

warm up: KEYSTONE # 7, 8

- ① A polynomial expression is shown below.

$$(mx^3 + 3)(2x^2 + 5x + 2) - (8x^5 + 20x^4)$$

The expression is simplified to $8x^3 + 6x^2 + 15x + 6$.
What is the value of m ?

- A. -8
- B. -4
- C. 4
- D. 8

Simplify:

$$\frac{-3x^3 + 9x^2 + 30x}{-3x^3 - 18x^2 - 24x}; \quad x \neq -4, -2, 0$$

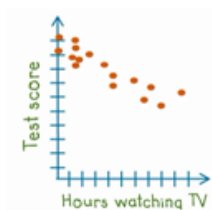
- A. $-\frac{1}{2}x^2 - \frac{5}{4}x$
- B. $x^3 - \frac{1}{2}x^2 - \frac{5}{4}x$
- C. $\frac{x+5}{x-4}$
- D. $\frac{x-5}{x+4}$

⑧

Line of Best Fit

<https://learnzillion.com/lessons/1203-draw-a-line-of-best-fit>

Essential question: How do you use observed data to predict unobserved data?



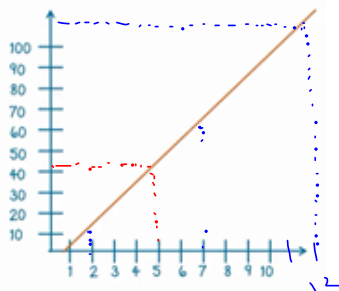
What general observation can you make from the data plotted here?

as TV watching increases, test scores decrease

Objective:

In this lesson, you will learn how to interpret scatterplots by identifying the line of best fit.

Let's Review



- 1) What is the value of y when $x = 7$? 65
- What is the value of y when $x = 2$? 15
- What is the value of y when $x = 12$? 120
- What is the value of x when $y = 45$? 5

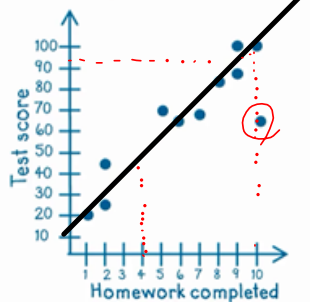


- 2) A common mistake when identifying the line of best fit is letting the outlier have too much influence on the line of best fit.

Definition: An outlier something that is out of the ordinary.

- 3) When drawing the line of best fit, it is important that the points be as close to the line as possible, with the exception of the outliers.

Core Lesson



4) Draw in the line of best fit.

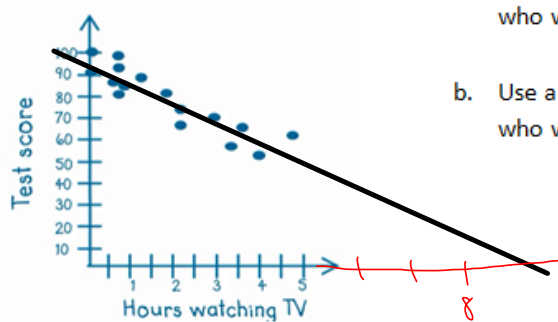
5) What are we going to do with the line of best fit?

Use the line to make a prediction of something I did not observe based on the information of something that I did observe.

- Predict the test score for a student who completed only 4 homework assignments. Score = 45.
- Predict the score for a student who does all 10 HW assignments. Score = 76.
- Does this mean that doing all of your homework guarantees you a high test score?

No, this is a predicted score based on our linear model.

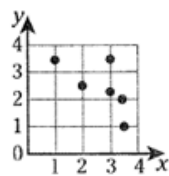
Core Lesson



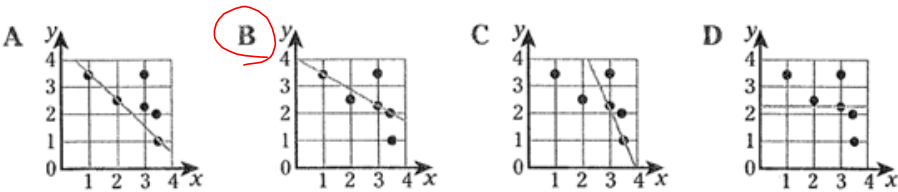
6) try these:

- Use a line of best fit to predict the test score of a student who watches 2.5 hours of TV. Score = 70.
- Use a line of best fit to predict the test score of a student who watches 8 hours of TV. Score = 20.

7) A set of data points is shown below.

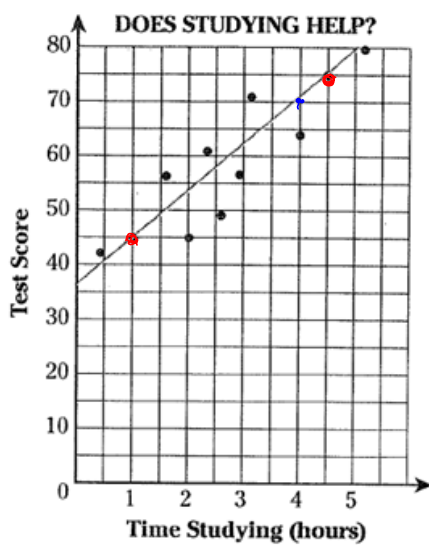


Which graph shows a line that best fits the data?



Core Lesson

Finding an equation of the line of best fit



8) Write a linear equation to model this data.

a. The line of best fit passes through many points.

Pick two:

$$(1, 45) \quad (4.5, 75)$$

$x_1 \quad y_1$

b. Find the slope using these points:

$$m = \frac{30 \text{ points}}{3.5 \text{ hours}} = \frac{60}{7}$$

c. Use point-slope form to write the equation:

$$y - 45 = \frac{60}{7}(x - 1)$$

d. What grade does the model predict for a student who studies or 4 hours?

$$y = \frac{60}{7}(x - 1) + 45$$

$$y = \frac{60}{7}(4 - 1) + 45 = 70.7$$

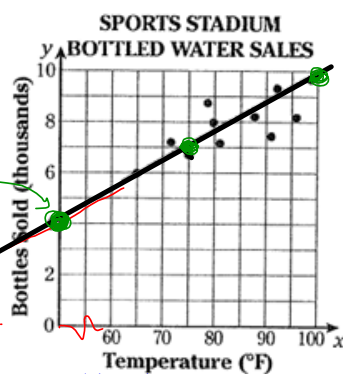
A student studies about
4 hours is expected to score about 71.

$$y - y_1 = m(x - x_1)$$

Try this:

The scatter plot shows the relationship between the average temperature at a sports stadium and bottled water sales. Which of the following is the equation of the line of best fit?

- ☒ A $y = 0.11x - 1.15$
☐ B $y = 0.11x + 1.15$
☒ C $y = 9.17x - 9.98$
☒ D $y = 9.17x + 9.98$



$x_1 \ y_1$
 $(75, 7)$
 $x_2 \ y_2$
 $(100, 10)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{10 - 7}{100 - 75} = \frac{3}{25} = .12$$

$$y - y_1 = m(x - x_1)$$

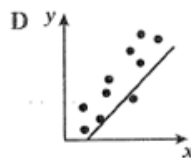
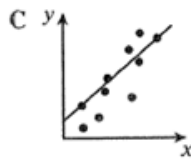
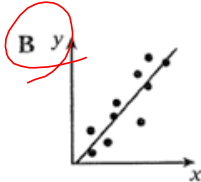
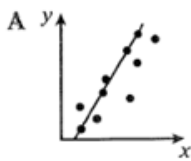
$$y - 7 = .12(x - 75)$$

$$y - 7 = .12x - 9$$

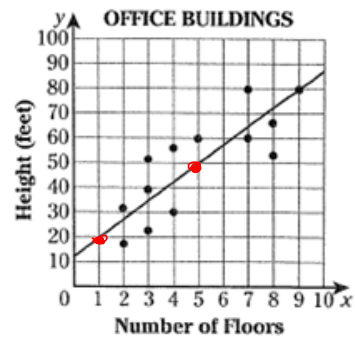
$$y = .12x - 2$$

Read each problem. Circle the letter of the best answer.

1. Which scatter plot shows a line of best fit?



2. The scatter plot below shows the relationship between the heights of office buildings downtown and the number of floors in each office building.



Which equation best represents the line of best fit for this data?

A $y = \frac{2}{15}x + 12.5$

B $y = \frac{3}{4}x + 12.5$

C $y = \frac{4}{3}x + 12.5$

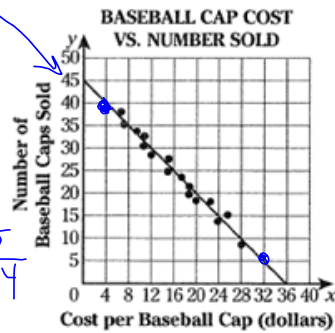
D $y = \frac{15}{2}x + 12.5$

$(5, 50) \quad (9, 80)$

$m = \frac{30}{4} = \frac{15}{2}$

Read each problem. Circle the letter of the best answer.

3. The scatter plot below shows how the number of baseball caps sold each day at a tourist shop is related to the cost per baseball cap.



Which equation **best** describes the line of best fit?

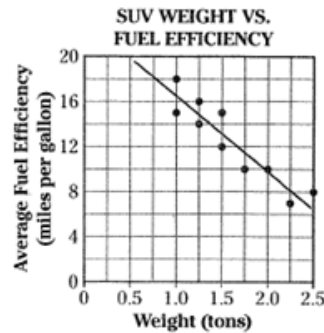
~~A~~ $y = -\frac{4}{5}x + 36$

~~B~~ $y = -\frac{4}{5}x + 45$

C $y = -\frac{5}{4}x + 36$

D $y = -\frac{5}{4}x + 45$

4. The scatter plot below shows the relationship between the weight in tons of an SUV and the SUV's average fuel efficiency in miles per gallon.



Which equation models the line of best fit?

A $y = 0.15x + 2.7$

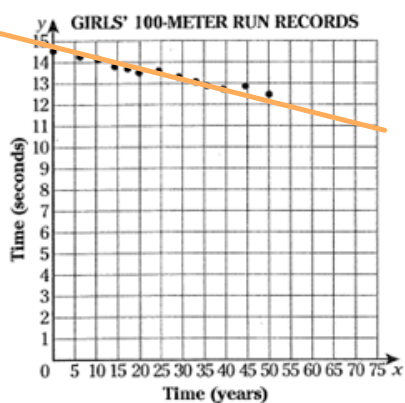
B $y = -0.15x + 2.7$

C $y = 6.7x + 23$

D $y = -6.7x + 23$

Read the problem. Circle the letter of the best answer.

5. The scatter plot below shows how the school record in the girls' 100-meter run has changed over a period of 50 years.



Lily drew the line of best fit on the scatter plot. Which equation **best** approximates the line of best fit?

~~A~~ $y = -0.02x + 12.5$

B $y = -0.02x + 14.5$

~~C~~ $y = -0.04x + 12.5$

D $y = -0.04x + 14.5$

$$(15, 14) \quad (75, 11)$$

$$m = \frac{-3}{60}$$

Read the problem. Write your answer for each part.

1. There is a linear relationship between the number of people in a group and the cost to enter a museum. The museum charges \$20 for two people and \$28 for three people.

A Write the equation in slope-intercept form that relates the number of people in a group to the cost of entering the museum. Show your work.

$$m = \frac{28 - 20}{3 - 2} = 8 \text{ per person}$$

$$y - 20 = 8(x - 2)$$

$$y - 20 = 8x - 16$$

x is # people
 y is cost

$(2, 20)$ $(3, 28)$

x_1 y_1

$$y = 8x + 4$$

Answer: _____

- B How much will it cost for a single individual to enter the museum?

$$y = 8(1) + 4 = 12$$

Answer: \$12

- C How many people can enter the museum for \$100?

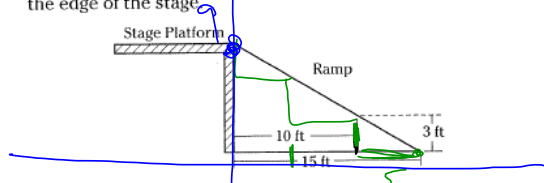
$$y = 8x + 4 = 100$$

$$8x = 96$$

$$x = 12$$

12 people

2. The bottom of a ramp is placed 15 feet from the edge of a stage platform. The ramp is 3 feet off the ground when it is 10 feet from the edge of the stage.



- A What is the slope of the ramp? Show your work.

$$m = \frac{-3}{5}$$

Answer: $-\frac{3}{5}$

- B How many feet off the ground is the top of the ramp?

Answer: 9 ft

- C Write a linear equation in slope-intercept form that represents the height (y) of the ramp at any distance (x) from the stage.

$$(15, 0) \quad (10, 3)$$

$$m = -\frac{3}{5}$$

Answer: _____

$$y - 3 = -\frac{3}{5}(x - 10)$$

$$y - 3 = -\frac{3}{5}x + 6$$

$$y = -\frac{3}{5}x + 9$$

3. Ashley is the manager of a theater. She has \$240 to spend on posters to advertise a new play. Ashley can spend exactly \$240 to print 48 small posters. She can also spend exactly \$240 to print 30 large posters.

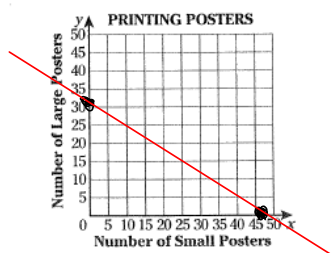
A Write an equation that can be used to find all combinations of small posters (x) and large posters (y) that will cost exactly \$240.

$(48, 0)$ $(0, 30)$

$$m = \frac{-30}{48} = \frac{-5}{8}$$

Answer: $y = -\frac{5}{8}x + 30$

B Graph your equation from part A below.



C What is the slope of the line you graphed in part B?

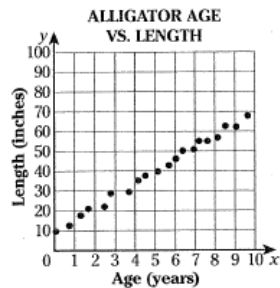
$$\frac{-5 \text{ large}}{8 \text{ small}}$$

Answer: _____

D Explain what the slope from part C means in this situation.

For every 8 small posters,
Ashley can purchase
5 less large posters.

4. The scatter plot below shows the age and length of 20 alligators.



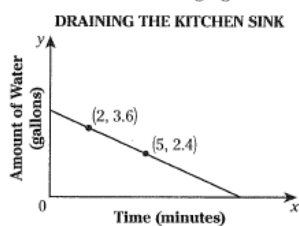
- A Draw the line of best fit on the scatter plot above.
- B Write an equation that describes the line of best fit.

C Explain how you found your equation in **part B**.

Answer: _____

D Explain the meaning of the slope of the line in this situation.

5. A kitchen sink is draining very slowly. The graph shows how the amount of water in the sink is changing over time.



- A Find the slope of the line in the graph.

Answer: _____

- B Write an equation of the line in point-slope form.

Answer: _____

- C Find the x - and y -intercepts of the line.

Answer: _____ and _____

- D Explain the meaning of the x - and y -intercepts in this situation.

