Lesson Context

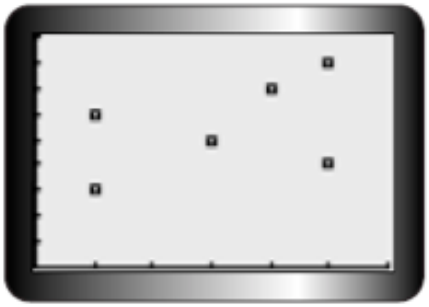
BIG PICTURE of this UNIT:	• What is meant by the term FUNCTIONS and how do we work with them? • What are the most important components of "Problem Solving"? • From last year's course, what are the major topics from linear relations that we have worked with, remember, and are fluent with? • How do we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

Lesson Objectives

a. Apply function concepts like domain and range and function notation in the context of linear models
b. Continue working with systems of equations and multiple ways to solve linear systems

PART 1 – Skills REVIEW

1. The scatter plot shows a relation. The marks on each axis indicate single units.



   a. State the domain and range of this relation.
   b. Draw an arrowing diagram (or a mapping diagram) to illustrate the relation.
   c. Is the relation a function? Explain.
   d. Mr. S wants to write a linear equation for this relation using LINREG on the TI-84. What will the equation be?
   e. Is the line a "good fit" for the data set? Explain.
   f. The first 2 points as well as the last 2 points form a quadrilateral. Plot the points and draw the quadrilateral using GEOGEBRA. What type of quadrilateral is it?

2. The symbols that make up this notation of **f(3) = 7** communicate INFORMATION

f	3	7

The information being communicated by these "symbols" can also be PRESENTED in ALTERNATE WAYS:

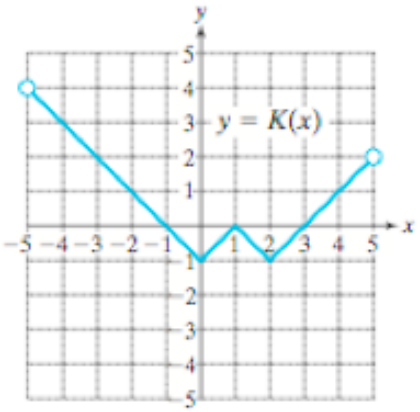
(i) op	(ii) m	(iii) g

3. The functions $y = f(x)$ and $y = g(x)$ are defined as follows:

$$f(x) = \{(-3,5), (-7,-3), (-1.5,4), (1.2,5)\}$$
$$g(x) = \{(0,6), (4,6), (6,0), (1,0)\}$$

   a. Identify the domains of both functions, $y = f(x)$ and $y = g(x)$.
   b. Identify the ranges of both functions, $y = f(x)$ and $y = g(x)$.
   c. For what value(s) of x is $f(x) = 5$; $f(x) = -3$?
   d. For what value(s) of x is $g(x) = 0$; $g(x) = 6$?
   e. Find the value of: (i) f(-7), (ii) g(0), (iii) $g(f(-1.5))$

4. The graph of $y = K(x)$ is given.



   a. Find $K(0)$.
   b. Find $K(-5)$.
   c. Find $K(1)$.
   d. For what value(s) of x is $K(x) = 0$?
   e. Solve the "equation" $K(x) = 3$ for x.
   f. Write the domain and range of K.
   g. HL EXTENSION: Write the equation for K.

PART 2 – Skills PRACTICE

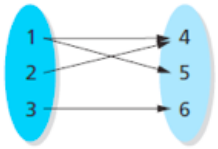
1. Determine the equation of the lines described in the following situations:
   a. Find the equation of a line that is parallel to the line $y - 5 = \frac{2}{3}(x - 2)$ and passes through the point (-3,6)
   b. Find the equation of a line that is perpendicular to $2x - 3y = -8$ and goes through the point (4,-3)
   c. Find the point at which the line $y - 5 = \frac{2}{3}(x - 2)$ meets the line $2x - 3y = -8$.

2. For each of the following, state:

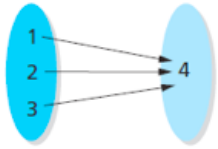
   i. The domain and range
   ii. Whether is defines a function or not and justify your answer.

   a. $\{(1,2), (3,1), (4,2), (7,2)\}$
   b. $\{(1,2), (1,3), (4,5), (6,1)\}$
   c. $\{(1,0), (0,1), (2,3), (3,2)\}$

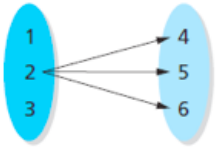
(d)



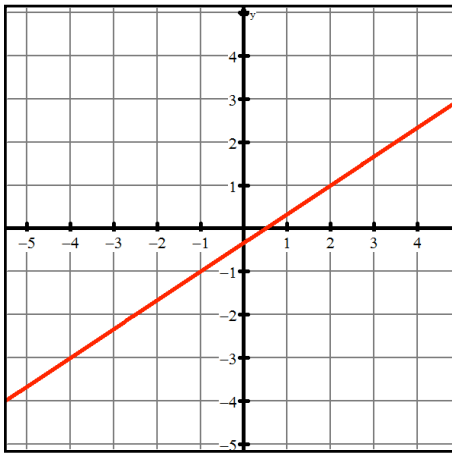
(e)



(f)



3. Determine the equation of the function, $f(x)$, shown in the diagram.



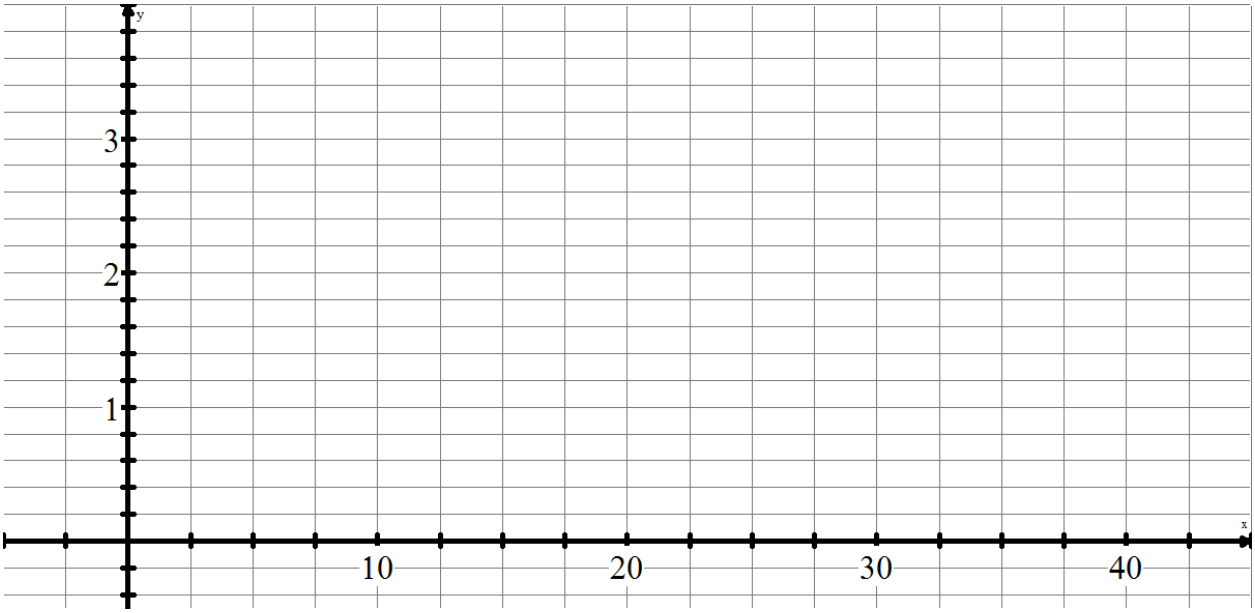
   a. Write the equation in all three forms:
   b. If the function value in this relation was -7, what is the value of the input? Show your reasoning/work.
   c. Solve the equation $f(x) = -7$.
   d. Determine where this function intersects with $8x - 12y - 4 = 0$

4. Exploring Piecewise Relations: 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)

   a. What is the independent variable (input)? What would the domain be?
   b. What is the dependent variable (output)? What would the range be?
   c. Would you expect this relation to be a function? Why/why not?
   d. Determine the cost of a 52 minute phone call.
   e. How long would a call be if you had to pay $2.41.
   f. 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 ($)									

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



Higher Level Extension Work

1. 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) $4-|3x-6|=4-x$