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

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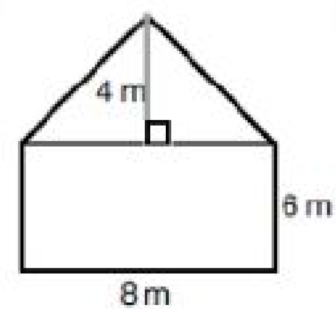
BIG PICTURE of this UNIT:	● mastery with linear algebraic skills to be used in our work with coordinate geometry (midpoint, length, slope) ● understanding various geometric properties of quadrilaterals, triangles & circles ● how do you really "prove" that something is "true"? ● introduction to working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

Part 1 - Skills Review



1. 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 and perimeter of the shape 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. 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?

7. **CHALLENGE Question & 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(5,8). Describe all the possible locations for the landfill site.

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.