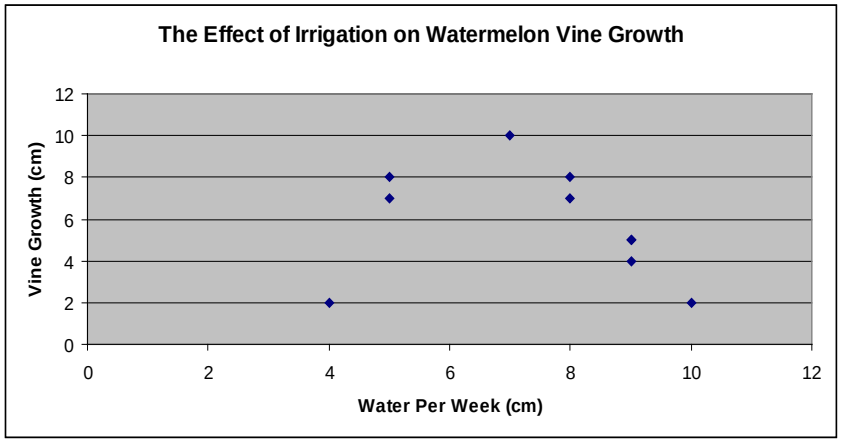
f. Some double bar graphs also show the relationship between two variables.

Making Conclusions with Data

g. Example Problem:
The length of a watermelon vine and the amount of water used to irrigate the plant was recorded.

Describe the data illustrated on the graphic.

What conclusions can be made from this data?



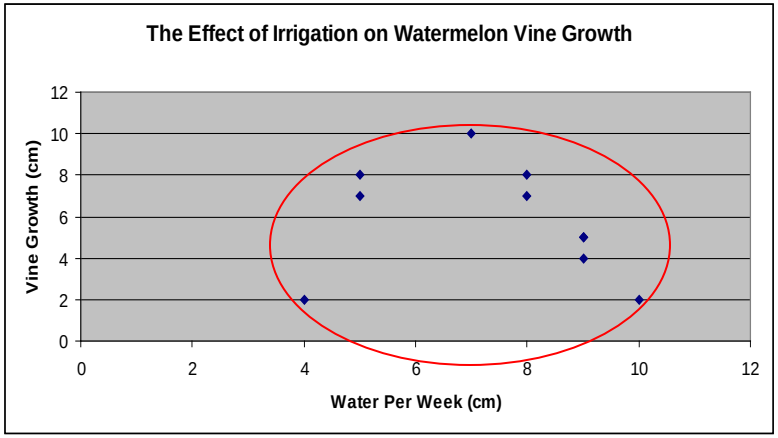
Making Conclusions with Data

Describe the data illustrated on the graphic.

No correlation exists for this data.

What conclusions can be made from this data?

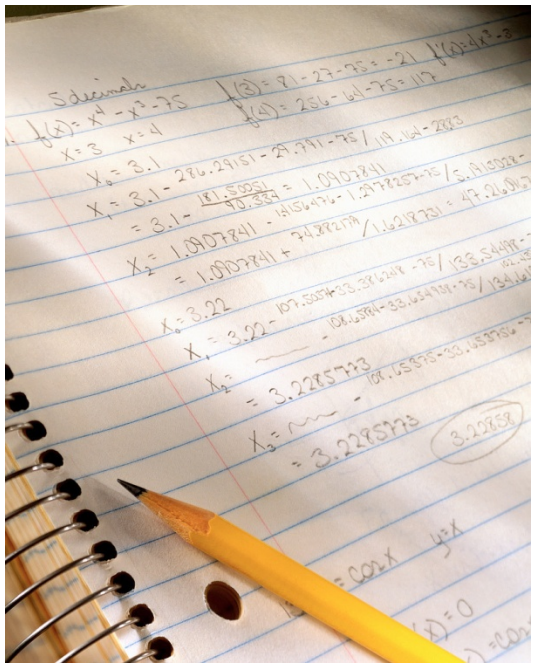
The amount of water irrigated onto watermelons does not effect the growth of watermelon vines.



Utilizing Statistics to Make Conclusions

II. Simple statistics can be used to make basic conclusions about a data set.

A. The ***range*** defines how spread out the data are.



Utilizing Statistics to Make Conclusions

1. To find the range, subtract the smallest data value from the greatest data value
2. Data with large ranges are more spread out.

3. Example Problem: The temperature was recorded for 10 days.

What is the range?

What conclusion can be made from this statistic?

Day	**High Temperature in Degrees Celsius**
1	24
2	27
3	26
4	24
5	30
6	29
7	28
8	31
9	35
10	33

Utilizing Statistics to Make Conclusions

What is the range?

35 – 24 = *11*

What conclusion can be made from this statistic?

Within the 10 days that data was recorded, the temperature differed by 11 degrees Celsius.

Day	**High Temperature in Degrees Celsius**
1	24
2	27
3	26
4	24
5	30
6	29
7	28
8	31
9	35
10	33

Utilizing Statistics to Make Conclusions

B. The ***mean*** is the average of all the data

1. To find the mean, sum the values of all data. Then divide the total by the number of data.

2. Example Problem: The temperature was recorded for 10 days.

What is the mean?

What conclusion can be made from this statistic?

Day	**High Temperature in Degrees Celsius**
1	24
2	27
3	26
4	24
5	30
6	29
7	28
8	31
9	35
10	33

Utilizing Statistics to Make Conclusions

What is the mean?

24+27+26+24+30+29+28+31+33+35=287

287 / 10 = *28.7*

What conclusion can be made from this statistic?

The average temperature in these 10 days was 28.7 degrees Celsius.

Day	**High Temperature in Degrees Celsius**
1	24
2	27
3	26
4	24
5	30
6	29
7	28
8	31
9	35
10	33

Utilizing Statistics to Make Conclusions

C. The ***mode*** is the data value that occurs most often within the data set.

1. To find the mode, look at the data. Count the number of times each value occurs. The value that occurs the most number of times is the mode.
2. Example Problem: The temperature was recorded for 10 days.

What is the mode?

What conclusion can be made from this statistic?

Day	**High Temperature in Degrees Celsius**
1	24
2	27
3	26
4	24
5	30
6	29
7	28
8	31
9	35
10	33

Utilizing Statistics to Make Conclusions

What is the mode?

24 (it occurs twice)

What conclusion can be made from this statistic?

The temperature that occurred most often was 24 degrees Celsius.

Day	High Temperature in Degrees Celsius
1	24
2	27
3	26
4	24
5	30
6	29
7	28
8	31
9	35
10	33

Utilizing Statistics to Make Conclusions

D. The ***median*** is the middle data value.

1. To find the median, place the values in order from least to greatest. The median value is the value that has an equal number of values above and below it. If no one value is exactly in the middle, find the mean of the two middle values to be the median number.
2. Example Problem: The temperature was recorded for 10 days.

Day	**High Temperature in Degrees Celsius**
1	24
2	27
3	26
4	24
5	30
6	29
7	28
8	31
9	35
10	33

What is the median?

What conclusion can be made from this statistic?

Utilizing Statistics to Make Conclusions

What is the median?

24, 24, 26, 27, 28, 29, 30, 31, 33, 35

(28 and 29 are the middle values)

28 + 29 = 57

57 / 2 = *28.5*

What conclusion can be made from this statistic?

The middle temperature was 28.5 degrees Celsius.

Day	**High Temperature in Degrees Celsius**
1	24
2	27
3	26
4	24
5	30
6	29
7	28
8	31
9	35
10	33

Review

- How are conclusions made from data illustrated in graphics?
- How are statistics utilized to make conclusions from data?