POWER BASICS®

Geometry

Teacher's Guide

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Unit 1: Lines and Angles

This unit introduces the study of geometry. In Lesson 1, students learn the basic terms of geometry, such as dimensions, points, and lines. In Lesson 2, they begin to learn about angles, including right angles, complementary angles, and supplementary angles. Lesson 3 continues the exploration of angles, introducing students to naming angles, equal angles, and finding the measurements of angles. Lesson 4 moves on to the study of triangles, with a definition of a triangle and an explanation of the ways to describe triangles. Lesson 5 introduces students to the Pythagorean theorem.

Lesson 1—Points, Lines, and Dimensions

Goal: To learn basic terms of geometry

WORDS TO KNOW

dimension	a measure in one direction, such as length, width, or height
edges	the line segments where two faces of a solid figure meet
geometry	the area of mathematics that deals with the measurement and relationship of points, lines, angles, solids, and surfaces
line	a straight path that goes on forever in two different directions
line segment	a part of a line that includes two points, called endpoints, and all the points between the endpoints
parallel	lying in the same plane but not touching at any point
parallel lines	lines that are always the same distance apart but never meet
plane	a flat surface or area
point	an exact location in space, usually represented by a dot
ray	part of a line; it has one endpoint and continues without end in one direction
solid figure	a three-dimensional shape

Lesson 2—Angles

Goal: To learn properties of different types of angles

WORDS TO KNOW

angles	figures formed by two lines that extend from the same point

complement	the complement of an angle is the angle that, when added to the first angle, totals 90°
complementary angles	two angles whose measures add up to 90°
degrees	units for measuring angles, shown with the symbol °; based on dividing a circle into 360 equal parts
perpendicular	meeting at a right angle
right angles	angles whose measure is 90°
straight angle	an angle that measures 180°
supplement	the supplement of an angle is the angle that, when added to the first angle, totals 180°
supplementary angles	two angles whose measures add up to 180°

Lesson 3—Equal Angles

Goal: To find equal angles and figure out the measurements of angles based on their relationships to other angles

WORD TO KNOW

transversal	a line that crosses two or more lines at different points

Lesson 4—Triangles

Goal: To identify different types of triangles and find the measurements of angles in a triangle

WORDS TO KNOW

acute angle	an angle that has a measure greater than 0° and less than 90°
acute triangle	a triangle in which all three angles are acute, that is, greater than 0° and less than 90°
equilateral triangle	a triangle where all three sides are the same length
isosceles triangle	a triangle in which two sides are the same length
obtuse angle	an angle that has a measure greater than 90° and less than 180°
obtuse triangle	a triangle that has one obtuse angle (one angle that measures greater than 90° and less than 180°)

plane figure	a figure that lies on one plane; it has only two dimensions
right triangle	a triangle that has one right angle (an angle that measures 90°)
scalene triangle	a triangle in which no two sides are the same length
triangle	a flat shape with three sides
two-dimensional	measured in two dimensions, or directions, such as length and width; flat

Lesson 5—Right Triangles and the Pythagorean Theorem

Goal: To use the Pythagorean theorem to find the lengths of the sides of right triangles

WORDS TO KNOW

formula	a general rule for finding the value of something; often written with variables
hypotenuse	the side of a right triangle that is opposite the right angle
legs	in a right triangle, the two sides that form the right (90°) angle
Pythagorean theorem	a statement that says that, in any right triangle, the square of the side opposite the right angle (the hypotenuse) is equal to the sum of the squares of the other two sides. If one side is 2 cm long and the other side is 3 cm long, then the square of the hypotenuse is $2^2 + 3^2 = 4 + 9 = 13$.
square	a number multiplied by itself
square root	The square root of a number is the factor that, when multiplied by itself, gives the number.
square root symbol	The symbol for "square root of" is $\sqrt{\ }$, as in $\sqrt{9} = 3$.
theorem	an important mathematical statement that can be proved to be true

Notes on Application Activities in Student Text

Activity	Skills Applied	Product
Finding Lines and Angles	gathering information preparing visual demonstrations	drawings
Triangle Angles	visualizing shapes working with others	reconfigured triangle written paragraph

Additional Activity Suggestions

- People who work in the building trades work with lines and angles a great deal. Have learners contact a builder or carpenter, and ask what specific skills (such as measuring and calculating) and tools (such as levels and T-squares) are used to make sure a project is done accurately and holds together. Learners could also have a builder or carpenter demonstrate how to use these tools, or learners could demonstrate this themselves.

Teaching Tip

- To reinforce identification of various types of triangles, have learners search their school, home, workplace, and so on for examples of scalene, equilateral, and isosceles triangles. Have them bring in pictures or drawings of five examples of each. They should also note which are also right triangles.

Differentiation

- Students learning geometry can get caught up in a slew of definitions, propositions, theorems, formulas, and so on. All the numbers and symbols can make everything seem very abstract. You can help learners see how geometry is connected to reality by taking them on a mini-field trip through the building. Have them observe structural congruencies, examples of parallelism, the way components of the building are made up of the figures they are studying, and so on. This should help them realize that geometry is real. It is everywhere. It is not just a bunch of formulas and theorems. Once students can recognize and name geometrical figures, they'll feel less intimidated to work with them.
- Preview the vocabulary in each lesson by reading the Words to Know and their definitions to your students. For each definition, point to an object in the classroom that fits the definition. Then ask students to identify other objects that also fit the definition. This helps them have a concrete understanding of the new concepts.

Graphic Organizers

Graphic Organizers

Graphic organizers are a versatile teaching and learning tool. They can help students clarify their thinking, integrate new knowledge, reinforce their understanding of a topic, and review material for quizzes and tests. Using graphic organizers, learners can understand content more clearly and can take clear, concise notes. Graphic organizers can also act as a visual aid to make abstract concepts more concrete.

The graphic organizers provided here can be used in many ways. You can use transparencies of the organizers to introduce or review a topic with the entire class. You can photocopy the organizers and allow students to use them as they work through the student text. Here is a brief description of the organizers in this section and their uses.

Structured Notes

This organizer is one way of organizing notes as students read through the text. Students should write the main topic in the box at the top. In the boxes underneath they can write details about the topic, specific information, examples, and so forth.

Concept and Definition Chart

This chart is used to keep track of new vocabulary and concepts as they are introduced in the text. Students should write the word or concept in the box at the top of the chart. They should then fill in the information in the rest of the boxes.

Steps in a Process Chart

This graphic organizer is used to show information in order. Students will find this organizer particularly useful when taking notes of mathematical processes, showing the steps in order. They should write the process in the box at the top of the chart, then break the process down into steps and write one step in one box, adding or deleting boxes as needed.

Table

This graphic organizer has many uses. Students should label each column, then write relevant information in each cell of the chart.

Concept and Definition Chart