BIG PICTURE of this UNIT:	• How do we REVIEW WORK WITH the concept of "functions" • Why are linear equations written in different forms? • How do we EXTEND our knowledge of LINEAR functions, beyond the basics of IM2?

In your group, discuss & prepare solutions to the following **CONCEPT EXTENSION** questions. Record the key ideas of your discussions/solutions in your notebook. Then, once you have had your discussions, present your solutions on the board. Solutions do NOT necessarily NEED to be correct – they simply form the basis for DISCUSSIONS!!!! If your group has (i) multiple solutions that lead to the same answers OR (ii) same/different solutions that lead to different answers, present them ANYWAY!!

1. A line that goes through the point (2,-3) and has a slope of 2. {1,3}

   a. Write its equation in standard form.
   b. State the slope of a line that is perpendicular to the line you worked with in Q1a.
   c. Knowing that this perpendicular line goes through the point (2,-3) as well, write its equation as well.
   d. Use your GDC to graph these two lines and verify that they look perpendicular (HINT: window adjustments or ZOOM options) {2}

2. Use DESMOS to graph the absolute value function $g(x) = |x|$. You will now investigate the concept of transformations of this parent function. {11,13}

   a. Graph the second function $f(x) = -|x-2|+3$ and explain how the new graph compares to the parent function, $g(x) = |x|$.
   b. Graph the second function $f(x) = 2|x+5|$ and explain how the new graph compares to the parent function, $g(x) = |x|$.
   c. Graph the second function $f(x) = -\frac{1}{2}|x| - 4$ and explain how the new graph compares to the parent function, $g(x) = |x|$.
   d. Make a general statement about the appearance of the graph of $f(x) = A\,|x-C| + D$.

3. Use your GDC to graph the parabola f(x) = $(x – 1)^2$ – 4. Find the x-intercepts and **hence** write the equation of the parabola in factored form. {Q1}

4. Use algebra to solve the system defined by $\begin{array}{l} f(x) = (x-1)^2 - 4 \\ g(x) = 2x - 7 \end{array}$. Use DESMOS on this system of equations in order to verify where they seem to intersect. {2,6,18}

5. A piecewise linear function is defined as $p(x) = \begin{cases} 2x+5 & if\ x < -2 \\ ax-3 & if\ x \geq -2 \end{cases}$. Determine the value of *a* such that the function is continuous at *x* = -2. {13}

6. A linear system can be described as having no solutions, one unique solutions or infinite solutions. {6}

   a. Use on-line resources to explain/describe/understand each term and write your definitions (include diagrams) into your notes.

   b. Given the linear system $\begin{matrix} 2x+3y=11 \\ kx+4y=-3 \end{matrix}$, determine a value for *k* such that:

      i. The system has NO solutions,

      ii. The system has a unique solution

   c. Now working with the linear system $\begin{matrix} 2x+3y=11 \\ kx+4y=m \end{matrix}$, determine values for *k* and *m* such that the system has INFINITE solutions.

7. A linear function is defined as follows: {1,2,3,6,7}

   I. It only exists on the domain of $\{x \in R | -2 < x \leq 10\}$

   II. It goes through the points A(1,2) as well as B(5,8).

   a. Determine its equation and write the equation in all 4 forms presented in IM3.

   b. Graph the line by hand on graph paper.

   c. State the range of this linear function.

   d. Mr. D wonders whether or not this line intersects with the line 4*x* + 3*y* + 24 = 0. Show/explain whether or not the two lines intersect.

8. I have been observing the motion of a bug that is crawling on my graph paper. When I started watching, it was at the point (1, 2). Ten seconds later it was at (3, 5). Another ten seconds later it was at (5, 8). After another ten seconds it was at (7, 11). {16}

   a. Draw a picture that illustrates what is happening.

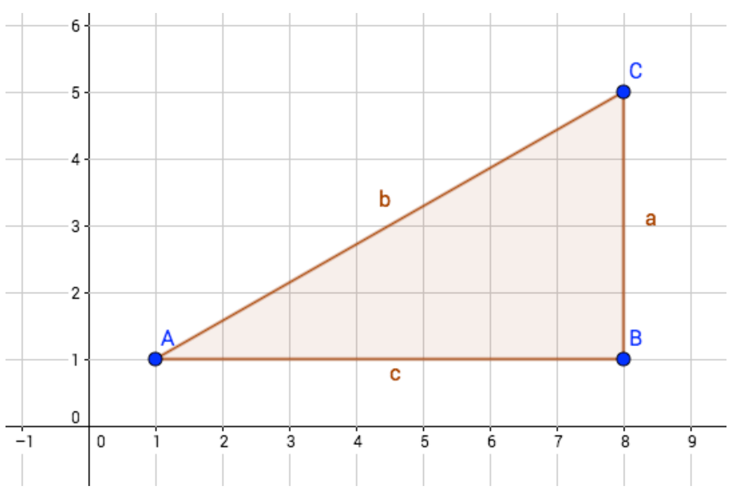
   b. Write a description of any pattern that you notice. What assumptions are you making?

   c. Where was the bug 25 seconds after I started watching it?

   d. Where was the bug 26 seconds after I started watching it?

9. Use DESMOS to graph the function $f(x) = \frac{1}{x}$. {11,13,15}
   a. Use online resources to help you define "asymptote" and record a definition.
   b. Does the function $f(x) = \frac{1}{x}$ have asymptotes? If so, where? Prepare a sketch in your notes.
   c. Now graph the transformed function, $f(x) = \frac{1}{x+3} - 2$. Explain how the two graphs compare. Present a sketch in your notes.

10. The diagram below (from GEOGEBRA) shows the points A(1,1), B(8,1) and C(8,5) and the triangle ABC. {4,T1}
   a. Explain how you would ALGEBRAICALLY prove that the angle at vertex B is a right triangle.
   b. use right triangle trigonometry (SOHCAHTOA) to detemine the measure of angle BAC.
   c. You had to use a special key on the GDC in order to determine the measure of the angle. Which key did you use. Now explain the role of the "inverse" concept.
   d. Determine the slope of the line segment AC.
   e. Determine the tangent ratio. Compare this ratio to your answer from 12d. Explain WHY!
   f. Reflect this triangle over the line y = x and state the new co-ordinates of point A, B and C.



HOMEWORK:

Watch the following videos about inverse functions and record the examples into your notebook. Our next lesson will help you consolidate your understanding of this concept and your ability to work algebraically with this concept.

(1) from Khan Academy ➔ https://www.youtube.com/watch?v=W84lObmOp8M

(2) from Mindset Learn ➔ https://www.youtube.com/watch?v=RvnGcL3XIiQ