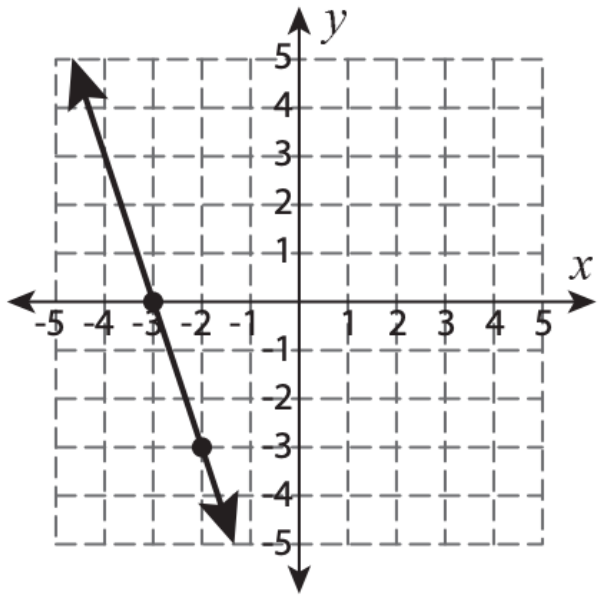
Name: Rihanna Date: 11/2/21

Grade 8 Math - Unit 3: Applications of Linear Functions

Lesson 4: Linear Regression

Do Now

1. Write an equation from the graph above. What is the value of y when x is 2?



(-3, 0)
(-2, -3)

-3 - 0 = -3
-2 - -3 = 1

-3 / 1 = -3

-3 * -2 = 6
-3 - 6 = -9

x = 2

y = -3(2) - 9
y = -6 - 9
y = -15

Equation: y = -3x - 9

When x is 2, y is -15

2. Round each number to the place value given:

Less than 5, round down
More than or equal to 5, round up

   a. 5.6281, round to nearest *tenth*

   2 < 5

   Answer: 5.6

   b. 3.5282, round to nearest *hundredth*

   8 > 5

   Answer: 3.53

   c. 10.6249, round to nearest *thousandth*

   9 > 5

   Answer: 10.625

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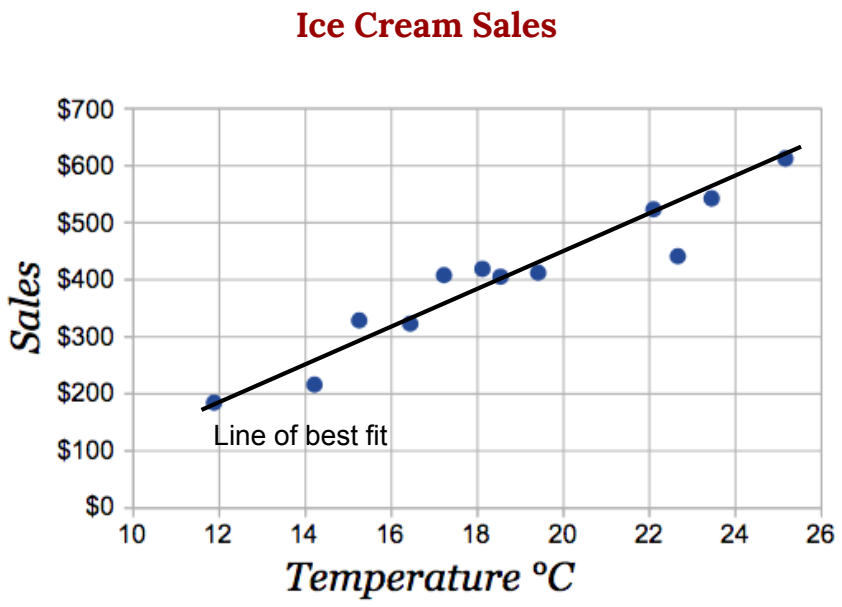
Explore

Mr. Saleh and Mr. Ierubino decide to sell ice cream during summer break. They want to find the relationship (if any) between ice cream sales and the temperature outside. Their data is recorded in a table and a **scatter plot**.



Ice Cream Sales vs Temperature	
Temperature °C	**Ice Cream Sales**
14.2°	$215
16.4°	$325
11.9°	$185
15.2°	$332
18.5°	$406
22.1°	$522
19.4°	$412
25.1°	$614

What does the graph above show us? What can you infer from this data?

The graph above shows us the ice cream sales in terms of the temperature (in degrees celsius). Based on this data, most of the time, the higher the temperature, the greater the ice cream sales; for other time, this is not the case, and high temperatures can have smaller ice cream sales.

Class Notes:

- The hotter it gets, the more ice cream sales are earned (not constant throughout) -> Approximations, not always consistent or always true
  - Graph points from left to right is discretely increasing (no pattern, and no lines connecting the dot)
- No constant rate of change
  - Not a linear function
- Sales vary based on temperature
- Scatter Plot - points are all over the place
  - Usually linear functions are a straight line
- Line of best fit makes predictions

We will use our graphing calculator to generate a linear regression equation that models our ice cream sales based on the temperature. Round all values to the nearest **thousandth** place.

★ ***Linear Regression Equation:*** y = 33.023x - 213.09

Linear Regression:

- A line drawn on a scatter plot that is close to most of the data points (line of best fit)
- A calculator generated equation used to model a linear relationship and make predictions

★ Based on our equation, predict the amount of ice cream sales when the temperature is 20 degrees Celsius. Round to the nearest whole number.

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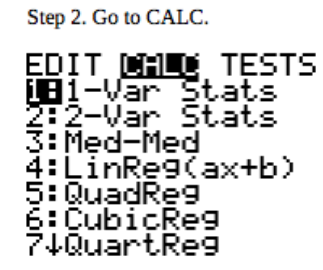
Unit 3: Graphing Calculator Tips

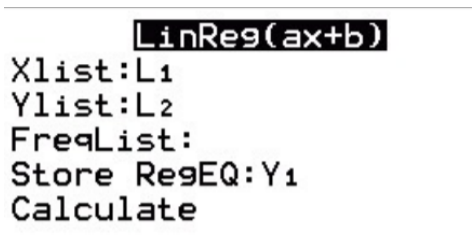
Linear Regression

1. Once you have entered the data, press **STAT** then **CALC** [Use the right arrow].

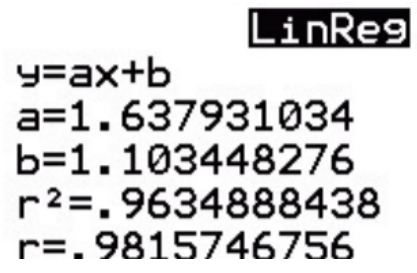


2. Highlight the fourth option, **LinReg (ax + b)**, and press *Enter*.

3. Scroll down to calculate and press *Enter*.



4. For the linear regression, the *a*-value is the **slope** and the *b*-value is the **y-intercept.**



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Practice

1. The data table below shows water temperatures at various depths in an ocean.

Water Depth (*x*) (meters)	**Temperature (*y*)** (°C)
50	18
75	15
100	12
150	7
200	1

Part A: Write a linear regression equation that approximates the temperature. Round all values to the nearest ***thousandth***.

Linear Regression Equation: y = -0.112x + 23.448

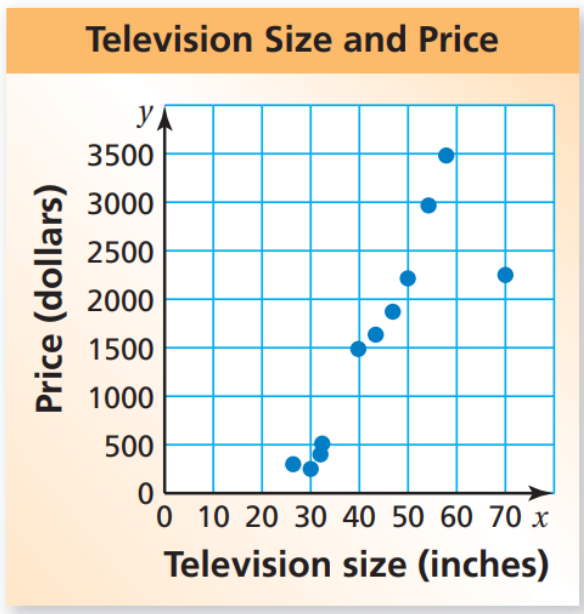
Part B: Using this equation, predict the temperature (ºC), to the nearest integer, at a water depth of 255 meters.

y = -0.112(255) + 23.448
y = -28.56 + 23.448
y = -5.112

-5.112 -> -5

Answer: -5ºC

2. Does the graph show a positive, negative or no association?
   Explain your answer.



Predict how much a 35 inch tv would cost

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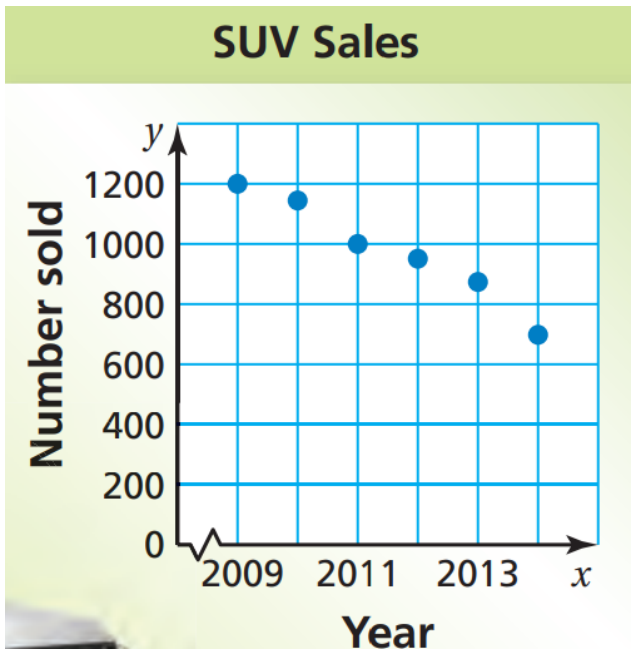
Practice

3. The scatter plot shows the numbers of sport utility vehicles sold in a city from 2009 to 2014.



Describe the relationship shown by the data

In what year were 1000 SUVs sold?

About how many SUVs were sold in 2012?

4. The table shows the numbers **y** of visitors to a particular beach and the average daily temperatures **x**.

Average Daily Temperature (°F)	Number of Beach Visitors
80	100
82	150
83	145
85	190
86	215
88	263
89	300
90	350

Part A: Write a linear regression equation that approximates the temperature. Round all values to the nearest ***hundredth***.

Linear Regression Equation: _____

Part B: Interpret the slope and y-intercept of the linear regression (include **units)**.

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Practice

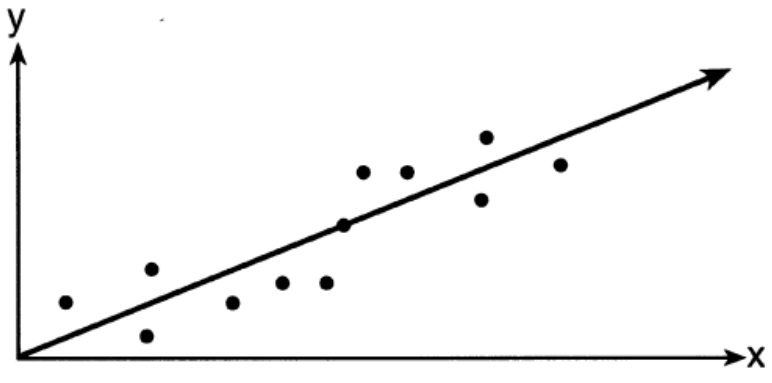
5. The table shows the average number of minutes **y** per kilometer for runners and the total distance of a running race, **x** (in kilometers).

x	3.1	6.2	9.3	12.4	15.5	18.6	21.7	24.8	27.9
y	5.4	5.6	5.7	5.9	6.0	6.1	6.3	6.5	6.9

Use a graphing calculator to find an equation of the line of best fit. Round all values to the nearest ***tenth.***

Predict the average number of minutes per kilometer when the distance of a race is 31 kilometers.

6. A line of best fit has been drawn on the scatter plot below.



The relationship between these variables can be described as having

1) a negative correlation

2) no correlation

3) a positive correlation

4) zero correlation

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Practice

7. The table shows the total number y of rolls of wrapping paper sold by a student after x weeks.

x	1	2	3	4	5	6
y	3	5	9	12	17	24

Write a linear equation that models the number of rolls of wrapping paper as a function of the number of weeks.

Interpret the slope and y-intercept of the line of fit.