MTH1W Analytic Geometry Name: Ms. Jacob

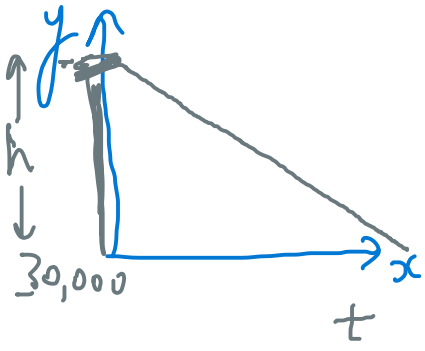
Lesson 7.4: Writing Linear Equations from a Context Date: May 5, 2026.

Learning Goal: We are learning to write an equation of a line given various "real-life" situations.

Example 1: An airplane 30,000 feet above the ground begins descending at a rate of 2000 feet per minute. Assume the plane continues at the same rate of descent. The plane's height and minutes above the ground are related to each other.

Identify the variables in this situation: x = time (min.) y = height (feet)

What information is given? Slope = 2000 ft/min. y-intercept = 30,000



a. Write an equation to model the situation.

$y = mx + b$

$y = 2000x + 30\,000$

b. Use your equation to find the altitude of the plane after 5 minutes.

$y = ?$ $x = 5$ min

$y = 2000(5) + 30\,000$

$= 10\,000 + 30\,000$

$= 40,000$

∴ The plane will be at an altitude of 40,000 ft at 5 min.

Example Two: A car rental's cost is based on how many kilometers driven. If 15 km were driven, the cost would be $28. If 50 km were driven, the cost would be $35.

Identify the variables in this situation: x = km driven y = cost ($)

What information is given? $(x_1, y_1) = (15, 28)$ $(x_2, y_2) = (50, 35)$

a. Determine an equation for the cost of renting a car.

$y = mx + b$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{35 - 28}{50 - 15} = \frac{7}{35} = \frac{\$1}{5\text{km}} = \$0.20/\text{km}$

∴ EQUATION: $y = 0.2x + 25$

b. If you were charged $78, how many kilometers did you drive.

$y = \$78$ $x = ?$

$78 = 0.2x + 25$

$78 - 25 = 0.2x$

$53 = 0.2x$

$\frac{53}{0.2} = \frac{0.2x}{0.2}$

$265 = x$

$28 = 0.2(15) + b$

$28 = 3 + b$

$28 - 3 = b$

$25 = b$

∴ $78 would be charged for 265 km drive.

You do:

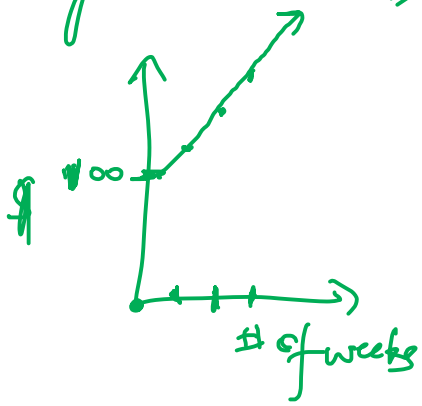
Question 1: Suppose you receive $100 for a graduation present, and you deposit it in a savings account. Each week thereafter, you add $5 to the account (but no interest is added for simplicity). The amount in the account is a function of the number of weeks that have passed.

Identify the variables in this situation: x = # of weeks y = Money in account ($)

What information is given? RoC = m = $5/week, b = $100.

a. Create an equation for the amount *y* you have after *x* weeks.

$y = 5x + 100$



b. Use your equation to find when you will have $310 in the account.

$x = ?$ $y = 310$

$310 = 5x + 100$

$310 - 100 = 5x$

$\frac{210}{5} = \frac{5x}{5} \Rightarrow 42 = x$

∴ I will have $310 by week 42.

Question 2: Marty is spending at the average rate of $3 per day. After 14 days, he has $68 left. The amount left depends on the number of days that have passed.

Identify the variables in this situation: x = # of days y = Amount left ($)

What information is given?

RoC = m = −$3/day

P(x, y) = (14, $68)

a. Write an equation for the situation.

$y = mx + b$

$68 = (-3)(14) + b$

$68 = -42 + b$

$68 + 42 = b$

$110 = b$

$y = -3x + 110$

b. Use your equation to find the amount of money he began with.

$y = ?$ $x = 0$

∴ $y = b = \$110$

∴ Marty began with $110.

Question 3: Suppose a 5-minute overseas call costs $5.91 and a 10-minute call costs $10.86. The cost of a call and the length of the call are related.

Identify the variables in this situation: x = length of call (min) y = cost ($)

What information is given?

$P(x_1, y_1) = (5, 5.91)$; $(x_2, y_2) = (10, 10.86)$

a. Write an equation to represent the cost of a call based on the length of the call.

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{10.86 - 5.91}{10 - 5} = \frac{4.95}{5} = \$0.99/\text{min.}$

$y = mx + b \Rightarrow 5.91 = 0.99(5) + b \Rightarrow b = 0.96$

$y = 0.99x + 0.96$

b. How long can you talk if you have $12 to spend?

$x = ?$ $y = 12$

$12 = 0.99x + 0.96$

$12 - 0.96 = 0.99x$

$\frac{11.04}{0.99} = \frac{0.99x}{0.99} \Rightarrow 11.15 = x$

So, you can talk for 11.15 min for $12

Question 4: Melanie is given $50 to spend on vacation. She decides to spend $5 a day. The amount Melanie has left and the number of days are related.

Identify the variables in this situation: x = # of days y = Amount left ($)

What information is given? $b = \$50$ $m = -\$5/\text{day}$

a. Write an equation relating *x* and *y*.

$y = -5x + 50$

b. Use your equation to find out when Melanie will have $15 left.

$x = ?$ $y = \$15$

$15 = -5x + 50$

$15 - 50 = -5x$

$\frac{-35}{-5} = \frac{-5x}{-5}$

$7 = x$

∴ She will have $15 in 7 days.

Question 5: Biologists have found that the number of chirps some crickets make per minute is related to temperature. The relationship is very close to being linear. When it is about 68 degrees Fahrenheit, crickets chirp 124 times per minute. When it is about 80 degrees Fahrenheit, they chirp 172 times a minute.

Identify the variables in this situation: x = temperature (F) y = # chirps per minute (Cricket)

What information is given? $(x_1, y_1) = (68, 124)$ $(x_2, y_2) = (80, 172)$

a. Find an equation that models this situation.

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{172-124}{80-68} = \frac{48}{12} = 4$

$y = mx + b$

$124 = 4(68) + b$

$124 = 272 + b \Rightarrow 124 - 272 = b$

$-148 = b$

$\therefore y = 4x - 148$

b. How warm is it when the crickets are chirping 150 times a minute?

$x = ?$ $y = 150$

$150 = 4x - 148$

$150 + 148 = 4x$

$\frac{298}{4} = \frac{4x}{4} \Rightarrow 74.5 = x$

$\therefore$ crickets chirp 150 times a minute at 74.5 degrees.

Question 6: Julio plans a diet to gain 0.2 kg a day. After 14 days, he weighs 40 kg. The number of days he diets and his weight are related. (m) (x) (y)

Identify the variables in this situation: x = # days y = weight (kg)

What information is given? $m = 0.2\text{kg/day}$

a. Write an equation for this situation.

$y = mx + b$

$40 = (0.2)(14) + b$

$40 = 2.8 + b$

$40 - 2.8 = b$

$37.2 = b$

$\therefore y = 0.2x + 37.2$

b. How long will Julio take to reach his goal of 50 kg?

$x = ?$ $y = 50\text{kg}$

$50 = 0.2x + 37.2$

$50 - 37.2 = 0.2x$

$\frac{12.8}{0.2} = \frac{0.2x}{0.2} \Rightarrow 64 = x$

$\therefore$ Julio will take 64 days to reach 50kg