Name _____

Graphing Review

Introduction

Line graphs compare two variables. Each variable is plotted along an axis. A line graph has a vertical axis and a horizontal axis. For example, if you wanted to graph the height of a ball after you have thrown it, you would put time along the horizontal, or x-axis, and height along the vertical, or y-axis.

Line graphs are important in science for several reasons such as:

- showing specific values of data. If one variable is known, the other can be determined.
- showing trends and relationships in data clearly. They visibly depict how one variable is affected by the other as it increases or decreases.
- allowing the viewer to make predictions within recorded data, called **interpolation**, and to make predictions about data not yet recorded, called **extrapolation**.

Interpolation vs. Extrapolation

Determine which of the examples below is interpolation and which is extrapolation. Explain why.

1. The value of Sarah's car in 2004 was $17,500. _____
2. The value of Sarah's car in 2017 is $1,900. _____

How to Construct a Line Graph:

1. Identify the Variables & Label the Axes
    a. **Independent Variable** – factor that is varied in an experiment and specifically controlled by the experimenter
        i. Label along the x-axis (horizontal) – include units
        ii. Typically found on the left side of a data table
    b. **Dependent Variable** – factor that is measured in an experiment and will change as a result of the independent variable
        i. Label along the y-axis (vertical) – include units
        ii. Typically found on the right side of a data table

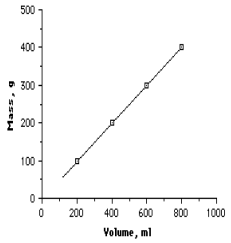
Independent vs. Dependent Variable Practice

- A student wanted to observe how changing the temperature of the aquarium water would affect the breathing rate of his goldfish.
    - What is the independent variable? _____
    - What is the dependent variable? _____
- A student wanted to determine how tall corn would grow if different types of fertilizer were used.
    - What is the independent variable? _____
    - What is the dependent variable? _____

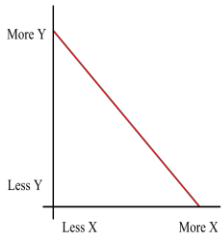
2. Determine the Graph Scale
    a. Determine the magnitude (numeric value) of each variable
    b. Establish a scale that best fits the range of each variable
    c. Spread the graph to use the MOST available space (use at least ¾ of the graph)
    d. Be consistent throughout each axes' scale
3. Plot the data points
    a. Plot each data value on the graph with a dot
    b. If multiple sets of data are being plotted, use different colored lines and include a key

Name _____

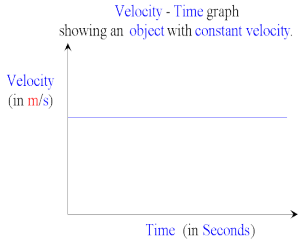
4. Draw the Graph
    a. DO NOT connect the dots unless specifically told to do so
    b. Draw one of the following types of graphs:
        i. Best fit Straight Line



DIRECT RELATIONSHIP
-Both variables increase together

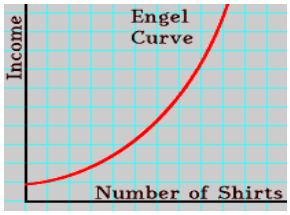


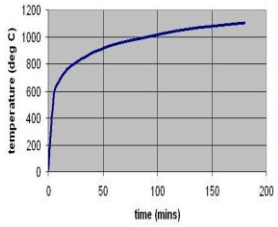
INDIRECT RELATIONSHIP
-As one variable increases, the other decreases



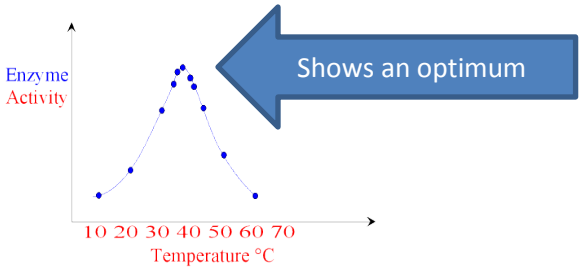
CONSTANT RELATIONSHIP
-Change in one variable has no effect on the other

        ii. Best fit Curved Line





        iii. Best fit Peak Line



5. Title the Graph

• Include a descriptive title that explains what kind of plot it is, the technique that was used, which substance was measured, and what instrument was used to measure it.
• IMPORTANT: Titles should not include (or be) "Plot of...", "Graph of...", or "...over a range of data points." - Be concise, but complete.

Graphing information can be found in your textbook on p. 815.

Name _____

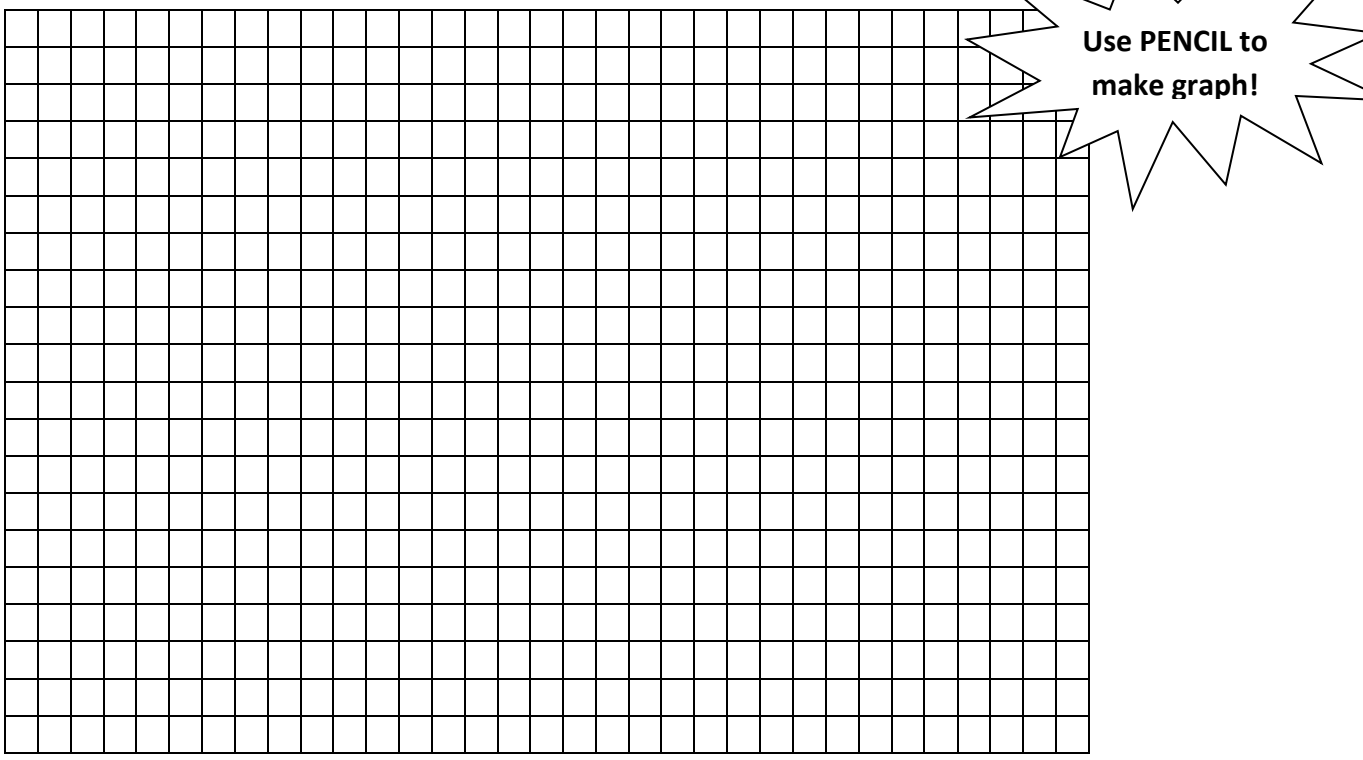
Graphing Practice

Practice Problem #1

Background: The thickness of the annual rings indicates what type of environmental situation was occurring the time of the tree's development. A thin ring usually indicates a rough period of development such as lack of water, forest fires, or insect infestation. On the other hand, a thick ring means a prosperous period of development. Use the information from the data table below to create a proper scientific graph and to answer the corresponding questions.

Age of Trees (in years)	Average Thickness of Annual Rings in Forest A (millimeters)	Average Thickness of Annual Rings in Forest B (millimeters)
10	20	24
20	24	28
30	30	35
35	34	38
50	41	45
60	46	51

1. What is the dependent variable? _____
2. What is the independent variable? _____
3. What was the average thickness of annual rings for 40 year old trees in Forest A? _____
4. What is it called when you make predictions within given data, such as made in question #3? _____
5. What was the mean thickness of annual rings for all trees found in Forest B? _____
6. Based on the data shown, what can be concluded about the comparative health of Forest A & B? _____
   _____
7. What type of relationship (constant, direct, or indirect) exists between the age of trees and the average thickness of the tree's rings? Explain. _____
   _____



Name _____

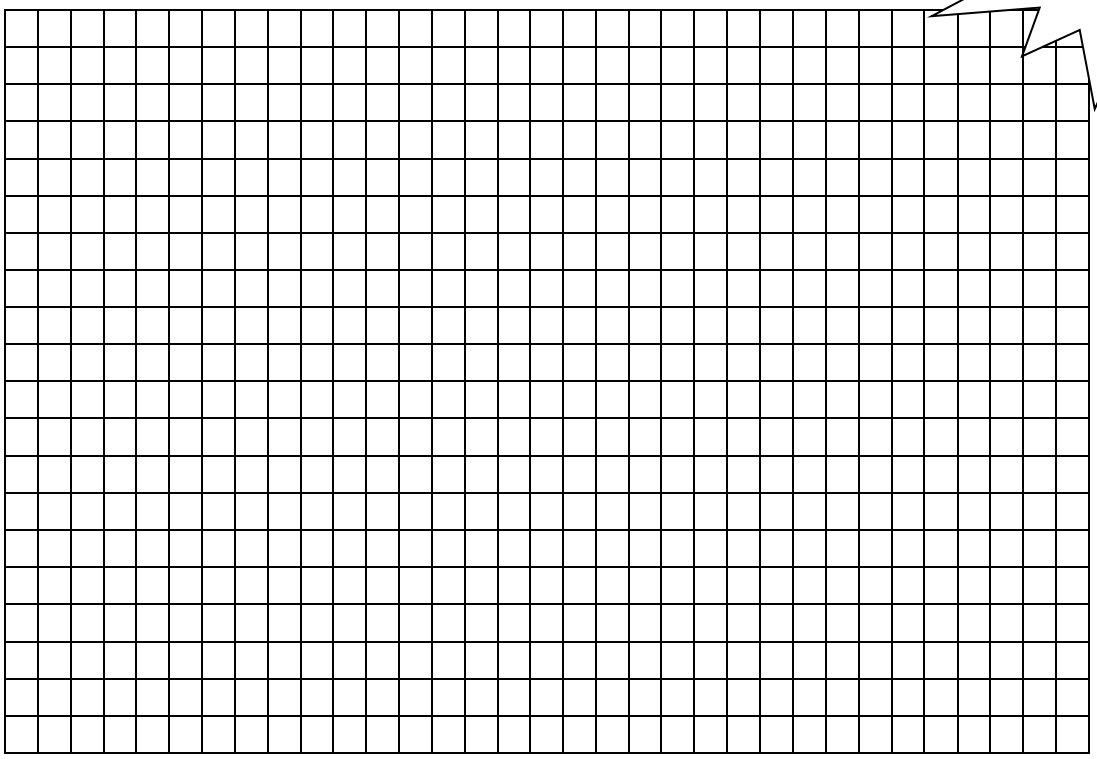
Practice Problem #2

Background: Clams were placed into various temperatures of water. Use the information in the data table below in order to create a proper scientific graph and to answer the corresponding questions.

Water Temperature (°C)	Number of Developing Clams
15	72
20	92
25	120
30	140
35	99
40	72
45	36
50	0

1. What is the dependent variable? _____
2. What is the independent variable? _____
3. What is the optimum temperature for clam development? _____
4. What is the mean number of clams per sample? _____
5. Approximately how many clams would be developing in 10 degree Celsius water? _____
6. What is it called when you make predictions about data not yet recorded, such as the prediction we made in question number 5? _____

Use PENCIL to make graph!



Name _____

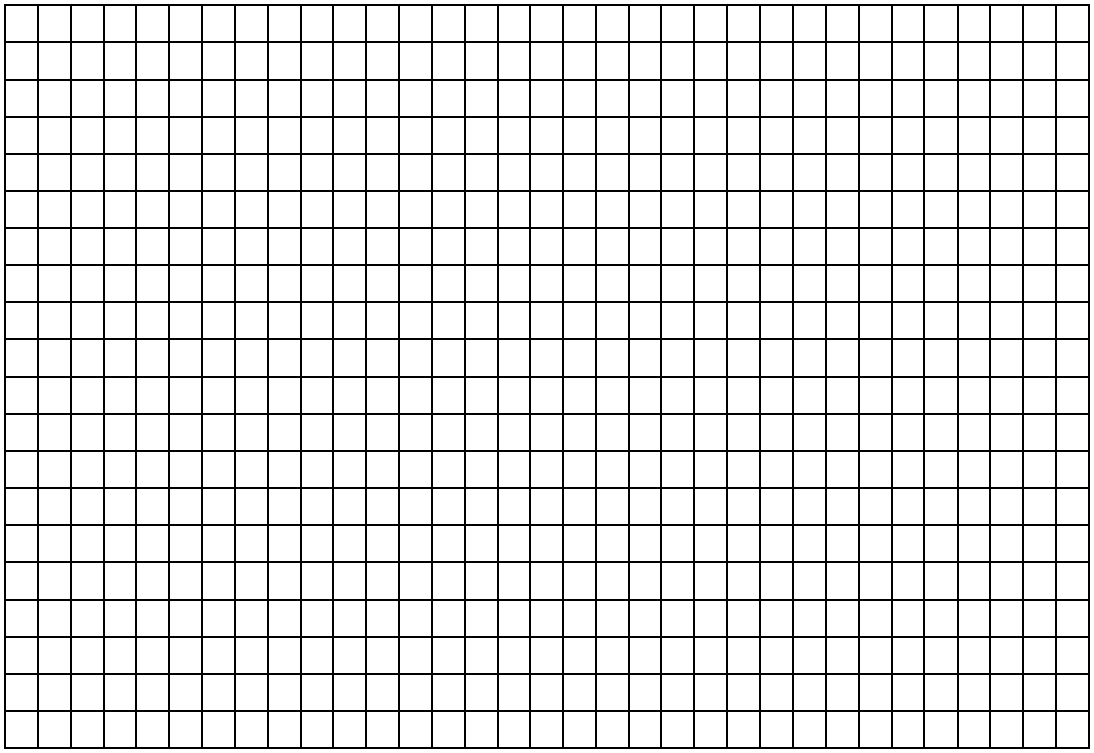
Practice Problem #3

Background: Natalie sets out to run 15 kilometers. Every 30 minutes she checked her pedometer to determine how far she had run. Use the data below to create a proper scientific graph and to answer the corresponding questions.

Time (minutes)	Total Distance (km)
0	0
30	6.8
60	10.1
90	12
120	13.3
150	15

1. What is the dependent variable? _____
2. What is the independent variable? _____
3. How many kilometers had Natalie run after 40 minutes? _____
4. What was Natalie's average speed (in kilometers per hour) over the course of her run? _____
   Use the formula Speed = Distance / Time

Use PENCIL to make graph!

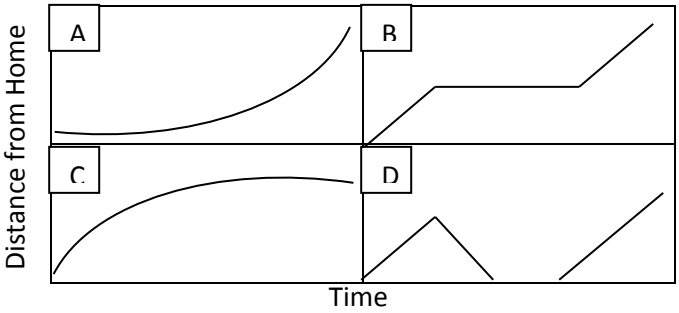


Name _____

Practice #4

Background: Match each story on the left with the graph it represents on the right. Each graph compares the distance a car is from home compared to time.

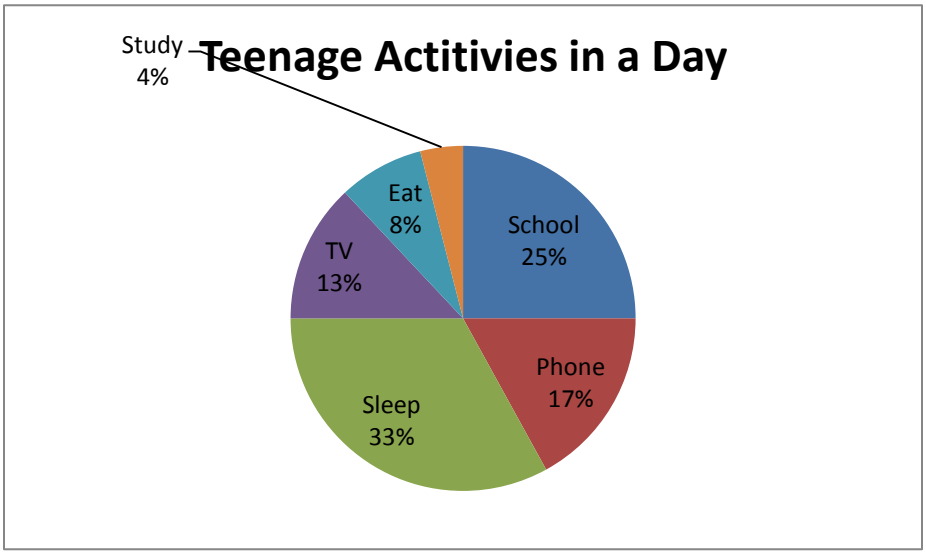
____1. I had just left home when I realized I had forgotten my books, so I went back to pick them up.
____2. The battery on my electric car started to run down.
____3. Things went fine until I had a flat tire.
____4. I started out calmly, but sped up when I realized I was going to be late.



Practice Problem #5

Background: The pie chart shows the approximate percentages teenagers spend doing various activities in a day. Use the information in the pie chart to answer the questions below.

1. What percent of the day is spent watching TV? _____
2. How many hours are spent sleeping? _____
3. What activity takes up the least amount of time? _____
4. What activity takes up a quarter of the day? _____
5. What two activities take up 50% of the day? _____
6. What two activities take up 25% of the day? _____



Practice Problem #6

1. What is the dependent variable? _____
   _____
2. Does the price per bushel always increase with demand?
   _____
3. What is the quantity demanded when the price is $5 per bushel? _____
4. What is the price per bushel when the quantity demanded is 80? _____