

A. Lesson Context

BIG PICTURE of this UNIT:	<ul style="list-style-type: none"> • What is meant by the term FUNCTIONS and how do we work with them? • mastery with working with basics & applications of linear functions • mastery with working with basics & applications of linear systems • understanding basics of function concepts and apply them to lines & linear systems 		
CONTEXT of this LESSON:	Where we've been In Lesson 5, you practiced with writing equations in different forms & practiced your algebraic fluency	Where we are Using the different forms of linear equations in order to model applications of linear functions	Where we are heading How do we apply the concept of "functions" to linear relations.

B. Lesson Objectives

- Write equations to model real world scenarios using slope-intercept form of linear functions
- Write equations to model real world scenarios using standard form of linear functions
- Apply function basics like domain and range to real world scenarios

C. Fast Five: Writing Equations

4. For each statement, define two variables and write a linear equation that models the sentence.
- The sum of two numbers is 12.
 - The sum of the width and length of a rectangle is 36 m.
 - The total value of nickels and dimes is 75¢.
 - Fives times some number less three times another number is ten.
 - A sum of money invested at 5% per year and another sum at 8% per year earned a total of \$150 in the first year.
 - The cost of the rental is \$50 plus \$5/h.
 - A rectangle is 2 m longer than it is wide.
 - The total value of \$5 bills and \$10 bills is \$135.

D. Explorations → Health Issues

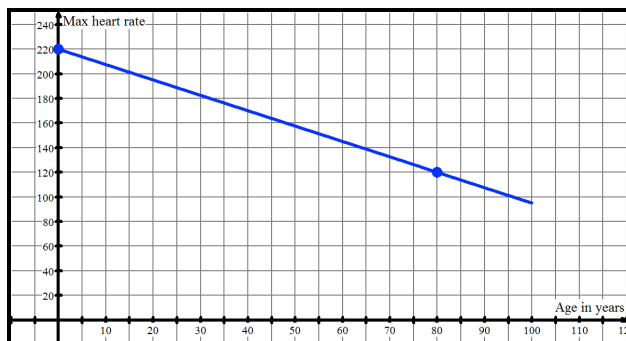
Verbal Description:

The graph below shows the relationship between a person's maximum heart rate and their age.

Data Table:

age	0	80
Max heart rate	220	120

Graph:



Equation:

Slope:

Meaning of Slope:

Y-intercept:

Meaning of y-intercept :

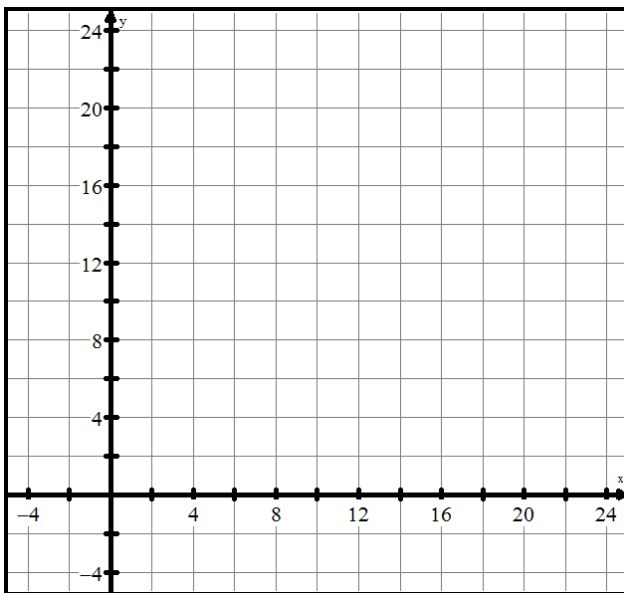
Questions:

- For what age will maximum heart rate be 170 beats per minute?
- What is the maximum heart rate for a 50 year old athlete?
- At what rate is the max heart rate decreasing from year to year?
- Evaluate $R(49)$ and interpret.
- Solve $R(y) = 0$ and interpret. Is this value reasonable or not?
- State the domain and range of this function. Explain.

E. Explorations → Mixtures

A candy store is preparing a mixture of chocolate raisins and chocolate peanuts. The raisins are sold for \$2.25/kg and the peanuts are sold for \$1.75/kg. They will produce a 20 kg mix that they will sell for \$41 (or \$2.05/kg).

Graph:



DEFINE YOUR VARIABLES, then complete the tables

Data Table: List some possible combinations of amounts of raisins & peanuts to account for the 20 kg.

Amt of Raisins					
Amt of Peanuts					

Data Table: List some possible combinations of amounts of raisins & peanuts to account for the VALUE of \$41.

Amt of Raisins					
Amt of Peanuts					

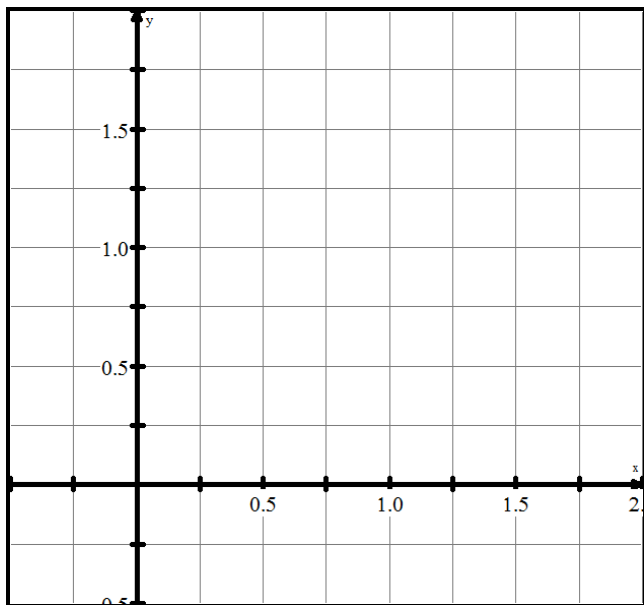
Questions:

- (a) Write an equation for the amount of the mixture made.
- (b) What do the x- and y-intercepts represent?
- (c) What would be the domain and range of this function?
- (d) Write an equation for the total cost of the mix.
- (e) What do the x- and y-intercepts represent?
- (f) What would be the domain and range of this function?

F. Explorations: Equations in Standard Form - Rates

Jose travelled 95 km from Oakville to Oshawa by car and by train. The car averaged a speed of 60 km/hr and the train averaged 90 km/hr. The whole trip took 1.5 hours of travel time.

Graph:



DEFINE YOUR VARIABLES, then complete the tables

Data Table (time):

x						
y						

Data Table (distance):

x						
y						

Questions:

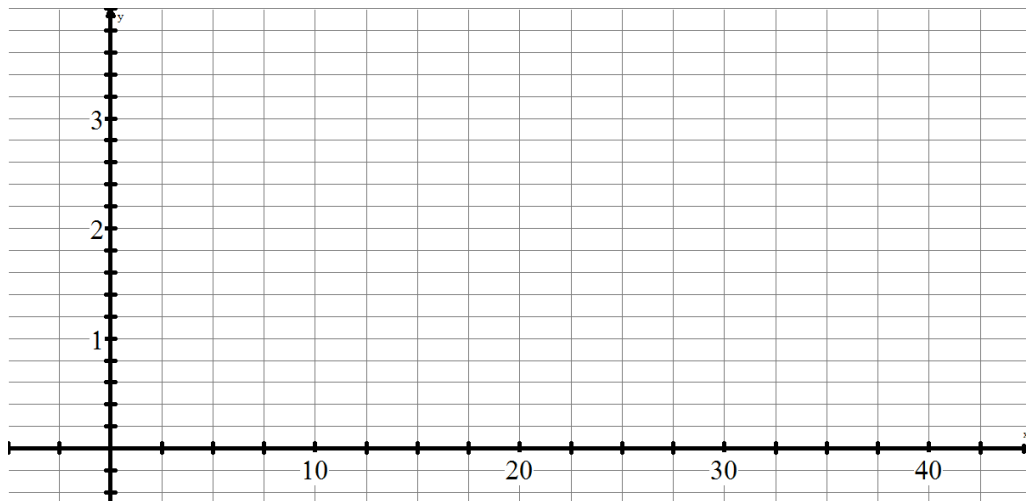
- (a) Write an equation for the time travelled.
- (b) What do the x- and y-intercepts represent?
- (c) Write an equation for the distance travelled.
- (d) What do the x- and y-intercepts represent?
- (e) Use algebra to write and solve a single equation that can be used to determine how much time was spent travelling by car.

G. Exploratory Example – Piecewise Linear Functions

A long distance calling plan charges \$1.29 for any call up to 20 minutes in length and 7 cents for each additional minute (or each part of a minute)

- What is the independent variable (input)? What would the domain be?
- What is the dependent variable (output)? What would the range be?
- Would you expect this relation to be a function? Why/why not?
- Evaluate $C(50)$ and interpret.
- Evaluate $\$2.41 = C(m)$ and interpret.
- To help draw a graph, complete the following table of values. Then graph this relation.

Time (min)	0	5	10	15	20	25	30	35	40
Cost (\$)									



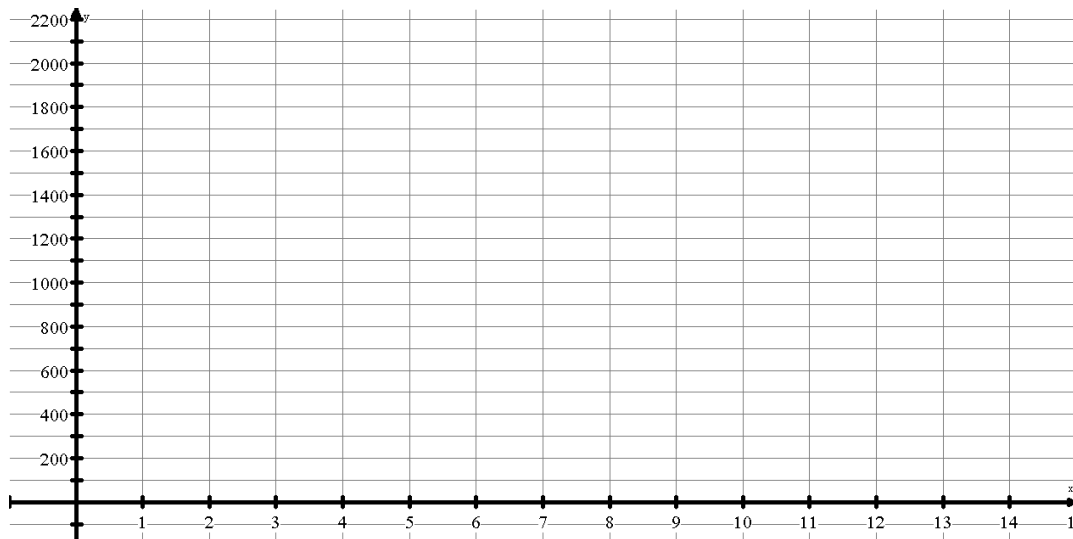
Now, how would you write an equation for this relation?

H. Exploratory Example – Piecewise Linear Functions

A hotel has the following rates that apply to groups who rent their ballroom. They charge \$400 for any time of 2 hours or less. If the rental time exceeds 2 hours, then an additional rate of \$200 per hour are charged. However, if the total rental time is more than 8 hours, they only charge an hourly rate of \$100. All rentals are not allowed to exceed 12 hours.

- What is the independent variable (input)? What would the domain be?
- What is the dependent variable (output)? What would the range be?
- Would you expect this relation to be a function? Why/why not?
- Evaluate $C(7)$ as well as $C(11)$.
- Evaluate $\$1150 = C(t)$ and interpret.
- To help draw a graph, complete the following table of values. Then graph this relation.

Time									
Cost (\$)									



Now, how would you write an equation for this relation?

I. PART C – Solving Linear Equations Involving Absolute Value.

- a. Explain what the Absolute Value “function” does to an input, for example the numbers -3 and +5
- b. Evaluate $|-2 + 5 + 7 - 13 \times 2|$ and evaluate $(-2 + 5 + 7 - 13 \times 2)$ and explain WHY the answers are different.
- c. Solve $|2x + 5| = 4$ GRAPHICALLY on DESMOS and explain WHY there are two solutions.
- d. Explain HOW to solve the equation $|2x + 5| = 4$ ALGEBRAICALLY.
- e. Solve $|2x + 5| = x + 4$ GRAPHICALLY and explain WHY there are two solutions.
- f. Explain HOW to solve the equation $|2x + 5| = x + 4$ ALGEBRAICALLY.
- g. Solve the following equations involving absolute value ALGEBRAICALLY.

(i) $|-2x + 5| = x + 4$

(ii) $\left|-\frac{2}{3}x - 1\right| = x + 4$

(iii) $|2x + 5| = x - 4$

(iv) $4 - |3x - 6| = 4 - x$

J. Further Skill Application – Working With Scatterplots & Lines of Best Fit (Regression Lines)

2. *Active Dentists in the U.S.*

Year (x)	0	5	10	15	20	25	30
Number of Dentists (y)	154	152	149	147	144	136	121

- Is there any constant rate of change with this data?
- Pick any two points and calculate the slope.
- What does the slope mean in the context of this situation?
- Calculate the line of best fit. Use mathematics to explain how you determined your answer. Use words, symbols, or both in your explanation.
- Identify the y – intercept.
- What does the y – intercept mean in the context of this situation?

K. For each of the following, determine the regression equation & solve the problem.

1. A student who waits on tables at a restaurant recorded the cost of meals and the tip left by single diners.

Meal Cost	\$4.75	\$6.84	\$12.52	\$20.42	\$8.97
Tip	\$0.50	\$0.90	\$1.50	\$3.00	\$1.00

If the next diner orders a meal costing \$10.50, how much tip should the waiter expect to receive?

Equation _____ Tip expected _____

2. The table below gives the number of hours spent studying for a science exam (x) and the final exam grade (y).

X	2	5	1	0	4	2	3
Y	77	92	70	63	90	75	84

Predict the exam grade of a student who studied for 6 hours.

Equation _____ Grade expected _____

3. The table below shows the lengths and corresponding ideal weights of sand sharks.

Length	60	62	64	66	68	70	72
Weight	105	114	124	131	139	149	158

Predict the weight of a sand shark whose length is 75 inches.

Equation _____ Weight expected _____

CLASSWORK SCORING RUBRIC:

Understanding	Communication	Perseverance/Collaboration
<p>4 – All my work is correct and has been verified by myself & others that I am working with. I have corrected any errors that I/others found in our checking.</p> <p>I know that I now understand this concept & skill</p>	<p>4 – the work that I am presenting ALWAYS shows clear & concise key steps & accurate & proper solutions, so that other students could read & understand it.</p>	<p>4 – we stayed on task ALL the time & solved our own problems if & when they came up. We finished all the class work.</p>
<p>3 – Most of my work is correct and has been checked by myself & others that I am working with. I have corrected most of the errors that I/others found in our checking.</p> <p>I believe that I now understand most of this concept & skill</p>	<p>3 – the work that I am presenting MOSTLY shows clear & concise key steps & accurate & proper solutions, so that other students could read & understand it.</p>	<p>3 – we stayed on task MOST the time & usually solved our own problems if & when they came up. We finished all the class work.</p>
<p>2 – Some of my work is correct and has been checked by myself & others that I am working with. I have corrected some of the errors that I/others found in our checking.</p> <p>I know that I partially understand this concept & skill</p>	<p>2 – the work that I am presenting SOMETIMES shows clear & concise key steps & accurate & proper solutions, so that other students could read & understand it.</p>	<p>2 – we stayed on task SOME the time (had to be reminded occasionally) & sometimes solved our own problems if & when they came up (needed some teacher help). We had to rush to finish all the class work.</p>
<p>1 – I don't know if my work is correct or not as I have not checked my work, nor have others that I am working with. So obviously, I have not corrected any errors.</p> <p>I still know that even now I don't understand this concept & skill</p>	<p>1 – the work that I am presenting RARELY shows clear & concise key steps & accurate & proper solutions, so that other students could read & understand it.</p>	<p>1 – we were off task often & had to be reminded & rarely solved our own problems if & when they came up (needed teacher help or help from the MF group). We didn't finish all the class work.</p>