(A) Lesson Objectives:

    a. Exploring the midpoint and length 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

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

Open an internet browser ➔ Using the following geometry applet (http://www.geogebratube.org/student/m12412), let's explore the midpoint

a. 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?

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?

b. 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? now, how can you predict where the midpoint should be?

c. 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?

(C) **Exploring Length – through dynamic geometry software: geogebra**

Open an internet browser ➔ Using the following geometry applet (http://www.geogebratube.org/student/m12412), let's explore the length of a line segment

a. Point A is fixed at (0,0) and move Point B (the first three B coordinates have been given to you. Record position of Point B and then aslo record the length of the segment ➔ Q? how can you determine the length of segment?

Point A	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)
Point B	(8,6)	(-15,8)	(-12,-5)			
Length						

Q? how can you determine the length of segment?

b. 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 length of the segment ➔ Q? how can you determine the length of segment?

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

Q? now, how can you determine the length of segment?

(D) CHALLENGE #1: Now Point A will be fixed at (16,-8) 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	(16,-8)	(16,-8)	(16,-8)	(16,-8)	(16,-8)	(16,-8)	(16,-8)
Length	10	13	17	5	21.9	28.2	30
Point B							

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

(F) Working with the Concepts

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

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

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

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

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

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

g. 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.

h. 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.
      i.   Draw a diagram that shows the path.
      ii.   Determine the co-ordinates of the lamp on your diagram
      iii.   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.

i. 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.

j. A helicopter is travelling from Town A to Town B. A grid is overlaid on the map of this region and Town A is at (-70,770) and Town B is at (220,490) & Town C is the origin.
      i.   Draw a diagram that shows the three towns.
      ii.   Approximately how far did the helicopter travel?
      iii.   What assumption did you make about the route of the helicopter?

k. Triangles can be classified according to the lengths of their sides (scalene, isosceles, equilateral). A given triangle has vertices at A(4,5), B(1,2) & C(6,1).
      i.   Determine the lengths of all three sides and then classify the triangle type.
      ii.   Construct the triangle on GEOGEBRA.
      iii.   Where would you move point C such that you now had an isosceles triangle?