BIG PICTURE of this UNIT:	• How do we WORK WITH & EXTEND 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?

This lesson will be based upon a STUDENT DIRECTED DISCUSSION model ….. in your groups, you should be having DISCUSSIONS about how to think and work through and then present the solutions to the following questions. The questions will involve basic ideas from IM2 Linear Relations UNIT including (i) functions, (ii) linear functions, (iii) GEOGEBRA and Co-ordinate Geometry. EVERY LESSON this semester will involve **spiralling through** these 4 major concepts as you will be given the opportunity to deepen and extend your conceptual knowledge & skill set on these 4 major themes as you see them multiple times in our lessons.

So, in your group, discuss & prepare solutions to the following 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. Last year, you were introduced to function notation. Explain what information is being communicated in the mathematical statement f(-2) = 5. Offer at least three different ideas. {1}

2. Determine the equation of the line that passes through the points A(2,5) and B(-4,8). Verify that your equation is correct and does in fact contain these two points. {3}

3. You will now work with the line 2x – 4y = 12. {1,2,3}

    a. Then use ALGEBRAIC METHODS to determine the x- and y-intercepts.
    b. Use DESMOS to graph the line 2x – 4y = 12.
    c. Use GEOGEBRA to graph the line 2x – 4y = 12.
    d. Now sketch the linear function into your notes, labelling the 2 key points intercepts.
    e. Determine the slope of this line.
    f. **HENCE**, write the equation of this same line in slope-intercept form (also known as function form).

4. Use your graphing calculator to graph 4x – 2y = 11. Sketch the function and label the key points. {2}

5. To make a new seating arrangement, everyone in the group should now switch seats. Now **predict** how many different seating arrangements might be possible, given your group of 6-8 students. Be able to explain/justify the total number of seating arrangements possible. {P1}

6. Use DESMOS to graph the following equations: (a) $2x + 5y = 10$ (b) $\frac{x}{5} + \frac{y}{2} = 1$ (c) $y = -\frac{2}{5}x + 2$ (d) $f(x) = -\frac{2}{5}x + 2$ (e) $f(x) = -\frac{2}{5}(x - 5)$. What do you notice? {2,3,4}

Higher Level Questions for More Complex Concepts OR an EXTENSION of basic concepts involved with linear relations and functions in general.

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

   a. State the slope of a line that is perpendicular to the line you worked with in Q1. Knowing that this perpendicular line goes through the point (2,-3) as well, write its equation as well. {1,3}

   b. Use your GDC to graph these two lines and verify that they look perpendicular (HINT: window adjustments or ZOOM options) {2}

   c. Use online resources to define the following terms: (i) a line that is ***tangent*** to a curve, (ii) a line that is ***normal*** to a curve, (iii) a line that is ***orthogonal*** to a curve {18}

2. Use DESMOS to graph (i) $f(x) = x^2 + 2x - 8$ and then (ii) $g(x) = (x + 4)(x - 2)$ and then (iii) $h(x) = (x + 1)^2 - 9$. What do you notice? Explain why? Sketch the parabolas and label their key features. {2,4}