Getting Bigger or Smaller? Meeting
provided by NCTM Illuminations
http://illuminations.nctm.org

Topic
This meeting allows your club to tackle a maze challenge—involving the four primary operations with decimals—and then analyze the club members' strategies in smaller groups.

Materials Needed
♦ 2 copies of the Maze Playing Board per club member - (downloaded from www.mathcounts.org)
♦ 1 calculator per club member
♦ Prize for winning student - *optional*

Meeting Plan
This activity provides an opportunity for students to explore the effect of addition, subtraction, multiplication and division on decimal numbers. To introduce the activity, write the problem shown here so all students can see it. Then ask students to discuss what they notice. Lead a discussion that includes these key points:

In computing the product of 4.5 and 1.2, a student carefully lined up the decimal points and then multiplied, bringing the decimal point straight down and reporting a product of 54.0. Reflection on the answer should have caused the student to realize the product was too big. Multiplying 4.5 by a number slightly greater than 1 produces an answer a little more than 4.5. Instead, this student applied an incorrect procedure (line up the decimal points in the factors and bring the decimal point straight down, which *is* the process used when adding or subtracting decimals) and did not consider whether the resulting answer was reasonable.

Explain to students they will be playing a game to practice decimal operations and their effects. Note: Students often shy away from dividing by decimals less than 1, so you may want to discuss the general effect of dividing by a number less than 1 or multiplying by a number greater than 1.

Now give each student a calculator and a copy of the Maze Playing Board. Students are to choose a path through the maze from "Start" to "Finish." To begin, have the students enter 100 on their calculators. For each segment chosen on the maze, the students should key in the assigned operation and number. The goal is to choose a path that results in the largest value at the finish of the maze. Students may not retrace a path segment or move upward in the maze. Encourage students to trace several paths through the maze while always looking for the path that will yield the greatest increase in the calculator's display.

After students have had 5-10 minutes to attempt the challenge on their own, you may wish to provide a prize to the student who attained the greatest result at the end of the maze (and can explain to the rest of the club how that result was attained!). Next, in pairs or in groups of three, students should discuss their strategies and what worked best for them.
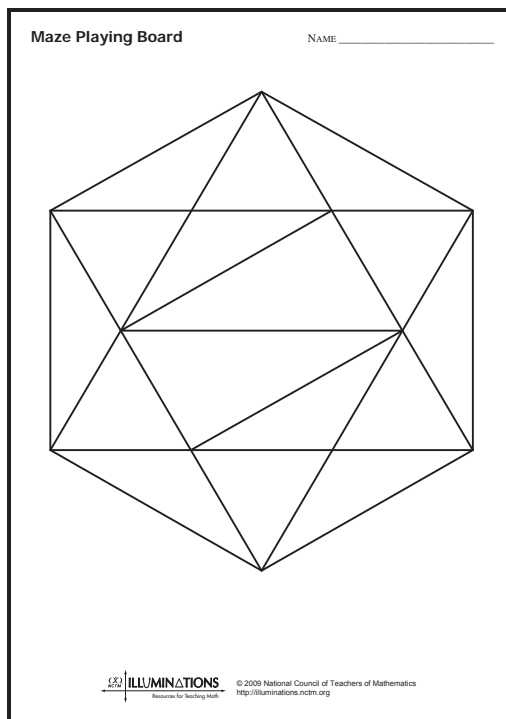
> SPOILER ALERT!! The solution is on the next page.

The path highlighted here gives a result of roughly 6332.
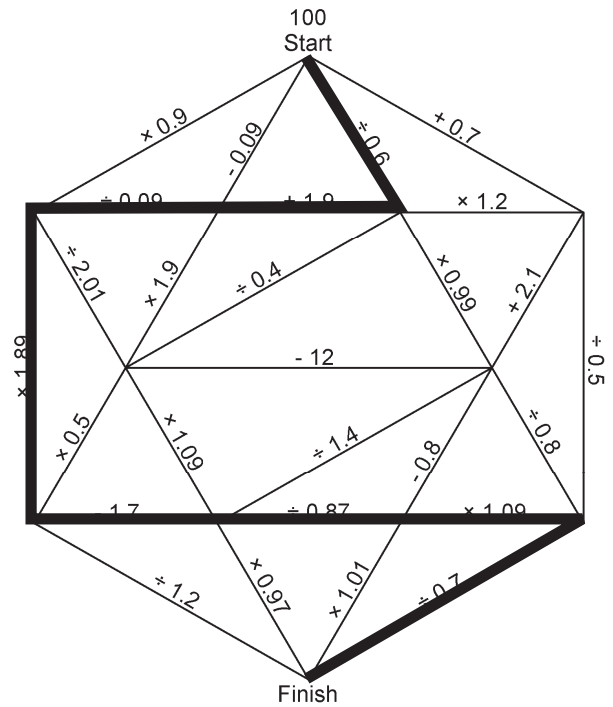
Possible Next Steps

Using the same maze, possible follow-up activities include finding the path that leads to the smallest finish number or finding a path that leads to a finish number as near the start number (100) as possible.

Using a blank maze with the same setup, each student can create his or her own rules for each segment of the maze and challenge the other students in the club to come up with the greatest possible finish number.

Using the same maze setup, students could change the numbers to include scientific notation or exponents, for example.

Note: A blank playing board can be downloaded from www.mathcounts.org.

This meeting plan is based on an activity from the NCTM Illuminations project.
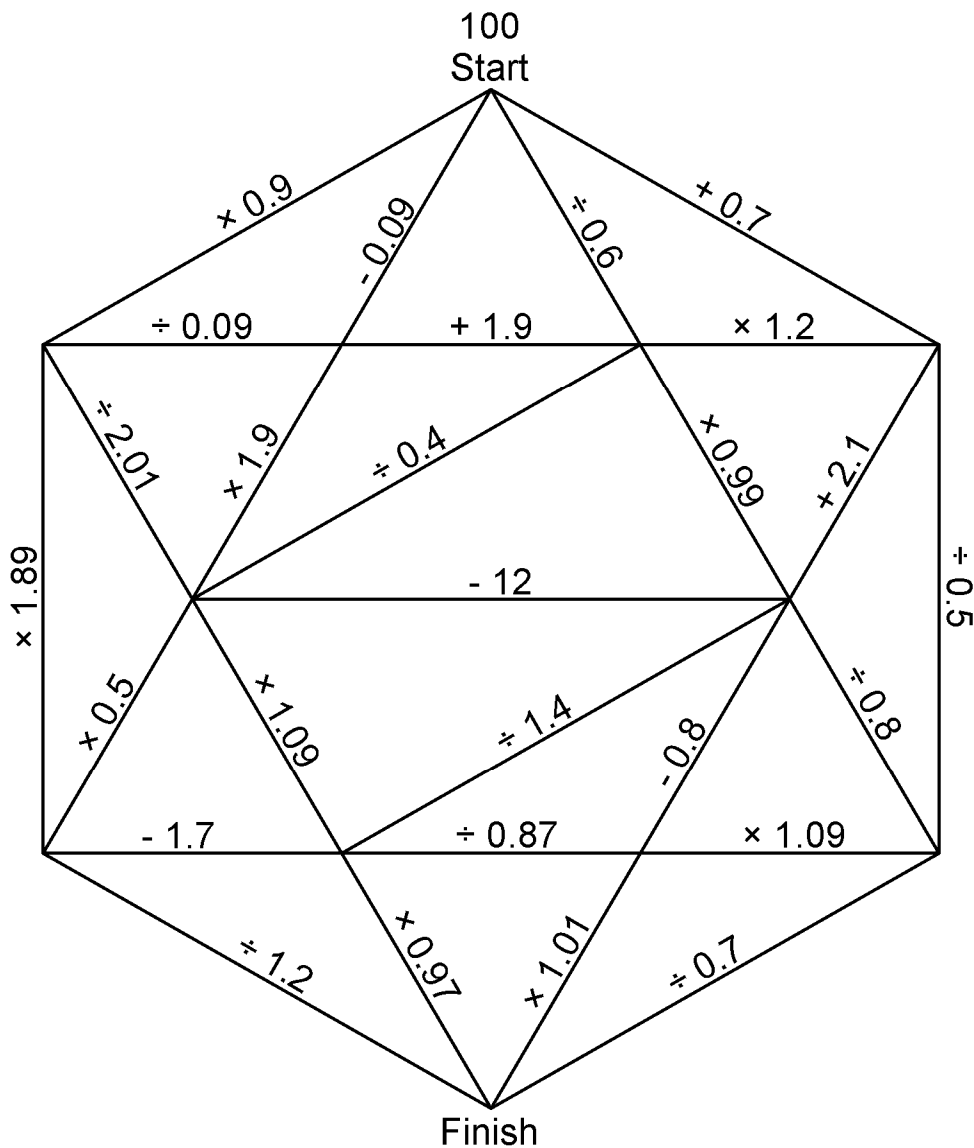http://illuminations.nctm.org

Maze Playing Board

NAME _____

*Move down or sideways (never up) through the maze from **Start** to **Finish**. You may not retrace any steps.*

Begin with a value of 100 on your calculator. As you cross a segment, perform the indicated operation on your calculator.

*The goal is to choose a path that results in the largest value when you reach **Finish**.*

100
Start

× 0.9   – 0.09   ÷ 0.6   + 0.7

÷ 0.09   + 1.9   × 1.2

÷ 2.01   × 1.9   ÷ 0.4   × 0.99   + 2.1

× 1.89   – 12   ÷ 0.5

× 0.5   + 1.09   ÷ 1.4   – 0.8   ÷ 0.8

– 1.7   ÷ 0.87   × 1.09

÷ 1.2   × 0.97   × 1.01   ÷ 0.7

Finish

Maze Playing Board

NAME _____