

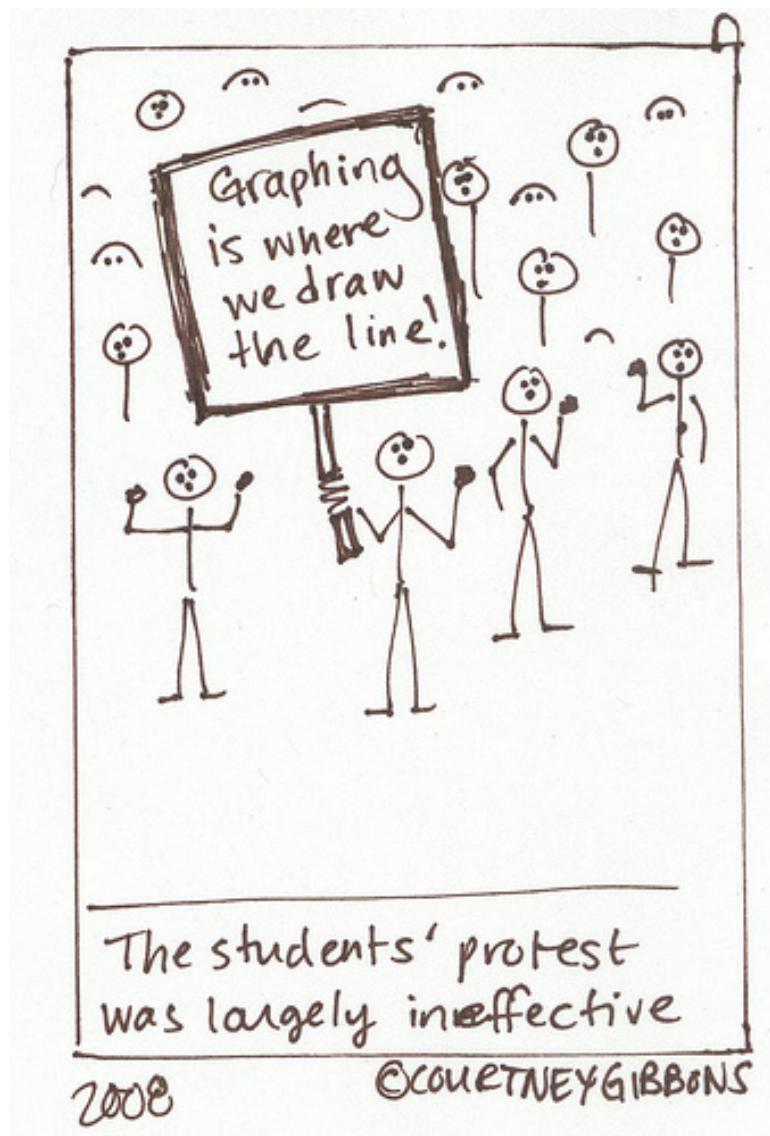
Unit 2 - Linear Relations

Chapter 2 – Relations

Chapter 5 – Modeling With Graphs

Chapter 6 – Analyze Linear Relations

MPM1D



Chapter 2 Outline

| Section | Subject | Curriculum Expectations | Lesson and Homework Complete (initial) |
|---------|-------------------------------------|-------------------------|--|
| 2.0 | Review of Plotting Points | B1.1 | |
| 2.1 | Hypotheses and Sources of Data | B1.2 | |
| 2.2 | Sampling Principles | | |
| 2.3/2.4 | Scatter Plots | B 1.1, B1.2, B1.4, B2.5 | |
| 2.5 | Linear and Non-Linear Relationships | B1.4, B2.3, C1.1 | |
| 2.6 | Distance Time Graphs | B2.3, B3.2 | |

Unit Performance

Homework Completion: None Some Most All

Days absent:_____

Test Review Complete? None Some All

Assignment Mark (%):_____

Test Mark (%):_____

Notes to yourself to help with exam preparation:

Chapter 5 Outline

| Section | Subject | Curriculum Expectations | Lesson and Homework Complete (initial) |
|---------|---------------------------|-------------------------|--|
| 5.1 | Direct Variation | B2.4, B3.1, B3.3 | |
| 5.2 | Partial Variation | B2.4, B3.1, B3.3 | |
| 5.3a | Slope | C2.1, C2.2 | |
| 5.3b | Slope | C2.1, C2.2 | |
| 5.4 | Slope as a Rate of Change | B3.3, C2.3 | |
| 5.5 | First Differences | B2.3, C1.1 | |
| 5.6 | Connecting Everything | B3.3, C3.3 | |

Unit Performance

Homework Completion: None Some Most All

Days absent: _____

Test Review Complete? None Some All

Assignment Mark (%): _____

Test Mark (%): _____

Notes to yourself to help with exam preparation:

Chapter 6 Outline

| Section | Subject | Curriculum Expectations | Lesson and Homework Complete (initial) |
|---------|--|-------------------------|--|
| 6.1a | Equation of a Line in Slope y-Intercept Form | B3.3, C1.2,C2.2, C3.1 | |
| 6.1b | Equation of a Line in Slope y-Intercept Form | B3.3, C1.2,C2.2, C3.1 | |
| 6.2 | Equation of a Line in Standard Form | C1.3 | |
| 6.3 | Graphing Using X and Y Intercepts | C3.1 | |
| 6.4 | Parallel and Perpendicular Lines | C2.4 | |
| 6.5 | Equation of a Line Given Slope and a Point | C3.2 | |
| 6.6 | Equation of a Line Given Two Points | C3.2 | |
| 6.7 | Linear Systems | C3.5 | |

Unit Performance

Homework Completion: None Some Most All

Days absent:_____

Test Review Complete? None Some All

Assignment Mark (%):_____

Test Mark (%):_____

Notes to yourself to help with exam preparation:

Section 2.0 – Review of Plotting Points

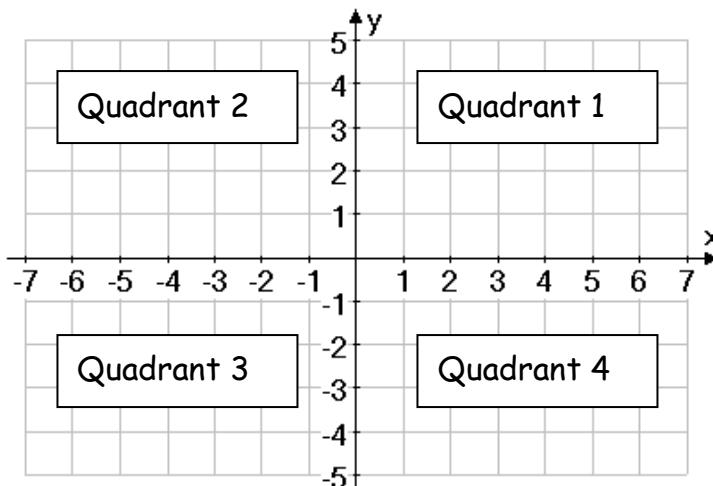
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Graphing on the Cartesian Plane



Rene Descartes, a 17th century mathematician, developed a system for graphing ordered pairs on a grid. The system, called the Cartesian Coordinate system in his honour, is made up of two perpendicular number lines that meet at a point O which is called the **origin**. The horizontal line is called the x-axis and the vertical line is called the y-axis.

The coordinate system is drawn as shown in the diagram. The positive side of the x-axis is to the right and the negative side to the left. The positive side of the y-axis is up and the negative side is down. The horizontal line is usually called the x-axis and the vertical is called usually called the y-axis. The plane is divided into quadrants. They are labeled in the counterclockwise as shown below.



READ THIS
CAREFULLY
BEFORE YOU MOVE
ON!!!!!!

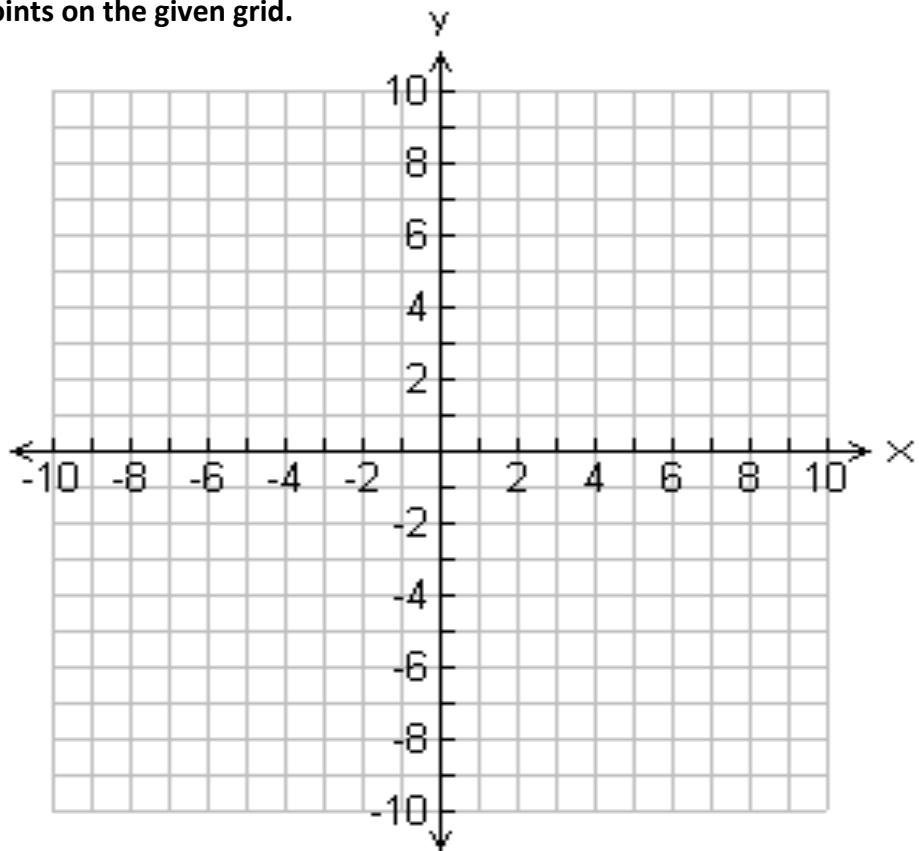


The ordered pair $(3, -2)$ represents a point on the Cartesian plane where 3 is the x-coordinate of the point and -2 is the y-coordinate of the point. The x-coordinate determines how far the point is to the left or right of the origin and the y-coordinate determines how far the point is above or below the origin. The point $(3, -2)$ is 3 units to the right of the origin and 2 units below the origin.

Remember, a point such as $(3, -2)$ is called an ordered pair because the order of the numbers is important. Ordered pairs are always written in the form (x-coordinate, y-coordinate).

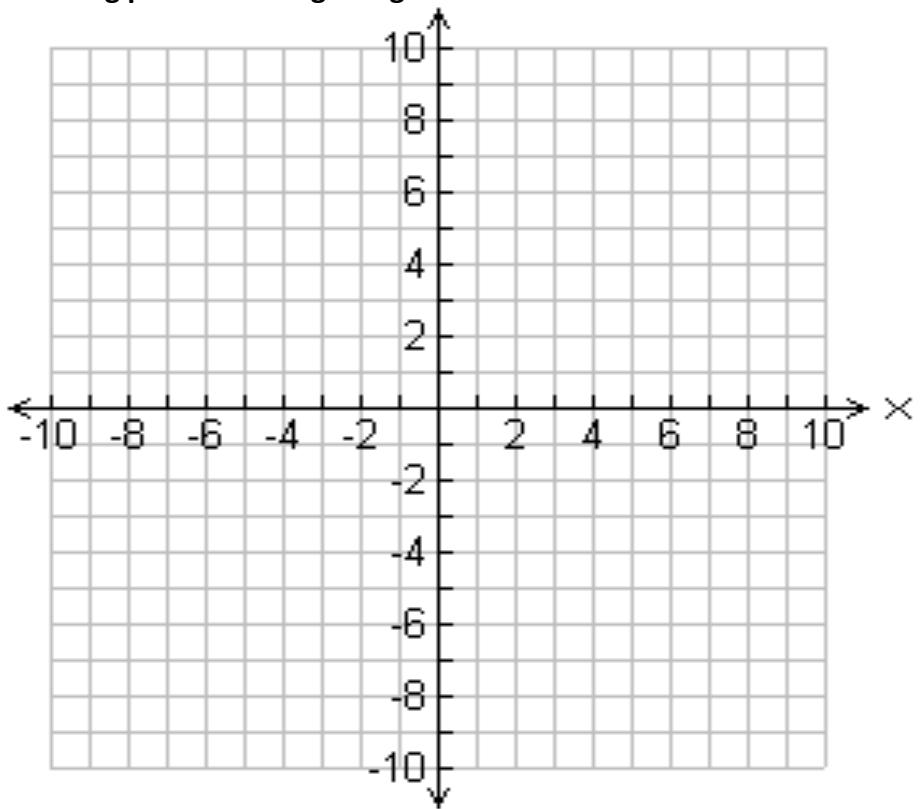
Example 1: Graph the following points on the given grid.

- | | |
|-----------|------------|
| A (3 , 4) | B (-1 , 4) |
| C (4, -2) | D (-5, -4) |
| E (2, 5) | F (-3, -1) |
| G (-3, 7) | H (6, -2) |
| I (2 , 0) | J (0 , -4) |



Example 2: On your own, graph the following points on the given grid.

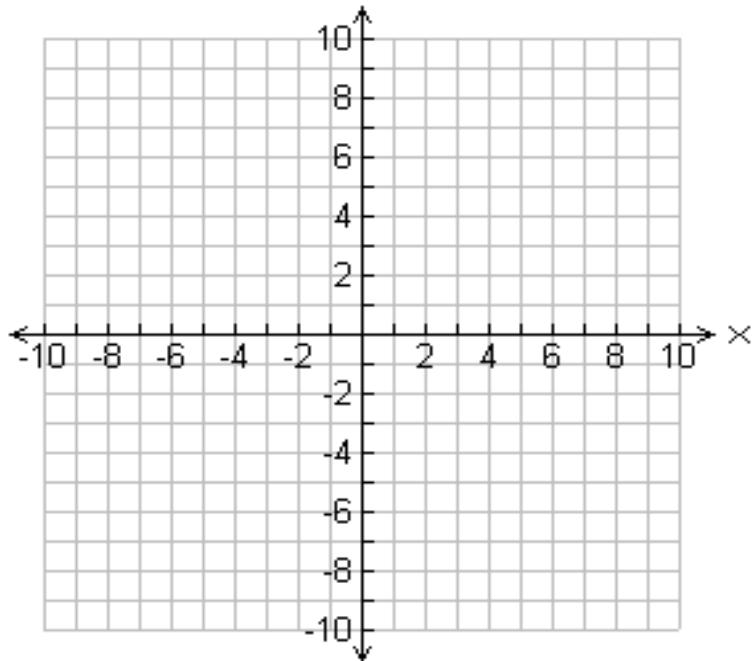
- | | |
|------------|------------|
| A (1 , 1) | B (-8 , 3) |
| C (1, -4) | D (-5, -4) |
| E (2, 9) | F (-5, -6) |
| G (-3, 10) | H (7, -2) |
| I (9 , 0) | J (0 , 3) |



Example 3: Plot and join the set of points in order. Join the last point to the first point to form a closed figure. Identify the figure and calculate its area in square units.

D(1 , 1), E(1 , -2) , F(-5 , -2), G(-5 , 1)

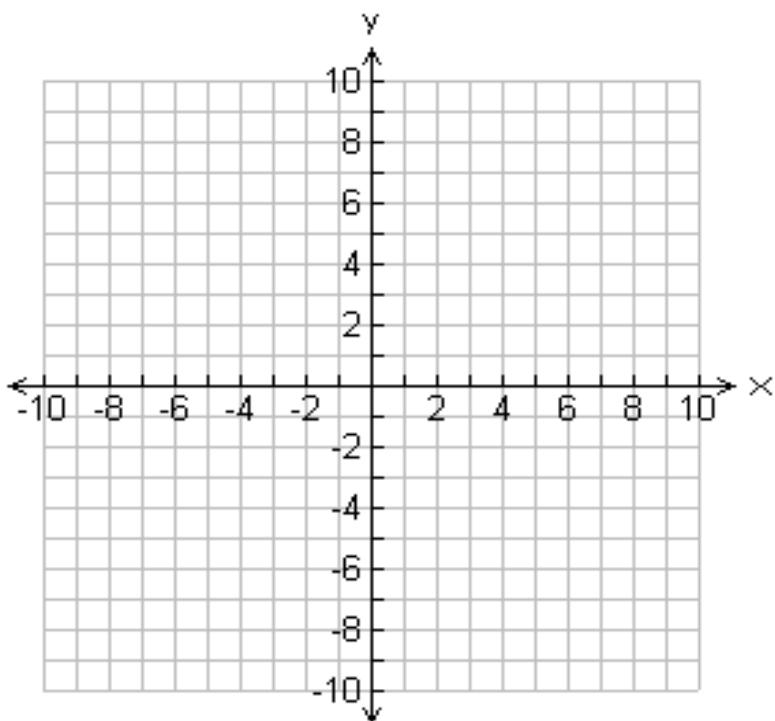
To figure out the length and width you simply need to count how many units are on each side once the figure has been plotted.



Example 4: Calculate the area of a triangle with vertices at A(-5,-3), B(3,-3), and C(3,8)

Step 1: Plot the points and connect the points to form a triangle

Step 2: Find the length of the base and height



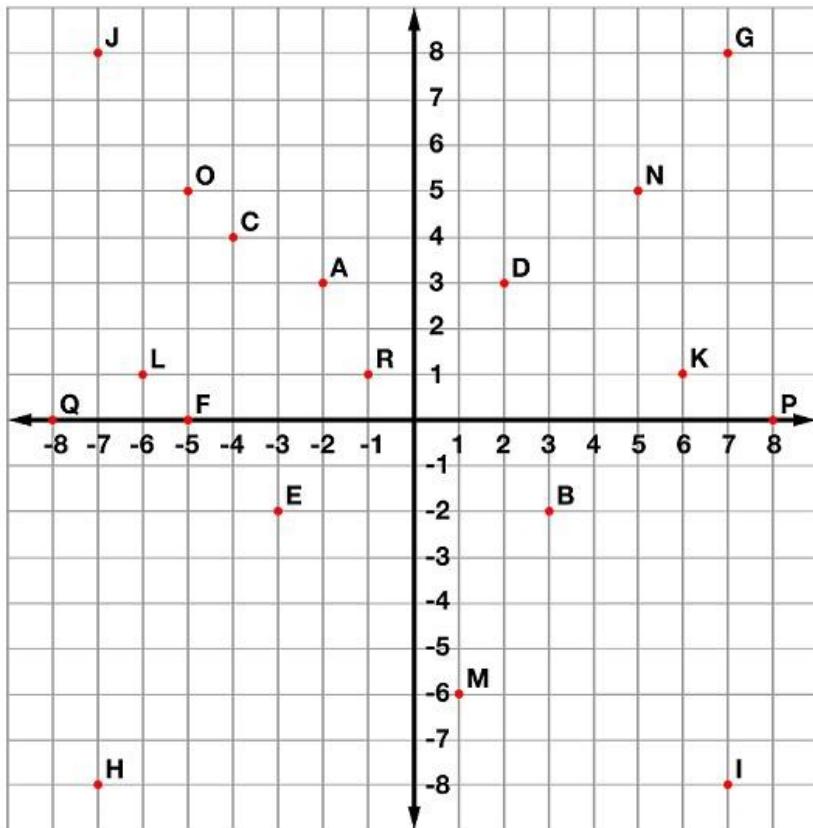
Step 3: Calculate the area

Please complete the following worksheets

Name: _____

Coordinate Plane & Ordered Pairs

Ordered Pairs



Tell what point is located at each ordered pair.

1. (3,-2) _____ 2. (2,3) _____ 3. (-5,5) _____

4. (-7,-8) _____ 5. (-4,4) _____ 6. (-5,0) _____

Write the ordered pair for each given point.

7. E _____ 8. M _____ 9. P _____

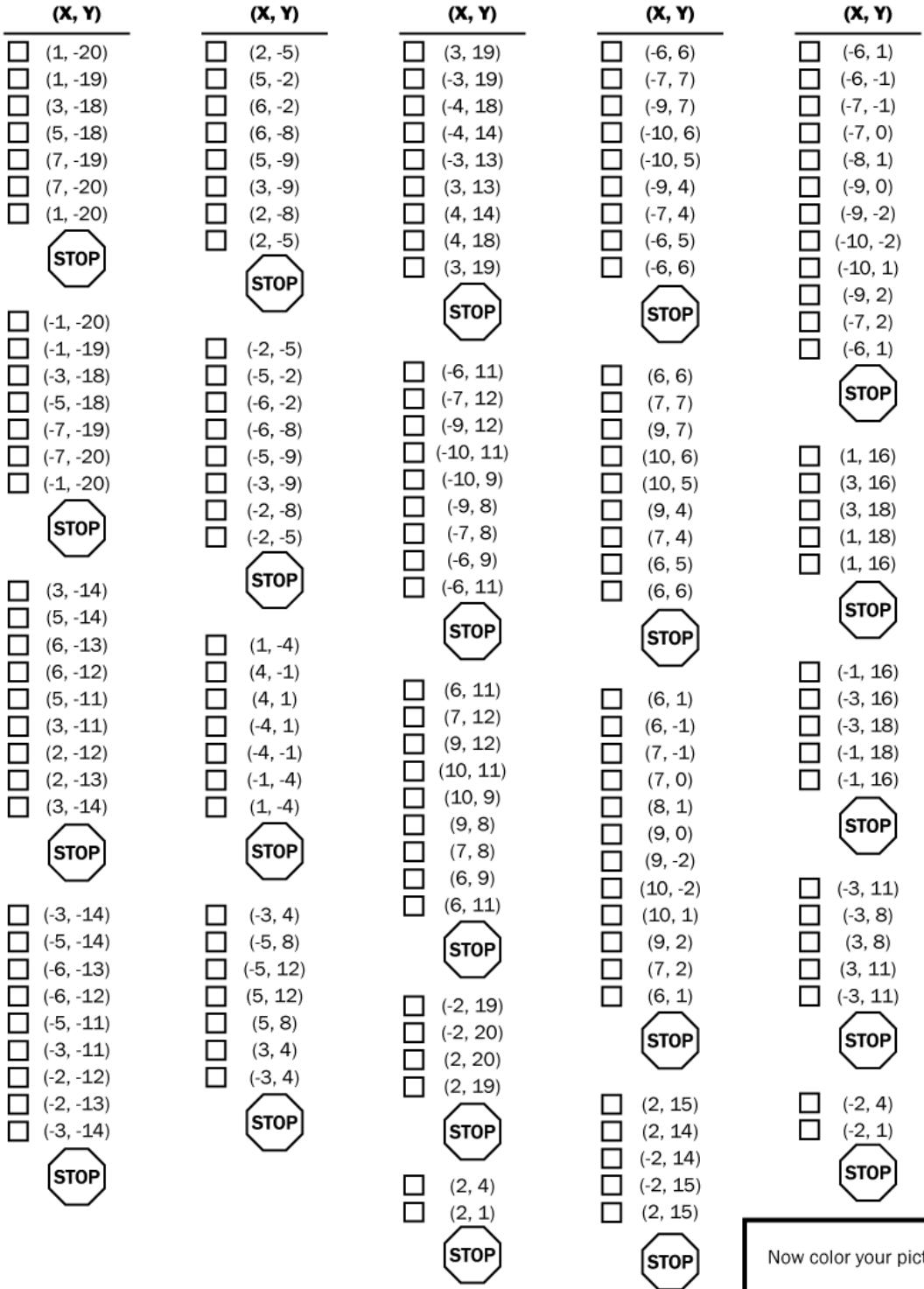
10. G _____ 11. Q _____ 12. N _____

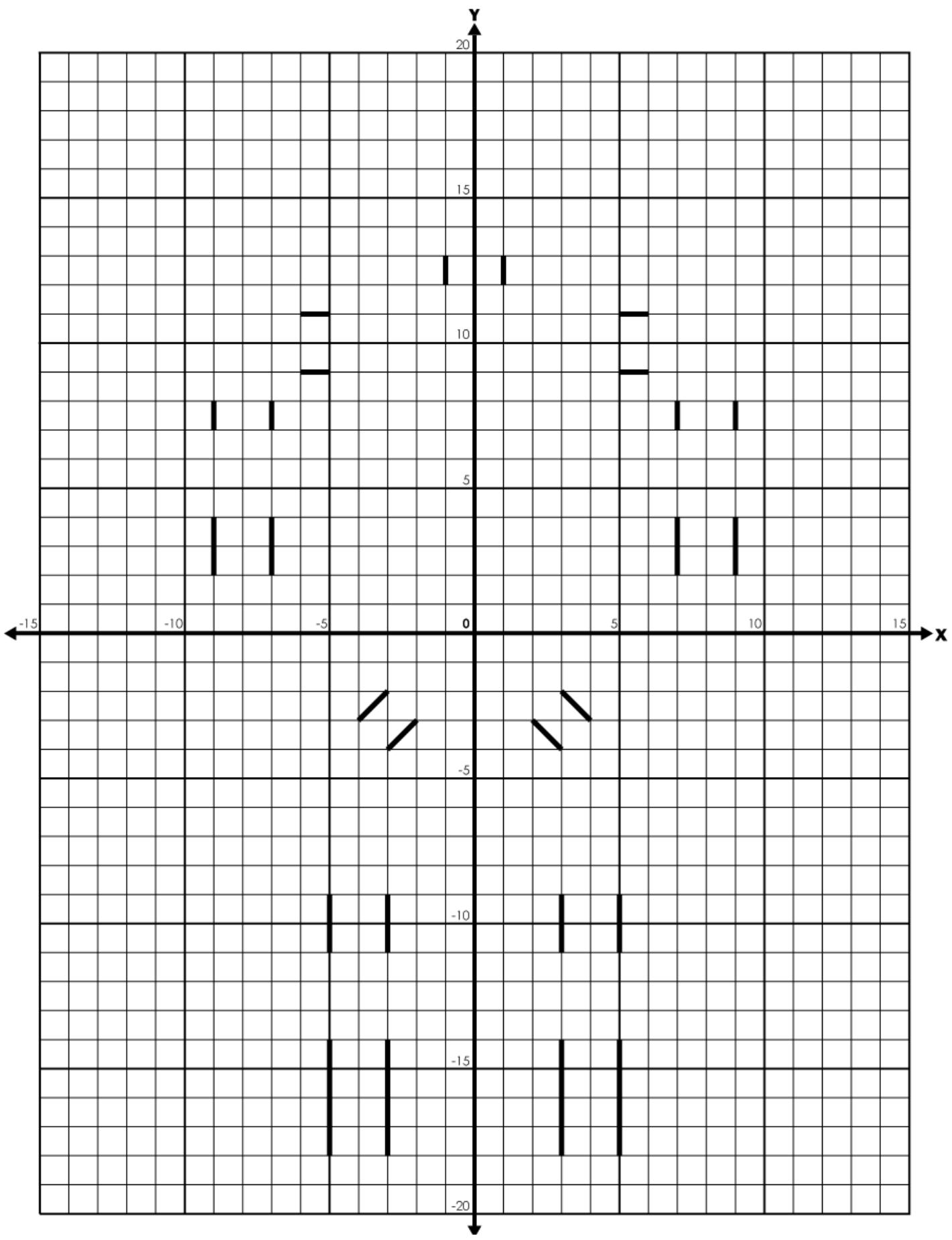
Plot the following points on the coordinate grid.

13. S (-6,-3) 14. T (2,-4) 15. U (5,8)

Complete the following by plotting each of the points below on the graph that follows. For each set you will need to plot each point and then connect the points in order to form a line. Stop where you are told to and start a new line for the next set of points.

NOTE: In each section, do NOT connect the last point back to first point.





Section 2.1 – Hypotheses and Sources of Data

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Part 1: Hypothesis

Hypothesis: The Pittsburgh Penguins are the most popular sports franchise.

Discuss the validity of this hypothesis:



How could this hypothesis be verified?

What is a hypothesis?....

A _____ is a theory or statement that is either true or false.

Practice making hypotheses about the relationship between each pair of variables :

1. The number of texts sent per day and the age of a person?

2. How much a person likes the Penguins and their IQ?

3. The size of an animal and its lifespan?

Part 2: Hypotheses and their Opposites

Write a hypothesis about a relationship between the variables in each pair. Then, give the opposite hypothesis.

4) A driver's age and the risk of having an accident

5) Homework completion and marks.

Part 3: Sources of Data

_____ : Original data that a researcher gathers specifically for a particular experiment or survey

_____ : Data that someone else has already gathered for some other purpose

6) Which of the following is a primary source of data:

- a)** an article in a magazine
- b)** a database
- c)** conducting an experiment to test the effectiveness of a new medication
- d)** an entry from an online encyclopedia

7) Which of the following is a secondary source of data:

- a)** conducting a survey amongst your classmates
- b)** conducting an experiment to study the effects of pollution
- c)** data collected 100 years ago by the Canadian government
- d)** counting the makes of cars in a mall parking lot

Explain whether each set of data is primary or secondary. What are the advantages and disadvantages of each person's choice of data source.

8) Daniel phoned 100 families in his town to ask them how many pets they owned:

9) Cathy used data from Statistics Canada to determine the proportion of households in Canada that have at least one car.

Section 2.2 – Sampling Principles

MPM1D

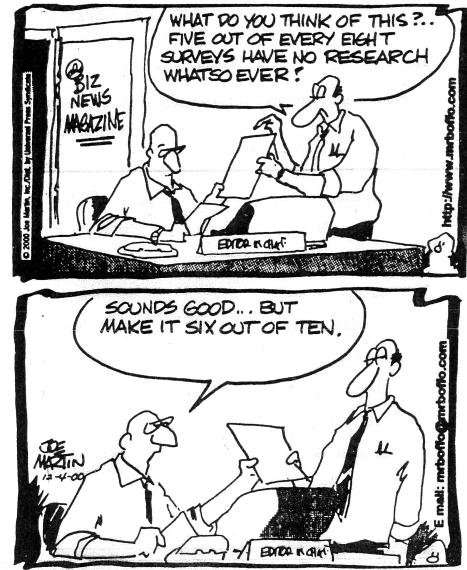
Part 1: Do It Now

King's Christian Collegiate wants to get a mascot for sporting events. They want the mascot to appeal to all of the students in the school. The school administration wants to ask student's what they want but they are unsure how to decide fairly. Should they:

- a) Ask all of the grade 9 students
- b) Let the first 100 students who arrive at school fill out a survey
- c) Ask 6 students from every period 1 class
- d) Ask all students whose last name starts with A,D, or Y
- e) Let Mr. Jensen decide, he will think of something awesome

Which one did you pick and why?

MISTER BOFFO By Joe Martin



Part 2: Definitions

Population:

Sample:

Census:

Why is the whole population not always surveyed when a hypothesis about the population is to be verified?

1) For which of the following is a sample suitable?

- a) Find the most common make of car in the school parking lot.
- b) Find your family's favourite food.
- c) Find the most popular video game among grade 9 students in your class.
- d) Find the favourite video game among grade 9 students in Canada.

Part 3: Types of Sampling

Random Sample:

Example:

Non-Random Sampling:

Example:

Part 4: Types of Random Sampling

Simple Random Sampling:

Example:

Systematic Random Sampling:

Example:

Stratified Random Sampling:

Example:

2) Classify the sampling technique used in each survey as simple random, systematic random, stratified random, or non-random sampling.

- a) The principal selects people that work in the cafeteria to interview about the quality of cafeteria food.
- b) A computer is programmed to randomly select 100 names from a club's membership list.
- c) Students are selected at random, with the number of students in each age group selected proportional to the size of the age group.
- d) To select 100 people who can buy concert tickets, the ticket agent randomly selects one wristband number and then every 10th number after that.

3) Hobson's Company surveyed its 2000 customers by generating 200 random numbers between 1 and 2000, and then selecting names from the customer list corresponding to these numbers. This is an example of:

- a) systematic random sampling
- b) non-random sampling
- c) stratified random sampling
- d) simple random sampling

4) Which of the following is not an example of random sampling?

- a) Use a random number generator to pick 10% of the players in each division of a hockey league.
- b) Use a randomly generated number between 1 and 10 to pick a name on a list, and then select every 8th person on the list.
- c) Ask every 10th person entering a mall for an opinion on government spending on health care.
- d) Write names on slips of paper, and then pick the names out of a hat, making sure the pieces of paper are well mixed.

5) Which of the following is a systematic random sample?

- a) A name is randomly selected from a list of a store's customers and every 10th person is selected before and after it.
- b) A Member of Parliament randomly selects phone numbers from a city directory to survey citizen's opinions on government taxation.
- c) The principal selects the same fraction of students from each class for a survey.
- d) The Human Resources department of Acme Manufacturing Company sends out surveys to 50 employees randomly selected from the entire list of employees.

Part 5: Bias

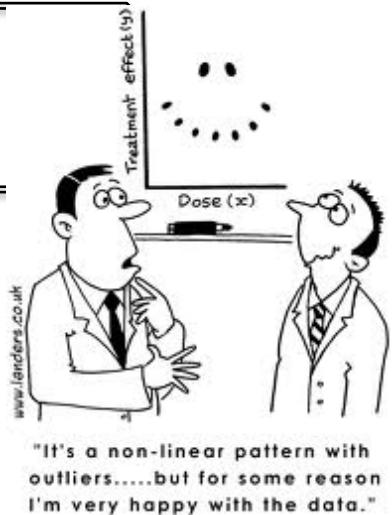
Bias:

6) A sample could be biased if it is:

- a) too small
- b) only based on one gender and age group
- c) not randomly drawn
- d) all of the above

Section 2.3/2.4 – Scatter Plots

MPM1D



Example:

Independent - time spent practicing free throws

Dependent - free throw percentage in games

Your free throw percentage **depends on** the amount of time you spend practicing free throws.

1)

| # of Hours John Studies | John's Test Score |
|-------------------------|-------------------|
| 0 | 75 |
| .5 | 80 |
| 1 | 85 |
| 1.5 | 90 |
| 2 | 95 |
| 2.5 | 100 |

How are they related?

Independent Variable:

Dependent Variable:

2)

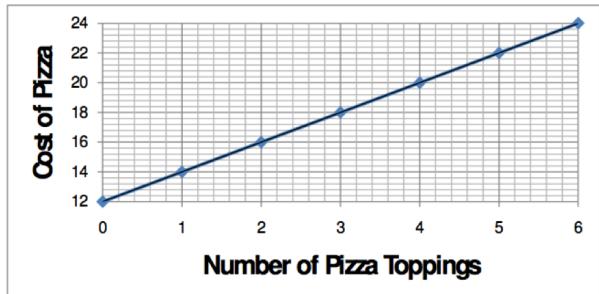
| Number of Guests | Meal Preparation Time (min) |
|------------------|-----------------------------|
| 3 | 25 |
| 4 | 33 |
| 5 | 41 |
| 6 | 49 |
| 7 | 57 |
| 8 | 65 |

Independent Variable:

Dependent Variable:

How are they related?

3)



Independent Variable:

Dependent Variable:

How are they related?

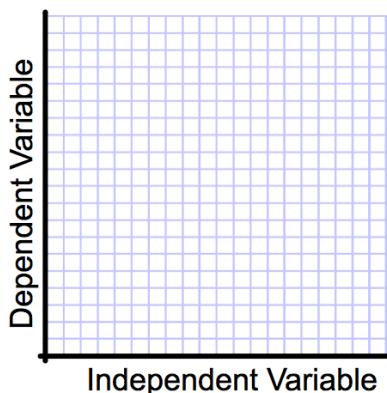
4) Now fill in the following chart using your understanding of each type of variable:

| Independent Variable | Dependent Variable |
|--------------------------------------|-------------------------|
| Number of gallons in your gas tank | |
| | Your IQ |
| Number of calories you eat each day | |
| | Your level of happiness |
| Number of hours you study for a test | |

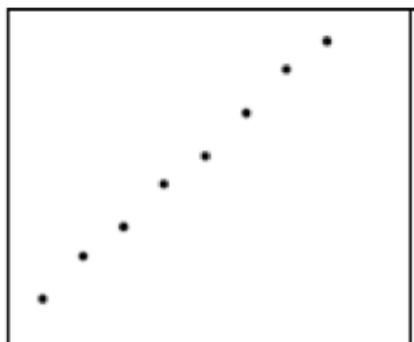
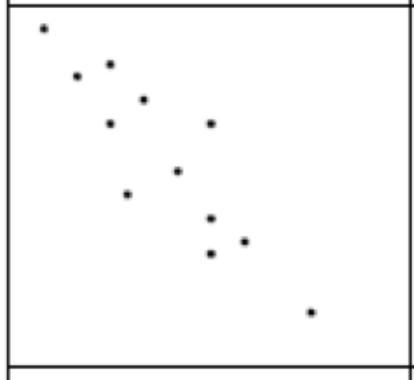
Part 2: Scatter Plots

A **Scatter plot** is a graph that shows the _____ between two variables.

The Independent variable goes on the horizontal (x) axis, and the dependent variable goes on the vertical (y) axis.



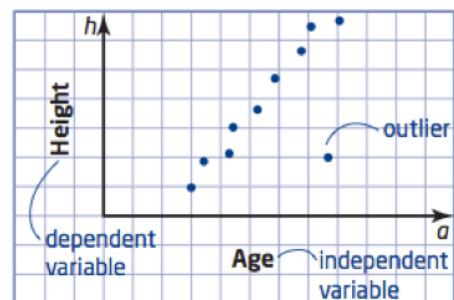
Types of Correlations:

| | |
|---|---|
|  | A scatter plot shows a _____ correlation when the pattern rises up to the right. <i>This means that the two quantities increase together.</i> |
|  | A scatter plot shows a _____ correlation when the pattern falls down to the right. <i>This means that as one quantity increases the other decreases.</i> |
|  | A scatter plot shows _____ correlation when no pattern appears. <i>Hint: If the points are roughly enclosed by a circle, then there is no correlation.</i> |

Correlations can also be _____ or _____ depending on how close or spread out the points on the scatter plot are.

Define an outlier:

When should you include an outlier in your data set?

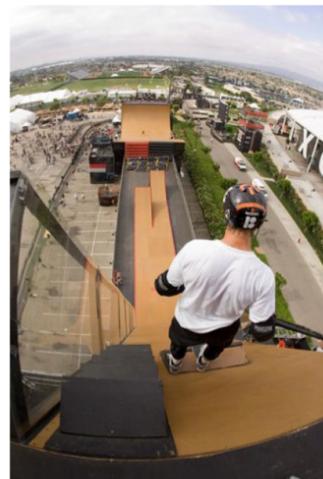
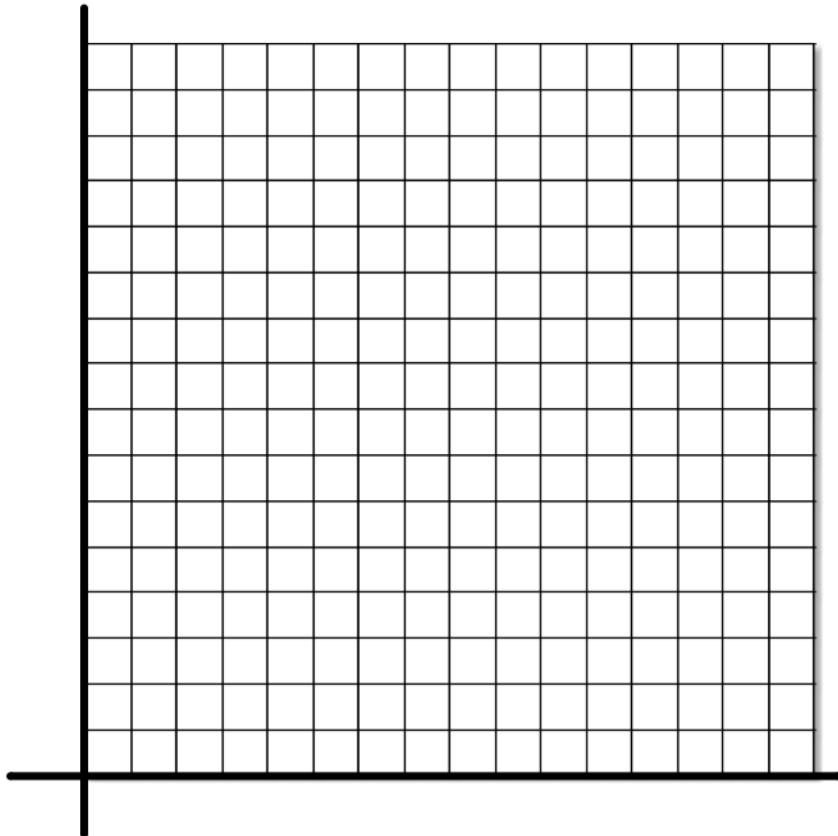


When shouldn't you?

Make a Scatter Plot

5) A skateboarder starts from various points along a steep ramp and coasts to the bottom. This table lists the initial height and his speed at the bottom of the ramp.

| | | | | | | | | |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Initial Height (m) | 2.0 | 2.7 | 3.4 | 3.8 | 4.0 | 4.5 | 4.7 | 5.0 |
| Speed (m/s) | 4.4 | 5.2 | 5.8 | 6.1 | 4.5 | 6.5 | 6.6 | 6.9 |



Independent Variable:

Dependent Variable:

Describe the relationship:

Are there any outliers? If so what are possible reasons for the outlier?

Part 3: Line of Best Fit

A line of best fit can help you see the relationship between variables and also to make interpolations and extrapolations.

Properties of a line of best fit:

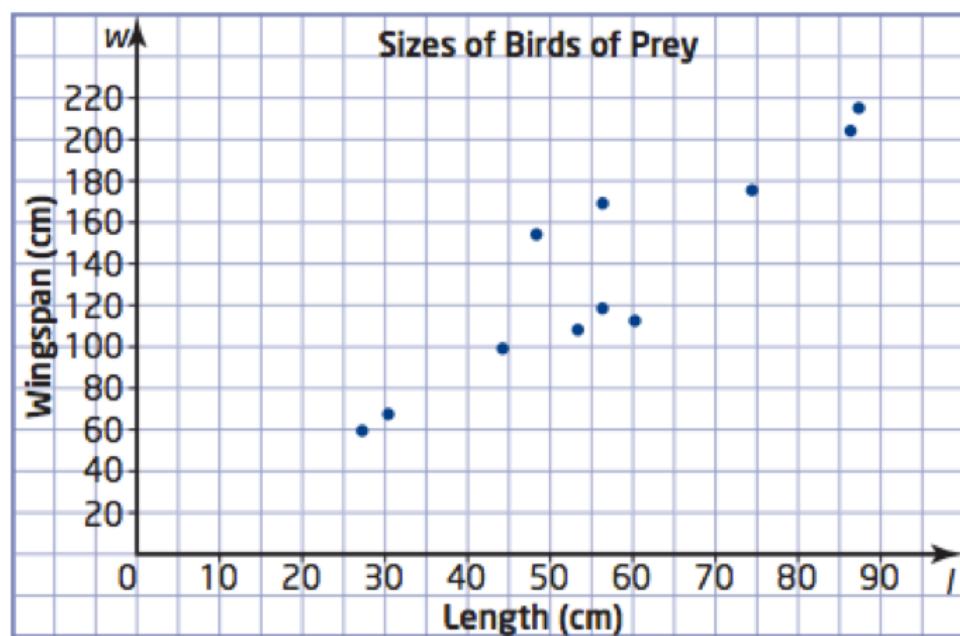
1.

2.

Interpolation:

Extrapolation:

Practice drawing a line of best fit:



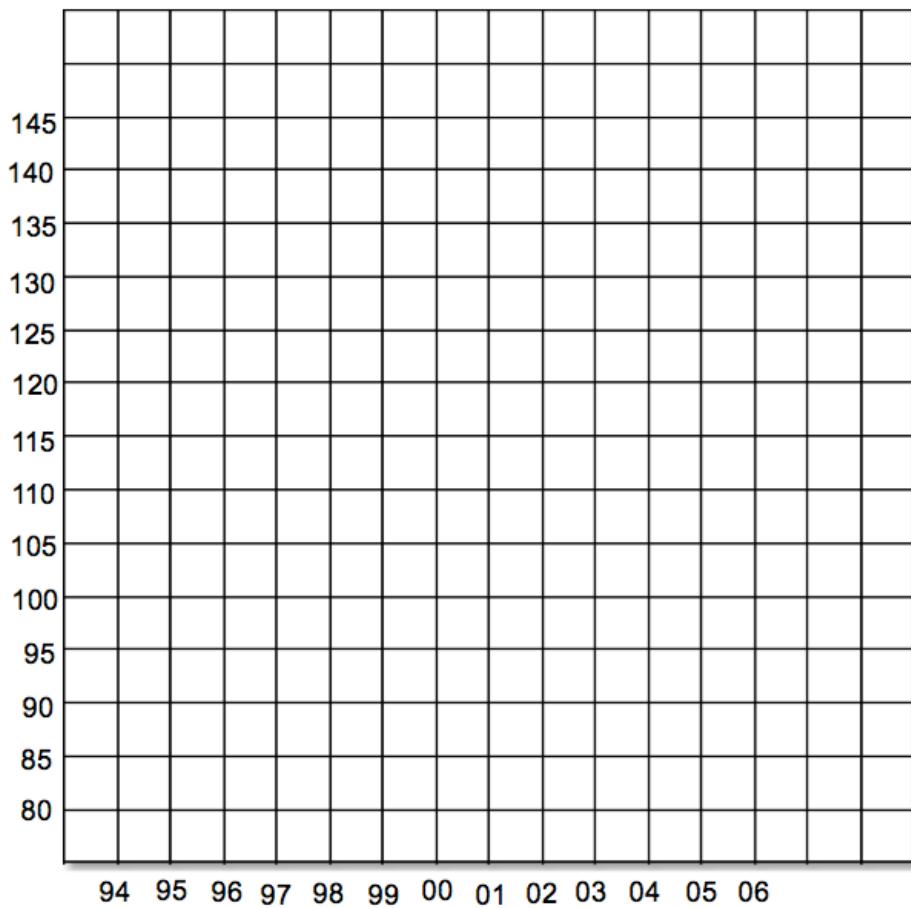
6) This table shows the number of paid movie admissions in Canada for 12-month periods.

| Fiscal Year | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|-----------------------|------|------|------|------|-------|-------|-------|---------|-------|-------|
| Attendance (millions) | 83.8 | 87.3 | 91.3 | 99.1 | 111.6 | 119.3 | 119.3 | no data | 125.4 | 119.6 |

Independent Variable:

Dependent Variable:

Graph the data and draw a line of best fit:



Describe the correlation:

There is no data for 2001, estimate the movie attendance for this year using your line of best fit?

Did you use interpolation or extrapolation to estimate this data?

Estimate the movie attendance for 2005 by extending your line of best fit:

Did you use interpolation or extrapolation to estimate this data?

Section 2.5 – Linear and Non-Linear Relationships

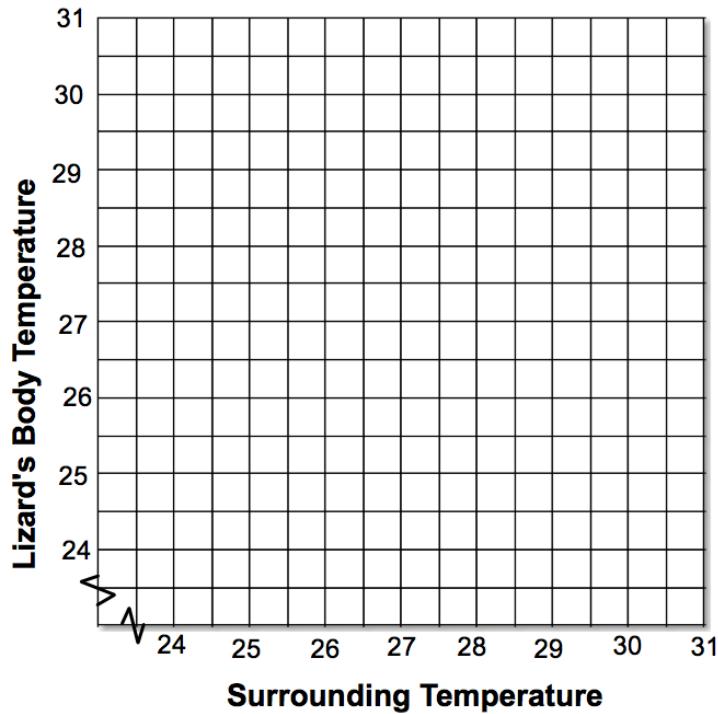
MPM1D

Part 1: Do It Now

The gymnophthalmid lizard lives in the Amazon rainforest. Recent research found that this lizard keeps its body temperature close to the temperature of its surroundings. The table lists data from this research.

| | | | | | | | | | | | | | |
|--------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Surrounding Temperature (°C) | 25.0 | 24.8 | 27.9 | 30.3 | 28.2 | 24.8 | 25.6 | 29.9 | 25.5 | 28.4 | 28.5 | 28.0 | 27.9 |
| Lizard's Body Temperature (°C) | 26.2 | 28.2 | 29.7 | 30.3 | 29.8 | 28.3 | 27.6 | 30.8 | 29.5 | 30.0 | 28.8 | 28.7 | 29.0 |

a) Graph the data



b) Draw a line of best fit

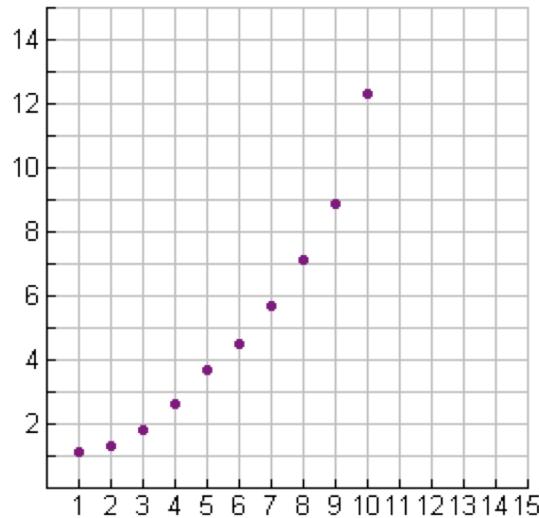
c) Estimate the lizard's body temperature if the surrounding temperature is 26°C. Is this interpolation or extrapolation?

d) Estimate the lizard's temperature if the surrounding temperature is 31 degrees Celcius. Is this interpolation or extrapolation?

Example 1:

A scatter plot of the following ten points is given below.

| | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| y | 1.1 | 1.3 | 1.8 | 2.6 | 3.7 | 4.5 | 5.7 | 7.1 | 8.9 | 12.3 |



Gandolf predicts that when x is 11, y will be 11.
Merlyn predicts that when x is 11, y will be 15.

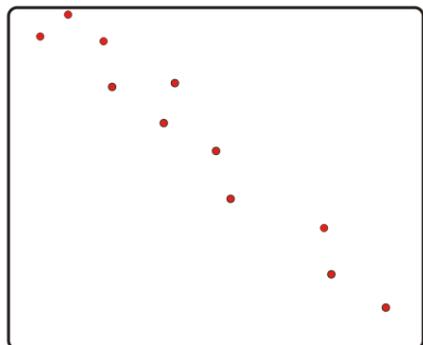
Who is correct? Why?

Many non-linear relations can be modeled with a _____ . You can draw curves of best fit using the same method as for a line of best fit. A curve of best fit should:

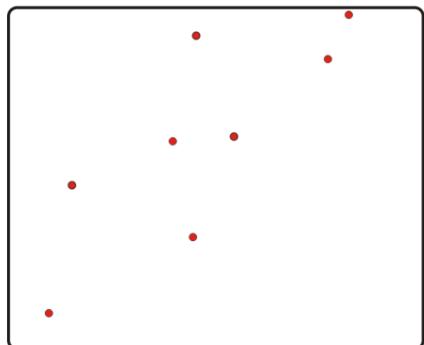
1. Pass through or close to as many points as possible,
2. Any points that are not on the curve should be distributed evenly above and below it.

Example 2: Describing Scatter Plots and Lines/Curves of Best Fit

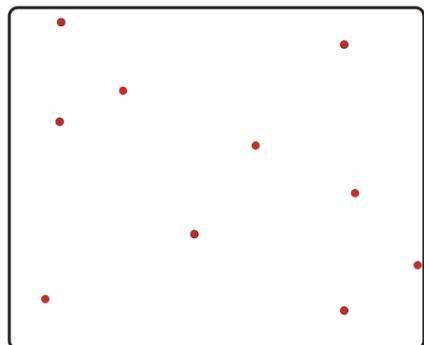
Draw a line or curve of best fit for each of the scatter plots below, if possible. Write two or three key words to describe each relation on the line below the scatter plot. (*positive relationship, negative relationship, no relationship, strong, weak, linear, non-linear*)



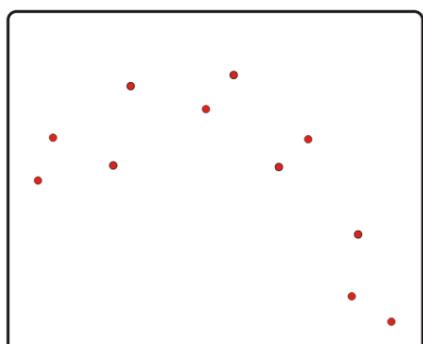
a) _____



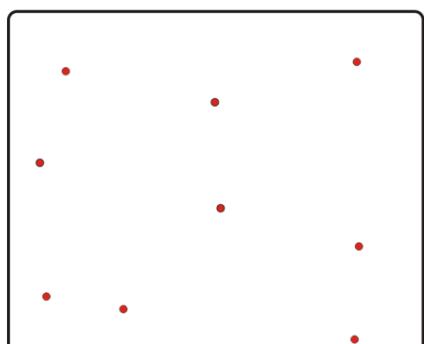
b) _____



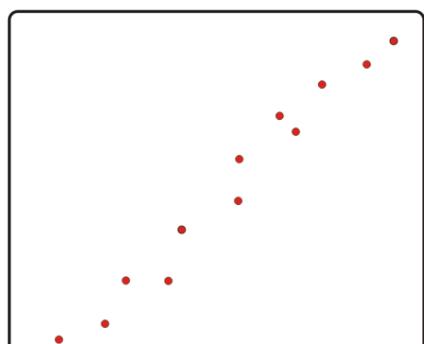
c) _____



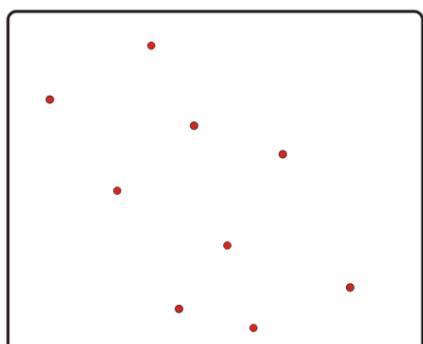
d) _____



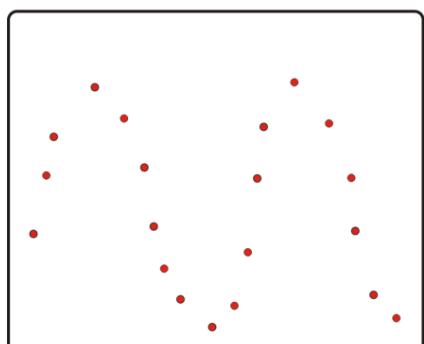
e) _____



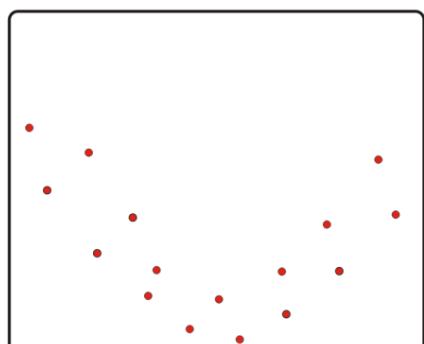
f) _____



g) _____



h) _____

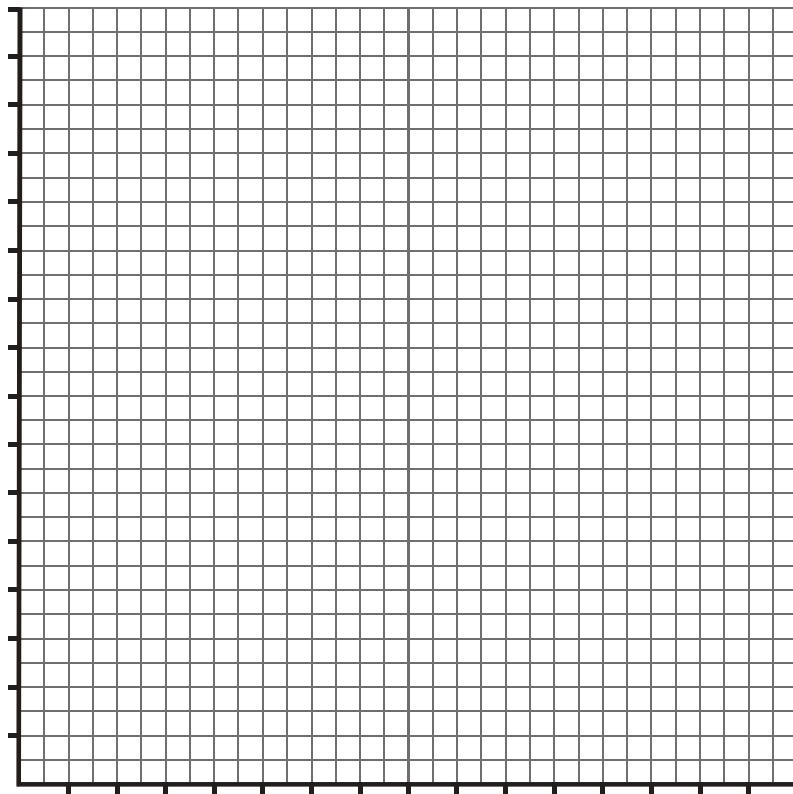


i) _____

Example 3: 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.

| Age | Earnings (\$) |
|-----|---------------|
| 25 | 22000 |
| 30 | 26500 |
| 35 | 29500 |
| 37 | 29000 |
| 38 | 30000 |
| 40 | 32000 |
| 41 | 35000 |
| 45 | 36000 |
| 55 | 41000 |
| 60 | 41000 |
| 62 | 42500 |
| 65 | 43000 |
| 70 | 37000 |
| 75 | 37500 |

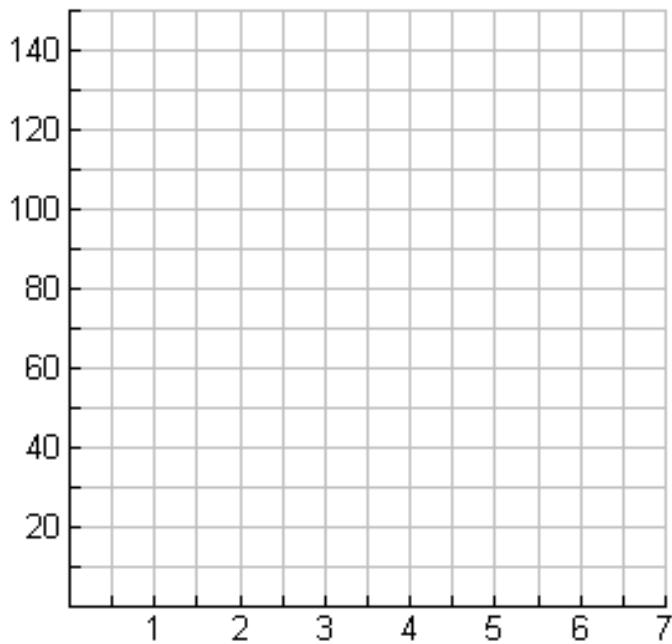


- a)** Draw a curve of best fit. Describe the trend in the data.
- b)** Does the data support the hypothesis? Give reasons to support your answer.
(Refer to the scatter plot.)
- c)** Explain why the data for ages over 65 do not correspond with the hypothesis.

Example 4: A skydiver jumps from an airplane. The distance fallen and time taken are recorded in the table.

| Time (s) | Distance (m) |
|----------|--------------|
| 0 | 0 |
| 1 | 5 |
| 2 | 19 |
| 3 | 42 |
| 4 | 74 |
| 5 | 115 |

- a) Draw a scatter plot of the relation and draw a line or curve of best fit.



- b) Classify the relation as linear or non-linear. Explain your choice.

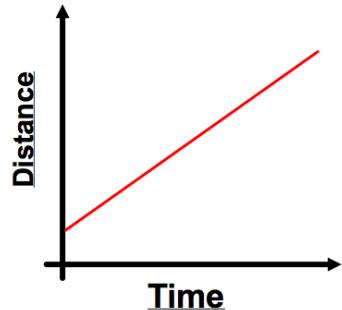
- c) How far will the skydiver have fallen in 3.5 s?

Section 2.6 – Distance Time Graphs

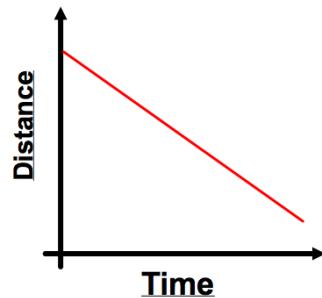
MPM1D

Part 1: Intro to Distance-Time Graphs

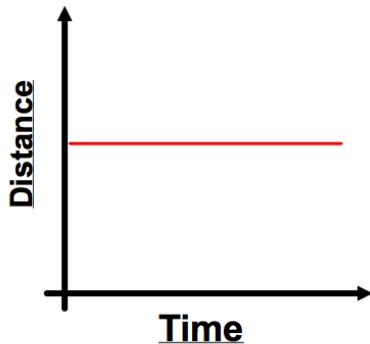
A *distance-time graph* shows an object's distance from a fixed point over a period of time. A rising line shows that distance from a point _____ as time increases.



A falling line shows that distance from a point _____ as time increases.



A horizontal line shows that distance from a point remains _____.



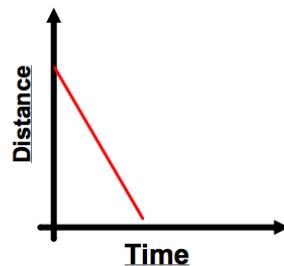
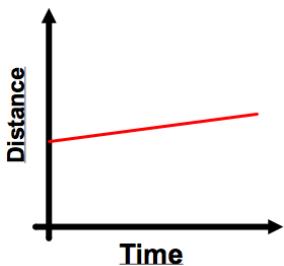
Part 2: Rate of Movement

The **speed** of a person affects the steepness of the graph.

The steeper the line is, the _____ the rate of movement.

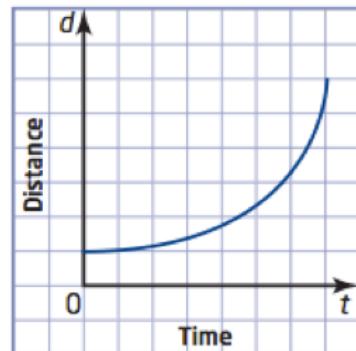
Remember:

Which graph represents slow movement? Which one represent fast movement?

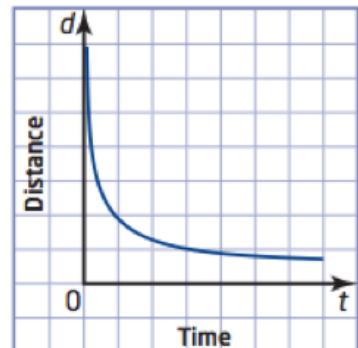


Changes of Rate of Movement

A curve may represent an increase in rate of movement
(_____)

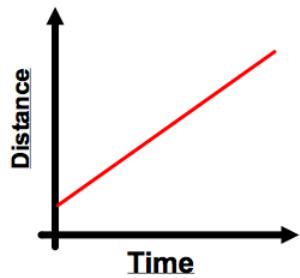


A curve may represent a decrease in rate of movement
(_____)



A straight line represents an object moving at a

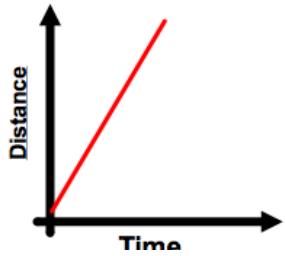
_____ or _____.



Part 3: Practice Describing Distance Time Graphs

1) A person walks in front of a motion sensor. Describe the motion that would produce each of the following graphs:

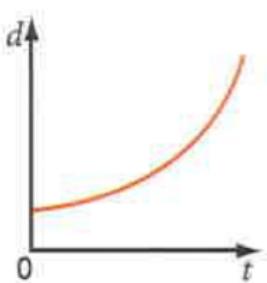
a)



b)



c)



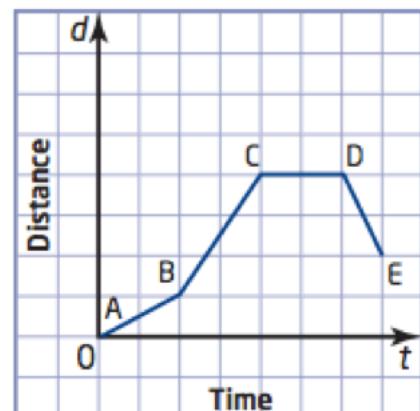
2) Describe the following graph that represents a person's distance from home over a period of time:

AB:

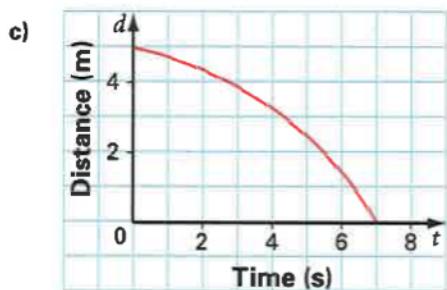
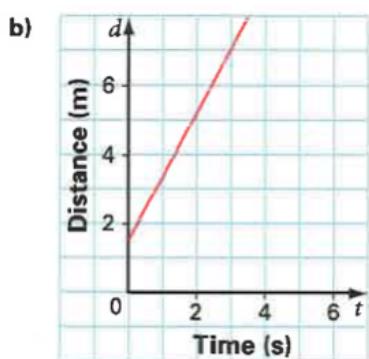
BC:

CD:

DE:

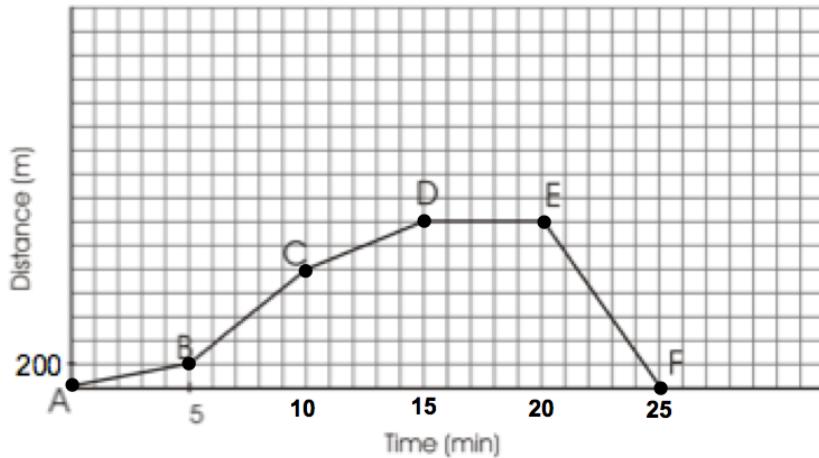


3) Describe the motion represented by each of the following graphs:





- 4) Chris walks each day as part of his daily exercise. The graph shows his distance from home as he walks his route.



Using the graph, give an explanation of what is occurring over Chris' walk. Include information about time, distance, direction and speed during each segment

AB:

BC:

CD:

DE:

EF:

Part 4: Creating a Distance Time Graph

- 5) Create a graph that shows Mr. Jensen's **distance from his own team's net** while he is playing hockey based on the following scenario:

Mr. Jensen starts with the puck in his own end and skates away from his net towards the other teams end at a steady pace. At center ice he gets the puck stolen from him. Mr. Jensen is furious and stops for a couple seconds to slam his stick on the ice in frustration. He then decides to chase down the guy who stole the puck from him. He accelerates back towards his own net and steals the puck. He then slams on the brakes and skates at a fast steady pace away from his net towards the other team's net. He is so fast that he gets a breakaway and scores (bar down of course).

