MA 7A	Mathematics Embedded Credit
Cape Career & Technology Center	Last Update: April 2017
Topic: Basic Geometry	Focus: Area, Perimeter, Volume, Surface Area

Show-Me Standards: MA2	MO Grade Level Expectations: G1A8, G1B9, G1B10	NCTM Standards: 5A, 5C, 8A

OBJECTIVE: Students will be able to use basic formulas for Area, Perimeter, Volume and Surface Area to solve problems.

Introduction:
An understanding of basic geometry concepts is essential in most career fields. In a number of career fields, basic geometry is vital to success. Perimeter, area and volume are the foundations for calculating required materials for many jobs. The beginning to understanding starts with basic definitions. The following definitions are essential to one's understanding of basic geometry:

PERIMETER: simply, the distance around.
AREA: simply, the surface covered by distinct parameters.
VOLUME: simply, the calculation of the area combined with the height, or thickness.

Here are some other important definitions in understanding basic geometry.

PLANES: the area defined by two-dimensional, flat surfaces.
INTERSECT: to cross.
PARALLEL: nonintersecting lines and/or planes. (The distance between straight, parallel lines/planes is the same at all locations.
DEGREES: a circle is divided so that 360 equal-size angles result. Degrees are an angular measure.
RIGHT ANGLES: angles that measure 90-degrees. A right angle is often shown with a small square drawn in the corner of the angle.
PERPENDICULAR: lines or planes that together form a right angle. (Also called 'square'.)

Certain figures have specific rules that must be applied, and/or followed, when solving problems. This lesson will define rules related to Rectangles, Squares, Triangles and Circles.

RECTANGLES:

A rectangle is a four-sided figure that is a parallelogram. Each of the opposite sides is parallel and is equal in length. The four angles in the rectangle each equal 90-degrees. The lines connecting opposite corners, and drawn within the rectangle are called 'diagonals'. These lines are equal in length and meet at a point called the 'center' of the rectangle.

SQUARE:

A 'special' case of a rectangle, the square has four sides all with equal length. Each of the opposite sides is parallel. The four angles in the square each equal 90-degrees. The lines connecting opposite corners, and drawn within the square are called 'diagonals'. These lines are equal in length and meet at a point called the 'center' of the square.

TRIANGLE:

A triangle is a three-sided figure. Each of the sides may be any length. The three inside angles of a triangle total 180-degrees when added together. A right triangle can be thought of as one-half of a rectangle. An 'oblique triangle' is a triangle that does not contain a right angle. There are two kinds of 'oblique triangles'. An 'obtuse triangle' has one angle that is greater than 90-degrees and an 'acute triangle' has all of its angles equal to less than 90-degrees. There are three types of triangles: Equilateral, Isosceles, and Scalene. An Equilateral Triangle has three equal sides, and three equal angles. An Isosceles Triangle has two equal sides, and two equal angles. A Scalene Triangle has no equal sides and no equal angles.

CIRCLE:

All points along the line of a circle are the same distance from the center of the circle. By definition, there are 360-degrees in a circle. The radius (usually represented by the letter 'r') is the distance from the center of the circle to a point on the circle. The diameter (usually represented by the letter 'd') is the distance from one side of the circle to the other, measured through the center of the circle. The diameter is twice as long as the radius. The circumference of a circle (usually represented by the letter 'c') is both the boundary of the circle and the measurement of the distance around the circle. The ratio of circumference to diameter (c/d) of any circle is 3/1416. This ratio is denoted by the Greek letter π (pi). A 'radian' is an angle, the measure of which is defined by two radii of a circle and an arc joining them, all of the same length. The number of 'radians' in any circle is always 2π (or two times pi), or 6.28. Conversion factor: 2π radians = 360-degrees.

FORMULAS FOR PERIMETER:
Perimeter of a rectangle is: $P_r = 2l + 2w$, where l=length; and w=width.

Perimeter of a square is: $P_s = 4s$, where s=length of one side.

Perimeter of a triangle is: $P_t = a + b + c$, where a, b and c are the length of the sides of the triangle.

Perimeter of a circle is: $\begin{aligned} P_c &= 2\pi r \\ P_c &= \pi d \end{aligned}$, the top formula to be used when a radius is known and the bottom to be used when the diameter is known.

FOMULAS FOR AREA:
Area of a rectangle is: $A_r = l * w$, where l=length; and w=width.

Area of a square is: $A_s = s^2$, where s=length of one side.

Area of a triangle is: $A_t = \frac{1}{2}(b * h)$, where b=base; and h=height.

Area of a circle is: $\begin{aligned} A_c &= \pi r^2 \\ A_c &= \frac{\pi d^2}{4} \end{aligned}$, the top formula to be used when you are given a radius and the bottom when you are given the diameter.

FORMULAS FOR VOLUME:
Volume of rectangular prisms are: $V_{rp} = l * w * h$, where l=length; w=width; and h=height.

Volume of cubes are: $V_c = s^3$, where s=length of one side.

Volume of triangular prisms are: $V_{tp} = \frac{1}{2}(b * h * d)$, where b=base; h=height and d=depth, or length, of prism.

Volume of prisms, in general: $V_{gp} = A_b * d$, where A_b = Area of the base; and d=depth, or length, of the prism.

Volume of cones are: $V_{co} = \frac{1}{3}(\pi r^2 * h)$, where r=radius of the circular base; and h=height of the cone.

Volume of cylinders are: $V_{cy} = \pi r^2 * h$, where r=radius of the circular base; and h=height (or depth) of the cylinder.

Volume of spheres are: $V_s = \frac{4}{3}(\pi r^3)$, where r=radius.

FIND THE PERIMETER:

1.

18″   18″

20″   20″

22″

2.

15m   28m

23m

3.

100mm

4.

12cm

26cm
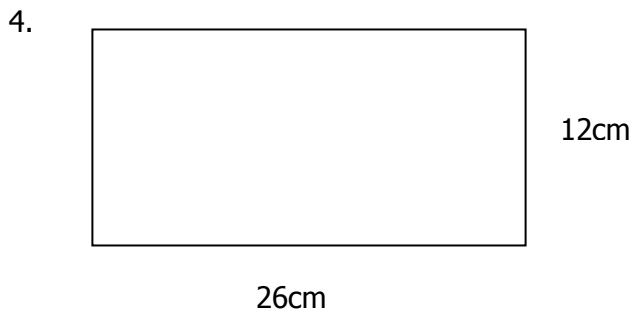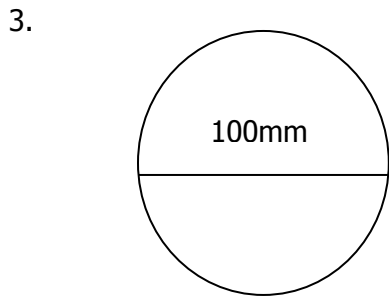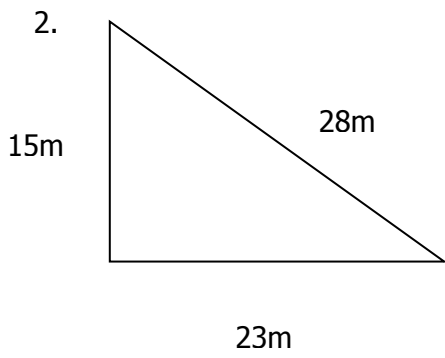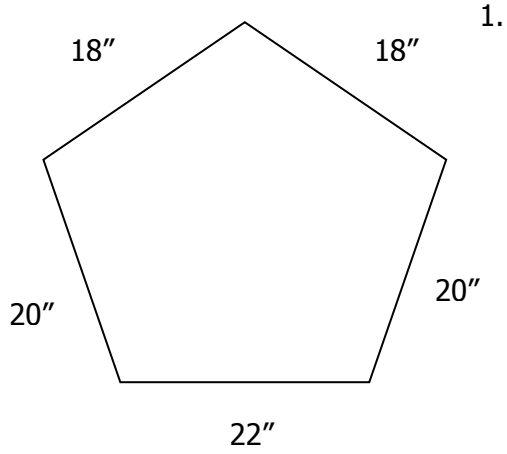
Use AREA to help solve.

5. A room with an 8' high ceiling has two walls that are 18' long and two walls that are 24' long. What is the combined surface area of the walls? If a gallon of paint covers 360 sq. ft., how many gallons are needed to paint the walls?

6. A roll of wallpaper is 100' long and 24" wide. How many rolls will be needed to cover the walls of your daycare if the room is 12' by 14'?

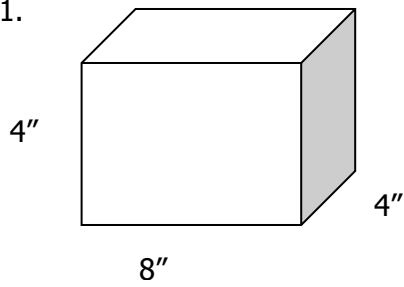7. Find the area of the following figure.

22'

17'
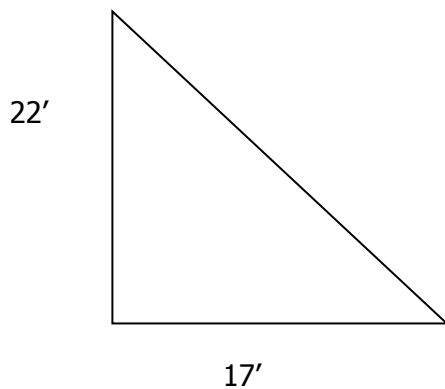
8. How much floor space (area) is taken up by a 10' diameter circular staircase?

9. How many 12" square ceiling tiles are used in a 14' by 16' room?
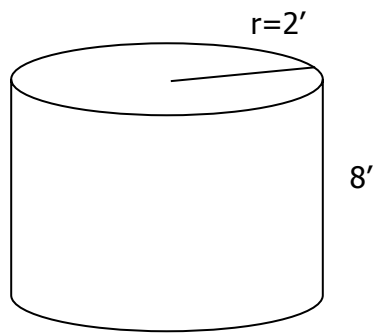
Use VOLUME to help solve.

10. How many cubic feet of compressed sawdust can be packed into a 36" tall cardboard box with an 18" by 24" bottom (and top) ?

11.

4"

4"

8"

What is the volume of the figure to the left?

12.

r=2'

8'

What is the volume of the figure to the left?

13. What is the volume of liquid contained in a glass jar that is 5" tall and 3" in diameter?

14. Calculate the cubic yards of gravel needed to fill a rectangular-shaped hole that is 3' deep, 9' wide and 24' long.