

22. The sum of the ages of three brothers is 63. If their ages can be represented as consecutive integers, what is the age of the middle brother?

$$\begin{aligned} x &= \text{age of youngest brother} = 20 \\ x + 1 &= \text{age of middle brother} = \boxed{21} \\ x + 2 &= \text{age of oldest brother} = 22 \end{aligned}$$

$$\begin{aligned} x + x + 1 + x + 2 &= 63 \\ 3x + 3 &= 63 \\ 3x &= 60 \\ x &= 20 \end{aligned}$$

23. The perimeter of a triangle is 80cm. The first side of the triangle is 7cm shorter than the second side. The third side is 4cm longer than the first side. Find the length of each side.

$$\begin{aligned} x - 7 &= \text{length of the 1}^{\text{st}} \text{ side} = \boxed{23 \text{ cm}} \\ x &= \text{length of the 2}^{\text{nd}} \text{ side} = \boxed{30 \text{ cm}} \\ x - 3 &= \text{length of the 3}^{\text{rd}} \text{ side} = \boxed{27 \text{ cm}} \end{aligned}$$

$$\begin{aligned} x - 7 + x + x - 3 &= 80 \\ 3x - 10 &= 80 \\ 3x &= 90 \\ x &= 30 \end{aligned}$$

24. The distance a free falling object has traveled can be modeled by the equation $d = \frac{1}{2}at^2$ where a is acceleration due to gravity and t is the amount of time the object has fallen.

a) Express t in terms of a and d .

$$2 \cdot d = 2 \cdot \frac{1}{2}at^2$$

$$2d = at^2$$

$$\frac{2d}{a} = t^2$$

$$\boxed{\sqrt{\frac{2d}{a}} = t}$$

b) Find the amount of time an object spent falling if it accelerated 2.5 inches/sec² and traveled a distance of 20 inches.

$$\sqrt{\frac{2(20)}{2.5}} = t$$

$$\sqrt{16} = t$$

$$t = \boxed{4 \text{ seconds}}$$

25. Michael put \$5.00 in dimes, nickels and quarters in his piggy bank. He had 8 less dimes than nickels and 4 more quarters than nickels. How many coins of each type are there? (Solve algebraically)

| | Value | Quantity | Total Value |
|----------|-------|----------|-------------|
| nickels | 5 | x | $5x$ |
| dimes | 10 | $x - 8$ | $10(x - 8)$ |
| quarters | 25 | $x + 4$ | $25(x + 4)$ |

$$\begin{aligned} 5x + 10(x - 8) + 25(x + 4) &= 500 \\ 5x + 10x - 80 + 25x + 100 &= 500 \\ 40x + 20 &= 500 \\ 40x &= 480 \\ x &= 12 \end{aligned}$$

12 nickels, 4 dimes and 16 quarters

26. Two cars take a trip following the same route. One leaves at 9am averaging 48mph, the other leaves at 9:30am averaging 56mph. At what time of day will the second car catch up to the first car?

$x = \#$ of hours Car A travelled at 48mph
 $x - 0.5 = \#$ of hours Car B travelled (at 56mph)

$$48x = 56(x - 0.5)$$

$$48x = 56x - 28$$

$$-8x = -28$$

$$x = 3.5$$

9am + 3.5 hours = **12:30pm**

27. Solve and graph the solution on a number line. $2x - 4 \leq 8$ or $-3x > 9$

$$2x - 4 \leq 8$$

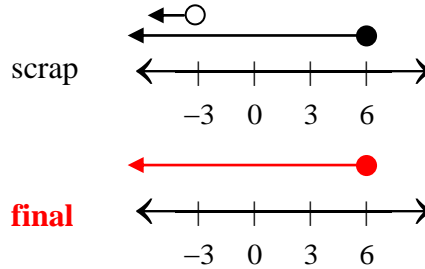
$$2x \leq 12$$

$$x \leq 6$$

or

$$-3x > 9$$

$$x < -3$$



28. Solve the following system algebraically. $2y - 3x = -11$
 $y - 5 = -2x$

$$2y - 3x = -11$$

$$2[-y - 2x = -5]$$

$$2y - 3x = -11$$

$$-2y - 4x = -10$$

$$-7x = -21$$

$$x = 3$$

$$y - 5 = -2x$$

$$y - 5 = -2(3)$$

$$y - 5 = -6$$

$$y = -1$$

(3, -1)

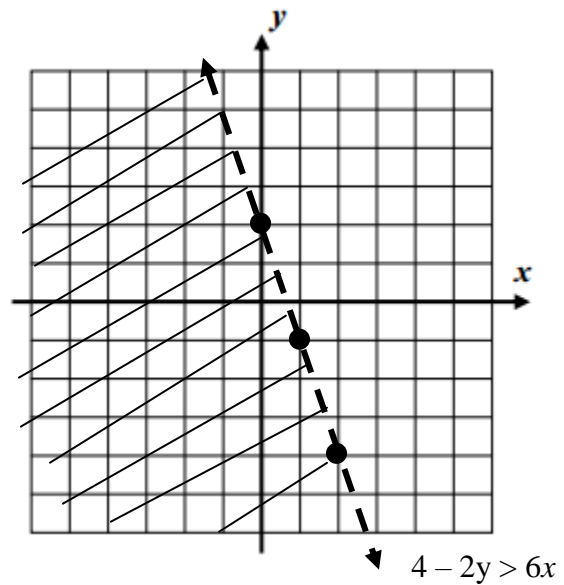
29. Graph $4 - 2y > 6x$ on a coordinate plane.

$$4 - 2y > 6x$$

$$-2y > 6x - 4$$

$$y < -3x + 2$$

$m = -3$ $b = 2$



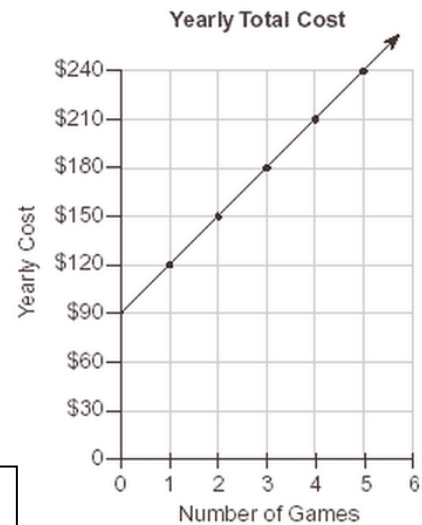
30. Examine the graph pictured below which shows yearly cost based on the number of golf games played at a private club.

a) Write an equation that represents the relationship shown.

y-int: 90

slope (rate of change): $\frac{\Delta y}{\Delta x} = \frac{120 - 90}{1 - 0} = \frac{30}{1} \quad m = 30$

$y = 30x + 90$



b) What is the rate of change? What does it represent?

The rate of change is 30. The golf games cost \$30 each.

c) What is the y-intercept? What does it represent?

The y-intercept is 90. The initial membership fee for the private club is \$90.

31. To thaw a specimen stored at -25°C , the temperature of a refrigeration tank is raised every hour. The temperature in the tank after x hours can be described by the function $y = -25 + 5x$.

a) Identify the y-intercept of the function. Describe its meaning.

The y-intercept is -25. Before any time has passed or the temperature has been raised, the temperature of the refrigeration tank is -25°C .

b) Identify the rate of change of the function. Describe its meaning.

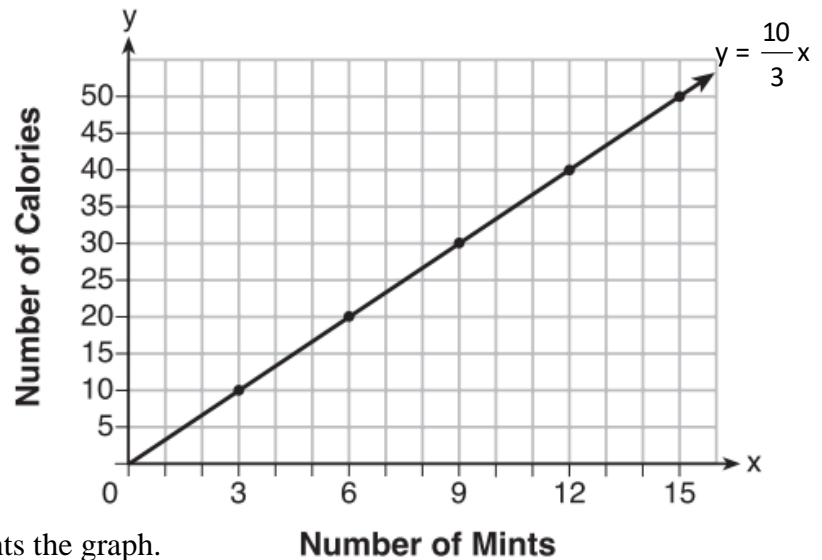
The rate of change is 5. Every hour, the temperature of the refrigeration tank is raised 5°C .

$$\frac{\Delta y}{\Delta x} = \frac{\text{temperature}}{\text{hour}} = \frac{5}{1}$$

32. Max purchased a box of green tea mints. The nutrition label on the box stated that a serving of three mints contains a total of 10 calories.

a) On the axes below, graph the function that represents the relationship described above.

| Mints (x) | Calories (y) |
|-----------|--------------|
| 0 | 0 |
| 3 | 10 |
| 6 | 20 |
| 9 | 30 |
| 12 | 40 |
| 15 | 50 |



b) Write an equation that represents the graph.

y-int: 0

slope (rate of change): $\frac{\Delta y}{\Delta x} = \frac{10 - 0}{3 - 0} = \frac{10}{3}$ $m = \frac{10}{3}$ $b = 0$ $y = \frac{10}{3}x + 0 \rightarrow y = \frac{10}{3}x$

c) A full box of mints contains 180 calories. Use the equation to determine the total number of mints in the box.

$$y = \frac{10}{3}x \rightarrow x: \# \text{ of mints, } y: \# \text{ of calories}$$

$$180 = \frac{10}{3}x$$

$$\frac{3}{10} \cdot 180 = \frac{10}{3} \cdot \frac{3}{10}x$$

$$54 = x$$

There are a total of 54 mints in the box.

33. Emma recently purchased a new car. She decided to keep track of how many gallons of gas she used on five of her business trips. The results are shown in the table below.

- a) Write the linear regression equation for these data where miles driven is the independent variable (Round all values to the nearest hundredth).

$$y = 0.05x - 0.92$$

| Miles Driven | Number of Gallons Used |
|--------------|------------------------|
| 150 | 7 |
| 200 | 10 |
| 400 | 19 |
| 600 | 29 |
| 1000 | 51 |

- b) Identify the correlation coefficient rounded to the nearest thousandth. Explain its meaning.

$$r = 0.999$$

There is a very strong positive correlation between miles driven and number of gallons used.

- c) Emma plans to take a business trip next week that requires her to drive 850 miles. Using your regression equation, predict the number of gallons of gas Emma will use.

| | |
|------------------------|------------------------|
| x: # of miles | $y = 0.05x - 0.92$ |
| y: # of gallons of gas | $y = 0.05(850) - 0.92$ |
| | $y = 42.5 - 0.92$ |
| | $y = 41.58$ |

Emma will use approximately 42 gallons of gas on her trip.

34. On the set of axes below, draw the graph of the equation $y = -\frac{3}{4}x + 1$ defined over the domain $-8 \leq x \leq 8$. State the range of the function.

| x | y |
|----|----|
| -8 | 7 |
| -4 | 4 |
| 0 | 1 |
| 4 | -2 |
| 8 | -5 |

Domain: Use x-values that range from -8 to positive 8.

Range:
The set of y-values that range from -5 to 7, including -5 and 7.

$\{-5 \leq y \leq 7\}$ inequality

$[-5, 7]$ interval notation

