UNIT: CIRCUITRY GAME

ACT-Based Math: Calculating Circuit Resistance

### Here are ACT-aligned math activities for the Build Your Own Circuitry Game that help students apply real-world skills in electrical measurement, formula application, and data interpretation relevant to voltage, current, and resistance in circuit design.

### Objective:

Students calculate total resistance in series and parallel circuits.

MATERIALS NEEDED:

* Circuitry Game Kit
* Multimeter
* Resistors
* Worksheet

Student Directions:

**Goal:**
You will use real resistors and circuit components from the Circuitry Game Kit to measure and calculate resistance in both **series** and **parallel** circuits. This activity helps you apply **Ohm’s Law** and reinforces your understanding of how electrical components interact mathematically—skills directly aligned with ACT math standards.

**STEP 1: Identify and Measure Individual Resistors**

* Use the **multimeter** to measure the resistance (in ohms, Ω) of **each individual resistor** provided in your kit.
* **Record the value** for each resistor on your worksheet.
* Label each resistor clearly (e.g., R1 = 6Ω, R2 = 4Ω).

*Helpful Tip:* Set your multimeter to the correct resistance range and make sure the leads are properly connected.

**STEP 2: Build a Series Circuit**

* Connect two or more resistors **end-to-end** to form a **series circuit**.
* Use your recorded resistor values to **calculate total resistance** using the formula:

**Total Resistance in Series:**
R<sub>total</sub> = R₁ + R₂ + R₃ + ...

* Then use the multimeter to **measure the actual total resistance** in your completed series circuit.
* **Compare your calculation to the measurement**—they should be very close!

**STEP 3: Build a Parallel Circuit**

* Connect the same resistors in a **parallel circuit** (side-by-side branches).
* Use the following formula to **calculate total resistance**:

**Total Resistance in Parallel:**
1/R<sub>total</sub> = 1/R₁ + 1/R₂ + 1/R₃ + ...

Then solve for R<sub>total</sub>.

* Measure the total resistance of the parallel circuit using the multimeter.
* Again, **compare your calculated value to the measured value** and note any differences.

**STEP 4: Analyze and Reflect**

On your worksheet, answer the following:

* In which circuit type was the **total resistance lower**: series or parallel? Why?
* What happens to total resistance as you add more resistors in series? In parallel?
* How does this activity connect to real-world circuit design (e.g., in homes, electronics, or games)?

## ACT-Style Question:

## A series circuit has a **6Ω** and **4Ω** resistor. What is the total resistance?

## 2Ω

## 5Ω

## 10Ω

## 12Ω

## **⚡ Why These Activities and Questions Matter**

By engaging in math-based activities connected to the **Build Your Own Circuitry Game**, students:

✅ Practice organizing electrical concepts into clear, structured calculations and formulas.
✅ Strengthen their ability to explain circuit design, Ohm’s Law, and electrical efficiency in mathematical terms.
✅ Develop problem-solving and analytical reasoning skills using real-world topics like voltage, current, and resistance.

These skills mirror the **ACT Math** requirements—helping students become confident, effective problem-solvers, prepared for college-level math and careers in STEM fields.