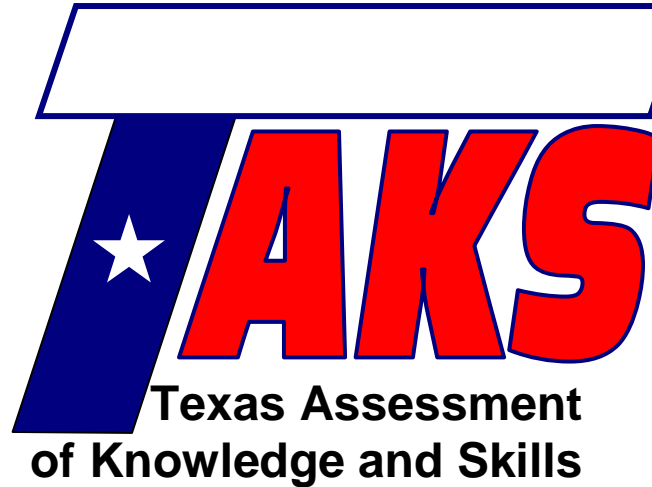


Student Name: _____

Date: _____

Contact Person Name: _____

Phone Number: _____



Exit Level Math Review

Lesson 5

Analyze and Interpret Graphs

TAKS Objective 2 – Demonstrate an understanding of the properties and attributes of functions

Lesson Objectives:

- Analyze a graph to describe a quantity over time
- Understand and determine the correlation of a scatterplot

Authors:

Tim Wilson, B.A.
Jason March, B.A., M.S.Ed

Editor:

Linda Shanks

Graphics:

Tim Wilson
Jason March

The Texas Assessment of Knowledge and Skills (TAKS) exit level exam covers ten learning objectives. These lessons are designed to teach math concepts specific to each objective as well as strategies to consider when approaching typical TAKS questions. To successfully complete the TAKS exit level exam, the student should be able to:

- 1) Describe functional relationships in a variety of ways.
- 2) Demonstrate an understanding of the properties and attributes of functions.
- 3) Demonstrate an understanding of linear functions.
- 4) Formulate and use linear equations and inequalities.
- 5) Demonstrate an understanding of quadratic equations and other nonlinear functions.
- 6) Demonstrate an understanding of geometric relationships and spatial reasoning.
- 7) Demonstrate an understanding of two- and three-dimensional representations of geometric relationships and shapes.
- 8) Demonstrate an understanding of concepts and uses of measurement and similarity.
- 9) Demonstrate an understanding of percents, proportional relationships, probability, and statistics in application problems.
- 10) Demonstrate an understanding of the mathematical processes and tools used in problem solving.

National PASS Center
Geneseo Migrant Center
3 Mt. Morris – Leicester Road
Leicester, NY 14481
(585) 658-7960
(585) 658-7969 (fax)
www.migrant.net/pass



Developed by the National PASS Center under the leadership of the National PASS Coordinating Committee with funding from the Region 20 Education Service Center, San Antonio, Texas, as part of the Mathematics Achievement = Success (MAS) Migrant Education Program Consortium Incentive project.

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TAKS Mathematics Chart



Length

Metric

1 kilometer = 1000 meters
1 meter = 100 centimeters
1 centimeter = 10 millimeters

Customary

1 mile = 1760 yards
1 mile = 5280 feet
1 yard = 3 feet
1 foot = 12 inches

Capacity and Volume

Metric

1 liter = 1000 milliliters

Customary

1 gallon = 4 quarts
1 gallon = 128 fluid ounces
1 quart = 2 pints
1 pint = 2 cups
1 cup = 8 fluid ounces

Mass and Weight

Metric

1 kilogram = 1000 grams
1 gram = 1000 milligrams

Customary

1 ton = 2000 pounds
1 pound = 16 ounces

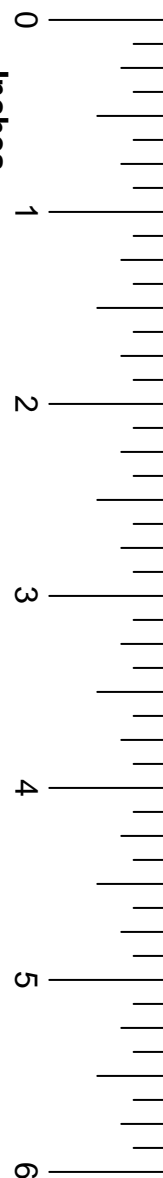
Time

1 year = 365 days
1 year = 12 months
1 year = 52 weeks
1 week = 7 days
1 day = 24 hours
1 hour = 60 minutes
1 minute = 60 seconds

TAKS Mathematics Chart

Perimeter	Rectangle	$P = 2l + 2w$ or $P = 2(l + w)$
Circumference	Circle	$C = 2\pi r$ or $C = \pi d$
Area	Rectangle	$A = lw$ or $A = bh$
	Triangle	$A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$
	Trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$ or $A = \frac{(b_1+b_2)h}{2}$
	Regular polygon	$A = \frac{1}{2}aP$
	Circle	$A = \pi r^2$
P represents the perimeter of the base of a three-dimensional figure.		
B represents the area of the base of a three-dimensional figure.		
Surface Area	Cube (total)	$S = 6s^2$
	Prism (lateral)	$S = Ph$
	Prism (total)	$S = Ph + 2B$
	Pyramid (lateral)	$S = \frac{1}{2}Pl$
	Pyramid (total)	$S = \frac{1}{2}Pl + B$
	Cylinder (lateral)	$S = 2\pi rh$
	Cylinder (total)	$S = 2\pi rh + 2\pi r^2$ or $S = 2\pi r(h + r)$
	Cone (lateral)	$S = \pi rl$
	Cone (total)	$S = \pi rl + \pi r^2$ or $S = \pi r(l + r)$
	Sphere	$S = 4\pi r^2$
Volume	Prism or Cylinder	$V = Bh$
	Pyramid or Cone	$V = \frac{1}{3}Bh$
	Sphere	$V = \frac{4}{3}\pi r^3$
Special Right Triangles	30°, 60°, 90°	$x, x\sqrt{3}, 2x$
	45°, 45°, 90°	$x, x, x\sqrt{2}$
Pythagorean Theorem		$a^2 + b^2 = c^2$
Distance Formula		$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Slope of a Line		$m = \frac{y_2 - y_1}{x_2 - x_1}$
Midpoint Formula		$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$
Quadratic Formula		$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Slope-Intercept Form of an Equation		$y = mx + b$
Point-Slope Form of an Equation		$y - y_1 = m(x - x_1)$
Standard Form of an Equation		$Ax + By = C$
Simple Interest Formula		$I = prt$

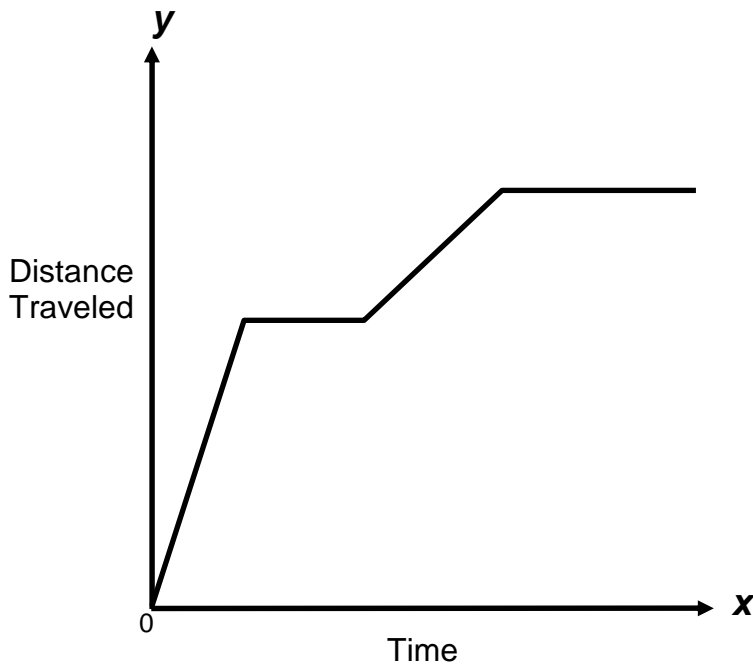
Inches



To progress as a learner of math, you must analyze graphs more completely.

Example

Amelia drove from her house to the grocery store to buy milk. The graph below shows the distance she traveled in terms of the amount of time since she left home. What is a reasonable interpretation of the graph?



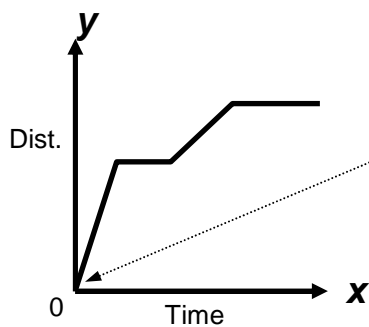
FACT

This is a graph of Amelia's speed because it shows the change in distance over time.



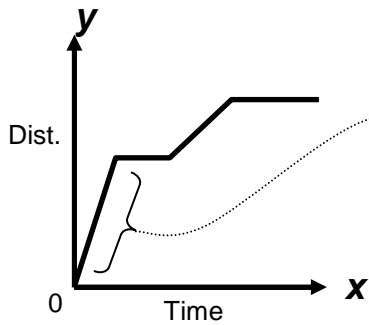
Solution

Read the graph from left to right. We will talk about the graph in segments. What you should write to answer the question is in bold. The paragraph below explains the answer.



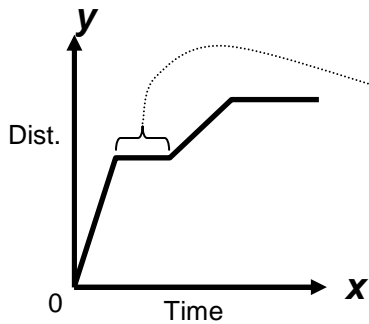
The graph starts at the point (0,0).

(0,0) is this point. When she starts, Amelia has traveled no distance. Starting time is always set at zero, even if the time on a clock is 2 pm.



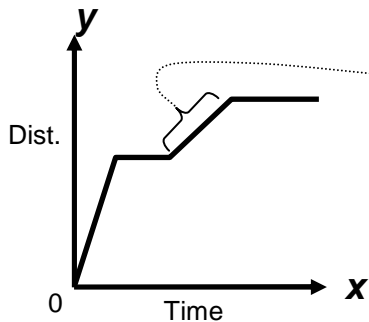
Amelia then drove at a constant speed away from her house.

Since the line goes up from left to right, we say her distance is increasing. Because it is a straight line segment, the rate or speed is constant.



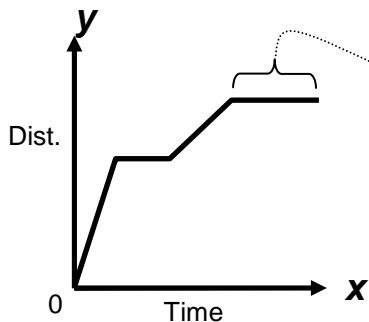
Next, Amelia stopped the car.

The second line segment is flat. This shows that the distance from her house is not changing – she must be stopped.



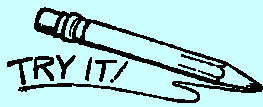
Amelia then drove again at a constant speed, but more slowly than before.

The straight upward tilt of the 3rd line segment shows a constant speed away from the house, just as before. This segment is less steep than the first. That indicates a slower speed than before. The steepness of a line is called its **slope**. We will learn more about slope later.

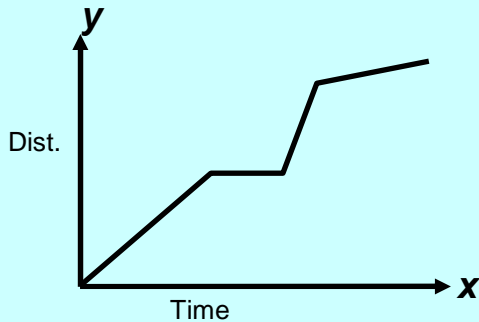


Finally, Amelia reaches the grocery store and stops her car.

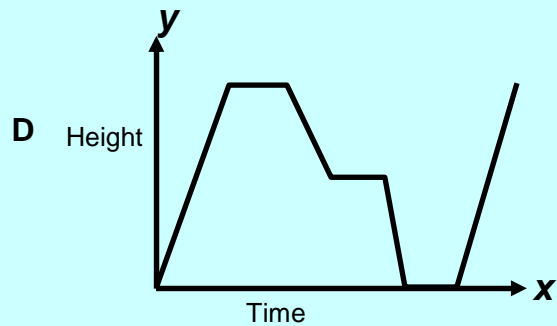
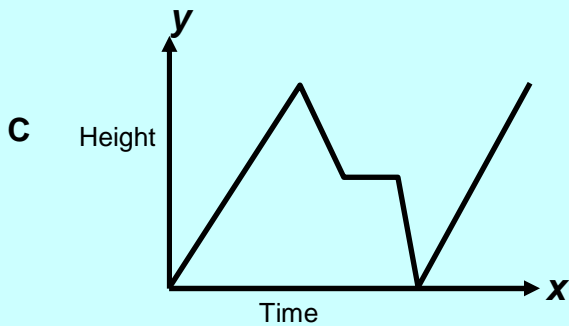
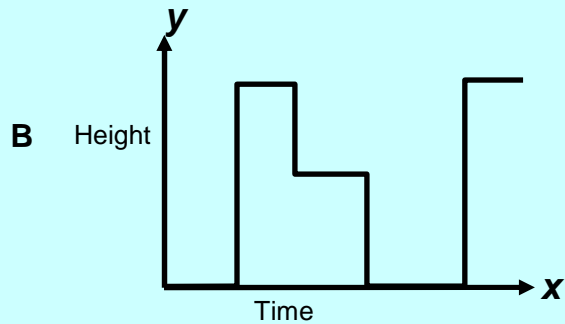
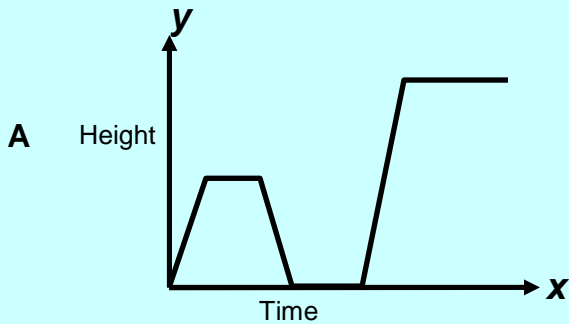
Again, the flat line segment shows that her car is stopped. Also, since this segment is longer than the second segment, she was stopped for more time than before.



- 1) Pablo walks to school. The graph below shows the distance he travels as a function of time. Using words, give a reasonable interpretation of the graph.

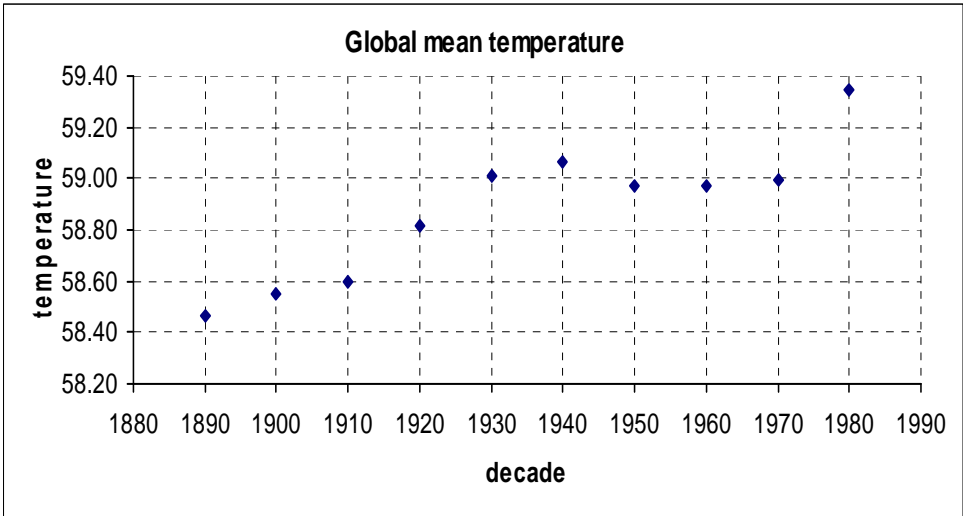


- 2) Eugene fills a cylindrical glass full of milk. He drinks the milk at a constant rate until half the original milk is left. After a short period of time, he accidentally spills the rest of the milk. Then, Eugene refills the glass with milk. Which graph best represents the height of milk in the glass as a function of time?



You must be able to read and analyze many types of graphs.

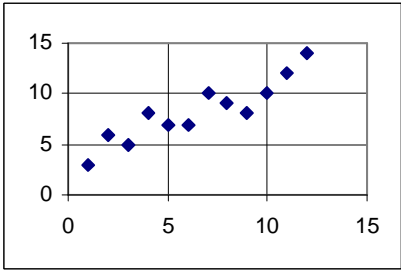
A **scatterplot** is a graph of two sets of data. It shows whether they are related or not.



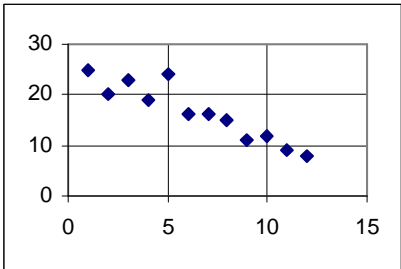
Notice in the above scatterplot:

- Two sets of data are being graphed: decade and global temperature.
- Following the graph from left to right, the data points generally move up.
- As time increases, so does the global temperature.
 - This shows a **positive correlation**.

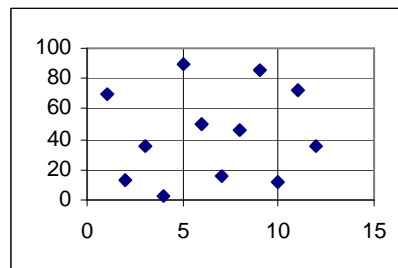
From left to right, if data generally moves up, it shows a **positive correlation**.



From left to right, if data generally moves down, it shows a **negative correlation**.

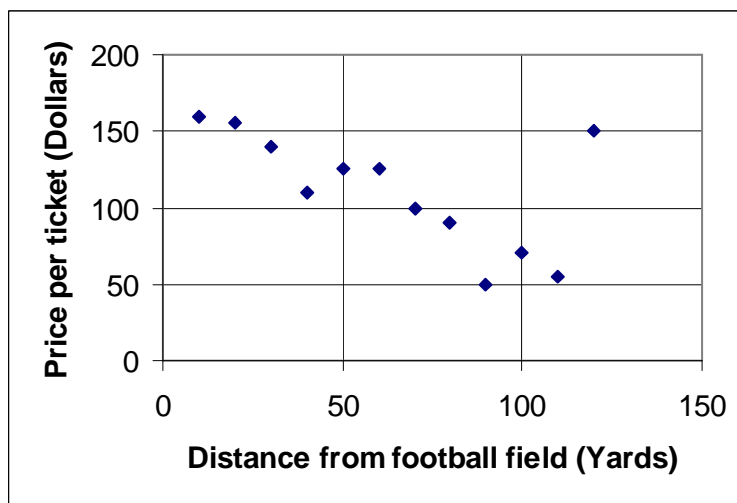


From left to right, if data follows no pattern, it shows **no correlation**.



Example

The scatterplot compares the distance a seat is from the field at a football game, to the ticket price of that seat.



Which is the best conclusion based on this scatterplot?

- A 120 yards from the field, the price per ticket is \$150.
- B The price per ticket increases as the distance from the field does.
- C The data shows a negative correlation between the price per ticket and the distance from the football field.
- D The independent variable is the price per ticket.

Solution

With any multiple choice question, you must first read all the answers. Notice the question asks you to find the **best** conclusion. This means there may be more than one correct answer listed, but one is a more complete answer. Let's consider each answer choice.

- A** 120 yards from the field, the price per ticket is \$150

Observing the graph, we see that there is one data point that agrees with this answer choice. Choice A is not false. However, the object of a scatterplot is to show a correlation between many data points. Perhaps there is a better answer.

- B** The price per ticket increases as the distance from the field does.

This is false. From left to right, we see that the ticket price goes down as the distance from the field increases.

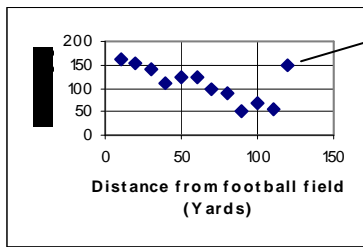
- C** The data shows a negative correlation between the price per ticket and the distance from the football field.

This is true; the data shows a negative correlation. Also, this is a very good conclusion, because a scatterplot is supposed to point out a correlation (or a lack of one). This choice is probably the best conclusion, but let's be certain by comparing it to the other choices.

- D** The independent variable is the price per ticket.

This is false; the independent variable is the data graphed on the x-axis.

From our observations, though choices **A** and **C** are correct, choice **C** is the best conclusion. The correct answer is choice **C**.



This point is an **outlier**.

An **outlier** is a data point that does not fit the general data trend.

In general, a correlation may still exist if there are only one or two outlier points. Perhaps people who paid this ticket price had an expensive luxury suite.

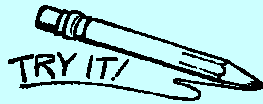
TRY IT!

Write either **positive correlation**, **negative correlation**, or **no correlation**, depending on the correlation of the scatterplot shown.

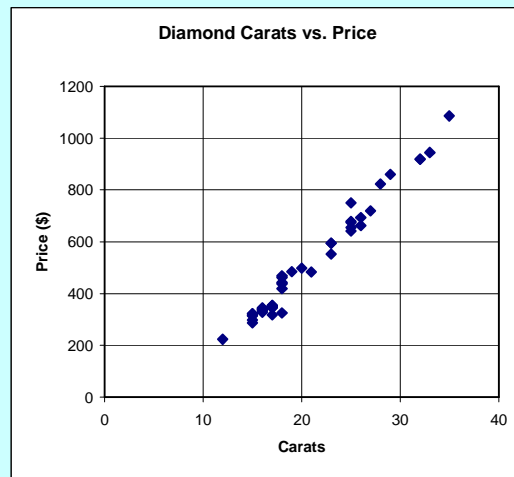
3)

4)

5)



- 6) A jewelry store records the number of carats of each of their diamonds. The scatterplot below shows the relationship between the number of carats a diamond weighs and its price. Based on the graph, choose the best conclusion.



- A The graph shows a positive correlation between the number of carats and the price of a diamond.
- B You cannot buy a diamond less than ten carats.
- C The graph shows no correlation.
- D The number of carats depends on the price.

 **Review****Know these concepts:**

1. A graph of a straight line segment indicates a constant rate of change.
 - a. A flat line segment indicates no rate of change.
 - b. A steeper line segment, up or down, indicates a greater rate of increase or decrease, respectively.
2. When graphing something over time, time equals zero at the starting point, regardless of what a clock reads.
3. A scatterplot graphs two sets of data to look for a possible correlation.
 - a. From left to right, data that generally moves:
 - i. up – shows a positive correlation
 - ii. down – shows a negative correlation
 - iii. in no pattern – shows no correlation
4. If a question asks you to choose the best answer, there may be more than one correct answer choice. You must read each choice carefully and decide which is the most complete.

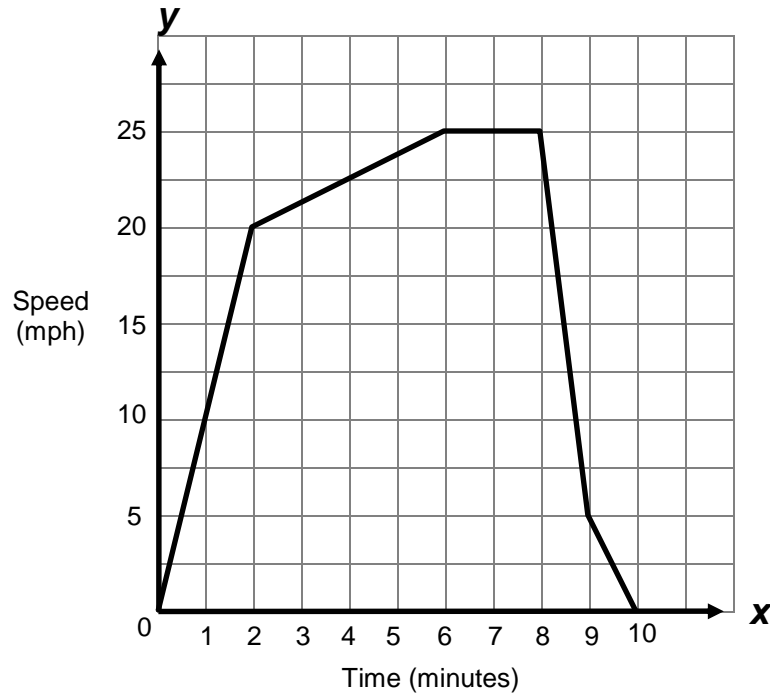


Practice Problems

Lesson 5

Directions: Write your answers in your math journal. Label this exercise
TAKS Review – Lesson 5.

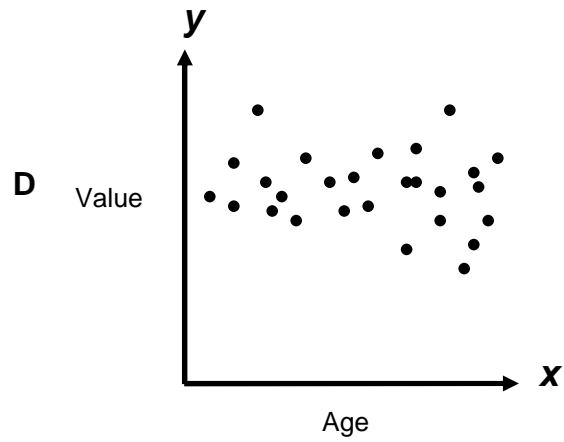
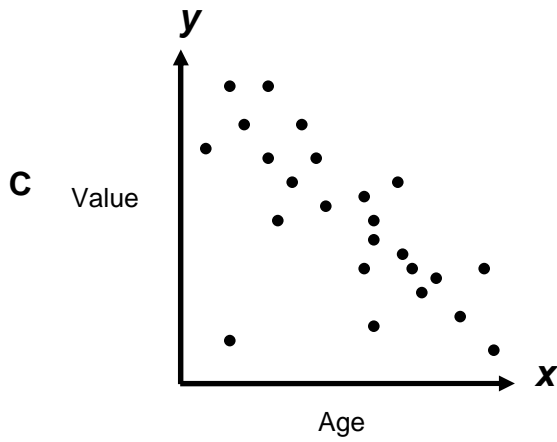
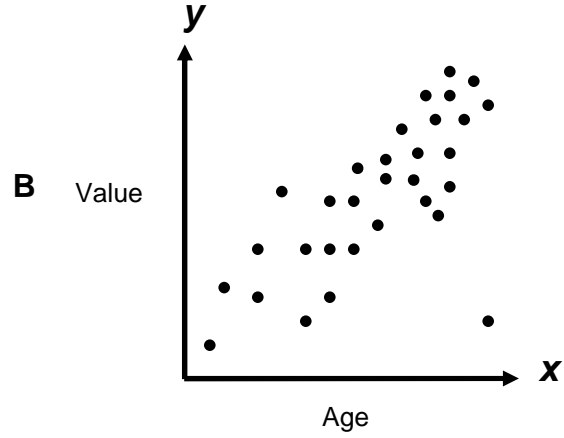
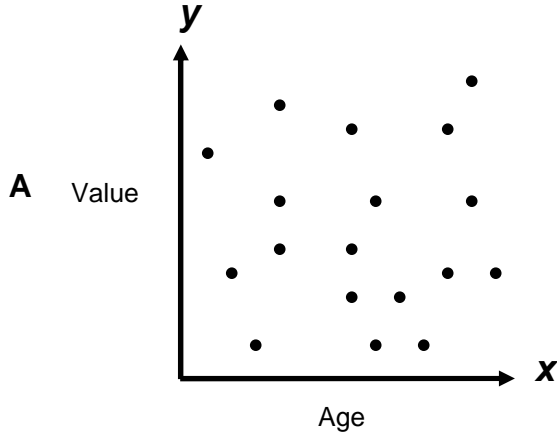
- 1) The graph below shows the speed of a bicyclist over a ten minute bike ride



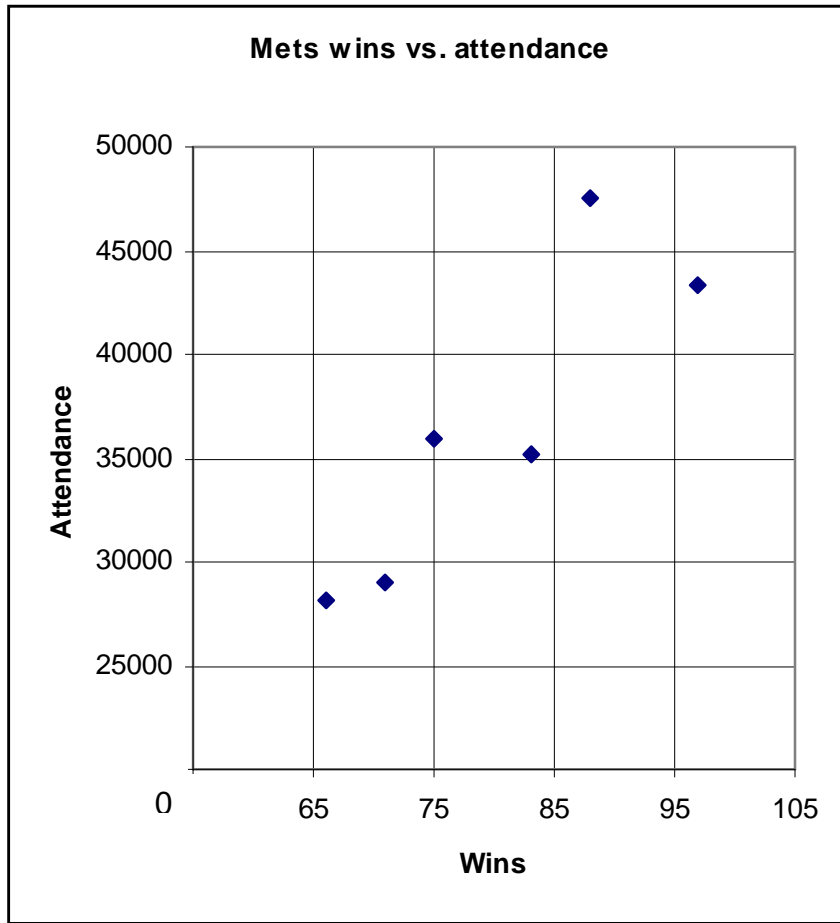
What can be inferred from this graph?

- A** In the fourth minute, the bicyclist is traveling at a constant 22.5 mph.
- B** Between minutes 6 and 8, the bicyclist stops for a rest.
- C** Between the eighth and ninth minute, the bicyclist slows at a constant rate from 25 mph to 5 mph.
- D** The bicyclist travels 25 miles round trip.

2) As the age of a computer increases, its value decreases. Which scatterplot best represents this relationship?



3) Which is the best conclusion based on the scatterplot below?



- A There is no correlation between winning games and attendance.
- B There is a negative correlation between winning games and attendance.
- C There is a positive correlation between winning games and attendance.
- D High attendance caused the Mets to win more games.

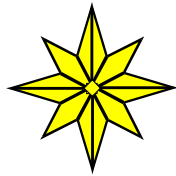


ANSWERS TO
TRY IT

- 1) Pablo begins from a stop. He then walks at a constant rate. Next, he stops for a short period of time. Then he begins walking again, but faster than before. Finally, without stopping, he slows down, continuing to walk.
- 2) **D**
- 3) positive correlation
- 4) negative correlation
- 5) no correlation
- 6) **A**

TAKS Review

NOTES



End of Lesson 5