(A) Lesson Context

BIG PICTURE of this UNIT:	• mastery with algebraic skills to be used in our work with co-ordinate geometry (midpoint, length, slope) • understanding various geometric properties of quadrilaterals & triangles • how do you really prove that something is "true"?		
CONTEXT of this LESSON:	Where we've been In MS, you have been taught about various types of geometric figures like quadrilaterals & triangles	Where we are Becoming proficient with one analytical tool that we can use in co-ordinate geometry ➔ midpoint	Where we are heading How can I prove various geometric properties of quadrilaterals and triangles?

(B) Lesson Objectives:

a. Exploring the midpoint of a line segment through dynamic geometry software (geogebra)
b. Develop proficiency in analytic/algebraic determination of midpoints of line segments
c. Apply the use of midpoints to problem solving questions

(C) Exploring Midpoint – through dynamic geometry software: geogebra

Open Firefox, Explorer, Safari (but NOT CHROME) ➔ Using the following dynamic geometry applet (http://www.geogebratube.org/student/m12412), (you may have to download JAVA) let's explore the midpoint

i. Point A is fixed at (0,0) and move Point B ➔ Record position of Point B and then aslo record the position of the midpoint ➔ Q? how can you predict where the midpoint should be?

Midpoint and Length of a Line Segment

Drag the points A and B to the desired Coordinates. Try to work out the midpoint and length of the line segment AB before using the check boxes to reveal the answers.

☑ Midpoint ☐ Right–Angled Triangle ☐ Show Length Calculation ☐ Length of AB
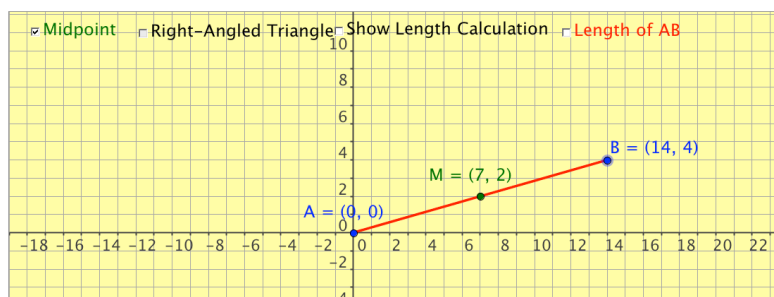
B = (14, 4)
M = (7, 2)
A = (0, 0)

Point A	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)
Point B	(14,4)						
Midpoint							

Q? how can you predict where the midpoint should be?

ii. Now Point A will also move and you will also move Point B ➔ Record position of Points A and B and then aslo record the position of the midpoint ➔ Q? how can you predict where the midpoint should be?

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)	(-4,2)	(-6,2)	(5,0)
Midpoint							

Q? how can you predict where the midpoint should be?

iii. 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							

Q? how can you predict where Point B should be?

(D) Working with the Formula

a. The formula to find the midpoint between two points on a graph is

$$(x,y) \text{ of midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

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

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

iii. Determine the midpoint of the line segment between $A(-2,6)$ and $B(3,-4)$

iv. Determine the midpoint of the line segment between $A(1,-2)$ and $B(8,-2)$

b. A line segment has an endpoint at $A(5,2)$ and midpoint at $M(9,-3)$. Determine the co-ordinates of the other endpoint. Show the algebraic reasoning/work that leads to your conclusion.

c. On the design plan for a landscaping project, a straight path runs from $(11,29)$ to $(53,9)$. A light is going to be placed halfway along the path.

1. Draw a diagram that shows the path.
2. Determine the co-ordinates of the lamp on your diagram
3. The one lamp is not bright enough to illuminate the pathway. So two more lamps will be placed along the path, such that each lamp is placed a quarter of the distance of the path. Determine the coordinates of the other two lamps.

d. A perpendicular bisector of a line segment is a second line that will (i) cut the line segment in half and (ii) be perpendicular to the original line segment (see diagram). A line segment ends at the points $C(-2,0)$ and $D(4,-4)$. Determine the equation for the perpendicular bisector of line segment CD.

(E) **Homework/Resources**

Nelson 10 Chap 2.1 - Midpoint of a Line Segment, p78-80, Q4-7