

SPEED MEASUREMENTS

Level	3 (Age group 11 – 14)
Resources Required	Cylinders of different sizes (for example, food cans, soda cans, gas cylinders etc.)
Alternate Options for the Resources	Player or Facilitator can make his/her own cylinder using paper, Papers, Markers, Rulers, Scissors
Strand Covered	Shape and Measurements
Targeted Skills	Practice calculating the surface area of cylinder
Inspired by	Study.com - Heather Jenkins
Time Required	30 minutes to play 20 mins to make their own cylinder
Previous Learning Required	Know how to measure different lengths such as the radius of a circle or height of the cylinder Knowledge of multiplication
Support Required	Medium support

Rules of the Game:

Goal	Correctly measure the surface area of all cylinders
Rules	<p>Players must create a cylinder with the required surface area. They are allowed a margin of error of up to 1 digit.</p> <p>Cylinders will be created according to the following specifications:</p> <ul style="list-style-type: none"> - Radius: between 1-10 - Height: between 5-20 <p>This game is ideal for at least 6 players in groups of 2</p>
Steps	<p>Step 1: Using a sample cylinder, model for the players how to measure the radius of the cylinder's base and its height using a ruler. Then discuss how to find the total surface area of a cylinder using those measurements via the formula: $2\pi rh + 2\pi r^2$</p> <p>$\pi = 3.14159$</p> <p>Players must use a π value of up to at least three decimal places in their calculation</p> <p>Step 2: the facilitator asks players to create cylinders with a total surface area of 466.5.</p>

Step 3: Players use hypothetical dimensions to come up with the total surface area of 466.5

Step 4: once they arrive at a satisfactory height and radius, players prepare to create their cylinders. They assemble paper scissors and glue/tape. In groups of 2, players start creating their cylinders:

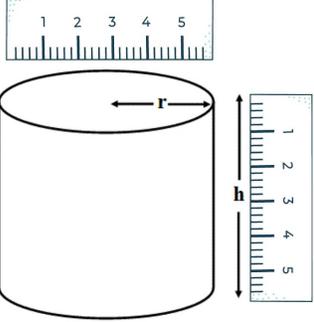
- Players determine the height of the cylinder and draw and cut out a rectangle of that width
- Players fold the rectangle to create a cylinder
- Before taping/gluing the edges, players check one of the two circle openings to make sure that it has the desired radius
- Once the desired radius is achieved, players glue or tape the edges of the paper to create a cylinder



Step 4: players measure the total surface area of their cylinders and report to the group. The group with the most accurate figure wins.

Images or Illustrations

How to measure the radius and height of a cylinder:

	 <p>Here, $r = 3$ and $h = 5.3$</p> <p>Therefore, the total surface area is $2\pi rh + 2\pi r^2 = (2 * 3.14159 * 3 * 5.3) + (2 * 3.14159 * 3^2) = 156.45$</p>
<p>Variations of the Game</p>	<p>The game can be played with different 3 dimensional shapes, for example, cubes or cuboids.</p> <p>Total surface area:</p> <p>Cuboid: $2(\text{length} \times \text{width} + \text{width} \times \text{height} + \text{length} \times \text{height})$</p> <p>Cube: $6(\text{side})^2$</p>