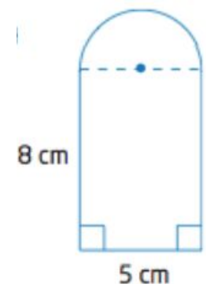
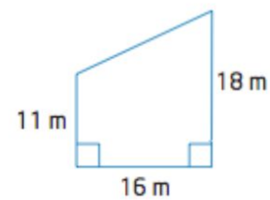
IM2 Problem Set 1.8 - Working with Circles

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



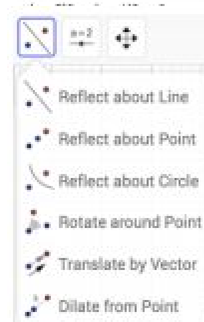
1. Find the volume and surface area of a cube whose side lengths all measure 3 cm.
2. Determine the equation of a line that is perpendicular to $y = \frac{1}{4}x + 7$ and passes through (-1,-2)
3. Solve $\frac{1}{4}(x + 3) + \frac{1}{3}(x - 2) = -\frac{1}{2}$
4. Find the perimeter and the area of these 2 shapes.



Part 2 – Skills REVIEW/EXPLORATION Translation Vectors

1. Here's another Geogebra investigation involving TRANSLATION VECTORS:

   a. Enter the equation $x^2 + y^2 = 9$.
   b. Go to the line tool (3rd "tool") and select VECTOR
   c. Start the VECTOR at (-8,-6) and end the VECTOR at (-6,-5) you should see u = Vector (A,B) and appear on the left.
   d. By considering what you see in GEOGEBRA, what IS a vector?
   e. Find the Translate by Vector tool
   f. So, now translate the circle using this vector (follow the 2 steps)
   g. Where is the new circle located? What is its equation?
   h. Drag the head of the vector to new locations record a few and then also notice how the circle moves and notice its equation as well what is the connection between the "translation", the center and the equation of the circle?
   i. Drag the entire vector around to a new location. Does anything about the circle change?
   j. If a circle of radius r has a center at (h,k), determine its equation.



PART 3 – Skills PRACTICE/Applications & GEOMETRY Contexts

1. Skills consolidation: Determine the equations of the following circles described below:

    a. center at (0,0) and a radius of 7
    b. center at (0,0) and goes through the point (5,3)
    c. center at (1,3) and a radius of 5
    d. center at (-3,-6) and a radius of 3
    e. center at (3,-2) and goes through the point (7,-4)
    f. center at (-4,5) and goes through the point (3,2)

2. Given the circle with the equation of $(x - 3)^2 + (y + 4)^2 = 64$. Using ALGEBRA, determine:

    a. Determine the length of the radius of this circle.
    b. Determine the domain and range of this relation.
    c. Determine the x- and y-intercepts of the circle
    d. If $x = -3$, determine the value(s) for y
    e. If $y = 2$, determine the value(s) for x

3. A circle has its diameter endpoints at A(-2,3) and B(4,13). Determine the equation of this circle. Use Geogebra to VERIFY your answer.

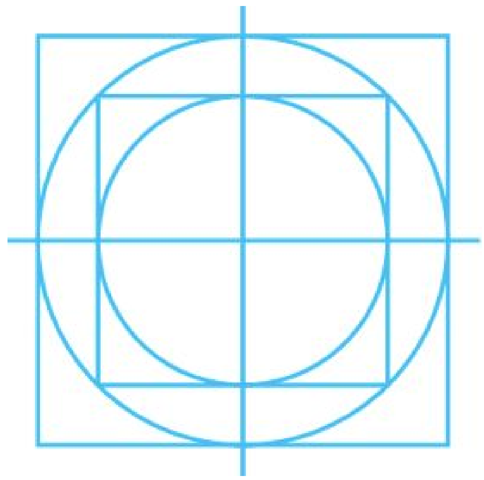
4. Two satellites are orbiting Earth. The path of the first satellite is modeled by the equation $x^2 + y^2 = 56{,}250{,}000$. The orbit of the second satellite is 200 km farther away from the center of the Earth. In one orbit, how much farther does the second satellite travel than the first satellite?

5. Determine the radius and center of the circle defined by:

    a. $9x^2 + 9y^2 = 16$ b. $(x - 2)^2 + (y + 4)^2 = 9$.

6. A truck with a wide load is approaching a tunnel that is shaped like a semi-circle. The maximum height of the tunnel is 5.25 m. If the load is 8 m wide and 3.5 m tall, will the truck fit into the tunnel? Show your calculations and explain your reasoning.

7. Chanelle is creating a design for vinyl flooring. She uses circles and squares to create the design as as shown. If the equation of the small circle is $x^2 + y^2 = 16$, what are the dimensions of the large square? You may use Geogebra to help you work out this question (HINT: try to recreate the design)



8. Mr. R has designed a circular vegetable garden with a diameter of 24.0 meters, as shown in the diagram. He has included a circular flowerbed, 6.0 m in diameter, at the center of the garden, as well as paths that are 1.5 m wide. Mr. R needs to make a plan on grid paper for the landscape gardeners, who will create the garden. Determine the equations of all circles he needs to draw. Assume that the center of the garden is (0,0) and that all non-circular gardens are of equal width.You may use Geogebra to help you work out this question (HINT: try to recreate the design)