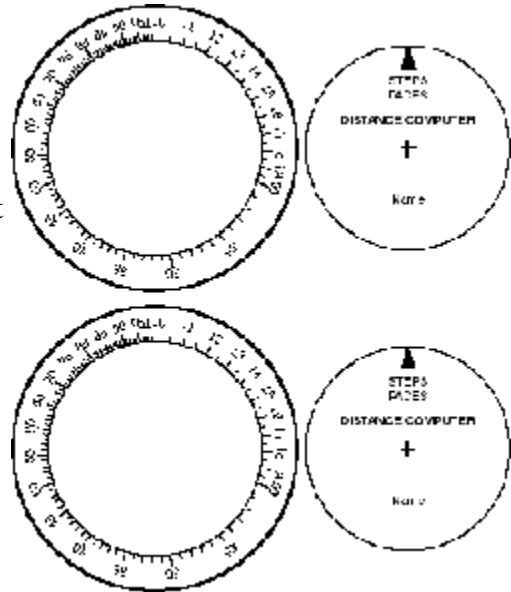


# How to Make Your Own Distance Computer

## Step 1: Download and print out the image file.

- The image file will look like the picture to the right.
- Each sheet will produce two computers.
- A laser printer is best; most inkjet ink will run if it gets wet. If you have an inkjet printer, you can reproduce the image with a photocopier.
- The computer is also sturdier if it is printed onto card stock, like that used for index cards. An office supply store or photocopier center can help you find this.



## Step 2: Cut out the circular patterns.

- Use scissors with care.

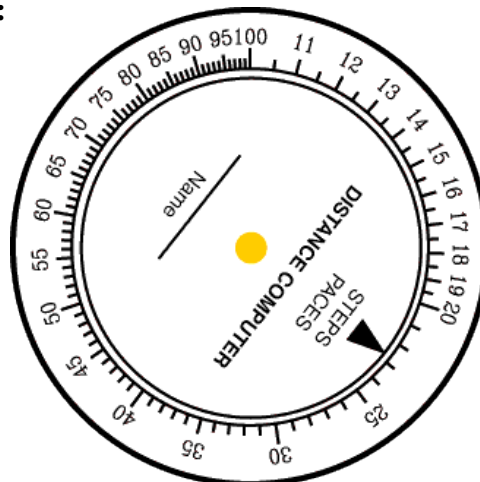
## Step 3: CAREFULLY punch holes in the center of each circle (marked by the cross).

- Each hole should be about 1/8 inch (3 mm) in diameter.
- A pencil works well for punching the holes.
- To be completely safe, it would be best to use a block of wood, with a 3/16 inch hole drilled into it, as a backing piece. Place the card on the block, center it over the hole, and punch.

## Step 4: Fasten the two circles together with a paper brad.

- These are still available at office supply stores.
- The ones I found are labeled "Brass Plated Fasteners."

The inner circle should turn freely and be centered within the outer circle. Your computer should look something like this:



## How to Measure Your Pace or Step Length

**First, measure and stake out a known distance on the ground.**

- Choose a level area where you can walk straight between the two stakes.
- To keep the accuracy of your distance measurements around 5%, you need to use a distance that will require at least 20 steps or paces. (You will learn about measurement accuracy if you study Physics in High School.)
- If you are counting steps, measure a course at least 50 feet in length.
- If you are counting paces, measure out at least 100 feet.
- If you are using the metric system, measure at least 20 m for steps, 40 m for paces.

**Now walk off the distance between the two stakes, counting your steps or paces.**

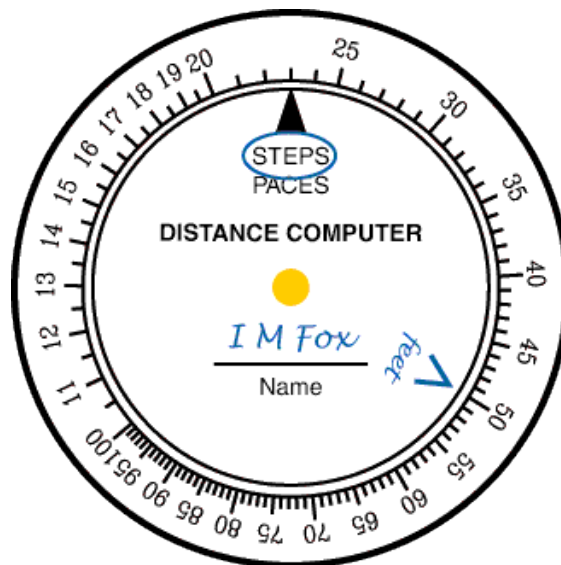
- For better accuracy, walk the course in both directions, and add up the counts and distances.

**Mark your step or pace length on the distance computer.**

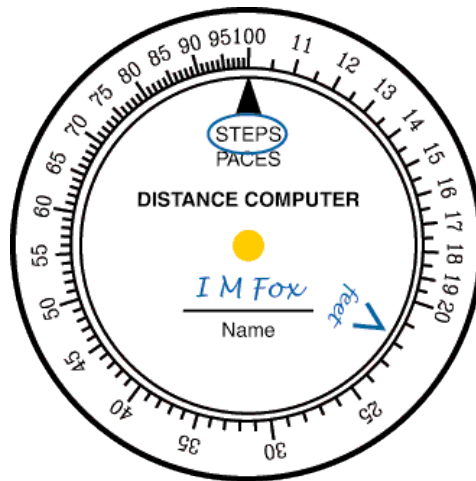
- To do this, rotate the inner disk so that the black triangle is pointing to the total number of steps or paces that you counted.
- Now, find the total distance you walked on the outer disk. Draw a mark on the inner disk pointing to this number.
- Label this line "feet" or "meters," according to how you measured the distance.
- Circle either the word "STEPS" or "PACES" to record how you did the counting.

**An Example:**

- Suppose you stepped off a distance of 50 feet in 23 steps. Then you would mark the computer like this:



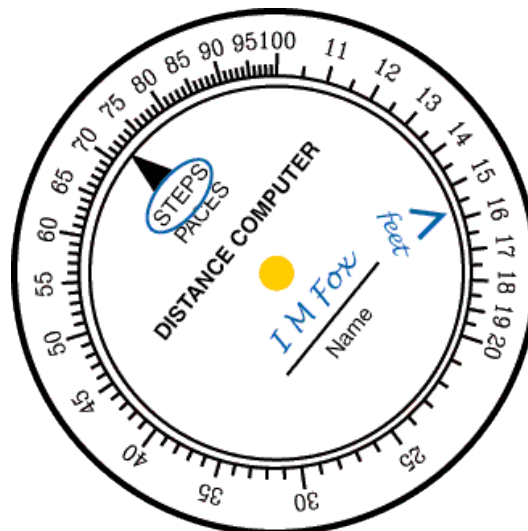
- To find the length of your step, rotate the computer until the "STEPS" marker points to "100." Now the "feet" marker points to about 22. This means that your step length is about 2.2 feet. One thing the distance computer will not do for you is put the decimal point in the right place. You have to do that so the answer makes sense. In this case, the step has to be about 2 feet; 22 feet would be much too big.



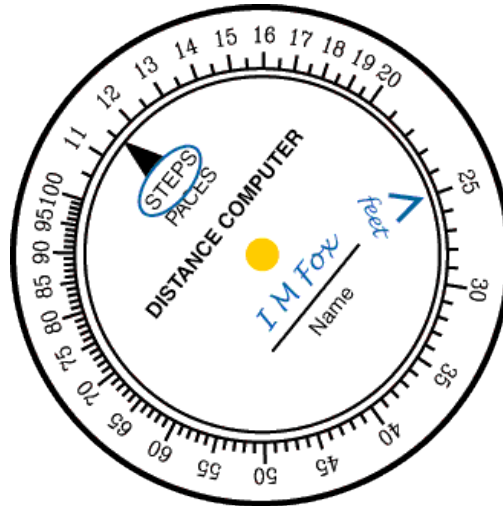
## Using the Distance Computer

With the computer properly marked for your step or pace length, using the computer is very simple. To calculate a distanced walked off, just rotate the computer so the STEPS marker points to the number of steps you counted. Then read the distance pointed to by the "feet" marker.

- Suppose that we stepped off a distance and counted 72 steps. Rotate the computer so STEPS points to 72. Now "feet" points a bit above the mark that is between 15 and 16. This mark represents 15.5, so we can call it about 15.7, or 157 feet. (Again, 15 feet is much too short a distance. It has to be around 150.)

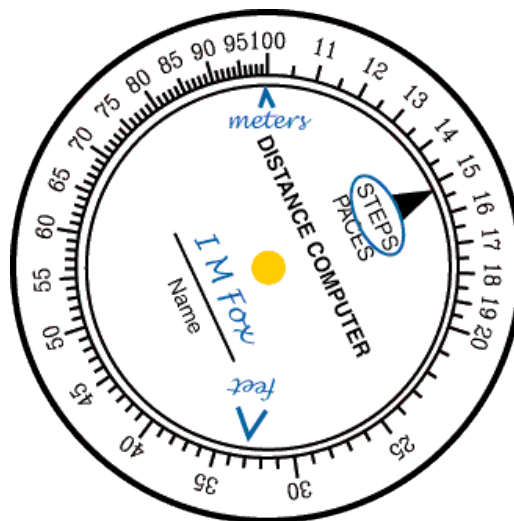


- Now, suppose that we want to step off a distance of 250 feet. To find the number of steps this will take, rotate the computer so that the "feet" marker points to 25. Now the STEPS marker points to 11.5, so we know that we have to go 115 steps.



## Adding Other Measurement Units to the Distance Computer

- You can easily add markers for other units of length to distance computer. All you have to know is the "conversion factors" between the new and the old units. (Those are just the numbers that express one unit in terms of another.) For example, one meter is about 3.3 feet. Turn the computer so the "feet" marker is pointing to 3.3, and draw a "meters" marker pointing to 100. Now you can measure distances in both feet and meters. Another unit that might be useful is the yard (3 feet). For example, you might be given a compass bearing and the distance to your campsite. If the distance is given in yards, all you have to do is to put a yard marker on your distance computer.



## Practice Problems

The "SETUP" section tells you how the step or pace was measured. Use this information to solve each of the problems. The problem will give you the distance or count; you calculate the count or distance, whichever one is not given. Remember that this kind of computer does not give exact answers; if you come within one or two units of the answer given, your answer is correct.

Here is how to do the practice exercises:

SETUP: 100 feet in 50 steps.

(Move the black arrowhead to 50. Move the blue triangle to 100.)

1. Steps = 75. (Drag the black triangle to 75. Notice the blue triangle (the feet) moves, too. That's because as the number of steps increases, so does the distance (feet).)

So, the answer is, Feet = 150. Now you try it.

1. SETUP: 100 feet in 45 steps.

1. Steps = 78. Feet = ??
2. Feet = 250. Steps = ??
3. Steps = 32. Feet = ??
4. Feet = 25. Steps = ??

2. SETUP: 100 feet in 18 paces

1. Paces = 55. Feet = ??
2. Feet = 380. Paces = ??
3. Paces = 12. Feet = ??
4. Feet = 75. Paces = ??

3. SETUP: 40 meters in 48 steps.

1. Steps = 37. Meters = ??
2. Meters = 90. Steps = ??
3. Steps = 82. Meters = ??
4. Meters = 55. Steps = ??

4. SETUP: 100 meters in 44 paces.

1. Paces = 30. Meters = ??
2. Meters = 85. Paces = ??
3. Paces = 72. Meters = ??
4. Meters = 115. Paces = ??