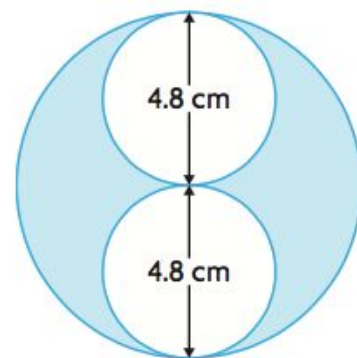


## IM2 Problem Set 1.3 - Working with the Midpoint & Length of a Line Segment

BIG PICTURE of this UNIT:	<ul style="list-style-type: none"><li>• mastery with linear algebraic skills to be used in our work with coordinate geometry (midpoint, length, slope)</li><li>• understanding various geometric properties of quadrilaterals, triangles &amp; circles</li><li>• how do you really “prove” that something is “true”?</li><li>• introduction to working with 3D shapes</li></ul>
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### Part 1 - Skills Review

1. Determine the equation of the line through A(-1,7) and B(2,6)
2. Show that line AB is perpendicular to the line  $y = 3x - 2$ .
3. Solve: (i)  $3(7 - 4x) - \frac{4}{3}(2x + 1) = 49$  (ii)  $(x - 1)^2 = 36$
4. Determine the point of intersection of the lines  $y = 2x + 5$  and  $y = 3x + 4$ .
5. Calculate the area of the shaded region in the diagram on the right.



### Part 2 – Concept Applications

1. 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.
  - a. Draw a diagram that shows the path.
  - b. If one unit on the grid is equal to 5m, determine the length of the path.
  - c. Determine the coordinates of the lamp on your diagram.
  - d. 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.
2. 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.
  - a. Draw a diagram that shows the three towns.
  - b. Approximately how far did the helicopter travel?
  - c. What assumption did you make about the route of the helicopter?

3. 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. Create a diagram to show this concept. 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.
4. 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).
  - a. Determine the lengths of all three sides and then classify the triangle type.
  - b. Construct the triangle on GEOGEBRA.
  - c. Where would you move point C such that you now had an isosceles triangle?
5. **Guided Discussion:** A triangle has vertices at A(-3,-1), B(3,5) and C(7,-3). Determine an equation for the median from vertex A.
6. **Geogebra Visualization:** A waste management company is planning to build a landfill in a rural area. The company would like the landfill site to be the same distance from each town. On a coordinate map of the area, the towns are at A(1,8) and B(5,2). Describe all the possible locations for the landfill site.
7. A quadrilateral has vertices at P(1,3), Q(6,5), R(8,0) and S(3,-2). Determine:
  - a. whether or not the diagonals have the same midpoint?
  - b. whether or not the diagonals have the same length?
8. **CHALLENGE Question:** Graph the line  $y = 2x + 3$  as well as the point A(8,4).
  - a. The points B(0,3), C(4,11) and D(6,15) are on the line  $y = 2x + 3$ . Find their distances from point A(8,4).
  - b. Which point on the line is closest to A(8,4). Show supporting evidence.