

Navigating a Maze



Navigating a Maze Pre-Quiz

- 1. What is the difference between a program and an algorithm?**
- 2. About how many inches does an EV3 move in one motor rotation?**
- 3. How many rotations do you need for a 90° turn?**

Navigating a Maze Pre-Quiz **Answers**

- 1. What is the difference between a program and an algorithm?**

A program is a sequence of instructions written to direct a computer to perform a task. It is specific to the computer. On the other hand, an algorithm is a clear and specific procedure for solving a problem in a finite number of steps, and it is general to any task. For example, the “addition algorithm” is a procedure for how to add together any two numbers.

- 2. About how many inches does an EV3 move in one motor rotation?**

An EV3 taskbot moves about 7 inches in one rotation.

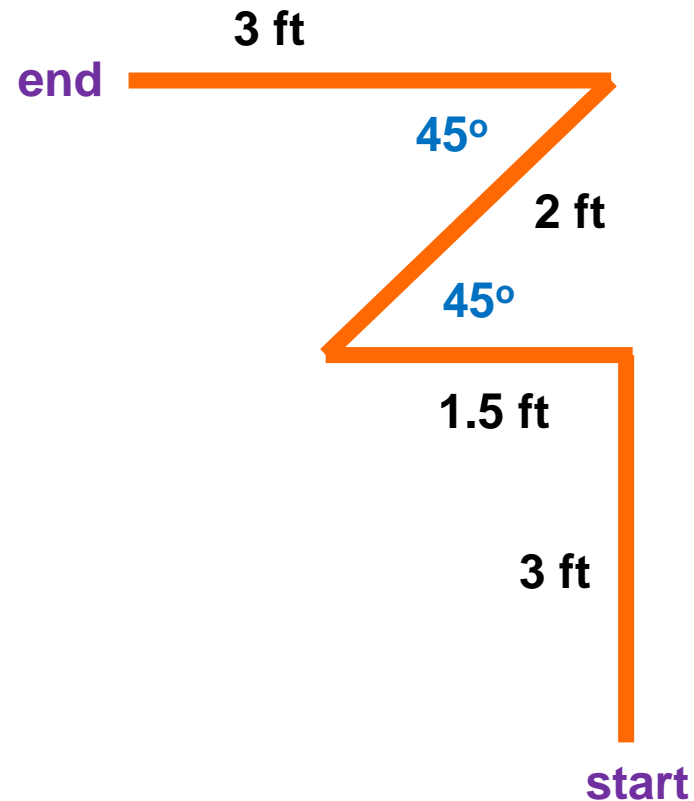
- 2. How many rotations do you need for a 90° turn?**

A 90o turn is about 0.5 rotations with the steering pointer pulled all the way in one direction.

Activity: Navigating a Maze

Do This:

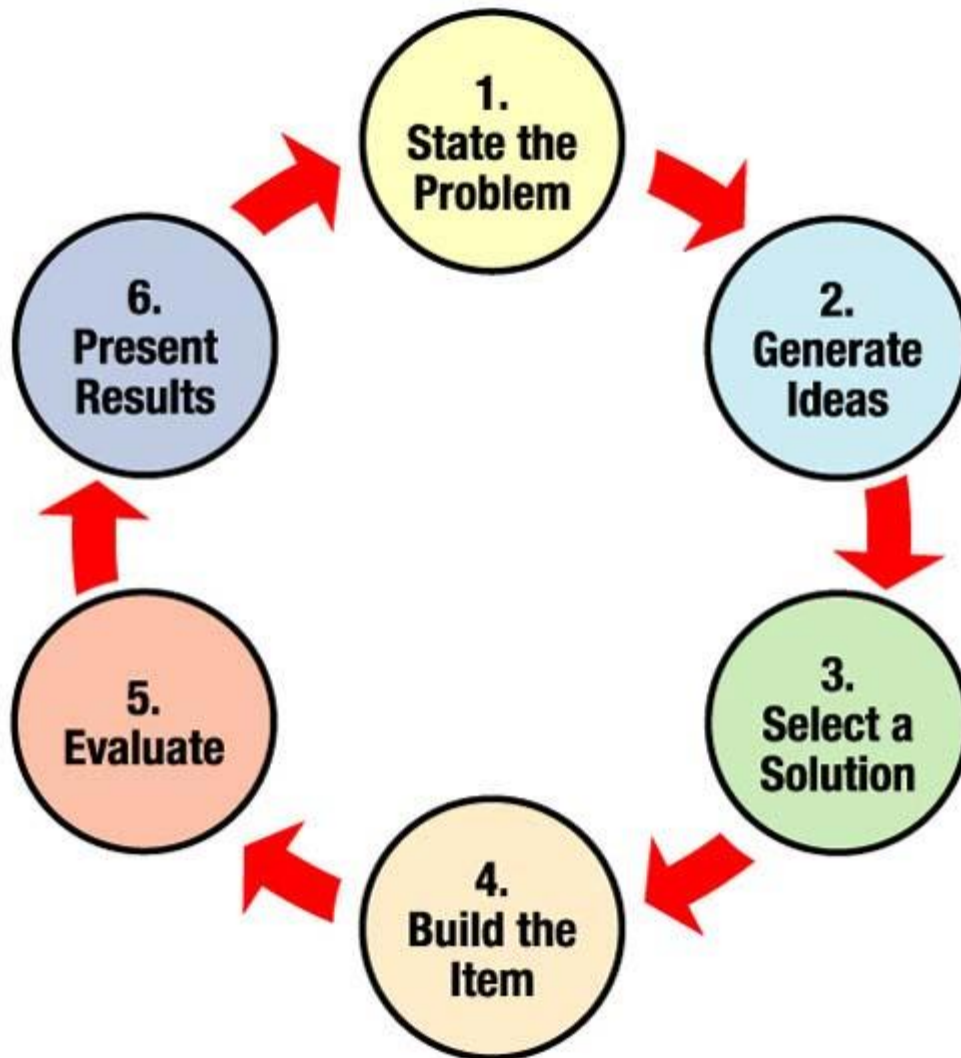
Program the robot to complete the maze (on the right →) using only the rotation sensor.



How Do You Develop a Computer Program?

- (As we saw in the previous lesson) a **program** is a sequence of logical instructions written to direct a computer to perform a task.
- Developing such instructions involves **careful thinking!**
- So, we are creating something that does not exist. In engineering, such a process is called “**design.**” In this case, we are “designing” a program to do a particular task.
- The **engineering design process** involves certain well-defined steps. *What do you think is the first step?*
- The **first step** is to come up with what you want the computer program to do! Define the problem. Understand the need.
- Once you know what you want the program to do, we need a method to do it. Let’s look more closely at the engineering design cycle, which tells us how.

Engineering Design Cycle: How Engineers Design



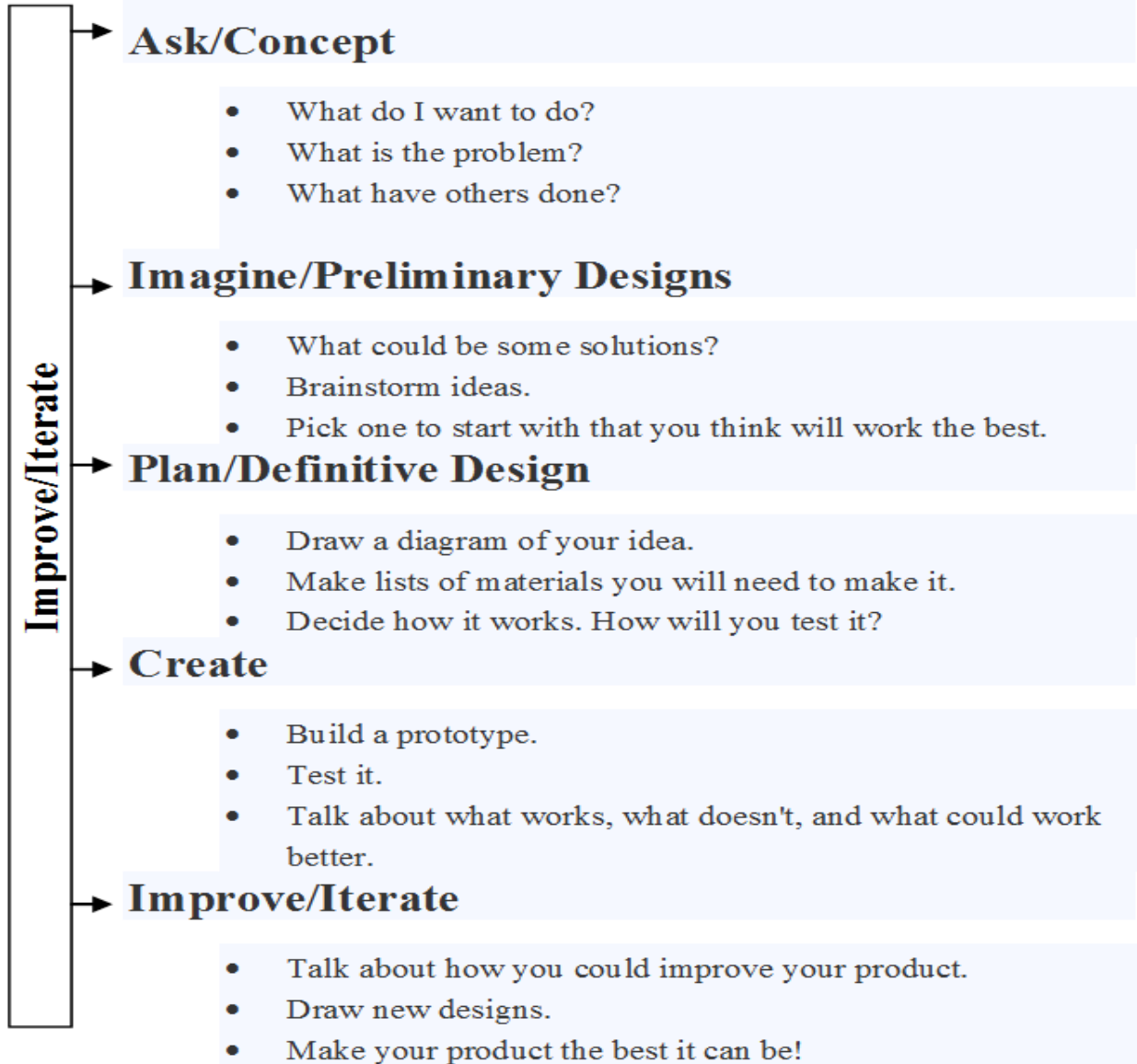
For engineers, the design process is **a series of steps** that helps teams frame and solve complex problems. *Anyone can do it!*

To figure out how to build something, engineering teams **gather information** and conduct research to understand the needs and challenges to be addressed.

← So, in a design cycle, the steps are done in this sequence but often repeated because it may not work, or you want to improve the design!

More details on the next slide. →

Engineering Design Cycle: How Engineers Design



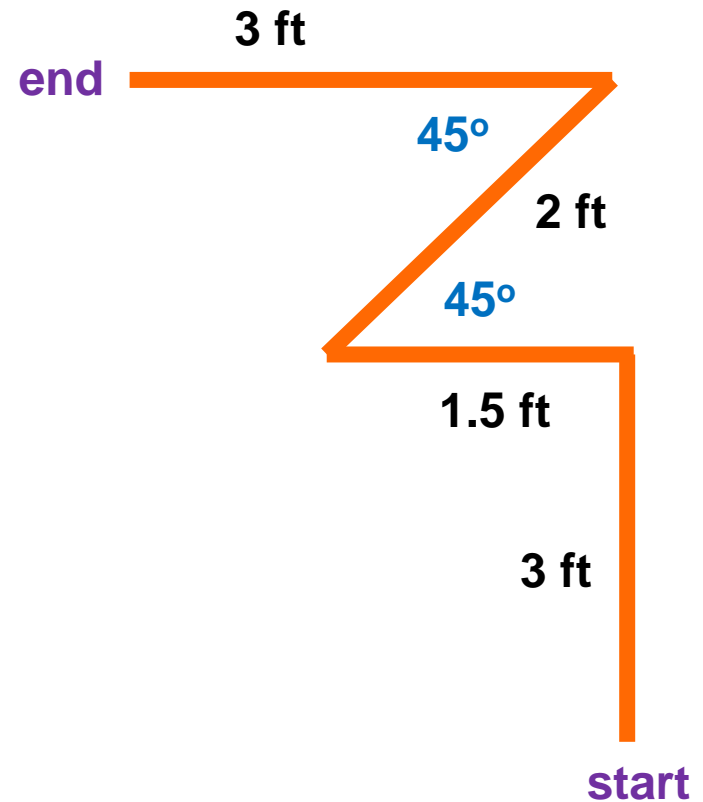
Activity: Navigating a Maze

Your Design Challenge:

Program the robot to complete the maze on the right → using only the rotation sensor.

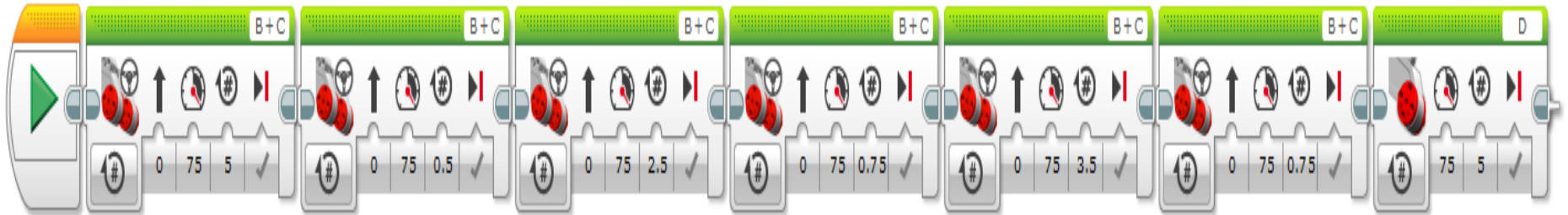
Things to keep in mind:

- If 1 rotation \approx 7 inches, how many rotations are needed to make the robot go 3 ft? 1.5 ft? 2 ft?
- If 0.5 rotations is the duration for a 90° turn, what duration is needed for a 135° turn?



Programming Activity **Answer**

Note: Keep in mind that the values for durations shown in the solution are approximate and may need to be adjusted for each robot.



Navigating a Maze Post-Quiz

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Navigating a Maze Post-Quiz **Answers**

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- 2. How many rotations do you need for a 90° turn?**

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Vocabulary

algorithm: A clear and specific procedure for solving a problem in a finite number of steps.

brainstorming: Thinking of ideas as a group.

engineering: Creating new solutions and new things.

engineering design process: A series of steps used by engineering teams to guide them as they develop new solutions and new things.

iteration: Doing something again, especially with the intent to make improvements.

program: A sequence of instructions written to direct a computer to perform a task.

Images Sources

- Slide 1: Maze lost sign; source: Lake County, FL:
http://www.lakecountyfl.gov/hometown_highlights/cornfield_maze.aspx
- Slide 4: standing on maze graphic; source: Maine State Library:
<http://www.maine.gov/msl/libs/ce/mentor/>
- Slide 6: engineering design process 6 steps diagram and text; source: eGFI: <http://teachers.egfi-k12.org/design-process/> and NASA
http://www.nasa.gov/audience/foreducators/plantgrowth/reference/Eng_Design_5-12.html
- Slide 7: improve/iterate EDP steps detail; source: Museum of Science, Boston:
<http://www.mos.org/doc/1559>
- Diagrams and screen captures by author