

1. Find the equation of the line passing through $(-6, 5)$ and $(8, -2)$.

$$m = \frac{-2 - 5}{8 - (-6)} = -0.5 \text{ and } y = b + mx. \text{ To find } b \text{ substitute one point into the equation.}$$

$$5 = b + (-0.5)(-6) = b + 3 \Rightarrow b = 2 \text{ so } y = 2 - 0.5x \text{ is the equation for the line.}$$

2. Complete Exploration 1.1 on page 36 of your textbook.
3. Complete Exploration 1.2 on page 36 of your textbook.
4. Complete Exploration 1.4 on page 39 of your textbook.
5. A major pollutant produced by burning fossil fuels is sulfur dioxide. An investigation in Oslo, Norway, has shown that the number N of deaths per week is a linear function of the mean concentration C of SO_2 measured in $\mu\text{g}/\text{m}^3$. This function is $N = 94 + (0.031)C$.
 - (a) Give the units of the constants 94 and 0.031 and interpret them physically.

94 deaths/week is the number of deaths per week when the concentration is zero 0.031 deaths/week/ $\mu\text{g}/\text{m}^3$ is the rate of increase in deaths/week per unit increase in concentration.
 - (b) For what concentration of SO_2 is the number of deaths per week 100?

Set $N = 100$ then $100 = 94 + 0.031C \Rightarrow C = (100 - 94)/0.031 = 32 \mu\text{g}/\text{m}^3$
 - (b) If this function is only valid for the domain $50 < C < 700$ find the range.

If $C = 50$ then $N = 94 + 0.031 \times 50 = 96$ deaths/week. if $C = 700$ then $N = 94 + 0.031 \times 700 = 116$ deaths/week, So the range is $96 < N < 116$.

6. By burning fossil fuels mankind releases 200 million metric tons of poisonous carbon monoxide into the atmosphere each year. Nevertheless the concentration of CO remains between 0.04 and 0.90 ppm in the ambient air. The main reason is that microorganisms in the soil absorb CO rapidly and convert it to CO₂. In an experiment with 10 litres of air and some potting soil, 1443 μg of CO were reduced to 47 μg within 3 hours.

(a) What was the average rate of change in CO concentration?

$$\text{average rate of change} = \frac{47 - 1443}{3} = -465 \text{ } \mu\text{g/hour}$$

(b) Find an equation describing the mass of CO as a function of time assuming it is a linear relationship.

$$\text{The equation is } y = b + mx \text{ with } m = -465. \text{ Initially } y = 1443 \text{ so } y = 1443 - 465x$$

(c) After how much time does this model predict that the amount of CO will be reduced to zero?

$$0 = 1443 - 465x \Rightarrow x = 1443/465 = 3.1 \text{ hours}$$

7. Assume an adult needs at least 70 g of protein in his daily food. What possible amounts of food can he consume if he wants to fulfill this condition by eating soybeans and/or lentils? 100 g of soybeans contains 35 g of protein and 100 g of lentils contains 26 g of protein. Express your answer as an equation.

Let x be the amount of soybeans consumed in grams and y be the amount of lentils consumed in grams. Then

$$\left(\frac{35 \text{ g protein}}{100 \text{ g soybeans}} \right) (x \text{ g soybeans}) + \left(\frac{26 \text{ g protein}}{100 \text{ g lentils}} \right) (y \text{ g lentils}) = 70 \text{ g protein}$$

or without units

$$0.35x + 0.26y = 70$$

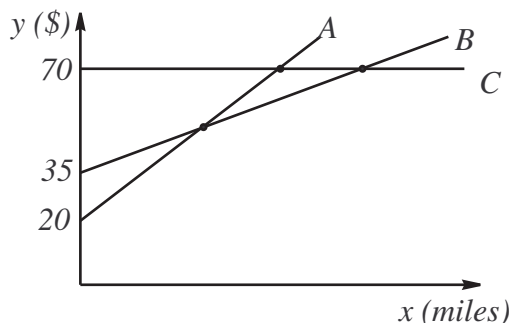
To plot the graph find the x and y intercepts and connect them with a straight line. If $x = 0$ then $y = 70/0.26 = 270$ g. If $y = 0$ then $x = 70/0.35 = 200$ g.

8. You need to rent a car for a day and compare the charges of three companies. Company A charges 20 cents per mile plus \$20 per day. Company B charges 10 cents per mile plus \$35 per day. Company C charges \$70 per day with no mileage fee.

(a) For each of the three companies find expressions for the cost y in dollars of driving the cars for a day as a function of the mileage x in miles.

For company A $y = 20 + (0.2)x$, for company B $y = 35 + (0.1)x$ and for company C $y = 70$.

(b) Sketch the graph of each function on the same set of axes



(c) If you plan a round trip of 300 miles what company should you use?

Company A costs $y = 20 + 0.2 \times 300 = \80 . Company B costs $y = 35 + 0.1 \times 300 = \65 . Company C costs \$70

(d) For what values of mileage is company B the cheapest option.

First when company A costs the same as company B then

$$y = 20 + (0.2)x = 35 + (0.1)x \Rightarrow (0.1)x = 15 \Rightarrow x = \frac{15}{0.1} = 150 \text{ miles.}$$

When company B costs the same as company C then

$$y = 35 + (0.1)x = 70 \Rightarrow (0.1)x = 35 \Rightarrow x = 350 \text{ miles.}$$

So for less than 150 miles A is cheaper. For more than 350 miles C is cheaper. B is cheapest between 150 and 350 miles.