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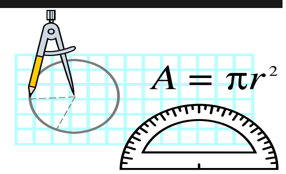
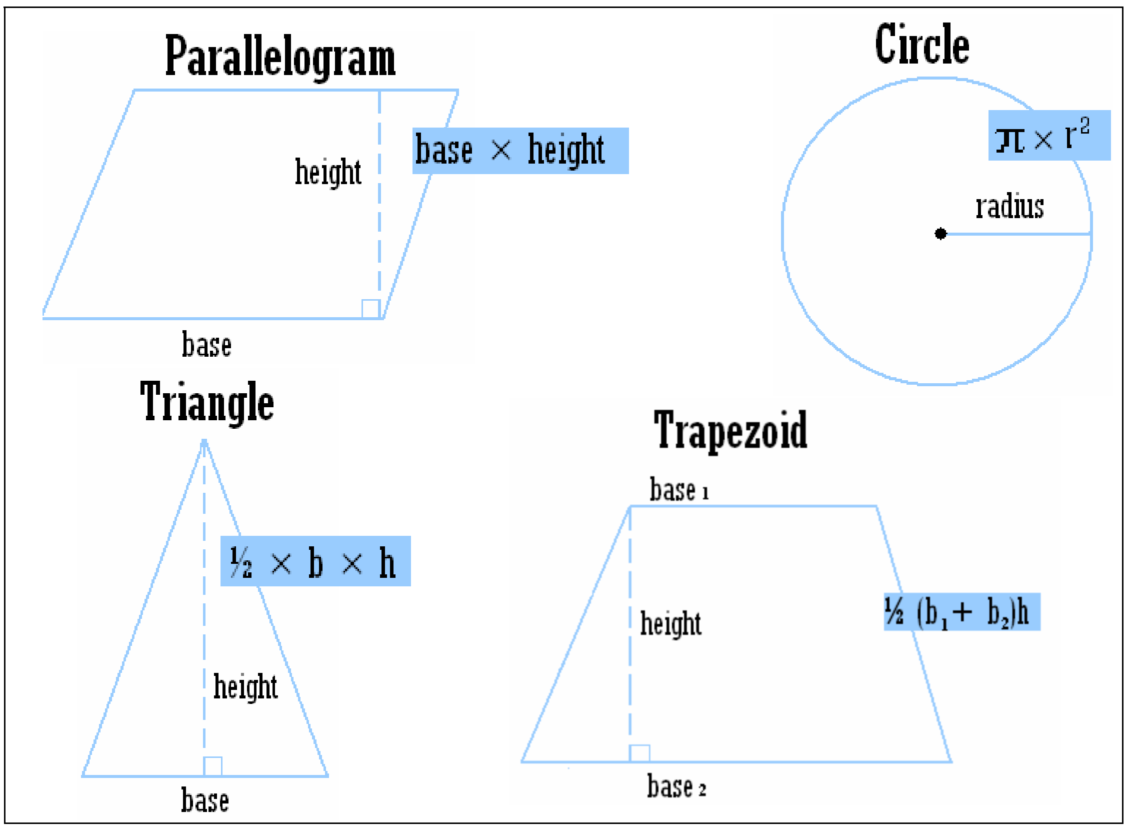
#12066
GEOMETRY 1: AREAS OF PARALLELOGRAMS, TRAPEZOIDS, TRIANGLES, CIRCLES AND CIRCUMFERENCE

BENCHMARK MEDIA, 2004
Grade Level: 7–10
27 Minutes





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TEACHER'S GUIDE

MATH SERIES 2

GEOMETRY, Part 1:

27 Minutes

Distributed by BENCHMARK MEDIA

FOR USE IN: Mathematics

LEVEL: Grades 7-9

EDUCATIONAL ADVISOR: Richard Albero, Math Instructor, Briarcliff Manor High School, MS Educational Psychology, MS Physics

EDUCATIONAL OBJECTIVES:
To help students understand the basis for:
Area formulas for a parallelogram (square, rectangle, rhombus), trapezoid, triangle, and circle
Circumference formula

BACKGROUND INFORMATION:
Geometry, is a branch of mathematics that involves studying the shape, size, and position of lines, angles, curves, and figures. The name *geometry* comes from two Greek words meaning *earth* and *to measure.* The earliest uses of geometry included measuring lengths and areas of land. Most scholars believe that the ancient Egyptians and Babylonians were the first people to use geometry extensively.
The figures studied in Geometry Part 1 are *plane* (flat) figures, such as circles, triangles, and rectangles. Geometry Parts 2 & 3 will study *solid* (three-dimensional) figures, such as cubes, cones, and spheres.
Geometric shapes fill the world around us. For example, honeybees build their honeycombs in a pattern of hexagons, and earthworms are shaped like cylinders. Most houses and buildings have walls shaped like rectangles, and many bridges have supports shaped like triangles. By knowing something about geometry, we can better understand and appreciate our world.
Geometry has many practical uses. To construct stable and attractive buildings, architects and carpenters, for example, must understand the characteristics of geometric objects. Navigators of airplanes, ships, and spacecraft rely on geometric ideas to chart and follow a

set course. Artists, designers, engineers, and photographers also use geometric principles in their work.

CONTENT OF THE VIDEO:

Areas of Parallelograms, Trapezoids, and Triangles

Areas are measured in a standard unit of measure, be it inches, feet, or miles. **Rectangles** are four-sided figures with opposite sides that are equal and all four interior angles measure 90 degrees. It's area formula is A (area) = b (base) h (height). A rectangle all of whose sides are the same length, is also a **square.** It's sides are then labeled "s" and its area formula is A = (s) (s) or s^2. A **parallelogram** has two sides which are parallel and of equal length, and the other two sides are also parallel and of equal length. The parallelogram is transformed with a rectangle of identical area, to show that the same area formula holds for both, A = (b)(h), but noting that the height a parallelogram is measured along a line at right angles to its base, up to the opposite parallel side. A parallelogram whose sides are all of equal length is also a **rhombus**. So the area formula for a rhombus is the same as for a parallelogram, A = (b) (h). A rhombus, when its sides meet at 90 degrees, is also a square. A four-sided figure with only 2 parallel sides is a **trapezoid**. When a trapezoid is duplicated, and the duplicate inverted and added next to the original, a parallelogram is created. The area of the trapezoid then becomes the same as that for a parallelogram divided by 2: A = b1 (base length of trapezoid) + b2 (top length of trapezoid) multiplied by (h) and divided by 2. A **triangle** is duplicated, inverted, and placed adjacent to the original so creating a trapezoid. A, the area of the triangle = (b) the base of the trapezoid multiplied by (h) height of the triangle measured from its top vertex to its base meeting the base at a 90 degree angle, and divided by 2. Some of the many useful **applications** of these area formulas are shown. A review of the preceding is given here.

Circumference and Area of a Circle

A bicycle tire is used to illustrate a **radius (r)**, and a **diameter (d)**, which is 2r. The **circumference (C)**, as a multiple of the diameter is a number with a never-ending number of decimal places is a value represented by the Greek letter **π (pi).** The circumference of a circle is **$C = \pi d$** and the **area (A)** of a circle is **$A = \pi r^2$.** A mnemonic aid is given for remembering circle formulas.

AFTER SHOWING THE VIDEO:

The students may be asked to recall and review the following key concepts in the video:

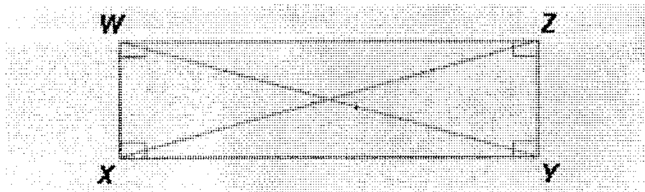
- Note that when we vary the shape of a four-sided figure (quadrilateral) by making some of its sides parallel, by making some of its sides equal in length, or by making its angles right angles, we get different members of the family of quadrilaterals.

- All rectangles, rhombuses, and squares are members of the family of parallelograms. Therefore the property of the family of parallelograms must also be a property of rectangles, rhombuses, and squares. Explain how the property of a parallelogram (A parallelogram has two sides which are parallel and of equal length, and the other two sides are also parallel and of equal length) is also a property of rectangles, rhombuses, and squares. Draw examples to illustrate that.
- A square is a member of the family of rectangles. Explain how the property of a rectangle (rectangles are four sided figures with opposite sides that are equal and all four interior angles measure 90 degrees) must also be a property of a square. Draw examples to illustrate that.
- A square is also a member of the family of rhombuses. Explain how the property of a rhombus (a rhombus is a parallelogram in which all sides are of equal length) must also be a property of a square. Draw examples to illustrate that.
- What are the formulas for the areas of rectangles, rhombuses, and squares?
- Define a trapezoid. (a four sided figure in which two and only two opposite sides are parallel).
- How is the area of a trapezoid calculated?
- Define a triangle.
- How is the height of a triangle measured?
- How is the area of a triangle calculated?
- What is the formula for the circumference of a circle? Explain pi.
- What is the formula for the area of a circle?

FURTHER EXPLORATION

Imagine you are making a picture frame from four boards, and you want to make sure it is a perfect rectangle. You might start by drawing a picture of a rectangle like rectangle *WXYZ* shown below.

Plane geometry defines a rectangle as a quadrilateral whose pairs of opposite sides are congruent and parallel and whose four angles all measure 90°. This means that $\overline{WX}$ □ $\overline{ZY}$ and $\overline{XY}$ □ $\overline{WZ}$. Likewise, since all four angles measure 90°, □*X* □ □*Y*. This information enables us to use the side-angle-side axiom to show that Δ*WXY* □ Δ*ZYX*. And, because the corresponding parts of congruent triangles are congruent, we know that $\overline{ZX}$ □ $\overline{WY}$.



We have used deductive reasoning to prove the theorem *The diagonals of a rectangle are congruent.* So, we can check the picture frame by measuring the distance between its pairs of opposite corners. If both distances are equal, we can be sure that the frame is a perfect rectangle. In fact, when carpenters are constructing a rectangular shape with four boards, they sometimes measure the diagonals to confirm that the angles at the corners measure 90°.

Math Series 1, consists of 10 videos:

ALGEBRA: A Piece of Cake Part 1
ALGEBRA: A Piece of Cake Part 2
SLOPES: That's a Bit Steep!
PERCENTAGES: That Make Sense
LINEAR EQUATIONS and Their Graphs: Let's Get It Straight Part 1
LINEAR EQUATIONS and Their Graphs: Let's Get It Straight Part 2
INTEGER OPERATIONS: Into the Negative Zone Part 1 Adding and Subtracting
INTEGER OPERATIONS: Into the Negative Zone Part 2 Multiplying and Dividing
FACTORING IS FANTASTIC Part 1: Common Factors
FACTORING IS FANTASTIC Part 2: Quadratic Trinomials

Math Series 2, consists of 12 videos:

PROBABILITY, Parts 1 & 2
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GEOMETRY Parts 1, 2, &3

BENCHMARK MEDIA 569 NORTH STATE ROAD, BRIARCLIFF MANOR, NY 10510TEL: 914/762-3838, 1/800-438-5564 FAX: 914/762-3895 E-MAIL: benchmedia@aol.com