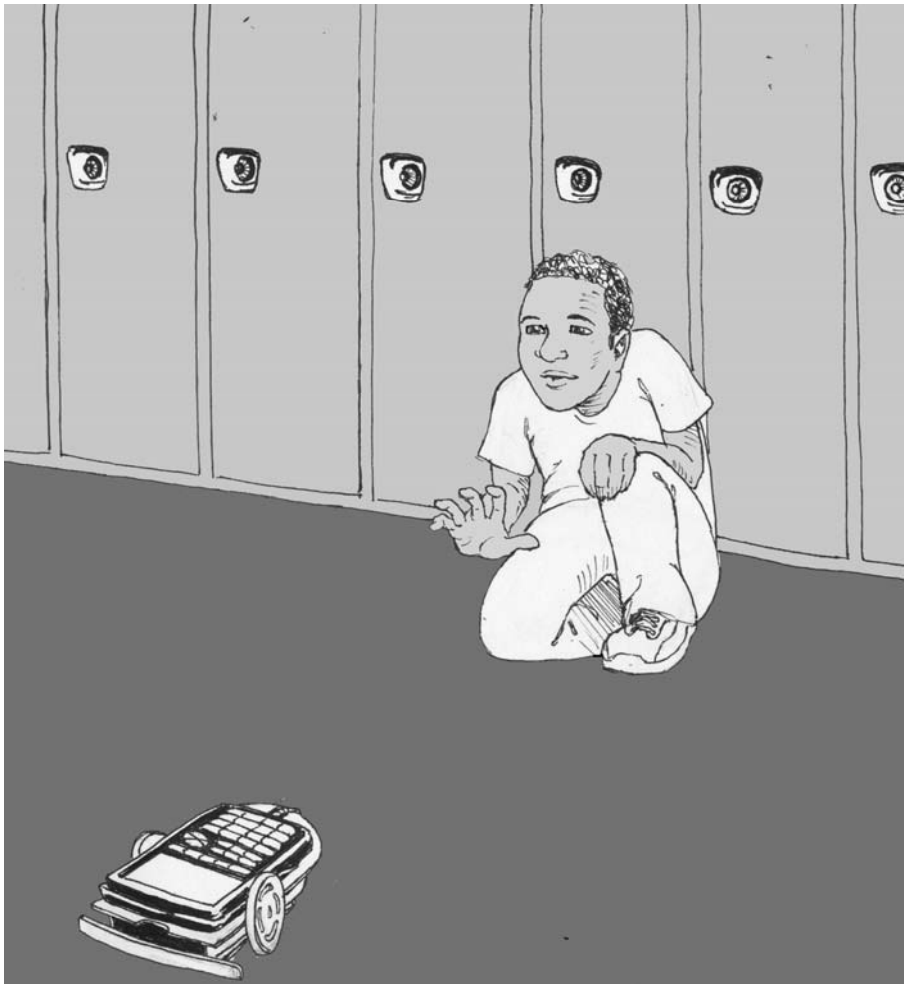
Name _____ Date _____

Measure Mission 1

Your first mission, should you decide to take it (and you will), is to measure the width of the hallway outside your classroom using only a robot and a graphing device.

YOU NEED:

1 Norland Robot (Your wheels for this adventure.)
1 TI-83 or TI-83 Plus Graphing Device (Robot brains)
1 Meter Stick
Program: **GO**



INSTRUCTIONS:

Write a simple program (see **PROGRAMMING INSTRUCTIONS** if needed) for your robot on a TI-83/TI-83 Plus handheld named **GO**:

```
PROGRAM: GO
: Send ({222})
: Get (R)
: Disp R
: Stop
```

This will instruct the robot to move forward until its bumper runs into something. Attach your TI-83/TI-83 Plus to the robot and run **GO**. You have fifteen minutes to experiment using the robot and a meter stick before you measure the hallway. Remember the meter stick cannot leave the classroom and the width of the hallway must be measured using the movement of the robot. Time will be displayed in centiseconds on the graphing device's screen after each run, i.e. 524=5.24 seconds. On the following page are tables to help you record your data. Decide ahead of time how to label the columns and rows.

Accuracy of Measurement Grading Scale:

Within 0-10 cm A
11-20 cm B
21-30 cm C

Off by more than 30 cm (or messing around): Long boring assignment in textbook

Who will be closest to the actual measurement?

Mission Data:

Inside the classroom:

Trials		
Total		
Average		

Outside the classroom:
(No meter sticks allowed)

Trials		
Total		
Average		

RESULTS:

1. What is your estimate of the width of the hallway in centimeters?

2. How fast did your robot travel?

3. The bumper is at the front of the robot. How did you account for this in your measurement of the hallway?

4. What calculations did you use to determine the width of the hallway?

EXTENSION:
(Answer on a separate sheet.)

How would you go about using the robot to measure your height?

How could you get those measurements in feet and inches?

What calculations would you want the robot to do automatically?

Design an advanced program to measure your height in meters and feet/inches.

Measure Mission 1

PROGRAMMING INSTRUCTIONS:

Turn on TI graphing handheld. Press the **PRGM** button, then use the arrow to highlight "NEW". Press the **ENTER** button, then spell out **GO** by pressing the appropriate keys. Press the **ENTER** button and you're ready to enter the first command for the program.

Line 1: Press the **PRGM** button, then use the arrow to highlight "I/O". Use the arrow to scroll down to "B: Send (". Press the **ENTER** button. Press the **2nd** button and then press **{** for an open brace. Type in 222. Close the braces and parentheses by pressing the **2nd** button, the **}** button, and then the **)** button. Press the **ENTER** button. The first line should appear as:
:Send ({222})

Line 2: Press the **PRGM** button, then use the arrow to highlight "I/O". Use the arrow to scroll down to "A: Get (". Press the **ENTER** button. Press the **ALPHA** button, then press **R**. Press **)** then **ENTER**. The second line should appear as:
:Get (R)

Line 3: Press the **PRGM** button, then use the arrow to highlight "I/O". Use the arrow to scroll down to "3: Disp". Press the **ENTER** button. Press the **ALPHA** button, then press **R**. Press the **ENTER** button. The third line should appear as:
:Disp R

Line 4: Press the **PRGM** button and "CTL" will be highlighted. Use the arrow to scroll down to "F: Stop". Press the **ENTER** button. The fourth line should appear as:
:Stop

Press the **2nd** button, then **QUIT.**

To run the program, attach the TI-83/TI-83 Plus handheld to your robot and connect link cable. Make sure the robot and handheld are both switched on. Press the **PRGM** button and use the arrow to scroll down to ": GO". Press the **ENTER** button. Place the robot on the floor, then press the **ENTER** button again and the robot will move forward until the bumper hits something.

Teacher Notes

Measure Mission 1

ACTIVITY NOTES:

Measure the hallway yourself with a metric tape measure or meter stick. Students work well in pairs for this activity. If robots veer to one side or the other, adjust the rubber bands on the wheels.

Data tables are left partially blank for students to choose their own labels and methods. A more directed approach would be to label the first table across the top with TRIALS, 1 METER, 2 METERS. Number of trials could be listed down the first column. TRIALS, TIME, and DISTANCE could be used in the second table with the first column again labeled with number of trials.

Students can be left to discover ways to solve this problem on their own or they can be given some review on proportions or the DERT formula (distance = rate X time or d=rt). After the initial use of the meter sticks, it's helpful to store them away to avoid other creative, but less mathematical solutions.

When measuring the hallway, the length of the robot (from the front bumper to the back) needs to be taken into account. This can be measured beforehand, calculated out in the hallway by running the robot the short distance of its own length, or sometimes an adjusted starting point can be used.

In the extension activity, one way to measure height is to have students lie on the floor with their feet against the wall and use the robots to measure how many seconds tall they are and then use the DERT formula to convert to distance. There is a program available at smallrobot.com (**RULERI**) that measures in meters and feet/inches up to ten feet. To use it, you need only to designate the units of measure and input the rate for your robot.