

LINEAR MODELLING

Example 1 ~ Car Value Model

The average price of a used Camero Z28 depends on the age of the car. Suppose a 2 yr old Camero costs \$32,350 and a 5 yr old costs \$26,875. Assume a linear relationship can be used to model the situation.

a) Find the equation that describe this relationship.

2yr → \$32,350

5yr → \$26,875

(x, y)
(2, 32,350)

(5, 26,875)

The cost depends on the age
(y) (x)

Find the slope:

Let x be the age
y be the cost

(DEFINE THE
VARIABLES)

$$m = \frac{\Delta y}{\Delta x}$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{26,875 - 32,350}{5 - 2}$$

$$m = \frac{-\$5475}{3 \text{ yr}}$$

Significance of slope ...
every year the cost decreases (-) by \$1825

$$m = -\$1825/\text{yr}$$

Find the y-intercept:

Write equation:

$$y = mx + b$$

$$y = -1825x + 36000$$

$$y = mx + b$$

$$26,875 = -1825(5) + b$$

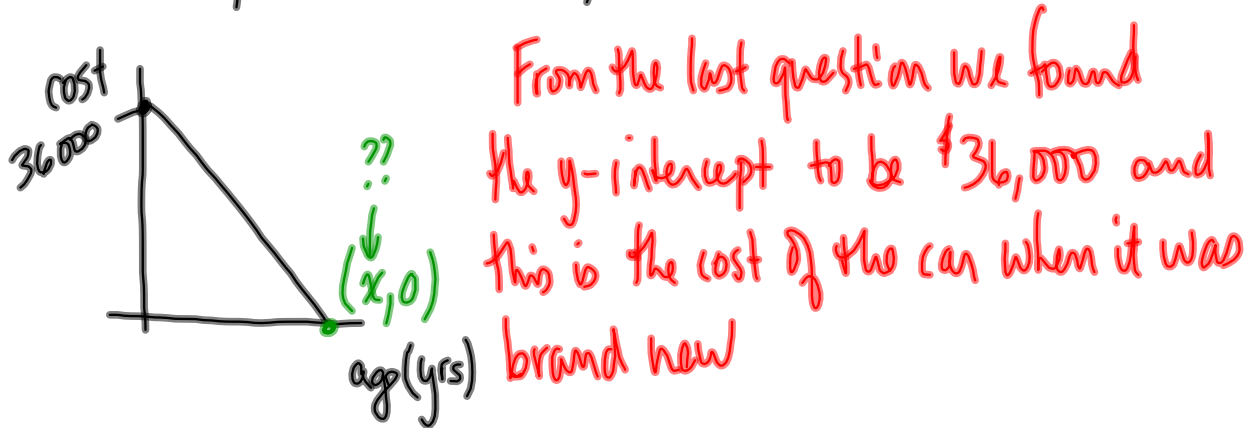
$$26,875 = -9125 + b$$

$$26,875 + 9125 = b$$

Significance of y-intercept → $b = \$36,000$

is that it represents the cost of the car when

b) Determine the x and y -intercepts and explain their meaning in the context of the situation.



To find the x -intercept, let $y = 0$

$$y = -1825x + 36000$$

$$0 = -1825x + 36000$$

$$\frac{-36000}{-1825} = \frac{-1825x}{-1825}$$

In 19.7 yrs
the cost of the
car will be zero

$$x = 19.7 \text{ yr}$$

c) How much would a 7 yr old Camero cost?

$$y = -1825x + 36000$$

$$y = -1825(7) + 36000$$

$$y = \$23,225$$

Example 2 ~ Bridge Problem

A bridge is constructed of steel so that it has gaps of 1.3 cm when the outside temperature is 22°C. The steel will contract by 0.05 cm for each 1°C drop in temperature. ← tells us the slope

The width of the gap depends on the temperature.

Let x be the temperature (°C)
 y be the width of the gap (cm)

$(22, 1.3)$

$m = \frac{0.05 \text{ cm}}{-1^\circ\text{C}} = -0.05$

a) Find the equation that relates gap width to temperature

$$y = mx + b$$

$$1.3 = -0.05(22) + b$$

$$1.3 = -1.1 + b$$

$$2.4 = b$$

$$y = -0.05x + 2.4$$

gap temp

b) At what temperature would the gap close completely? (i.e. $y=0$)

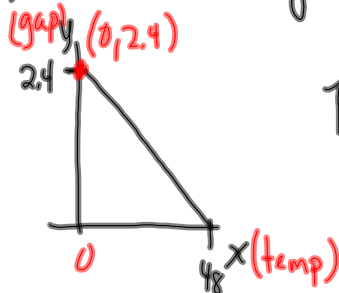
$$y = -0.05x + 2.4$$

$$0 = -0.05x + 2.4$$

$$\frac{-2.4}{-0.05} = \frac{-0.05x}{-0.05}$$

$$x = 48^\circ\text{C}$$

c) what is the significance of the y-intercept?



The y-intercept represents the gap width at 0°C.