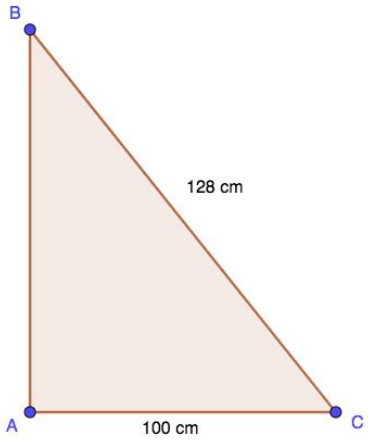
IM2 Problem Set 1.4 - Further Geometric Applications of Midpoint & Length of a Line Segment

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. A rectangular field measures 78 m by 46 m. Determine its perimeter and area.
2. A cube has side lengths of 4 cm. Determine its volume and surface area.
3. Determine the equation of a line that passes through (4,-3) and is parallel to the line $2x - 4y = 7$.
4. Determine the area and perimeter of the triangle pictured here.



Part 2 – Concept Applications

1. The endpoints of the diameter of a circle are A(-1,1) and B(5,-3). Make a diagram showing this information. Determine the coordinates of the center of the circle and then determine the length of the radius of this circle.

2. A triangle has vertices at A(2,-2), B(-4,4) and C(0,4). Make a diagram showing this information.
   a. Draw the triangle on graph paper.
   b. Determine the length of each side. What type of triangle is it?
   c. Determine the coordinates of the midpoints of its sides.
   d. Draw the median from vertex A and determine its equation.

3. A point is one-third of the way from point A(1,7) to point B(10,4). Determine the coordinates of this point. Explain the strategy you used.

4. **Geogebra & Guided Discussion**: Graph the line $f(x) = 2x - 4$ and the point (-3,4) using Geogebra and then calculate the distance between the point (-3,4) and the following points which are on your line $f(x)$. Round your answer to two decimal places (in other words, round to the nearest hundredth.)

   a. (i) (0,-4) (ii) (1,-2) (iii) (2,0) (iv) (3,2) (v) (4,4)
   b. The point (-3,4) is closest to which point on the line? Call this point P.
   c. Determine the equation of the line through P and (-3,4).

5. Determine the equation of the median from K in a triangle with vertices at K(2,5), L(4,-1) and M(-2,-5).

6. A triangle has vertices at P(7,7), Q(-3,-5) and R(5,-3).

   a. Graph these three points
   b. Determine the coordinates of the midpoints of side PQ and side PR. Label these points M and N respectively.
   c. Draw the line MN in triangle is called a midsegment. Determine the slope and length of this midsegment, MN.
   d. Determine the length and slope of the third side of the triangle, side QR. What do you notice?

7. A quadrilateral has vertices at W(-7,-4), X(-3,1), Y(4,2) and Z(-2,-7). Two lines are drawn to join the midpoints of the nonadjacent sides in the quadrilateral. Determine the coordinates of the point of intersection of these lines.

8. **CHALLENGE Q**: Triangle ABC has vertices at A(1,2), B(4,8) and C(8,4) and triangle DEF has vertices at D(-1,1), E(-2,6) and F(-8,3). Are the two triangles **congruent**? Provide supporting evidence in your work.