Geometry and Measurements

Program 3 Guide

The *Go Figure? Interactive Multimedia Kit* may be used in a classroom or intervention setting. Presented in a fun and creative way, each program on the *Go Figure?* DVD can be used as an introduction to or a review of basic mathematics concepts. The accompanying CD-ROM edu-game was designed for use by students on an individual basis. The object of the edu-game is to solve a mystery. In order to do this, the student must solve mathematics problems in the specific content areas presented by the DVD dramatic video series. Consequently, programs on the DVD are used to generate interest in and enthusiasm for learning mathematics concepts, while the CD-ROM edu-game allows students to practice the concepts in a challenging game format.

The three main characters in each DVD video program – the mysterious Pythagleo, plus two students named Carter and Chris who are trying to solve the mystery of Etna High School – discuss the targeted math concepts.

Chris, and to a lesser extent, Carter, verbalizes what each is thinking as they work through problems associated with the math concepts. The DVD programs assume that, like Chris and Carter, your students have already been introduced to the math concepts presented in the episode. The dialog may be too quick for some students. Every step that some of your students will need to solve similar problems on their own may not be mentioned in the programs. Therefore, pausing the DVD to review or present additional information will help adapt the learning situation to the needs of your students. See additional materials about teaching with videos and differentiated instruction in the Introduction of the Teacher Resources Guide.

Ohio Mathematics Content Standards and Benchmarks

Measurement Benchmarks

B. Covert units of length, area, volume, mass, and time within the same measurement system.
C. Identify appropriate tools and apply appropriate techniques for measuring angles, perimeter, or circumference and area of triangles, quadrilaterals, circles and composite shapes, and surface area and volume of prisms and cylinders.
E. Using problem solving techniques and technology as needed to solve problems involving length, weight, perimeter, area, volume, time and temperature.
G. Understand and demonstrate the independence of perimeter and area for two-dimensional shapes and of surface area and volume for there-dimensional shapes.

Math Content

- Area of a rectangle
- Area of a triangle
- Area of a circle
- Value of pi
- Volume of a rectangular solid
- Circumference of a circle
- Perimeter

Episode Content

- Carter did some outside research with old newspapers at his uncle's house. He discovered that the Etna High principal was the only one who did not disappear. Chris and Carter go to the principal's office and discover his notes and a map. The principal encoded his theories about the 1966 disappearances by using geometry and measurement concepts.

Teacher Notes

Use the episode to lead to discussions of Ohio Measurement and Geometry and Spatial Sense content. The formula lists below and the worksheets that accompany this guide provide information and practice.

- Grade Five: Measurement Indicators 3 and 6: Geometry Indicator 1
- Grade Six: Measurement Indicators 1, 2, 3, and 5
- Grade Seven: Indicator 1, 6, 7, 8, and 9

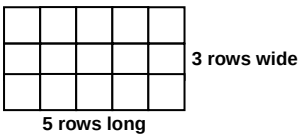
Formulas

See the Formula list on page 34. It is not recommended that formulas be memorized. Rather, if time permits, the students can be led through an intuitive process to develop a concept of area measurement.

Area

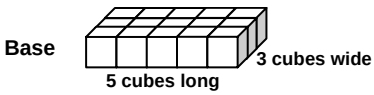
Area is a two-dimensional measurement (length times width). For example, the area of a 3 x 5 rectangle can be thought of as 3 rows of 5 square objects producing 15 square units.

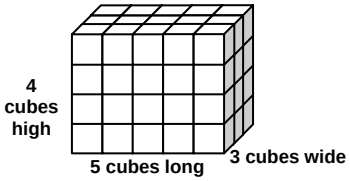
Area = length times width
A = $l \times w$ or A = lw
A = 5 square units $\times$ 3 square units
A = 15 square units



Volume

Volume is a three-dimensional measurement. To find the volume of a rectangular prism, we add a third dimension (height). For example, if we have a rectangular prism that is 3 x 5 x 4, we would think of this first as a base with 3 rows of 5 cubic objects and then as 4 layers of that base for 60 cubic units.



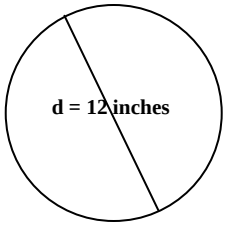


Volume = length times width time height
V = $l \times w \times h$ or V = lwh
V = 5 cubic units x 3 cubic units x 4 cubic units
V = 60 cubic units

Circumference

Example:

Determine the circumference of a circle having a diameter of 12 inches.
Use $\frac{22}{7}$ for the value of π.



$$C = \pi d$$
$$= \frac{22}{7} \text{ x } 12$$
$$= \frac{22}{7} \text{ x } \frac{12}{1}$$
$$= \frac{264}{7}$$
$$\approx 37.71 \textit{ inches}$$ (Consider rounding to 38 inches)

Go Figure? Formula List

To Find:	Label	Formula	Description
Area Circle	square units	A = πr^2	Multiply pi times the radius times the radius. [$\frac{22}{7}$ and 3.14 are approximate values of π.]
Area Triangle	square units	A = $\frac{1}{2}(bh)$	Multiply one half of the base times the height (or altitude).
Area Rectangle	square units	A = lw	Multiply the length times the width.
Circumference	units	C = $2\pi r$	Multiply two times the radius times pi or multiply pi times the diameter C = πd .
Perimeter	units	P = $s + s + s + s$…	Triangle: Add the three sides together. Rectangle: Add the four sides together. [Sides of equal length can be multiplied.]
Surface Area Cone	square units	Slant Area = $\frac{1}{2}(\pi d h)$ Base Area = πr^2 Total = $\frac{1}{2}(\pi d h)+\pi r^2$	Slant: Find the circumference (pi times the diameter) and multiply by the slant height. Then divide answer in half. Base: Multiply pi times the radius squared. Total: Add the slant area to the base area.
Surface Area Cylinder	square units	Side: $2\pi r h$ Both Bases: $2\pi r^2$ Total: $2r\pi h+2\pi r^2$	Side: Multiply two times the radius times pi times the height. Bases: Multiply two times pi times radius times the radius. Total: Add the bases to the side.
Surface Area Rectangular Prism	square units	SA = lw ….for each face Total: SA + SA + SA…	Find the area of each face and add the results together. [Prisms with congruent sides will have equal areas and those sides may be multiplied.]
Surface Area Triangular Prism	square units	Triangular surfaces = $\frac{1}{2}(bh)$ Rectangular surfaces = lw Total: $2(\frac{1}{2}(bh))$ + SA for each rectangular face	Triangular faces: Multiply one half of the base times the height (altitude). Rectangular faces: Multiply length times width. Total: Twice the triangular surface area plus the surface area for each rectangular face. [Triangular prisms with congruent rectangular faces will have equal areas and those faces may be multiplied.]
Volume Cylinder	cubic units	V = $\pi r^2 h$	Multiply pi times the radius times the radius times the height.
Volume Rectangular Solid	cubic units	V = lwh	Multiply the length times the width times the height.
Volume Triangular Prism	cubic units	V = $\frac{1}{2}bhl$	Multiply the base times the height (altitude) times the length. Then divide the answer in half.

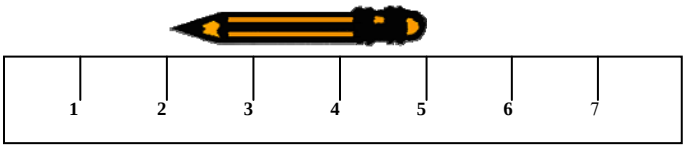
Geometry and Measurements
Worksheet 1

Choice *E*, in multiple-choice questions, is always: *I request help from the teacher*.

You may mark E in addition to one other choice if you think that you have the right answer to the question but you do not feel that you have a complete understanding of the problem.

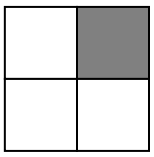
Your teacher will decide whether to use the two-point or four-point scoring rubric for problems that use numbers, pictures, or words to justify/explain your answer(s). You may request help for these questions, too. Write the word "teacher" by your answer(s).

1. What is the length of the pencil?



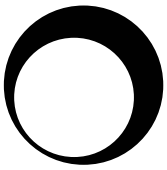
   A. 2 inches
   B. 3 inches
   C. 4 inches
   D. 5 inches
   E. Teacher

2. The larger square figure at the right is 6 inches on a side. The large square is divided into four identical smaller squares. What is the area of the shaded square?



   A. 9 sq. in.
   B. 36 sq. in.
   C. 6 sq. in.
   D. 3 sq. in.
   E. Teacher

3. The area of the larger circle at the right is 49 sq. cm, and the area of the smaller circle is 25 sq. cm. What is the area of the shaded region?



   A. 74 sq. in.
   B. 25 sq. in.
   C. 49 sq. in.
   D. 24 sq. in.
   E. Teacher

4. A classroom has exactly 7 rows of desks with 6 desks in each row. How many desks are in the room? Use pictures, numbers, or words to justify your answer.

5. An advertisement proclaims that a pizza having a 16" diameter is twice the size of a pizza having an 8" diameter. Is this a true statement? Use pictures, numbers, or words to justify your answer. Answers may be rounded to the nearest whole number.