Circuit Description Challenge

Classroom-ready printable pack · Grades 3–8

Pack contents
Two identical circuit-symbol sets, diagram mats, challenge cards, and a conventional-symbol reference. Two student sets are included.

Teacher directions

1. Use the printed simulation first. Give each partner a symbol set and circuit mat; place a barrier between them.
2. The Describer chooses a challenge and arranges a circuit without showing it.
3. The Describer names each component, terminal-to-terminal connection, branch, and open/closed switch state. The Builder recreates the diagram.
4. Compare diagrams with the answer key. If using physical components afterward, use only a teacher-approved low-voltage classroom kit under direct supervision.

Before class

- Print at 100% on US Letter paper. Use cardstock or laminate for reuse.
- Cut on the thick solid borders. Keep Set A and Set B separate.
- Give challenge/model cards only to the Describer.
- Use a folder, book, or tabletop barrier so partners cannot see each other’s work.

Accessibility and accommodations

Begin with one cell, one lamp, one switch, and connecting wires. Provide the symbol key and allow yes/no questions. Cards use names, symbols, border shapes, and patterns rather than color alone.

Electrical safety

Printed cards are a simulation and do not conduct electricity. Never connect this activity to a wall outlet or mains electricity. Physical construction requires a teacher-approved low-voltage classroom kit, intact leads, dry hands/work area, and direct teacher supervision. Disconnect power before changing a circuit. Do not intentionally short-circuit a cell or battery.

Storage-envelope labels

Circuit Description Challenge
Set A — Describer
Count pieces before storing.

Circuit Description Challenge
Set B — Builder
Count pieces before storing.

Circuit Description Challenge
Challenge / model cards
Count pieces before storing.

Circuit Description Challenge
Teacher reference
Count pieces before storing.

Student language supports

Position: above · below · beside · between · near · far · left · right · clockwise
Clarify: “Please repeat…” · “Is ___ beside ___?” · “What should I place next?”
Compare: same · different · rotate · move · replace · sequence

Movable pieces

Set A

Cut on the solid borders. This set is identical to the partner set.

cell

battery (2 cells)

lamp

motor

buzzer

resistor — IEC

open switch

closed switch

junction

crossing, not joined

wire — straight

wire — corner

wire — T branch

wire — crossing

Movable pieces

Set B

Cut on the solid borders. This set is identical to the partner set.

cell

battery (2 cells)

lamp

motor

buzzer

resistor — IEC

open switch

closed switch

junction

crossing, not joined

wire — straight

wire — corner

wire — T branch

wire — crossing

Circuit diagram mat

Cut the page in half. Both partner mats are identical.

Set A — Circuit diagram mat

Place the power source at left. Build clockwise. Use dots only where wires join.

top / far

center

bottom / near

Set B — Circuit diagram mat

Place the power source at left. Build clockwise. Use dots only where wires join.

top / far

center

bottom / near

Describer-only challenge cards

Keep these cards hidden from the Builder.

Challenge 1: Closed series circuit

one cell → closed switch → lamp → cell

one continuous path

Challenge 2: Open series circuit

battery → open switch → motor → battery

motor does not operate

Challenge 3: Two lamps in series

cell → lamp 1 → lamp 2 → cell

one path

Challenge 4: Two lamps in parallel

cell feeds two lamp branches that rejoin

two paths

Challenge 5: Lamp and buzzer in parallel

battery and closed switch feed separate lamp and buzzer branches

two paths

Challenge 6: Find the fault

cell and lamp with one missing connection

identify and repair the open path

Circuit Description Challenge reference

Symbol and circuit reference

Cell: one long and one short parallel line. **Battery:** two or more cells. **Lamp:** circle with a cross. **Resistor:** rectangle (IEC-style in this pack). **Motor:** circle marked M. **Buzzer:** circle marked BZ. **Open switch:** contacts separated. **Closed switch:** contacts joined. A dot marks an electrical junction; crossing wires without a dot are not joined.

Series circuits have one current path. Parallel circuits have branches and more than one path. This pack labels its IEC-style resistor so teachers do not accidentally mix conventions.

Reviewed with school-safety guidance from NIOSH/CPSC and conventional school circuit representations. Teacher should align symbols with the local curriculum.

Quality check after a round

- Can each student identify pieces by shape or label without relying on color?
- Do both models match in pieces, order, orientation, and relative position?
- Which direction was most precise? Which should be revised?