

Expand and simplify.

$$1. \quad 2(x - 3) + 3(x + 2)$$

$$2x - 6 + 3x + 6$$

$$5x + 0$$

Calculate.

$$2. \quad \frac{12}{x^3} \div \frac{45}{x^6}$$

$$1. \quad \frac{5}{3} \div \frac{29}{6}$$

$$2. \quad \frac{5}{3} \times \frac{6}{29}$$

$$3. \quad \frac{30 \div 3}{87 \div 3} = \frac{10}{29}$$

Learning Goals

1. To understand where to draw a line of best fit.
2. To understand what extrapolate and interpolate mean.
3. To be able to describe the trend in a scatter plot.
4. To be able to determine an equation for a line of best fit.

6.2 - Line of Best Fit

You can use a line of best fit to make predictions for values not actually recorded or plotted. This is done by interpolating or extrapolating.

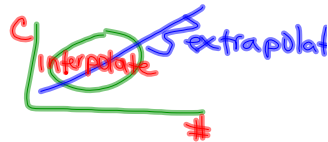
Line of Best Fit - A line that best describes the relationship between two variables in a scatter plot.

Extrapolate - To predict a value by following a pattern beyond known values.

Interpolate - To estimate a value between two known values.

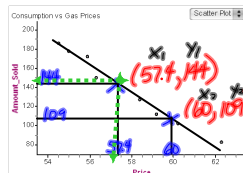
Trend - A relationship between two variables for which the independent variable is time.

↳ positive, negative or none



Example One

The manager of a service station changes the price of unleaded gasoline and records the amount of gas sold per hour at each price. The results are shown in the scatter plot below.



1. Draw the line of best fit.
Hint: When drawing the line of best fit, try to "balance" the points on either side of the line. A transparent ruler works best!
2. Determine the equation for the line of best fit.
Hint: Use two points that lie on the line of best fit and use these coordinates to solve for the slope and y-intercept.

$y = mx + b$

Slope (m)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{109 - 144}{60 - 57.4} = \frac{-35}{2.6} = -13.46$$

y-intercept

$$y = -13.46x + b$$

$$109 = -13.46(60) + b$$

$$109 = -807.6 + b$$

$$b = 916.60$$

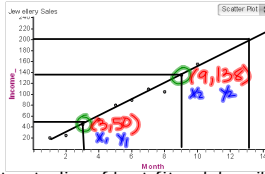
$\therefore y = -13.46x + 916.60$

3. Use your equation of a line of best fit to interpolate how many litres of gasoline would be sold if the price were \$0.57/litre.

$$Y = -13.46(57) + 916.60 = 149.38 \text{ L}$$

Example Two

Alexis and Scarlet make bead jewellery in their spare time. Their monthly income for consecutive months is shown in the scatter plot below.



1. Construct a line of best fit and describe the trend.
Positive trend, as month increases, income increases.
2. Determine the equation for the line of best fit.

Slope Y-intercept

$$m = \frac{138 - 50}{9 - 3} = 14.67$$

$$y = 14.67x + b$$

$$50 = 14.67(3) + b$$

$$50 = 44 + b$$

$$b = 6$$

$$y = 14.67x + 6$$

3. Use your line of best fit to **extrapolate** when income will reach \$200.
According to the graph, when $y = 200$, $x = 13$.

4. Use your equation in #2 to determine algebraically when income will reach \$200.

$$200 = 14.67x + 6 \quad \text{SAMD EB}$$

$$194 = 14.67x$$

$$\frac{194}{14.67} = \frac{14.67x}{14.67}$$

$$x = 13.22$$

∴ it would take 14 months to earn \$200.

Complete: p. 337 - 338 #1 - 3, 5.