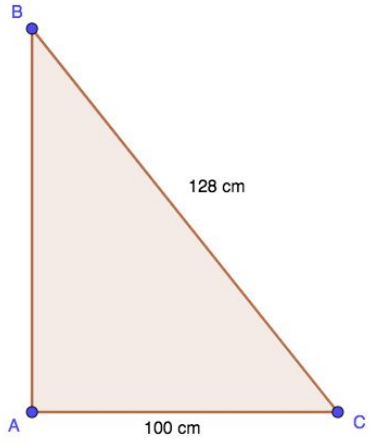
IM2 Problem Set 1.4 - Further Geometric Applications of Midpoint & Length of a Line Segment

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. Find the intersection of the lines $4x + 2y = 7$ and $6x - 4y = 0$.
4. Determine the equation of a line that passes through (4,-3) and is parallel to the line $2x - 4y = 7$.
5. Determine the area 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)
   a. Determine the coordinates of the center of the circle.
   b. 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).
   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. **Guided Discussion**: Calculate the closest distance between each line and the given point. Round your answer to one decimal place.
   a. $y = 4x - 2$ and the point (-3,3)
   b. $2x + 3y = 6$ and the point (7,6)

4. Determine the equations of all three medians of a triangle with vertices at K(2,5), L(4,-1) and M(-2,-5).

5. 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.

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.

9. **CHALLENGE Q**: A triangle has vertices at S(6,6), T(-6,12) and U(0,-12). The line segment SM is the median from vertex S.
    a. Determine the coordinates of the point that is two-thirds of the way from S to M that lies on SM.
    b. Repeat part a) for the other two medians, TN and UR.
    c. Show that the three medians intersect at a common point. What do you notice about this point?
    d. Do you think that this relationship you noticed is true for all triangle? Explain.