MATH NEWS

Grade 7, Module 3, Topic C

LAFAYETTE PARISH SCHOOL SYSTEM

7th Grade Math

Module 3: Expressions and Equations

Math Parent Letter

This document is created to give parents and students a better understanding of the math concepts found in Eureka Math (© 2013 Common Core, Inc.) that is also posted as the Engage New York material which is taught in the classroom. Module 3 consolidates and expands upon students' understanding of equivalent expressions as they apply the properties of operations to write expressions in both standard form and in factored form. They use linear equations to solve unknown angle problems and other problems presented within context to understand that solving equations is all about the numbers. Students use the number line to understand the properties of inequality. They interpret solutions within the context of problems. They extend their 6th grade study of geometric figures and the relationship between them as they apply their work with expressions and equations to solve problems involving area of a circle and composite area in the plane, as well as volume and surface area of right prisms. Students discover the most famous ratio of all, π.

Focus Area Topic C:

Use Equations and Inequalities to Solve Geometry Problems

Students discover the greatest ratio of all, pi. They examine the relationship between a circle's circumference and diameter, as students understand pi to be a constant. Applying what they know about area of a rectangle, students examine the dimensions to derive a formula for area of the circle. Students analyze figures to determine composite area by composing and decomposing into familiar shapes. Students apply their knowledge of plane figures to find surface area and volume of three-dimensional figures. Students use nets to understand surface area. Students will recognize the volume of a right prism to be the area of the base times the height and compute volumes of right prisms. Students will solve real-world and mathematical problems involving area, volume and surface area of two and three-dimensional figures.

Words to Know:

Circle - the set of all points in the plane that are equidistant from a given point called the center of the circle.

Radius - the length of any segment whose endpoints are the center of a circle and a point that lies on the circle.

Focus Area Topic C:

Use Equations and Inequalities to Solve Geometry Problems

Words to Know: Continued

Diameter - the length of any segment that passes through the center of a circle whose endpoints lie on the circle.

Circumference - the distance around a circle.

Pi (π) - value of the ratio given by the circumference to the diameter. The most commonly used approximations for π is 3.14 or $\frac{22}{7}$

Semicircle - the set containing all points that lie in a given half-plane determined by the diameter

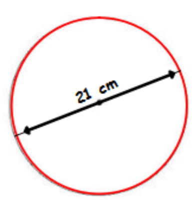
Circular Region (Disk) - Given a point C in the plane and a number $r>0$, the circular region (or disk) with center C and radius r is the set of all points in the plane whose distance from the point C is less than or equal to r.

The Most Famous Ratio of All

Students develop the definition of circle using diameter and radius. Students know the formula for the circumference C of a circle of diameter d and radius r. They use scale models to derive these formulas. Students use $\frac{22}{7}$ and 3.14 as estimates for π and informally show that π is slightly greater than 3.

Example:

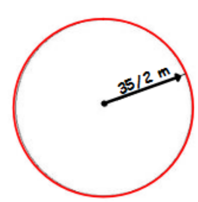
The following circle is not drawn to scale. Find the circumference of each circle. (Use $\frac{22}{7}$ as an approximation for π.)



$C = \pi \times d$

$C = \frac{22}{7} \times 21$

$C =$ 66 cm



$C = \pi \times d$

$C = \frac{22}{7} \times \frac{35}{2}(2)$

$C = \frac{22}{7} \times \frac{70}{2}$

$C = 110\ m$

Notice that the circumference of the two circles is roughly three times the diameter.

Focus Area Topic C:

Use Equations and Inequalities to Solve Geometry Problems

The Area of a Circle
Students give an informal argument explaining the difference between the circumference and area of a circle. Students know the formula for the area of a circle and use it to solve problems.

Example 1:
A circle has a radius of **7** cm.

*Find the **exact area** of the circular region.*

$A = \pi \cdot (7cm)^2 = 49\pi\ cm^2$

An answer in exact form is in terms of π, not substituting an approximation of pi.

*Find the **approximate area** using $\frac{22}{7}$ to approximate.*

$A = 49 \cdot \pi\ cm^2 \approx \left(49 \cdot \frac{22}{7}\right) cm^2 \approx 154 cm^2$

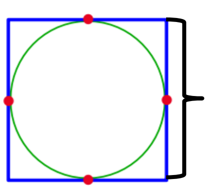
*What is the **circumference** of the circle?*

$C = 2\pi \cdot 7 \ = 14\pi\ c \ \approx\ 43.96\ cm$

This is equivalent to the diameter.

Example 2:

Using the figure below, find the area of the circle.



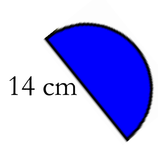
10 cm

The diameter is the same as the length of the side of the square, so the radius = 5 cm.

$A = \pi r^2$, so $A = \pi(5cm)^2 = 25\pi\ cm^2$

More Problems on Area and Circumference
Students examine the meaning of quarter circle and semicircle. Students solve area and perimeter problems for regions made out of rectangles, quarter circles, semicircles, and circles, including solving for unknown lengths when the area or perimeter is given.

Example:
Find the area of the following semicircle.



- If the diameter is 14, then the radius = 7
- The area of a semicircle is $\frac{1}{2}$ the area of the circular region.

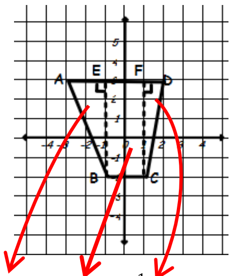
$A \approx \frac{1}{2} \cdot \frac{22}{7} \cdot (7cm)^2$

$A \approx \frac{1}{2} \cdot \frac{22}{7} \cdot 49cm^2$

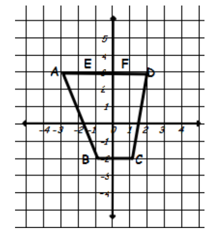
$A \approx 77\ cm^2$

Unknown Area Problems on the Coordinate Plane
Students find the areas of triangles and simple polygonal regions in the coordinate plane with vertices at grid points by composing into rectangles and decomposing into triangles and quadrilaterals.

Example:
Find the area of quadrilateral *ABCD* two different ways.

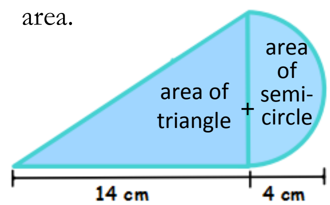


$\frac{1}{2} \times 2 \times 5 + 2 \times 5 + \frac{1}{2} \times 1 \times 5$
$5 + 10 + 2.5 = 17.5$
The area is 17.5 sq. units



$\frac{1}{2} \times (5 + 2) \times 5 = 17.5$
The area is 17.5 sq. units.

Composite Area Problems
Students decompose figures into familiar shapes to find area.



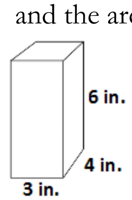
$\left(\frac{1}{2} \times b \times h\right) + \left(\frac{1}{2}\right)(\pi r^2)$

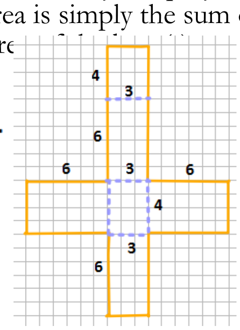
$\left(\frac{1}{2} \times 14 \times 8\right) + \left(\frac{1}{2}\right)(3.14 \cdot 4^2)$

$56 + 25.12 = 81.12$

The area is approximately 81.12 cm^2.

Surface Area
Students find the surface area of three-dimensional objects whose surface area is composed of triangles and quadrilaterals. They use polyhedron nets to understand that surface area is simply the sum of the area of the lateral faces and the are





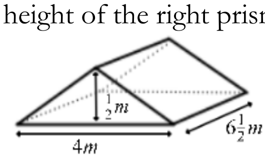
The four rectangles in the center form one long rectangle that is 20 in. by 3 in..
Area* = *lw ***Area*** = 3in.• 20in.
Area = 60in^2

Two rectangles form the wings, both 6 in. by 4 in
Area* = *lw ***Area*** =6 in •4 in
Area = 24 in^2

The area of both wings is 2(24 in.^{2}) = 48 in.^{2}

The total area of the net is A = 60 in.^{2} + 48 in.^{2} = 108 in.^{2}

Volume of a Right Prism
Students use the known formula for the volume of a right rectangular prism (length × width × height). To find the volume (***V***) of ***any*** right prism, students know to multiply the area of the right prism's base (***B***) times the height of the right prism (***h***).



The volume of the right prism is $6\frac{1}{2}m^3$.

$V = Bh$
$V = \left(\frac{1}{2}lw\right)h$
$V = \left(\frac{1}{2} \cdot 4m \cdot \frac{1}{2}m\right) \cdot 6\frac{1}{2}m$
$V = \left(2m \cdot \frac{1}{2}m\right) \cdot 6\frac{1}{2}m$
$V = 1m^2 \cdot 6\frac{1}{2}m$
$V = 6\frac{1}{2}m^3$