

Notes. Linear Modelling

Note Title

2/9/2010

Eg#1 Car Value Model

The average price of used Camero Z28 depends on the age of the car. Suppose a 2 yr old Camero costs \$32350 and a 5 yr old costs \$26875. Assume a linear relationship.

- a) Find an eq'n that describes this relationship.

Cost depends on age.
 y always depends on x
 $y = mx + b$

Sub in a pt

$$\begin{aligned} & \left\{ \begin{array}{l} (2, 32350) \\ (5, 26875) \end{array} \right. \quad m = \frac{\Delta y}{\Delta x} = \frac{32350 - 26875}{2 - 5} = \frac{5475}{-3} = -1825 \end{aligned}$$
$$y = -1825x + b$$

$$32350 = -1825(2) + b$$

$$32350 = -3650 + b$$

$$36000 = b$$

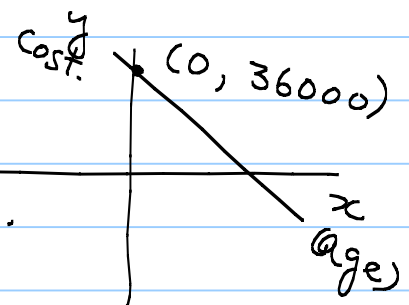
$$y = -1825x + 36000$$

- b) Determine the x & y intercepts and explain their meaning (in context)
 y -int is 36000 from above

A new car should cost \$36000.

x -int

calculate \rightarrow let $y = 0$, solve for x



$$y = -1825x + 36000$$

$$0 = -1825x + 36000$$

$$-36000 = -1825x$$

$$19.7 \doteq x$$

This makes no sense b/c any car will have some value if only for scrap.

c) Explain the meaning of the slope.

$$m = -1825 = \frac{\Delta y}{\Delta x} = \frac{\Delta \text{cost}}{\Delta \text{age}} = \frac{-1825}{1}$$

Each year the car will lose \$1825 in value.

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

$$y = -1825x + 36000$$

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

$$y = \$23225.$$

The value of a 7yr old Camero is about \$23225.

Eg #2 Bridges Problem

gap
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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.

a) Find the eq'n that relates gap width and temperature.

Gap width depends on temp.

(22, 1.3)

$$m = \frac{\Delta y}{\Delta x} = \frac{\Delta \text{gap}}{\Delta \text{temp}} = \frac{+0.05}{-1} = -0.05$$

$$y = -0.05x + b$$

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

$$1.3 = -1.1 + b$$

$$2.4 = b$$

$$y = -0.05x + 2.4$$

b) At what temp would the gap close completely?
let $y=0$ (no gap)

$$0 = -0.05x + 2.4$$

$$-2.4 = -0.05x$$

$$48 = x$$

The gap would close at a temp of 48°C

c) What is the meaning of the y-int?

$$y = -0.05x + 2.4$$

When the outside temp is 0°C the gap will be 2.4 cm wide.

