






Math Skills**Geometry and Resources**

Scientists often model the objects they study in terms of their geometric shapes. For example, Earth is a sphere. A section of ore may be like a rectangular box.

In studying resources, a researcher might want to measure the volume of a nodule or the space occupied by a mine. For example, you could calculate the area of a circular surface mine or the volume of the space occupied by the mine.

The table below shows equations for calculating the area and volume of some geometric shapes.

GEOMETRIC AREAS AND VOLUMES

Geometric shape	Equations for shape
Rectangle 	area = lw
Triangle 	area = $\frac{1}{2}bh$
Sphere 	surface area = $4\pi r^2$ volume = $\frac{4}{3}\pi r^3$
Cylinder 	surface area = $2\pi r^2 + 2\pi rh$ volume = $\pi r^2 h$
Rectangular box 	surface area = $2(lh + lw + hw)$ volume = lwh

SAMPLE PROBLEM

Miners obtain a piece of iron ore in a cylindrical shape. Although it is not a perfect cylinder, they can determine its approximate volume by comparing it to a cylinder. The diameter of the cylinder is 14.4 cm. The height of the cylinder is 26.3 cm. What is the approximate volume of the cylinder?

SOLUTION

Step 1: Write the equation to find the volume of a cylinder:

$$\text{volume} = \pi r^2 h$$

Step 2: Insert the known values into the equation.

$$r = \frac{1}{2}d; r = 14.4 \text{ cm} \div 2 = 7.2 \text{ cm};$$

$$h = 26.3 \text{ cm}$$

$$\text{volume} = \pi \times 7.2^2 \times 26.3$$

Step 3: Solve the equation.

$$\text{volume} = 3.14 \times 51.84 \times 26.3 = 4281.05 \text{ cm}^3$$

PRACTICE

Using the sample problem and the chart as guides, answer the following questions. Remember to show your work.

- A rectangular piece of land is occupied by a wind farm. The piece of land is 11.5 km long and 4.7 km wide. What is the area of the wind farm?
- A surface copper mine is in the shape of a half sphere. The mine has a diameter of .75 km. What is its approximate volume?
- A mining company is collecting nodules from a triangular section of the ocean floor. The base of the triangular section is .32 km. The height of the triangular section is .86 km. What is the area of the ocean floor section?
- At a recycling plant, metals are compacted into the shape of a rectangular box. Each box is 4.1 m long, 3.5 m wide, and 2.7 m high. What is its volume?
- After copper particles from ore are ground up, the copper is smelted, or heated to very high temperatures, and rolled out into sheets. One copper sheet is 6.5 m long and 5.2 m wide. What is the area of the copper sheet?

Graphing Skills

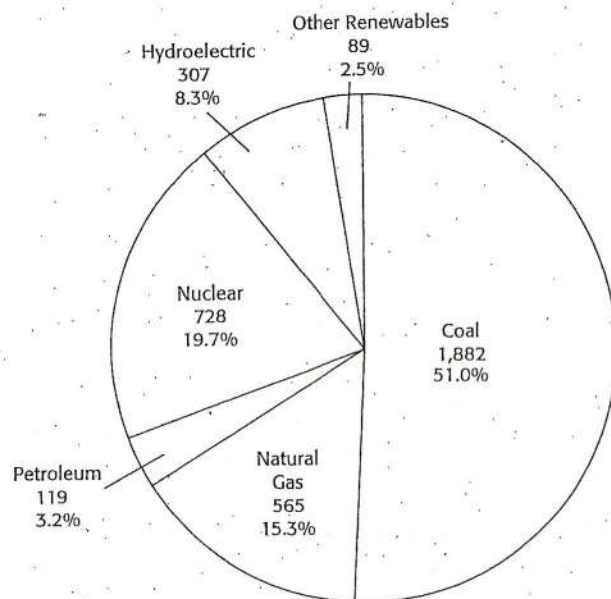
Pie Graphs

A pie graph shows how many parts of something make up the whole. Pie graphs are frequently created to show data consisting of percentages. For example, you could create a pie graph to show the percentage of each kind of energy used in a state or country.

To make a pie graph, draw a circle to represent the whole or total. Divide the circle into 100 equal sections of 3.6° each. Or, you can use a protractor to measure the number of degrees that is represented by a percentage of the circle. For example, 40% would be equal to $40 \times 3.6^\circ$, or 144° . Mark a section of the circle to represent each percentage. Then, use different colors or designs to shade in each portion of the circle.

The pie graph below shows the amounts and percentages of electricity generated by different kinds of fuel in the United States in 1999.

1999 U.S. Electricity Generation by Fuel Type
(Billion Kilowatt hours)



PRACTICE

Use the pie graph on the previous page to answer the following questions.

- From what fuel did the United States obtain the largest amount of electricity in 1999? What percentage of the total did this fuel represent?

- What was the total amount of electricity generated by fossil fuels? What percentage does this represent?

- What was the total amount of energy from renewable sources used by the United States in 1999? What percentage does this represent?

- On the Internet, find out how much electricity is generated by each fuel type in your state in one year. Find statistics for the latest year possible. Using the circle below, create a pie graph that displays this information.

