

CHANGING VOLUMES

Materials Needed:

2 heavy transparency sheets (8.5 X 11 inches)
clear tape
rice (about 2 pounds)
round pan or tray (a glass pie plate works well)

Demonstration:

Roll one transparency into a cylinder 8.5 inches high. Tape the ends so they just meet. Roll the second transparency into a cylinder 11 inches high and tape it at the ends. Place the taller cylinder on the tray and fill it with uncooked rice and tap gently to settle the rice.

Have students find the circumference and surface area of the tall cylinder.

Place the shorter cylinder around the tall one. Ask the students what they think will happen when we remove the tall cylinder. Remove the tall cylinder, allowing the rice to spill into the shorter, wider one. Discuss what they observed. The rice does not fill the shorter cylinder.

Have students calculate the surface area of the 8.5 inch cylinder and discuss what they think should have happened and why it did or didn't.

Have the students find the radius of each cylinder by using the formula $r = c / 2\pi$.

Calculate the volume of each cylinder using the formula $V = \pi r^2 h$.

Now find the ratio of the volumes of the two cylinders.

Key

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Place the taller cylinder on the tray and fill it with uncooked rice and tap gently to settle the rice.

Have students find the circumference and surface area of the tall cylinder.

$$C = 8\frac{1}{2}'' \quad SA = 8\frac{1}{2}(11) = 93\frac{1}{2} \text{ in}^2$$

Place the shorter cylinder around the tall one. Ask the students what they think will happen when we remove the tall cylinder. Remove the tall cylinder, allowing the rice to spill into the shorter, wider one. Discuss what they observed. (The rice does not fill the shorter cylinder.)

Have students calculate the surface area of the 8.5 inch cylinder and discuss what they think should have happened and why it did or didn't.

$$C = 11'' \quad SA = 11(8\frac{1}{2}) = 93\frac{1}{2} \text{ in}^2$$

Have the students find the radius of each cylinder by using the formula $r = c / 2\pi$.

$$r_1 = \frac{8\frac{1}{2}}{2\pi}$$

$$r_2 = \frac{11}{2\pi}$$

$$r_1 \approx 1.3528$$

$$r_2 = 1.75$$

Calculate the volume of each cylinder using the formula $V = \pi r^2 h$

$$V_1 = \pi r^2 h$$

$$V_2 = \pi (1.75)^2 \cdot 8.5$$

$$V_1 = \pi (1.3528 \text{ in})^2 \cdot 11 \text{ in}$$

$$V_2 = 81.84 \text{ in}^3$$

$$V_1 = 63.24 \text{ in}^3$$

Now find the ratio of the volumes of the two cylinders.

$$\frac{63.24}{81.84} \approx .7727 = \frac{17}{22} = \frac{8.5}{11}$$