|	
BIG PICTURE of this UNIT:	• mastery with linear algebraic skills to be used in our work with coordinate geometry (midpoint, length, slope) • understanding various geometric properties of quadrilaterals, triangles & circles • how do you really "prove" that something is "true"? • introduction to working with 3D shapes

Part 1 - Skills Review

1. Expand and simplify (i) $2(3x - 1) + 3(x + 2)$,   (ii) $6(3 - 2x) - 2(4 - 2x)$

2. Use the mini whiteboards to graph the relation $y = 2x - 3$ using the slope and y-intercept.

3. Use the mini whiteboards to graph the relation $4x - 5y = 10$ using the x- and y-intercepts.

4. Calculate the length of the indicated side in each right triangle:

a)

x

5 m

12 m

b)

x

200 mm

55 mm
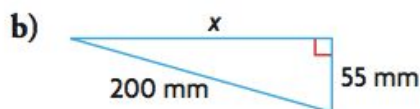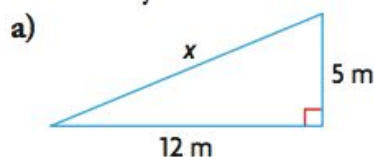
5. Use the mini whiteboards to graph the points P(2,1), Q(5,7) and R(8,4). Connect the points with line segments to construct a triangle and find the slope of each side. Are any sides *perpendicular*? How do you know?

Part 2 – Concept EXPLORATION

Exploring Midpoint and Length – through graphing and intuition

(A) Use the mini whiteboards to graph the following two points: A(0,0) and then B(14,4) and then draw the line segment AB

    (a) Decide where the midpoint of the line segment AB should be. Explain/give a reason for your selected location.

    (b) Find the slope of line segment AB.

    (c) How would you determine the length of this line segment?

    (d) Find the angle the line segment makes with the positive x-axis using a protractor.

(B) Use the mini whiteboards to graph the following two points: C(-4,-6) and then D(8,2) and then draw the line segment CD

    (a) Decide where the midpoint of the line segment CD should be. Explain/give a reason for your selected location.

    (b) Find the slope of line segment CD.

    (c) How would you determine the length of this line segment?

    (d) Find the angle the line segment makes with the positive x-axis using a protractor.

(C) Use the mini whiteboards to graph the following two points: E(-6,4) and then F(3,-5) and then draw the line segment EF.

    (a) Decide where the midpoint of the line segment EF should be. Explain/give a reason for your selected location.

    (b) Find the slope of line segment EF.

    (c) How would you determine the length of this line segment?

    (d) Find the angle the line segment makes with the positive x-axis using a protractor.

Exploring Midpoint & length – dynamic geometry software: geogebra

Open an internet browser Using the following geometry applet (https://www.geogebra.org/m/AafgtkrJ), let's continue to explore how to find the midpoint and the length of line segments

(A) Move the end points of the line segment to the given coordinates. Use the geogebra animation to determine both the midpoint and the length of the line segment AB in each case.

Point A	(2,5)	(3,6)	(-5,-4)	(-2,-8)	(3,-7)	(-2,9)	(0,-7)
Point B	(-4,7)	(0,-2)	(7,-1)	(-8,6)	(-4,-7)	(-2,2)	(5,0)
Midpoint							
Length							

How can you predict where the midpoint should be?

How can you calculate the length of a line segment?

(B) Now Point A will be fixed at (16,-8) and you will have to move Point B to get to the **requested midpoint**. Record the final position B. Q? how can you predict where Point B should be?

Point A	(16,-8)	(16,-8)	(16,-8)	(16,-8)	(16,-8)	(16,-8)	(16,-8)
Midpoint	(0,0)	(6,-1)	(9,-6)	(12,0)	(0,-3)	(4.5,-4)	(8.5,1.5)
Point B							

How can you predict where Point B should be?

(C) **CHALLENGE #1**: Now Point A will be fixed and you will have to move Point B to get to the **requested length**. Record the final position B. Q? how can you predict where Point B should be?

Point A	(0,0)	(0,0)	(0,0)	(6,-8)	(6,-8)	(6,-8)
Length	3	4	10	5	20	9
Point B						

(D) **CHALLENGE #2**: A line segment has an endpoint at A(5,2) and has a length of 13 units. Determine the coordinate(s) of the other endpoint(s). Show the algebraic reasoning/work that leads to your conclusion.

Part 3 – Skills PRACTICE

1. Determine the midpoint of the line segment between A(1,1) and B(5,9)

2. Determine the midpoint of the line segment between A(-1,1) and B(5,5)

3. Determine the midpoint of the line segment between A(-2,6) and B($\frac{7}{2}$, -4)

4. Determine the slope of the line segment between A(1,1) and B(5,9)

5. Determine the slope of the line segment between A(-1,1) and B(5,5)

6. Determine the slope of the line segment between A(-2,6) and B($\frac{7}{2}$, -4)

7. Determine the length of the line segment between   A(1,1) and B(5,9)

8. Determine the length of the line segment between A(-1,1) and B(5,5)

9. Determine the length of the line segment between A(-2,6) and B($\frac{7}{2}$, -4)