1. Lesson Context

BIG PICTURE of this UNIT:	• What is meant by the term FUNCTIONS and how do we work with them? • What are the most important components of "Problem Solving"? • From last year's course, what are the major topics from linear relations that we have worked with, remember, and are fluent with? • How do we apply the concept of linear relations to (i) geometry & (ii) data analysis & (iii) functions

2. Lesson Objectives

a. Write equations of linear models in multiple forms to model applications
b. Apply function concepts like domain and range and function notation in the context of linear models

PART 1 – Skills REVIEW

1. Leah works in a store and earns $1200/month plus 3.5% commission on her sales. Answer the following questions to help you model the relationship between her sales and her earnings.

   a. What is the independent variable? the dependent variable?
   b. Create an equation that she can use to model the relationship between her sales and her earnings.
   c. State a reasonable domain and range for this relation. Explain/justify your choice.
   d. Last month, Leah had $96,174 in sales. Her paycheck was $4566.09. Is this amount correct? Explain your solution.
   e. Would this relation be an example of a **function**? Why/why not?

2. Deb pays 10 cents per minute for cell phone calls and 6 cents for text messages. She has a budget of $25/month for both calls and text messages.

   a. Create a table to show the ways that Deb can spend up to $25 each month on calls and text messages. (HINT: What will your variables represent?)
   b. Graph the data from your table. (HINT: what will be your variables?)
   c. Write an equation that models this context.
   d. State the domain and range of the model that you created to describe this relation.
   e. Is this example of a relation also an example of a **function**? Why/why not?
   f. Deb's brother thinks he has found a better deal. He would pay 4 cents per text message and 12 cents per minute for calls for a month fee of $20 for both calls and texts. Explain whether or not her brother's deal is "better"

3. Melanie drove at 120 km/h from Cairo to Hurghada. She left Cairo at 2:15 pm with 35 L of gas in her car. The low fuel warning light came on when their were 9 L of gas left in the tank. If her SUV uses gas at the rate of 9.5 L per 100km, estimate the time when the warning light came on. How far from Cairo was she at this time?

4. Jacob has $15 to buy muffins and doughnuts for the school bake sale for the Math Club. Muffins cost $0.75 each and doughnuts are $0.25 each. How many muffins and doughnuts can he buy?

    a. Create a table to show some possible combinations of muffins and doughnuts.
    b. What is the maximum number of muffins her can buy? The maximum number of doughnuts he can buy?
    c. Write an equation that describes Jacob's options.
    d. Graph the possible combinations.
    e. Mr. S states that the domain can be a **real** number $\{x \in R.....\}$, whereas Mr. R states that the domain must be an **integer** number $\{x \in Z.....\}$. Who is correct and why?

PART 2 – Skills PRACTICE

1. Graph the function $f(x) = \frac{1}{2}x + 5$. From your graph (or from your calculator or from algebra):

    a. Determine the range if the domain were $\{x \in R | -8 \le x < 16\}$
    b. Determine the domain if the range were $\left\{y \in R | -\frac{5}{2} \le y < 1\right\}$
    c. Determine the x-intercept and y-intercept
    d. Evaluate $f(-2)$
    e. What value of x makes $f(x) = -8$?

2. Answer EITHER of the two questions below:

(a) (GREEN LEVEL) Determine the equation of the line that passes through A(5,-2) and B(-1,-6). Write the equation in all three forms.	(b) (BLUE LEVEL) Determine the equation of the line that passes through the point A(5,-2) and B(a,b). Write the equation in all three forms.

3. The equation $\frac{x}{7} - \frac{y}{2} = -1$ can also be written as $\frac{1}{7}x - \frac{1}{2}y = -1$.

   a. Why are they the same equation?

   All three of your Math teachers tried to convert the equation into standard form.

   b. Mr Rawlings multiplied the equation by 2 and got $\frac{2x}{7} - y = -2$. Is he correct? Why/why not?

   c. Mr Santowski multiplied the equation by 7 and got $x - \frac{7}{2}y = -7$. Is he correct? Why/why not?

   d. Mr Smith multiplied the equation by 14 and got $2x - 7y = -14$. Is he correct? Why/why not?

   e. Determine the value of x if $y = -14$

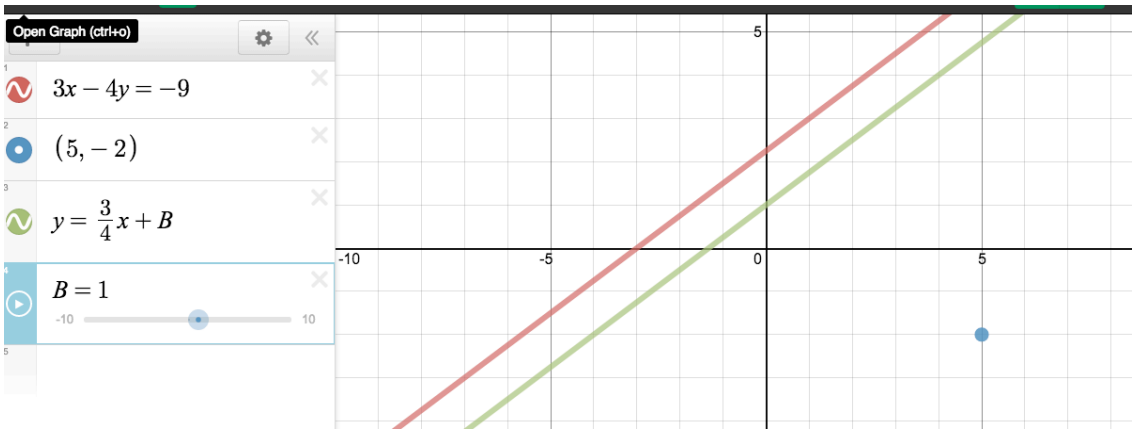
   f. State the slope and x- and y-intercepts

4. A line passes through the point E(5,-2) and is parallel to $3x - 4y = -9$. Answer the following guiding questions as work toward determine the equation of this line & express the equations in all three forms.

   a. Use DESMOS to graph the line $3x - 4y = -9$ as well as the point E(5,-2)

   b. Using algebra or DESMOS or any other method, EXPLAIN why the slope of the line $3x - 4y = -9$ is ¾.

   c. Using DESMOS, type in the new equation $y = \frac{3}{4}x + B$ and add a slider for B



   d. Play the slider and thus determine an appropriate value for B such that the line passes the point E(5,-2) and is parallel to $3x - 4y = -9$.

   e. Use algebraic processes to verify that your value of B from this graphic investigation is correct.

Higher Level Extension Work

1. Graphing & Solving Linear Inequalities

   a. Solve the linear inequality $3x + 5 < -2x + 3(x - 4)$

   b. Use DESMOS to graph the linear inequality $y \leq 2x + 4$. Explain what is happening and offer an explanation as to WHY the solution appears as it does. Explain how you could ALGEBRAICALLY verify that your solution was correct.

   c. (**CI**) Graph the linear inequality $f(x) < 2x - 16$. DO NOT USE TECHNOLOGY!! Verify your solution.

   d. (**CI**) Graph the linear inequality $f(x) \geq -x + 5$. Verify your solution.

   e. (**CI**) Graph the linear inequality $2x - 4y < 16$. Verify your solution.

   f. (**CI**) Graph the linear inequality $y - 6 \geq -2(x + 3)$. Verify your solution.