



## Geometry Vehicle Measurement Grades 9-12

**Objectives:** Students will apply geometric concepts to analyze and explore the design and structure of real vehicles. Through hands-on measurement and observation, they will calculate dimensions such as circumference, volume, and angles using geometric formulas. Students will learn how geometry is used in real-world applications like automotive design, safety, and efficiency.

### Common Core Mathematics Standards:

- **HSG-GMD.A.3:** Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
- **HSG-MG.A.1:** Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
- **HSG-MG.A.3:** Apply geometric methods to solve design problems.
- **HSG-CO.A.3:** Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure.

### Materials:

- Access to a vehicle (in-person or through images/specs)
- Measuring tape or ruler
- Calculator
- Protractor

### Directions:

#### Step 1: Geometry in Car Design

##### 1. Wheels & Circles

- a. Measure or research the **diameter** of one of the car's wheels (in inches).

Diameter = \_\_\_\_\_ inches

- b. Use the diameter to calculate the **circumference**:

$C = \pi d =$  \_\_\_\_\_ inches



- c. How many rotations does the wheel make to travel 1 mile (1 mile = 63,360 inches)?

$$\text{Rotations} = \frac{66,360}{C} = \underline{\hspace{2cm}}$$

## 2. Triangles & Windshield Angles

- a. Estimate the angle between the windshield and the hood. Use a protractor or describe your method.

Estimated Angle =                                  °

- b. How does this angle impact aerodynamics?

## 3. Symmetry Check

- a. Observe or photograph the vehicle from the front. Is it symmetrical?
- i. What features are symmetrical?
- ii. Are there any asymmetrical parts (like exhausts, logos, or lights)?

## Step 2: Vehicle Volume & Space

### 4. Trunk or Cargo Space (Rectangular Prism Approximation)

- a. Estimate or measure the length × width × height of the trunk in inches.

$$V = l \times w \times h = \underline{\hspace{2cm}} \text{ cubic inches}$$



- b. Convert volume to cubic feet: (1 cubic foot = 1,728 cubic inches)

$$V = \underline{\hspace{2cm}} \div 1,728 = \underline{\hspace{2cm}} \text{ cubic feet}$$

**5. Passenger Cabin Geometry**

- a. Approximate the cabin as a trapezoidal prism (sloped windshield/roof).
- b. Use a simplified cross-section to draw and label the shape. Estimate dimensions and calculate volume using:

$$V = \frac{1}{2} b_1 + b_2 (h \times l)$$

(where  $b_1$  and  $b_2$  are base lengths of the trapezoid,  $h$  is height, and  $l$  is the length of the car)

**Step 3: Follow Up Questions**

**6. Tire Tread and Safety**

- a. Research the minimum legal tread depth in your state.
- b. Why is tire geometry (depth, width, shape) important for safety?



## **Bring this lesson to the museum!**

Help students connect their learning to real-world contexts by conducting this lesson plan at Klairmont Kollektions using vehicles on display!