

MATH 020 Support 5 Applications of Linear Equations

Slope-Intercept Form	Point-Slope Form	Slope Formula
$y = mx + b$	$y - y_1 = m(x - x_1)$	$m = \frac{y_2 - y_1}{x_2 - x_1}$

Problems

1. A car rental agency charges \$275 per week plus \$0.40 per mile to rent a car.

- a) Write an equation that expresses the weekly cost to rent the car,  $y$ , in terms of the number of miles driven during the week,  $x$ .

$$y = 0.40x + 275 \quad ; \quad y = 275 + 0.40x$$

$\downarrow$   
Cost
 $\uparrow$   
rate of miles

- b) How many miles did you drive during the week if the weekly cost to rent the car was \$325?

$$325 = 0.40x + 275$$

$$\begin{array}{r} 325 \\ -275 \\ \hline 50 = 0.40x \end{array}$$

$$\frac{50}{0.40} = \frac{0.40x}{0.40} \Rightarrow x = 125 \text{ Miles}$$

2. A plant can manufacture 50 golf clubs per day at a total daily cost of \$5145 and 75 golf clubs per day for a total cost of \$6895.

$x = \text{No. of Golf Clubs}$

$y = \text{Daily Cost}$   
(50, 5145)

(75, 6895)  
 $x_2$   $y_2$

- a) Assuming that daily cost and production are linearly related, find the total daily cost,  $C$ , of producing  $x$  golf clubs.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6895 - 5145}{75 - 50} = \frac{1750}{25} = 70$$

$$y = mx + b$$

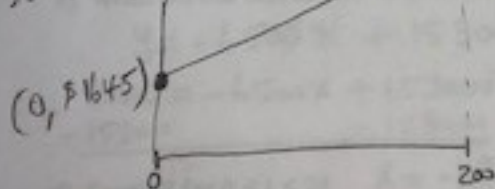
$$5145 = 70(50) + b$$

$$5145 = 3500 + b$$

$$-3500 \quad -3500$$

$$1645 = b$$

- b) Graph the total daily cost for  $0 \leq x \leq 200$ .



$$y = 70x + 1645$$

$$C = 70x + 1645$$

- c) Interpret the slope and y intercept of the cost equation.

Each additional golf clubs produce d will cost \$70.  
y intercept is (0, 1645) fixed cost or startup cost is \$1645.

$$(200, 167)$$

$$(400, 317)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{317 - 167}{400 - 200} = \frac{150}{200} = 0.75$$

3. The manager of a restaurant found that the cost to produce 200 cups of coffee is \$167, while the cost to produce 400 cups is \$317. Assume the relationship between the cost  $y$  to produce  $x$  cups of coffee is linear.

- a) Write a linear equation that expresses the cost,  $y$ , in terms of the number of cups of coffee,  $x$ .

$$y = mx + b$$

$$317 = 0.75(400) + b$$

$$317 = 300 + b \Rightarrow b = 17$$

$$y = 0.75x + 17$$

Cost      no. of Coffee Cups

- b) How many cups of coffee are produced if the cost of production is \$414.50?

$$414.50 = 0.75x + 17$$

$$\frac{-17}{397.5} = \frac{-17}{0.75x}$$

$$397.5 = 0.75x$$

$$\Rightarrow x = \frac{397.5}{0.75} = 530 \text{ cups}$$

4. A farmer buys a new tractor for \$153,000 and assumes that it will have a trade-in value of \$88,000 after 10 years. The farmer uses a constant rate of depreciation to determine the annual value of the tractor.

- a) Find a linear model for the depreciated value  $V$  of the tractor  $t$  years after it was purchased.

$$\begin{matrix} (0, 153000) \\ (10, 88000) \end{matrix} \Rightarrow m = \frac{88000 - 153000}{10 - 0} = \frac{-65000}{10} = -6500$$

$$y = -6500x + 153000$$

- b) What is the depreciated value of the tractor after 6 years?

$$V = -6500(6) + 153000 = 914000$$

$$V = -6500t + 153000$$

- c) When will the depreciated value fall below \$40,000?

$$y = -6500x + 153000$$

$$40000 = -6500x + 153000$$

$$\frac{-153000}{-113000} = \frac{-153000}{-6500}$$

- d) Graph  $V$  for  $0 \leq t \leq 20$ .  $x = \frac{-113000}{-6500} = 17.38$

$$x > 17.38$$