9/29

Warm Up

Does this data represent a linear relationship?
If so, can you write the equation?

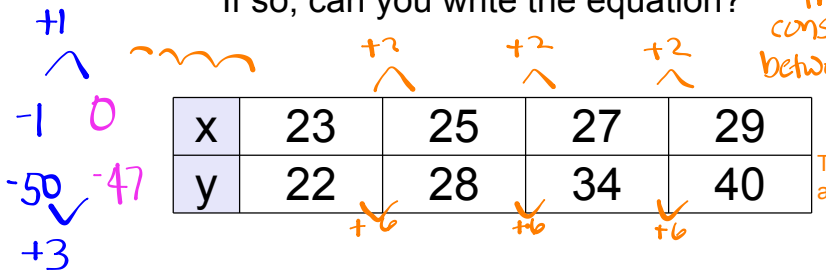
x	23	25	27	29
y	22	28	34	40

Write the table in your notebook. You are free to use the whiteboards to work out your answer.

How can we check if our equation is right?

$y = 3x - 47$

Does this data represent a linear relationship? Yes, there is a constant slope between ALL points
If so, can you write the equation?



x	23	25	27	29
y	22	28	34	40

These are all solutions!

We counted back down the table to find the y-intercept.

Use one of the many solutions we have in the table and see if the equation you have chosen balances.

$y = 3x - 47$

$(23, 22)$ $22 = 3(23) - 47$

$22 = 69 - 47$

$22 = 22$ ✓

Other method to find y-intecept:

$y = 3x + b$

$(25, 28)$ $28 = 3(25) + b$

$28 = 75 + b$

$-75 \quad -75$

$-47 = b$

$y = 3x - 47$

Problem 2.3

Recap

When finding an equation, it may help to calculate values of the dependent variable for some specific values of the independent variable. Then you can look for a pattern in those calculations. You can use the information given in words, tables of data, and graphs.

P = I - E

A Use what you know about linear equations to work out models for the Tree Top Fun business. Find an equation for each of the linear functions described below.

1. The standard charge per customer at TTF is \$25. Write an equation that relates the daily income I to the number n of customers.

I = 25n

2. Each TTF site has operating costs of \$500 per day. Write an equation that relates daily profit P to the number n of customers.

P = 25n - 500

3. One TTF site bought a new rope bridge for \$4,500. TTF will make monthly payments of \$350 until the bill is paid. Write an equation for the unpaid balance B after m monthly payments.

continued on the next page >

B = 4500 - 350m *

cost of bridge

monthly payment

Problem 2.3 continued

B One operator of a Tree Top Fun franchise suggested the group admission fees in the table below.

Number in Group	1	2	3	4	5	10	15	20
Admission (dollars)	75	90	105	120	135	210	285	360

+1 +1 +1 +1 +5 +5 +5

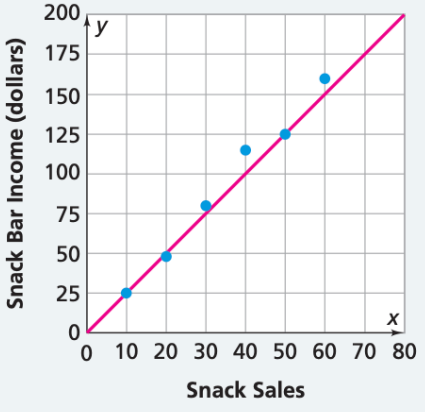
+15 +15 +15 +15 +75 +75

$\frac{\Delta y}{\Delta x} = \frac{15}{1}$

$\frac{\Delta y}{\Delta x} = \frac{75}{5} = 15$

1. Explain how you know the relationship between the admission fee for a group and the number of people in the group is linear.
2. What are the slope and y-intercept of the graph of the data?
3. What equation relates admission fee A to the number n in the group?

C The owners of Tree Top Adventures opened a snack bar at one site. The graph below shows the income from snack sales for six different days. What is the equation of the linear model on the graph?

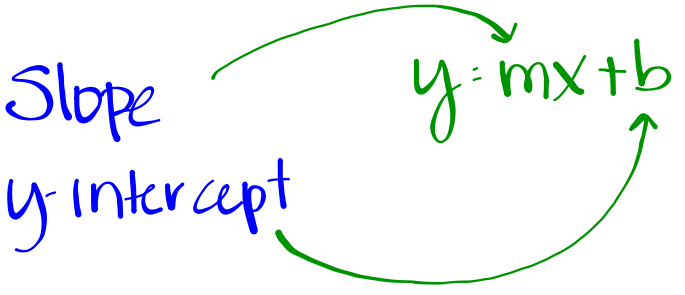


D Suppose you are asked to write an equation of the form $y = mx + b$ to represent a linear function. What is your strategy for each situation?

1. You are given a description of the function in words.
2. You are given two or more (x, y) values or a table of (x, y) values.
3. You are given a graph showing points with coordinates.

continued on the next page >

To write an equation of a line, we need:



Things to remember:

- Any 2 points on a line can be used to find the slope.

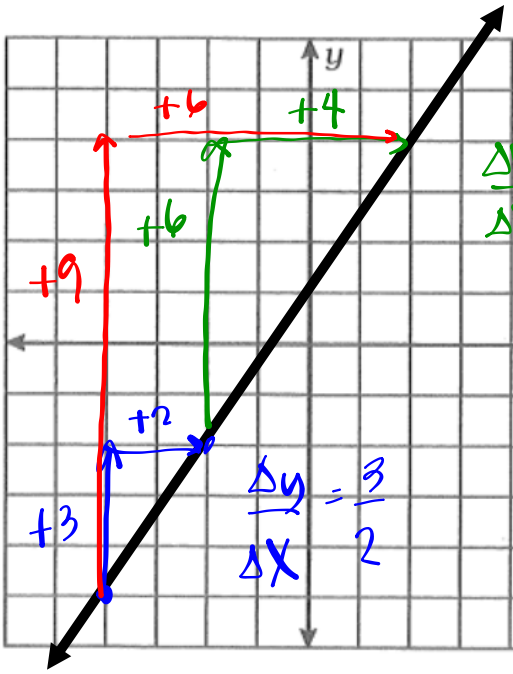
- If a relationship is linear, the slope is the same between all pairs of points.

- Any point on a line is a **solution** for the equation of the line.

If substyted into equation it will balance

The slope is the same between any 2 points on a line.

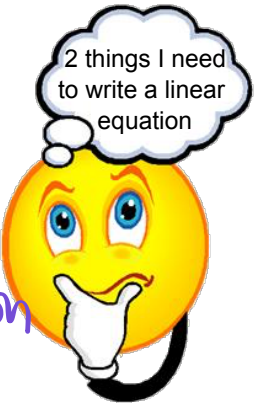
Constant Slope between ALL points



$\frac{\Delta y}{\Delta x} = \frac{6}{4} = \frac{3}{2}$

$\frac{\Delta y}{\Delta x} = \frac{9}{6} = \frac{3}{2}$

How do we write the equation of a line if we are just given the slope and one point on the line?



Slope = -1

Line contains the point (-2, 3)

↑ solution

$y = mx + b$

$y = -1x + b$ ← 3 variables x, y, b

$3 = -1(-2) + b$

$3 = 2 + b$

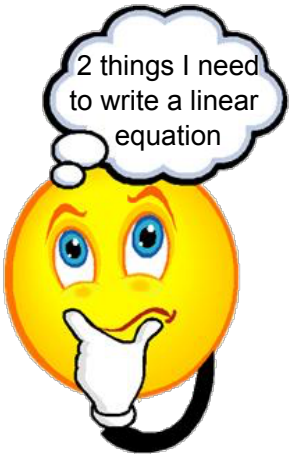
$-2 \quad -2$

$1 = b$

$\boxed{y = -1x + 1}$

How do we write the equation of a line if we are just given two points?

Line goes through the points (5, 1) and (8, 10)



See next slide!

Writing Equations of Lines

$y = mx + b$

All we need are:

- Slope
- y-intercept

If we are given two points, (5, 1) and (8, 10) → on a line

1. **Find the slope between the points:**

$+3 < \begin{matrix} 5,1 \\ 8,10 \end{matrix} > +9$

$$\frac{\Delta y}{\Delta x} = \frac{9}{3} = 3$$

2. **Substitute the slope into the Slope-Intercept equation:**

$y = \underline{3}\,x + b$

3. We now need to find the value of "b". We know how to solve for a variable, but what makes this difficult is that we have **3** variables at the moment.

   Fortunately we have **2 solutions** for this equation and they are the two points on the line! Let's **substitute in a point (x, y) and then solve for "b"**.

   Let's try both!

Substitute (5 , 1) in for x and y:

$(\ 1\ ) = 3(\ 5\ ) + b$

$1 = 15 + b$

$-15 \quad -15$

$-14 = b$

Substitute (8 , 10) in for x and y:

$(10\ ) = 3(\ 8\ ) + b$

$10 = 24 + b$

$-24 \quad -24$

$-14 = b$

$b = -14$

4. Use your slope and y-intercept to write the equation.

$y = 3x - 14$

Name _____ Block _____ Date _____

Writing Equations of Lines Practice

Write the slope-intercept form of the equation of the line through the given point with the given slope.

1) through: $(3, 2)$, slope $= -1$

2) through: $(-1, 0)$, slope $= 2$

3) through: $(-5, 4)$, slope $= -\frac{8}{5}$

4) through: $(3, -1)$, slope $= -2$

Write the slope-intercept form of the equation of the line through the given points.

5) through: $(-2, 5)$ and $(-1, -4)$

6) through: $(0, -5)$ and $(-3, -4)$

7) through: $(3, -5)$ and $(4, 3)$

8) through: $(2, -4)$ and $(-5, 3)$

Homework

Finish ODD numbers on the worksheet