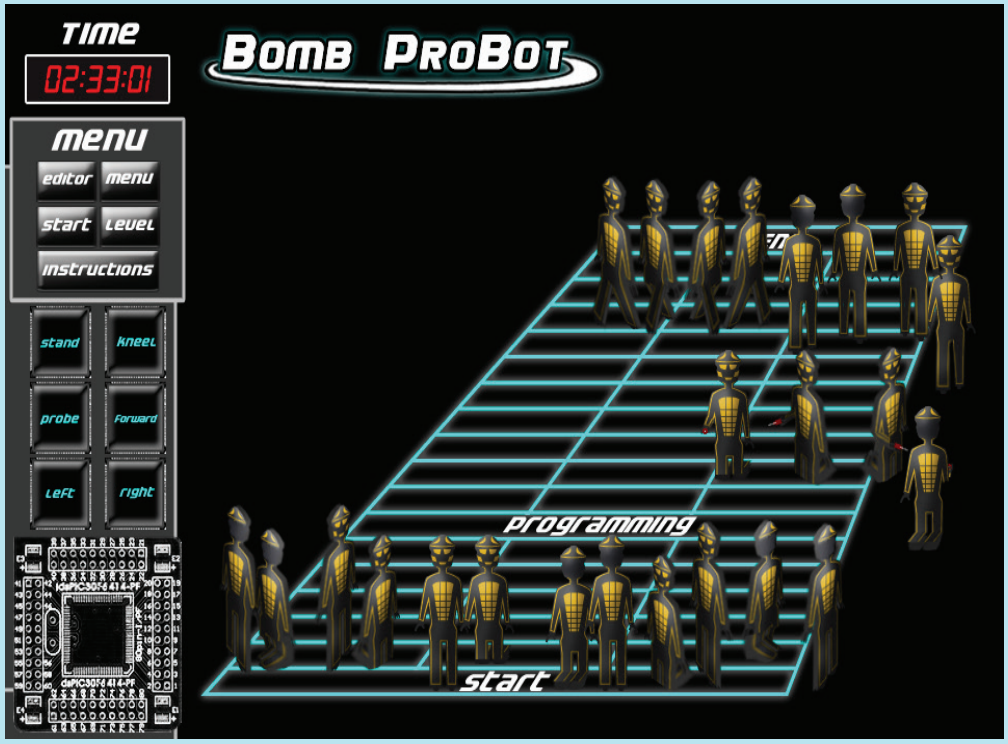
STEM Sims™

# Bomb ProBot



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**Do you need an idea for a scientific study?**
**Try out one of our ideas or make one of your own.**

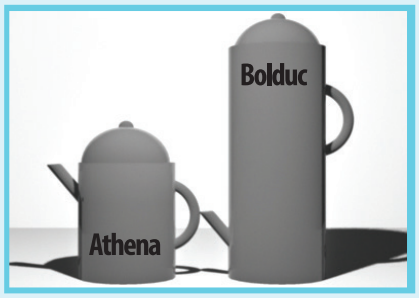
**Start learning right now about computer programming basics and how to think logically. Take the following brief quiz on classic logic puzzles to see how much you already know about logical thinking.** See the bottom of page 4 to check your answers.

1. Which statement below is true?
   a. The number of false statements here is one.
   b. The number of false statements here is two.
   c. The number of false statements here is three.
   d. The number of false statements here is four.

2. A man and a woman are sitting next to each other at an airport. “I’m a male,” says the person with blonde hair. “I’m a female,” says the person with brown hair. If at least one of them is lying, who is which?
   a. the blonde-haired person is a male, the brown-haired person is a female
   b. the blonde-haired person is a female, the brown-haired person is a male
   c. both have brown hair
   d. cannot be determined

3. Here’s a take on the classic train problem. One train travels from point A to point B at 110 miles per hour; the other travels from point B to point A at 90 miles per hour. How far apart were the two trains 30 minutes prior to their crossing?
   a. 90 miles
   b. 100 miles
   c. 110 miles
   d. cannot be determined

4. Two brands of coffeepots are shown in the illustration below. The Athena brand coffeepot holds about 500 milliliters of coffee. About how much coffee should the Bolduc brand coffeepot hold?
   a. 250 milliliters
   b. 500 milliliters
   c. 1,000 milliliters
   d. 2,000 milliliters



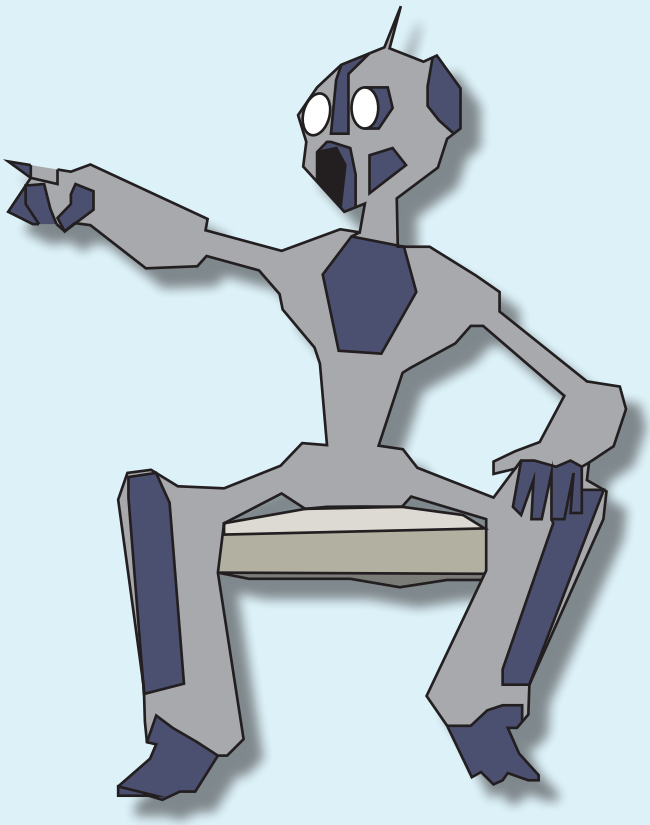

5. A student created a new mathematical system where 8 equaled twice 3. How would the student write the answer to 6 times 3 using the same system of notation?
   a. 8
   b. 12
   c. 18
   d. 24

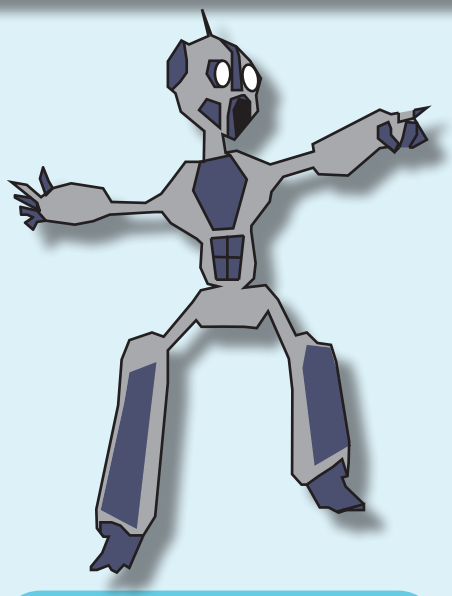
## Experimenting: Quite a Puzzle

**Imagine that you are a computer programmer given the following task. You must create a flowchart that can be used to write the programming code for a robot seated in a chair to touch a wall some distance directly in front of the chair. The robot must touch the wall and return to its seated position using the following conditions, commands, and decisions. A description of a flowchart, the symbols used, and an example appear on page 4.**

### Conditions

- The robot begins seated in a chair facing the wall.
- The distance to the wall is unknown.
- The robot must have its arms raised to sense touching the wall.
- The robot must walk with its arms lowered (not raised).
- The distance traveled in one step by the robot is unknown.
- The robot has an on-board counter that can be used to add and subtract.
- The robot must be seated facing the wall at the end of the task.





### Commands

- Take one step forward
- Turn right 90°
- Stand up
- Sit down
- Raise arms
- Lower arms
- Add one to the counter
- Subtract one from the counter
- Zero the counter

### Decisions

Touch wall? Yes/No
Is the counter zero? Yes/No

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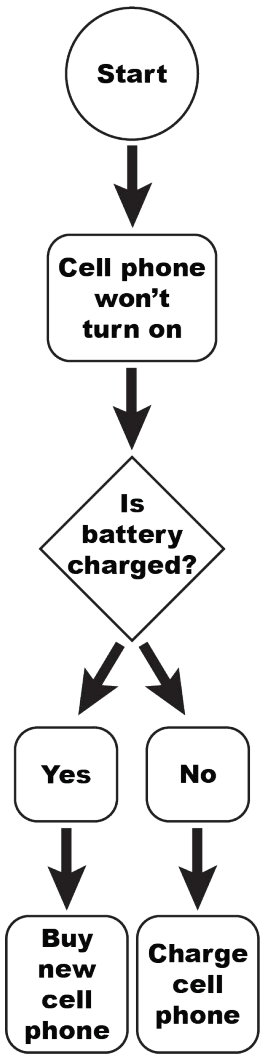
## Flowchart example

The following shows a simple flowchart for a non-working cell phone.




## What is a flowchart?

A flowchart is a type of diagram that represents a process. A flowchart uses various shapes to represent different steps in a series of actions. Arrows connect the steps and show the direction the process moves. Many computer programmers first create a flow chart to visualize the step-by-step process required for some computer action. The programmer then translates this plan into a computer language in the form of source code that the computer will then execute.

## What symbols are used in flowcharting?

Flowcharting uses a number of different shapes. A rectangle represents an action to be taken. A diamond shape indicates a decision to be made. An arrow points to the next step in the process. Programmers use many other symbols to create flowcharts.

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**Answers:** 1) c. Since only one statement is true, the other three statements must be false. 2) b. The blonde-haired person is a female, and the brown-haired person is a male. If at least one is lying, and there is one of each sex at the airport, then they both must be lying. 3) b. The two trains were 100 miles apart 30 minutes before the trains passed each other. The first train traveled at 110 mph, and the other train moved at 90 mph, so their relative speed was 200 mph (110 + 90). One hour (or 60 minutes) before they crossed, they would have been 200 miles apart. Therefore, 30 minutes before they crossed, they would have been separated by half that distance, or 100 miles. 4) a. Note the location of the pouring spout on the Bolduc coffeepot. The coffee would pour out when its level rises above the top of the spout, which is about 1/2 as much as the Athena coffeepot holds. 5) d. Using the first equation, 3 must be equal to 4 (8/2). Therefore, 6 times 4 equals 24.

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