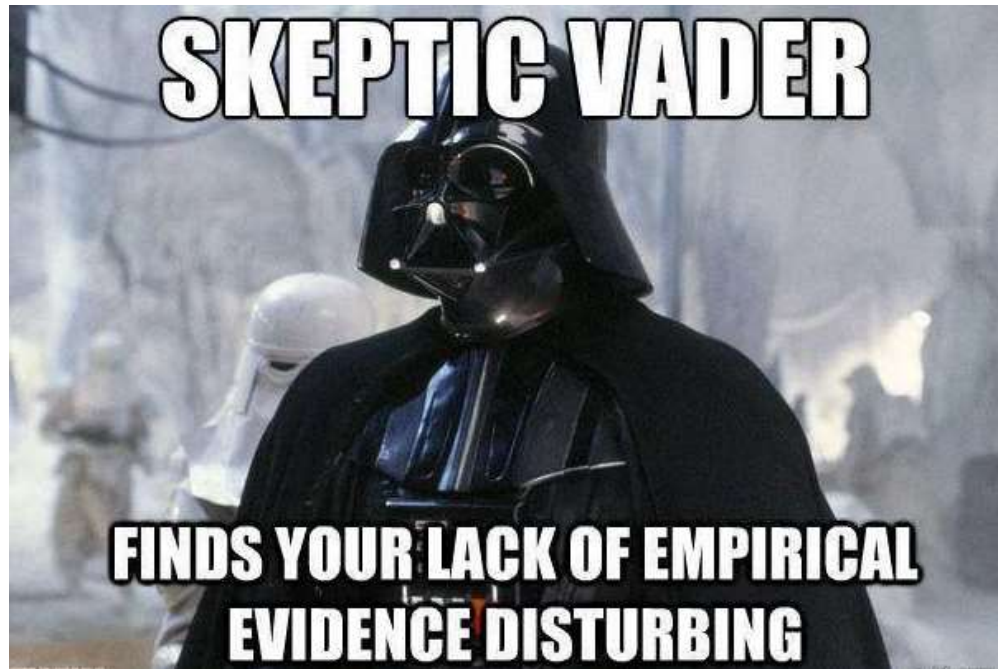


Tuesday, August 6, 2019

**Welcome to Investigative Science
with Mr. Fireng**



1. Get out your stampsheet
2. Get out your homework
3. Write tomorrow's homework in agenda
4. START WORKING QUIETLY

Investigative Science



Learning goal: Properly apply all steps in the scientific method when problem solving.

Tuesday, August 6, 2019

Learning goal: Properly apply all steps in the scientific method when problem solving.

Learning scale:

| 1 | 2 | 3 | 4 |
|----------------|--|---|--|
| Name the steps | Name the steps and follow directions in an investigation | Can design and conduct an investigation leading to a conclusion | Design and carry out an investigation leading to a valid and rational conclusion |

Student's self-evaluation: Complete at home or at the end of class, use the **4-3-2-1** Learning scale (two to three sentences).



- 4**
Design, complete, valid conclusion
- 3**
Design & complete
- 2**
Know steps, follow directions
- 1**
Know the steps

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I = Information: Type of information matches the graph. The correct type of graph is being used (bar vs. line graph, etc..).

T = Title: The graph contains a title that describes what the graph is about. An experimental question works well for a title.

A = Axis: The X, Y-axis are scaled correctly and spaced evenly. The graph takes up as much of the paper as possible.

L = Labels: Each axis is label with units

K = Key: If more than one data set is in the graph, the key describes which line is which.

4

Design, complete, valid conclusion

3

Design & complete

2

Know steps, follow directions

1

Know the steps

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Graphing Skill #2: What Type of Graph is it?

There are several types of graphs that scientists often use to display data. They include:

| Pie Graphs | Bar Graphs | Histograms | Line Graphs | Scatter Plots |
|--|--|---|--|--|
| <p>Percent of Trees Found in Missouri</p> | <p>Percent of Total Fish for Each Diet Type</p> | <p>Masses of Fish</p> | <p>Population of Whitebait</p> | <p>Height vs. Age Linear Regression (simulated data)</p> |
| <ul style="list-style-type: none"> • Dependent variable is NOT continuous • Usually presents data as a "part of a whole" or as percentages | <ul style="list-style-type: none"> • Dependent variable is NOT continuous • There is no order to the categories on the X-axis • Bars typically don't touch • Y-axis is usually a percentage or a frequency (count) | <ul style="list-style-type: none"> • A specific type of bar graph • Dependent variable must have a natural order that can be grouped into defined "chunks" • Bars must always touch • Y-axis is usually a percentage or a frequency (count) | <ul style="list-style-type: none"> • Dependent variable IS continuous • Points are plotted using x- and y-components • The points are connected because the observations are NOT independent (the next value depends on the previous value) | <ul style="list-style-type: none"> • Dependent variable IS continuous • Points are plotted using x- and y-components • The points are NOT connected because the observations are independent (the next value does NOT depend on the previous value) • Uses a best-fit line or curve to show relationship |

4
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Graphing Skill #2: What type of graph?

What are you trying to do? When you're putting together a chart, you're trying to show one of four things with the data you have: a *relationship* between data points, a *comparison* of data points, a *composition* of data, or a *distribution* of data.

- **A relationship** tries to show a connection or correlation between two or more variables
- **A comparison** tries to set one set of variables apart from another
- **A composition** tries to collect different types of information that make up a whole and display them together
- **A distribution** tries to lay out a collection of related or unrelated information simple to see how it correlates

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Chart Suggestions—A Thought-Starter

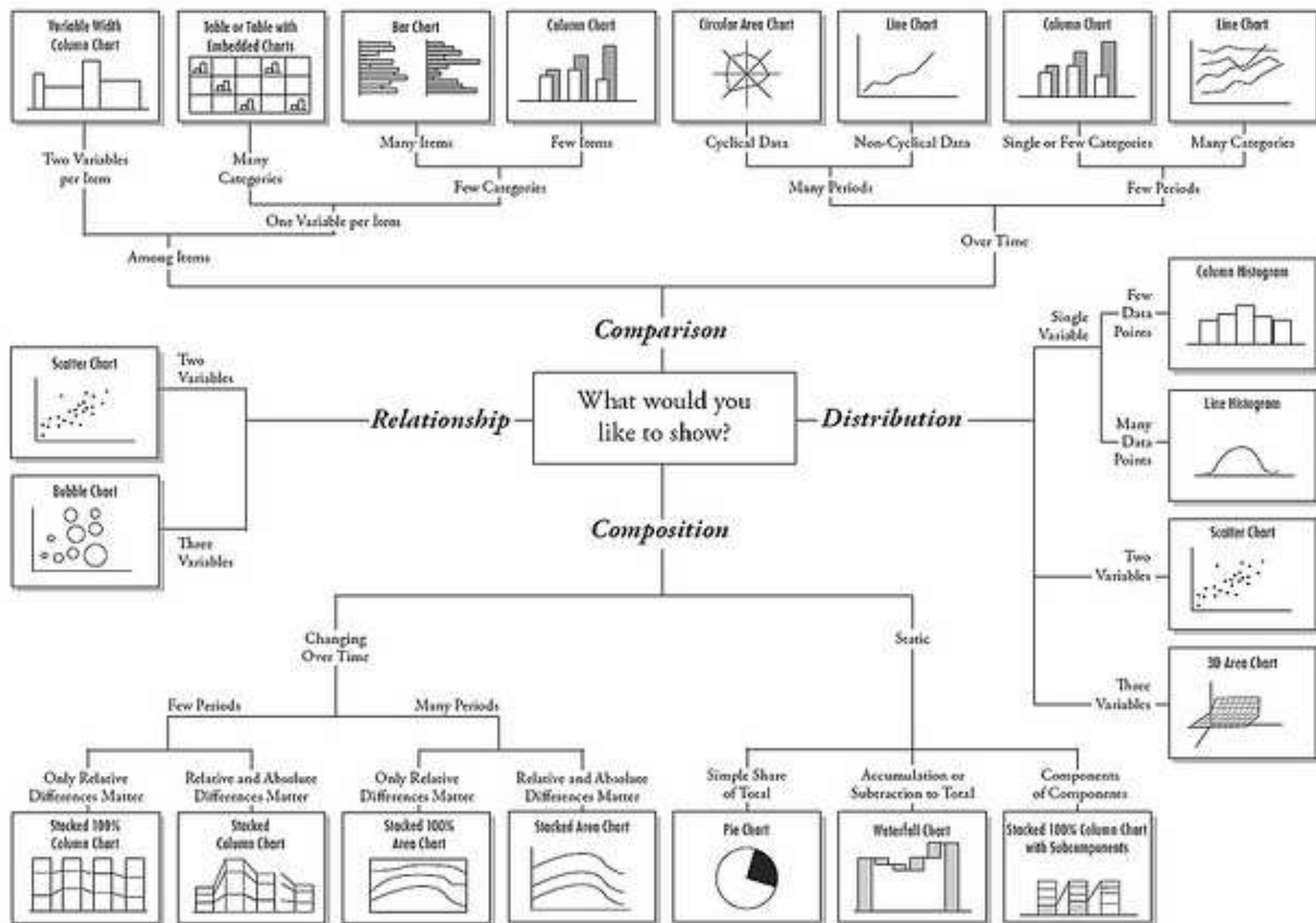
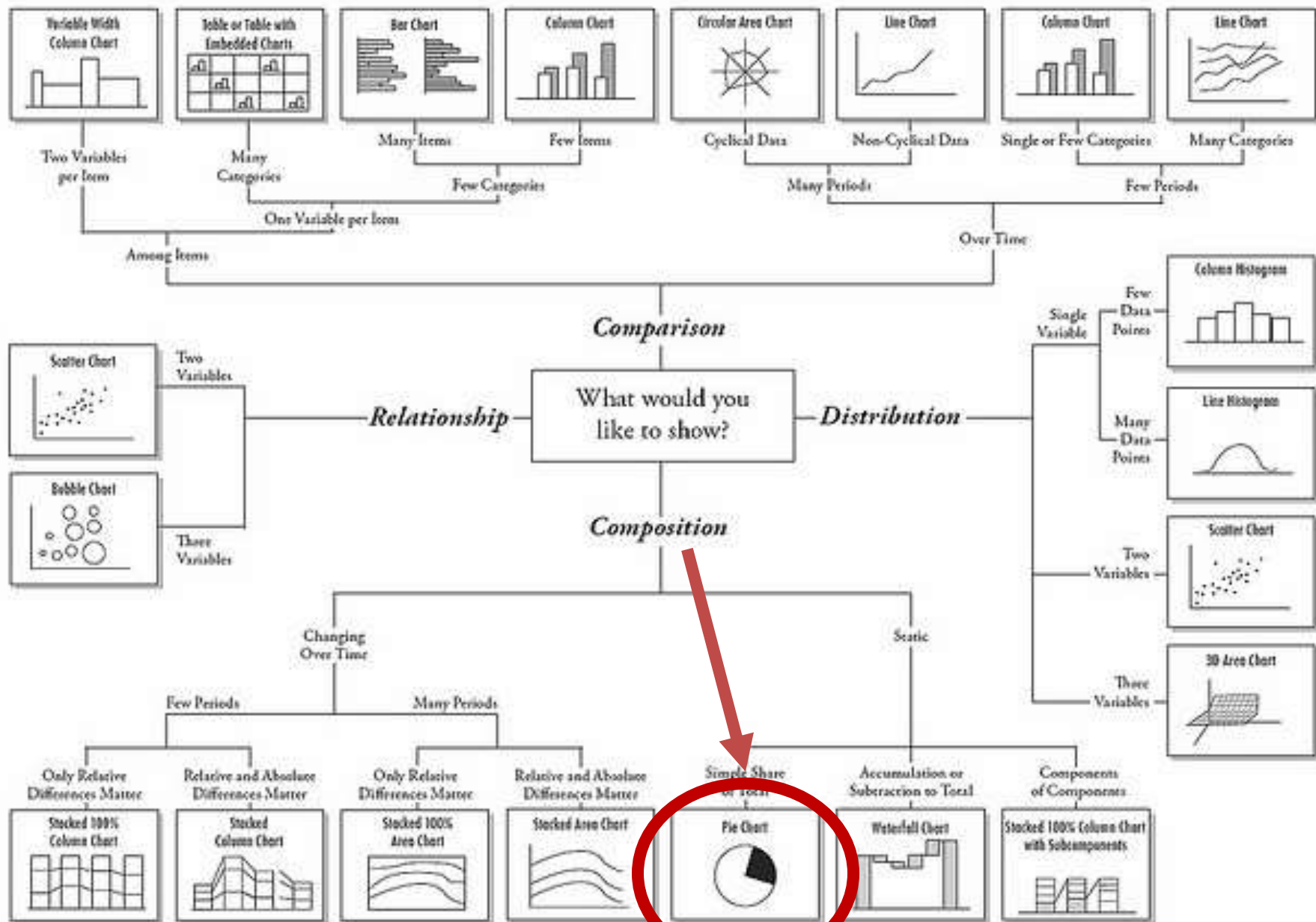


Chart Suggestions—A Thought-Starter



Investigative Science

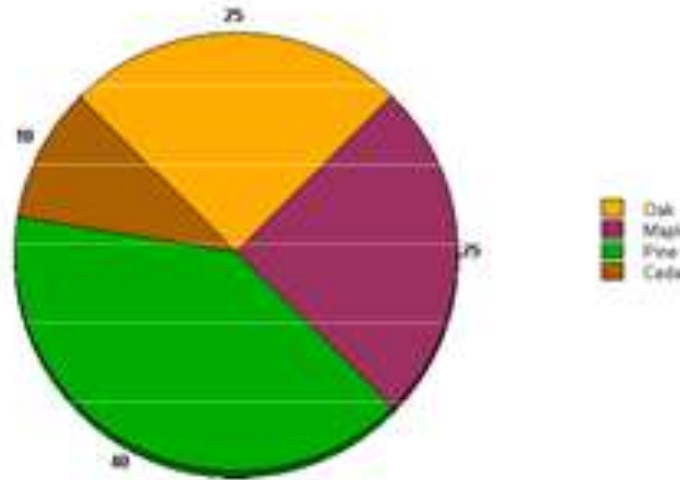


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Pie Graphs

Percent of Trees Found in Missouri



- Dependent variable is NOT continuous
- Usually presents data as a “part of a whole” or as percentages

4

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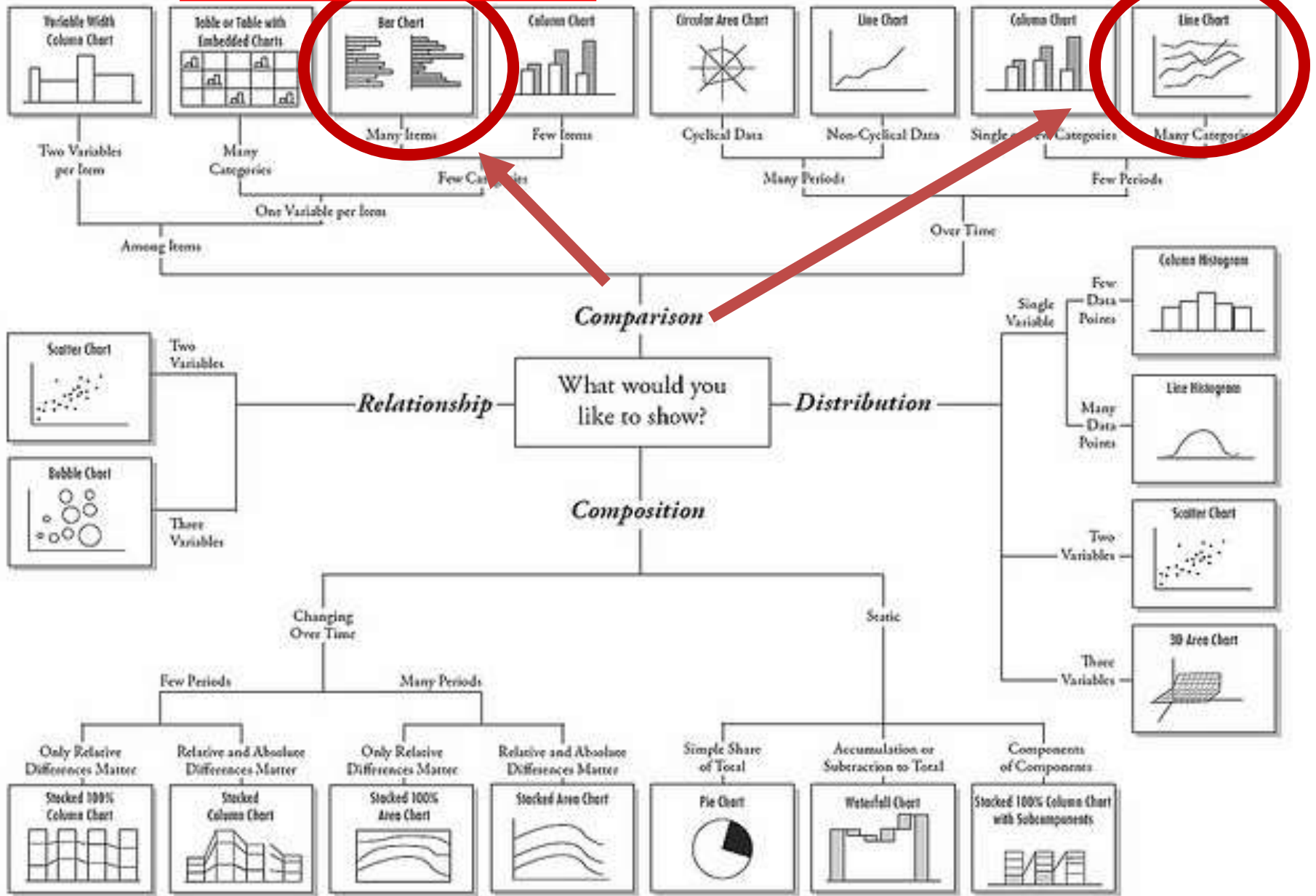
1

Know the
steps

When difference are BIG

—A Thought-Star

When difference are small



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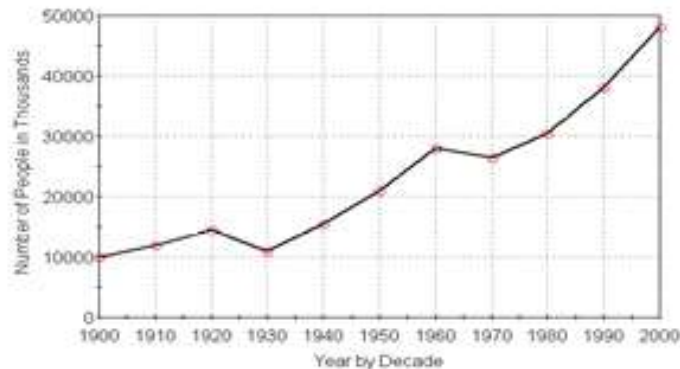
Learning goal: Properly apply all steps in the scientific method when problem solving.

Tuesday, August 6, 2019

4

Line Graphs

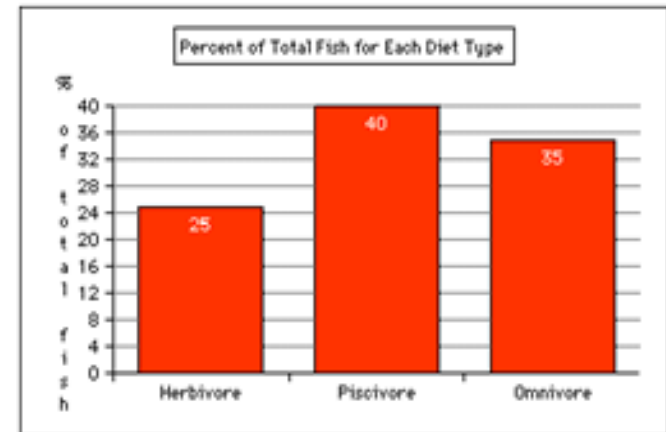
Population of Wildwood



- Dependent variable IS continuous
- Points are plotted using x- and y-components
- The points are connected because the observations are NOT independent (the next value depends on the previous value)

Bar Graphs

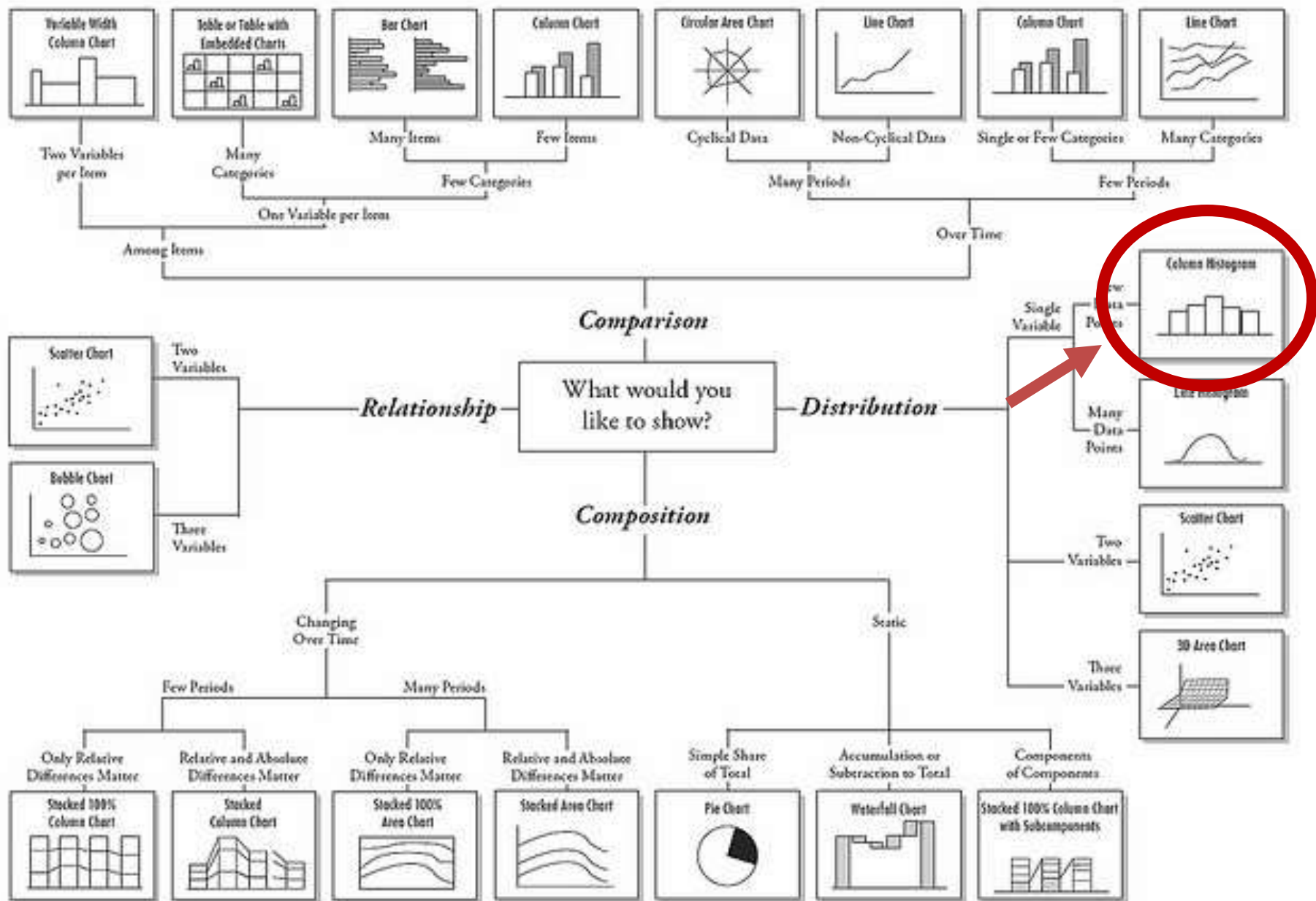
Percent of Total Fish for Each Diet Type



- Dependent variable is NOT continuous
- There is no order to the categories on the X-axis
- Bars typically don't touch
- Y-axis is usually a percentage or a frequency (count)

KNOW THE
steps

Chart Suggestions—A Thought-Starter

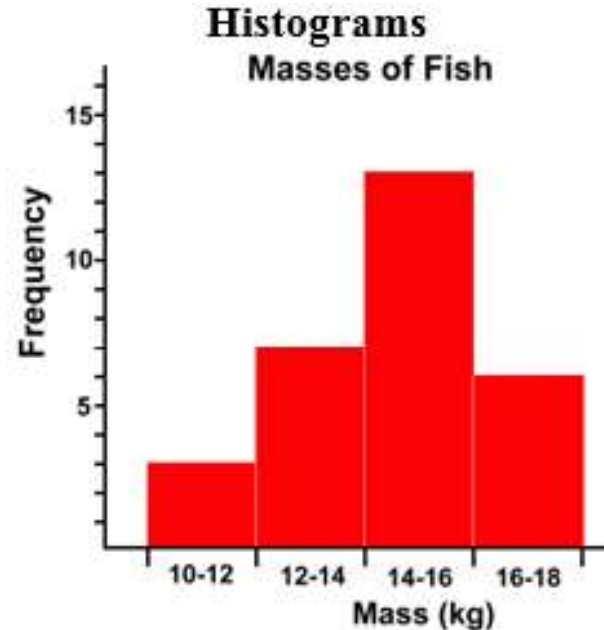


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- A specific type of bar graph
- Dependent variable must have a natural order that can be grouped into defined “chunks”
 - Bars must always touch
- Y-axis is usually a percentage or a frequency (count)

4

Design,
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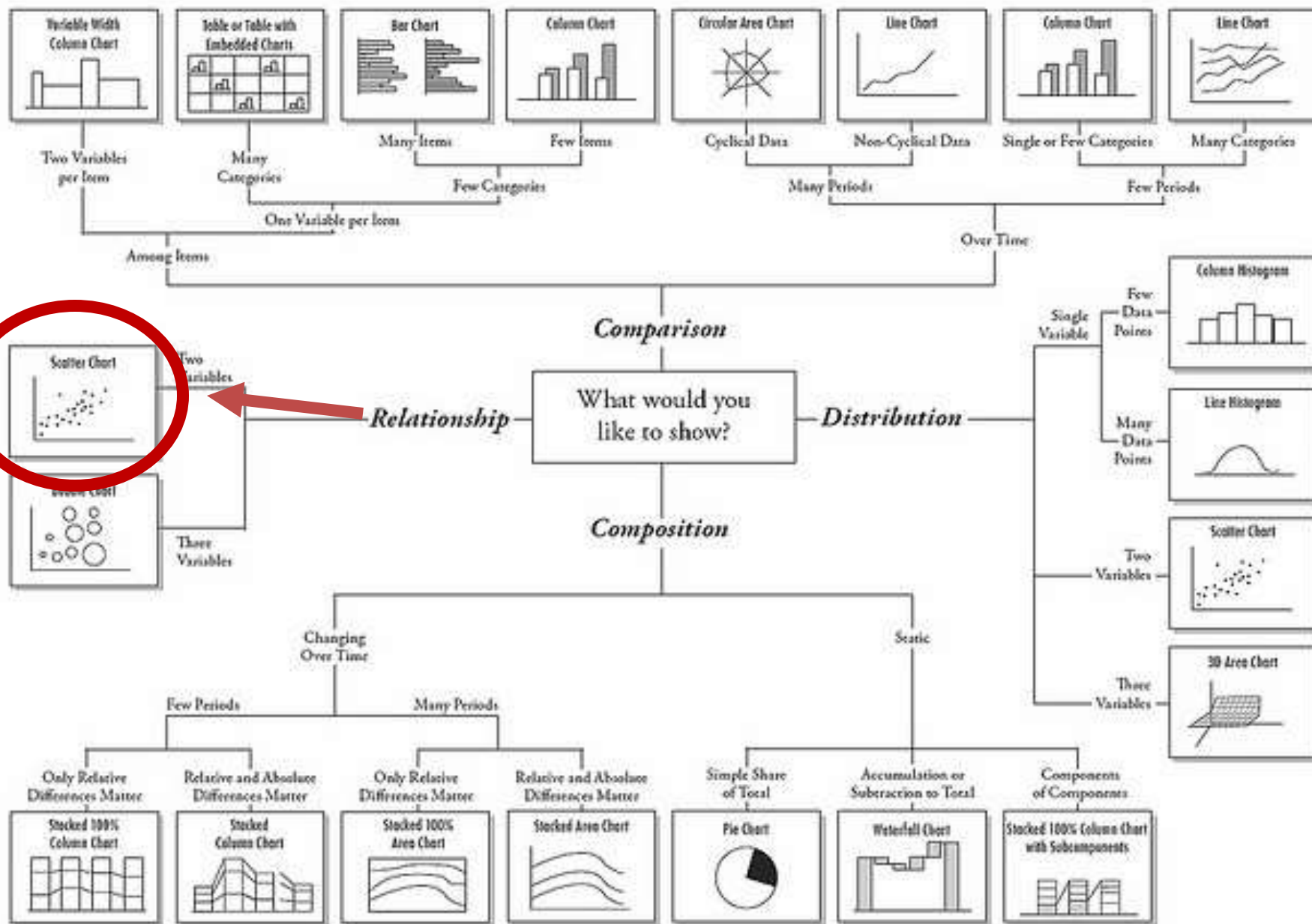
2

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Chart Suggestions—A Thought-Starter



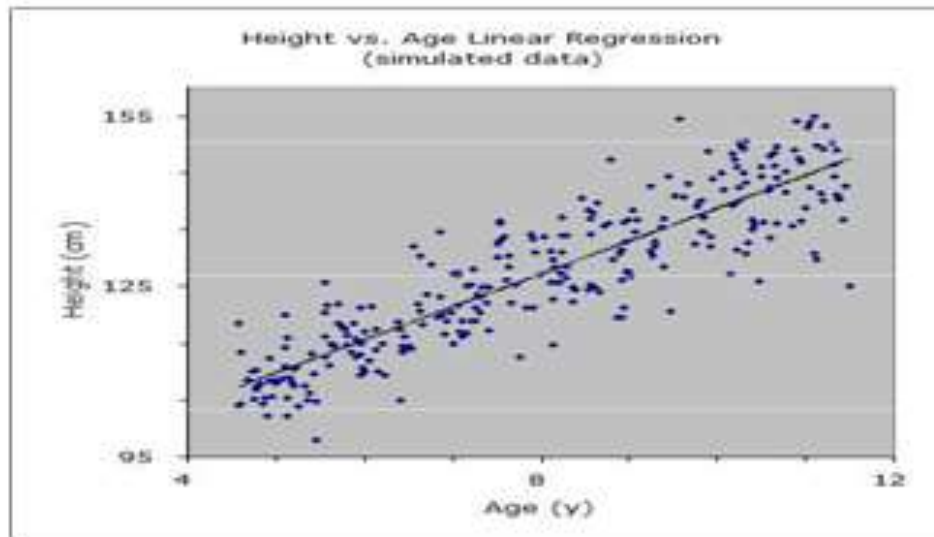
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Learning goal: Properly apply all steps in the scientific method when problem solving.



Tuesday, August 6, 2019

Scatter Plots



- Dependent variable IS continuous
- Points are plotted using x- and y-components
- The points are NOT connected because the observations are independent (the next value does NOT depend on the previous value)
- Uses a best-fit line or curve to show relationship

4

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Based on these definitions, and the descriptions of the experiments below, please put an "X" in the box for the type of graph that would be *most* appropriate (some descriptions may have several graph types that would be appropriate; you only need to select one).

| # | Description | Pie | Bar | Histo. | Line | Scatter |
|----|---|-----|-----|--------|------|---------|
| Ex | A graph showing the number of 5 th graders who prefer Coke or Pepsi | . | X | | | |
| 1 | A graph showing how a newborn baby's weight changes over time | | | | | |
| 2 | A graph showing the percentage of the class earning As, Bs, and Cs. | | | | | |
| 3 | A graph showing the distribution of trees of different size groups (e.g. 0-10cm, 10-20cm, etc...) in a forest | | | | | |
| 4 | A graph showing the relationship between height and arm length | | | | | |
| 5 | A graph showing the percentage of an allowance spent on different categories (e.g. food, movies, etc) | | | | | |
| 6 | A graph showing the amount of rainfall, by month over a 12 month period | | | | | |
| 7 | A graph showing the number of ice cream cones purchased as a function of the day's temperature | | | | | |
| 8 | A graph showing the number of pushups done each day during a 2-week training program | | | | | |

4
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Learning goal: Properly apply all steps in the scientific method when problem solving.

Tuesday, August 6, 2019

Graphing Skill #3: Labeling Axes

When labeling your axes, keep 3 things in mind: Remember DRY-MIX!

1. The **independent** (manipulated) variable is written along the horizontal axis (**X axis**)
2. **Dependent** (responding) variable is written along the vertical axis (**Y axis**)
3. **Units** on any variables should be included in **parentheses ()** following the axis title

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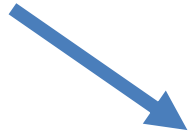
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Learning goal: Properly apply all steps in the scientific method when problem solving.



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Write this ON graph handout



DRY MIX

Dependent variable

Responding

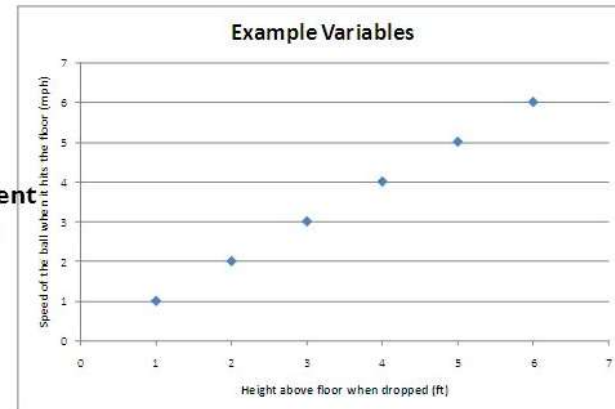
Y-Axis

Manipulated

Independent variable

X-Axis

Dependent Variable



Independent Variable

4
Design, complete, valid conclusion

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Investigative Science



Learning goal: Properly apply all steps in the scientific method when problem solving.

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Graphing Skill #3: Labeling Axes

Look at page one of your packet!

Practice Problems

For each experiment described below, write the independent and dependent variable on the appropriate axis. Be sure to include units when appropriate.

SAMPLE: A farmer wants to know if there is a relationship between the amount of fertilizer (in kilograms) she uses and how tall her corn grows (in centimeters).



4
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Graphing Skill #3: Labeling Axes

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Investigative Science



Learning goal: Properly apply all steps in the scientific method when problem solving.

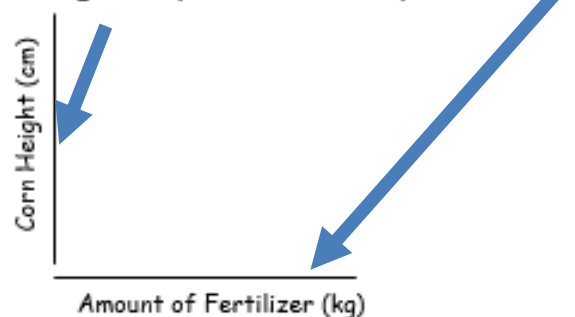
Tuesday, August 6, 2019

Graphing Skill #3: Labeling Axes

Practice Problems

For each experiment described below, write the independent and dependent variable on the appropriate axis. Be sure to include units when appropriate.

SAMPLE: A farmer wants to know if there is a relationship between the amount of fertilizer (in kilograms) she uses and how tall her corn grows (in centimeters).



3.1

4
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Investigative Science



Learning goal: Properly apply all steps in the scientific method when problem solving.

Tuesday, August 6, 2019

Graphing Skill #4: Creating Titles

When writing a title for you graph, please remember:

- 1. Must communicate the dependent and independent variables**
- 2. Can be presented in the form “Y versus X”**
- 3. Some graphs need more explanation than others. Make sure your reader would be able to understand what your data represent**

4

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complete,
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Design &
complete

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Investigative Science

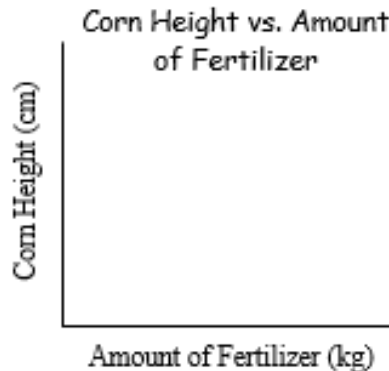


Learning goal: Properly apply all steps in the scientific method when problem solving.

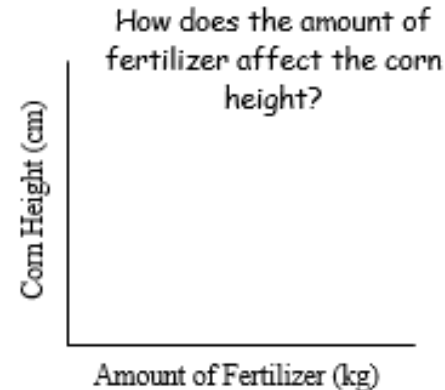
Tuesday, August 6, 2019

Graphing Skill #4: Creating Titles

SAMPLE: A farmer wants to know if there is a relationship between the amount of fertilizer (in kilograms) she uses and how tall her corn grows (in centimeters).



OR



Good

Better

4
Design, complete, valid conclusion

3
Design & complete

2
Know steps, follow directions

1
Know the steps

Investigative Science



Learning goal: Properly apply all steps in the scientific method when problem solving.

Tuesday, August 6, 2019

Graphing Skill #5: Scaling Axes

There are a few important steps involved in correctly scaling an axis:

STEP 1 Find the range for variable
Value range = $\text{largest Value} - \text{Smallest Value}$

Value

Monday

| Mass (g) |
|----------|
| 5 |
| 14 |
| 19 |
| 26 |
| 30 |
| 40 |

Largest #: 40

Smallest #: 5

Range: $35 - 5 = 35$

- 4 Design, complete, valid conclusion
- 3 Design & complete
- 2 Know steps, follow directions
- 1 Know the steps