

Elementary Algebra

Final Examination

SAMPLE FINAL EXAM

You will have 2 hours to complete this exam. You may use a calculator but must show all algebraic work in the space provided to receive full credit. Read all directions carefully, simplify all answers fully, and clearly indicate your answer. Good Luck!

NAME: Answer Key

Spring 2015

Fall 2017

Solve each equation. Show all algebraic work for full credit. (3 points each)

1) $16 - x = 35$

$$\begin{array}{r} -16 \quad -16 \\ \hline +x = 19 \\ \hline -1 \quad -1 \end{array}$$

$$x = -19$$

1) $x = -19$

2) $\frac{2}{5}x + 7 = 13$

$$\begin{array}{r} -7 \quad -7 \\ \hline \frac{2}{5} \cdot \frac{5}{2} x = 6 \cdot \frac{5}{2} \end{array}$$

$$x = 15$$

2) $x = 15$

3) $4a - 8 = -2a + 16$

$$\begin{array}{r} +2a \quad +2a \\ \hline 6a - 8 = 16 \\ +8 \quad +8 \\ \hline 6a = 24 \\ \hline 6 \quad 6 \end{array}$$

$$a = 4$$

3) $a = 4$

Solve each equation. Show all algebraic work for full credit. (3 points each)

4) $-4(3x - 1) = 52$

4) $X = -4$

$$\begin{array}{r} -12x + 4 = 52 \\ -4 \quad -4 \\ \hline -12x = 48 \\ -12 \quad -12 \\ \hline x = -4 \end{array}$$

5) $6\left(\frac{2}{3}x = \frac{1}{6}x + \frac{1}{2}\right) 6$

5) $X = 1$

$$\begin{array}{r} 4x = x + 3 \\ -x \quad -x \\ \hline 3x = 3 \\ \frac{3}{3} \quad \frac{3}{3} \\ \hline x = 1 \end{array}$$

6) $9x - (7x + 6) = 15 - 5x$

6) $X = 3$

$$\begin{array}{r} 9x - 7x - 6 = 15 - 5x \\ 2x - 6 = 15 - 5x \\ +5x \quad +5x \\ \hline 7x - 6 = 15 \\ +6 \quad +6 \\ \hline 7x = 21 \\ \frac{7}{7} \quad \frac{21}{7} \\ \hline x = 3 \end{array}$$

Solve the equation. Show all algebraic work for full credit. (3 points)

7) $-3(y+2) = 2(4y+3) + y$

7) $y = -1$

$$-3y - 6 = 8y + 6 + y$$

$$\begin{array}{r} -3y - 6 = 9y + 6 \\ -9y \quad -9y \\ \hline -12y - 6 = 6 \\ +6 \quad +6 \\ \hline -12y = 12 \end{array}$$

$$\begin{array}{r} -12y = 12 \\ \frac{-12y}{-12} = \frac{12}{-12} \\ y = -1 \end{array}$$

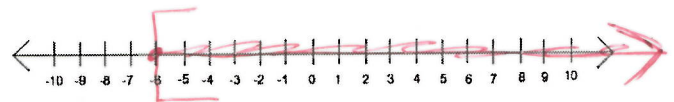
Solve each inequality and graph the solution on the number line provided. (3 points each)

8) $5x \leq 8x + 18$

8) $x \geq -6$

$$\begin{array}{r} 5x \leq 8x + 18 \\ -8x \quad -8x \\ \hline -3x \leq 18 \\ \frac{-3x}{-3} \geq \frac{18}{-3} \\ x \geq -6 \end{array}$$

$$x \geq -6$$



9) $(1.25y - 1.2 - 0.5 \geq -1.2y + 2.3 + 1.45y)$

9) $y \geq 4$

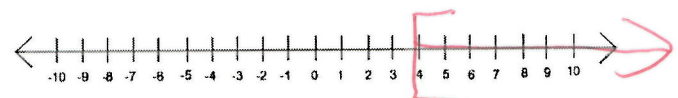
$$1.25y - 1.2 - 0.5 \geq -1.2y + 2.3 + 1.45y$$

$$\begin{array}{r} 1.25y - 1.7 \geq 1.25y + 2.3 \\ -1.25y \quad -1.25y \\ \hline -1.7 \geq 2.3 \end{array}$$

$$\begin{array}{r} -1.7 \geq 2.3 \\ +1.7 \quad +1.7 \\ \hline 0 \geq 4 \end{array}$$

$$\begin{array}{r} 0 \geq 4 \\ \frac{0}{100} \geq \frac{400}{100} \\ 0 \geq 4 \end{array}$$

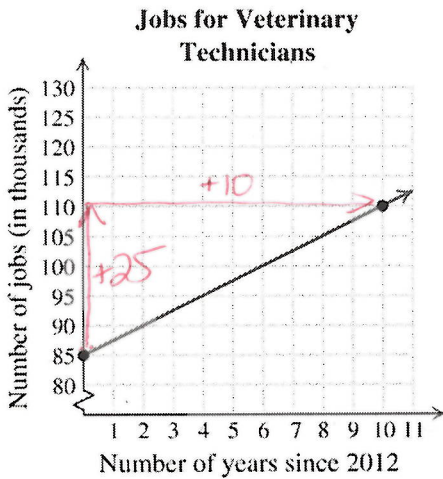
$$y \geq 4$$



- 10) Write the equation of a line that has a slope of -5 and intersects the y-axis at $(0, 7)$. (2 points)

$$y = -5x + 7$$

- 11) Use the two given points to write the equation of the line for the graph shown. (2 points)



$$m = \frac{\text{rise}}{\text{run}} = \frac{25}{10} = \frac{5}{2}$$

$$y = \frac{5}{2}x + 85$$

- 12) Find the slope of each line. Then state whether the two lines are parallel, perpendicular or neither. Show your work and justify your answer for full credit. (3 points)

$$y = -\frac{1}{4}x + 16$$

Slope of first line $-\frac{1}{4}$

$$x + 4y = 8$$

Slope of second line $-\frac{1}{4}$

$$\begin{aligned} x + 4y &= 8 \\ -x &\quad -x \\ \hline 4y &= -x + 8 \\ \frac{4y}{4} &= \frac{-x}{4} + \frac{8}{4} \\ y &= -\frac{1}{4}x + 2 \end{aligned}$$

Answer with reason: The lines are parallel because they have the same slope.

13) Given the line $-3x + 4y = 12$, find the following. (1 point each)

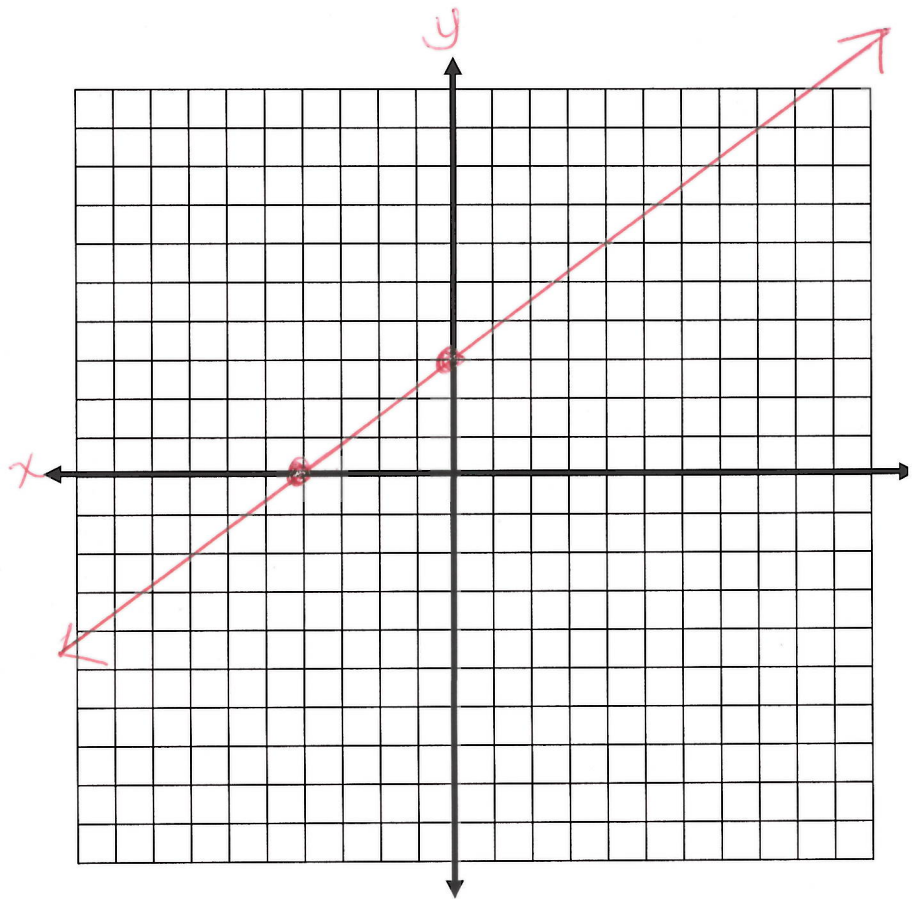
$$\begin{array}{r|l} x & y \\ \hline 0 & 3 \\ -4 & 0 \end{array}$$

a) x-intercept: $(-4, 0)$

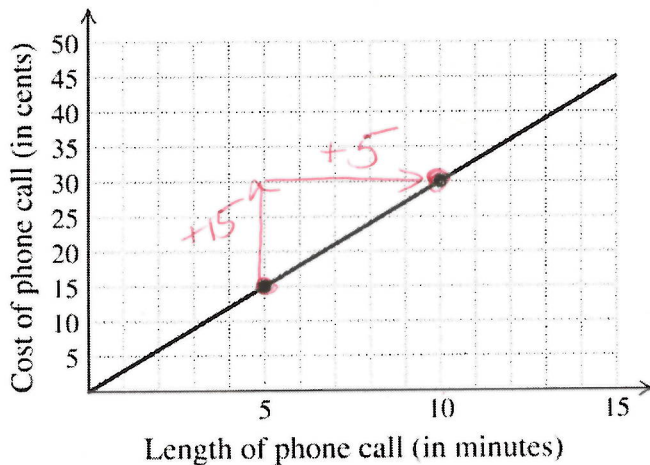
b) y-intercept: $(0, 3)$

c) slope: $\frac{3}{4}$

d) Graph.



14) Use the graph to find the rate that the customer was being billed. Include the proper units in your answer. (1 point)



$$\frac{\text{cents}}{\text{minutes}} = \frac{15 \text{ cents}}{5 \text{ mins}} = 3 \text{ cents/min}$$

14) 3 cents per minute

15) The cost to rent a bike is a \$10.00 flat fee per day plus \$5.00 for each hour.

a) What would the cost be if the bike is rented for 2 hours? \$20 (2 point)

$$y = 5(2) + 10 \\ = 10 + 10 = 20$$

b) What would the cost be if the bike was rented for 5 hours? \$35 (2 point)

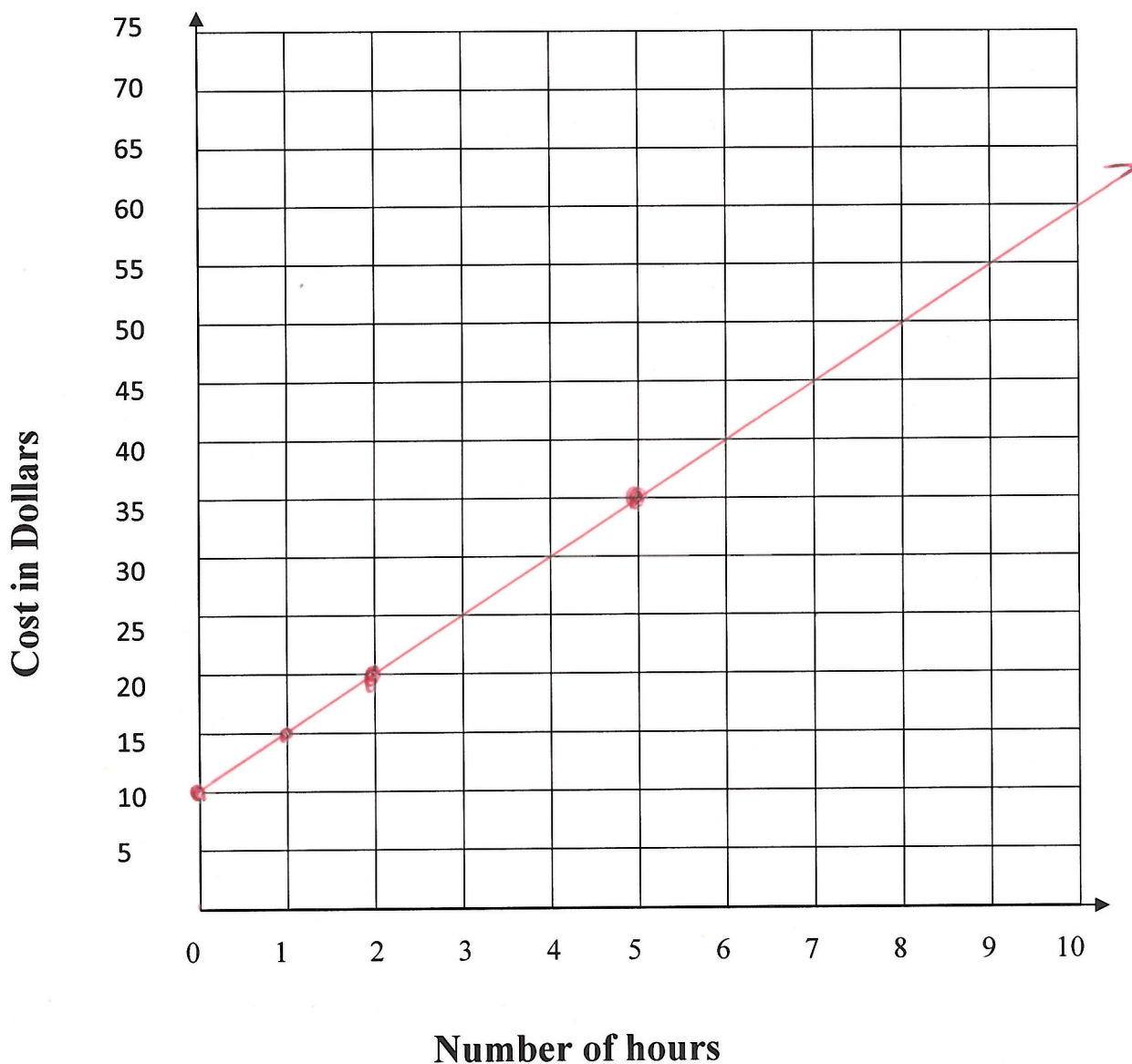
$$y = 5(5) + 10 \\ = 25 + 10 \\ = 35$$

c) Write an equation that models this situation.

Let y = the cost and let x = the number of hours the bike is rented.

Equation: $y = 5x + 10$ (2 points)

d) Graph. (2 points)



16) Write the equation of the line that contains the points $(8, -2)$ and $(12, 1)$. (3 points)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - (-2)}{12 - 8} = \frac{3}{4} = m$$

$$y = mx + b \quad \xrightarrow{\text{use}} m = \frac{3}{4} \text{ and } (12, 1)$$

$$1 = \frac{3}{4}(12) + b$$

$$1 = 9 + b$$

$$-8 = b$$

$$y = \frac{3}{4}x - 8$$

17) If $f(x) = x^2 - 5x + 6$, then find $f(0)$ and $f(-3)$. (1 point each)

$$a) f(0) = (0)^2 - 5(0) + 6 = 6$$

17a) 6

$$b) f(-3) = (-3)^2 - 5(-3) + 6$$
$$9 + 15 + 6$$

17b) 30

18) Find the point of intersection of the two lines using the substitution method. (3 points)

$$\begin{aligned} 4x - 2y &= -10 \\ y &= x + 3 \end{aligned}$$

$$4x - 2(x + 3) = -10$$

$$4x - 2x - 6 = -10$$

$$\begin{array}{r} 2x - 6 = -10 \\ +6 \quad +6 \end{array}$$

$$\frac{2x}{2} = \frac{-4}{2}$$

$$x = -2$$

$$y = x + 3$$

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

$$y = 1$$

$$(-2, 1)$$

19) Find the point of intersection of the two lines using the elimination (addition) method. (3 points)

$$\begin{aligned} 2(-3x + 4y &= 18) \cdot 2 \\ 6x - 2y &= 0 \end{aligned}$$

$$\begin{array}{r} -6x + 8y = 36 \\ + \quad 6x - 2y = 0 \\ \hline \end{array}$$

$$\frac{6y}{6} = \frac{36}{6}$$

$$y = 6$$

$$6x - 2(6) = 0$$

$$\begin{array}{r} 6x - 12 = 0 \\ +12 \quad +12 \end{array}$$

$$\frac{6x}{6} = \frac{12}{6}$$

$$x = 2$$

$$\begin{aligned} -3x + 4y &= 18 \\ 2(6x - 2y &= 0) \cdot 2 \end{aligned}$$

$$\begin{array}{r} -3x + 4y = 18 \\ + \quad 12x - 4y = 0 \\ \hline \end{array}$$

$$\frac{9x}{9} = \frac{18}{9}$$

$$x = 2$$

$$(2, 6)$$

$$6(2) - 2y = 0$$

$$12 - 2y = 0$$

$$-2y = -12$$

$$y = 6$$

20) Express 2,400,000,000 in scientific notation. (1 point)

21) 2.4×10^9

21) Write 7.2×10^{-5} in standard form (decimal notation). (1 point)

22) 0.000072

22) Multiply. Write your answer in scientific notation. (2 points)

23) 8.5×10^{-7}

$$(5 \times 10^6)(1.7 \times 10^{-13})$$

Simplify each expression. Write the result using positive exponents. Please circle your final answer.
(2 point each)

23) $x^7 \cdot x^{-2} \cdot x$

$$\boxed{x^6}$$

25) $(y^{-3})^5$

$$y^{-15} = \boxed{\frac{1}{y^{15}}}$$

26) $(2x^{-3}y)(4x^5y^3)$

$$\boxed{8x^2y^4}$$

27) $\frac{30a^6b^2}{15a^3b}$

$$\boxed{2a^3b}$$

Perform the indicated operations. Simplify answers fully. (2 points each)

28) $14y^2 + 4y - 7 - 5y^2 + y - 1$

$$9y^2 + 5y - 8$$

29) $(12x^2 - 5x + 3) - (2x^2 + 2x + 6)$

$$(12x^2 - 5x + 3) - (2x^2 + 2x + 6)$$
$$10x^2 - 7x - 3$$

30) $3x(2x^2 + 4x - 1)$

$$6x^3 + 12x^2 - 3x$$

31) $(2x + 5)^2$

$$(2x + 5)(2x + 5) \text{ FOIL!}$$

$$4x^2 + 10x + 10x + 25$$

$$4x^2 + 20x + 25$$

Perform the indicated operations. Simplify answers fully. (2 points each)

32) $(3x + 2)(3x - 2)$

$$9x^2 - 6x + 6x - 4$$

$$\boxed{9x^2 - 4}$$

33) $(2x + y)(4x + 3y)$

$$8x^2 + 6xy + 4xy + 3y^2$$

$$\boxed{8x^2 + 10xy + 3y^2}$$

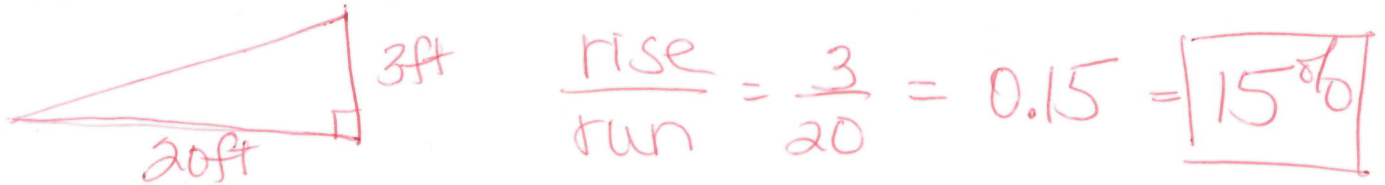
34) $\frac{20x^4 - 10x^3 + 5x^2}{5x^2}$

$$\frac{20x^4}{5x^2} - \frac{10x^3}{5x^2} + \frac{5x^2}{5x^2}$$

$$\boxed{4x^2 - 2x + 1}$$

Applications. Show your algebraic work for each problem. Include the proper units. Circle your final answer.

- 35) A boat ramp going into the water should not rise more than 3 feet over a horizontal distance of 20 feet. Express this slope as a grade. Leave your answer as a percent. (2 points)



- 36) A family drives 117 miles from Hartford to New York City at an average rate of 50 miles per hour. Use the formula $\text{Distance} = (\text{rate})(\text{time})$ to determine how much time they spent driving. Round your answer to the nearest variable tenth.

$$\text{Distance} = (\text{rate})(\text{time})$$

$$\frac{117}{50} = \frac{(50)(x)}{50}$$

$$2.34 = x$$

round ↙

$$\boxed{2.3 \text{ hours}}$$

***Choose 4 out of the following 5 word problems to complete. Please put a large X through the problem that you do not want graded. Show all work for each problem. (3 points each)**

- 37) You paid \$16.26 for a meal including a 20% tip. How much was the cost before the tip? Round your answer to two decimal places.

$X = \text{cost before tip}$

$$X + .20X = 16.26$$

$$\begin{array}{r} 1.20X = 16.26 \\ \hline 1.20 \end{array}$$

$$\boxed{\$13.55}$$

$$X = 13.55$$

- 38) The equation $C = 3d + 5.25$ can be used to determine the cost of a taxi ride C , in dollars, given the number of miles d that the taxi travels. Determine the distance a taxi drove for a ride that costs \$47.25.

$$\begin{array}{r} 47.25 = 3d + 5.25 \\ -5.25 \quad -5.25 \\ \hline 42 = 3d \\ \frac{42}{3} = \frac{3d}{3} \\ 14 = d \end{array}$$

$$\boxed{14 \text{ miles}}$$

- 39) A couple wants to spend at most \$14,000 for a wedding reception. If the catering company charges a one-time fee of \$750 plus \$65 per person, find the greatest number of people that can attend the wedding reception. Show your work.

$X = \# \text{ of people}$

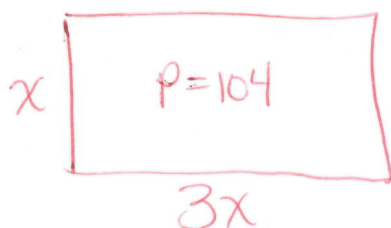
$$\begin{array}{r} 750 + 65X \leq 14,000 \\ -750 \quad -750 \\ \hline \end{array}$$

$$\begin{array}{r} 65X \leq 13,250 \\ \hline 65 \end{array}$$

$$X \leq 203.846 \dots$$

$$\boxed{203 \text{ people can attend}}$$

- 40) The perimeter of a field is 104 feet. The length is 3 times longer than the width. Find the dimensions of the field.



$$x + 3x + x + 3x = 104$$

$$\frac{8x}{8} = \frac{104}{8}$$

$$x = 13$$

$$\begin{array}{l} \text{width} = 13 \text{ ft} \\ \text{length} = 39 \text{ ft} \end{array}$$

OR

$$2x + 2(3x) = 104$$

$$2x + 6x = 104$$

$$8x = 104$$

$$x = 13$$

- 41) Tickets were sold at a summer fair for hot air balloon rides and a rock climbing wall. A hot air balloon ride cost \$50 and the rock climbing wall cost \$15. They collected \$2370 and sold 109 tickets altogether for both. How many hot air balloon rides did they sell?

$x = \# \text{ of balloon rides } (\$50)$

$y = \# \text{ rock climbing wall } (\$15)$

$$\begin{array}{l} -50(x + y = 109) \quad -50 \\ \hline 50x + 15y = 2370 \end{array}$$

$$\begin{array}{r} \Rightarrow -50x - 50y = -5450 \\ + 50x + 15y = 2370 \\ \hline \end{array}$$

$$\begin{array}{r} -35y = -3080 \\ \hline -35y = -3080 \\ \hline \end{array}$$

$$y = 88$$

$$x + 88 = 109$$

$$x = 21$$

21 Balloon Rides

88 Rock Climbing Wall

BONUS: (2 points)

$$-8 + 4$$

$$(-8)(4)$$

Find two integers that have a sum of -4 and a product of -32

Bonus: -8 and 4