



Chapter 5 - Compass Reading and Pacing

Revised 2025

Using a compass and pacing are two basic forestry skills that are practiced almost daily by professional foresters to navigate in the woods.

Compass Reading

The three essential **parts of a compass** include a magnetic **needle** balanced on a jeweled bearing or pivot and a **graduated dial**. The dial is divided into 360 degrees (360°) of azimuth. These parts are housed in a **base plate** or frame that has a sighting device for aiming at your direction of travel. All compasses contain these three basic parts. Because of the wide variety of uses for a compass, there are many different compass designs.

The **three** basic parts of the compass:

- 1. Compass Needle.** The magnetic needle is attracted by the magnetic North Pole of the earth. The red end points North and the white end points South.
- 2. Compass Housing or Dial.** The compass housing is a dial that is graduated into the 360° of a circle. The compass housing rotates on the base plate. Each mark on the housing represents 2°. The azimuth is read in degrees at the index pointer. The four principal directions are also indicated: North (0° and 360°), South (180°), East (90°), and West (270°). The orienting arrow is the black arrow that appears on the bottom of the housing.
- 3. Base Plate.** The base plate points out the line of travel.

Foresters use compasses in many ways, such as obtaining azimuths from a map, taking azimuths on the ground, giving directions, reporting the location of a forest fire, plotting locations on a map, and laying out timber sale boundaries or roads.

The compass portion of the Forestry Contest will involve determining an azimuth from one object to another object. Therefore, taking an azimuth will be the only procedure discussed in this text. You may want to refer to one of the compass publications to learn the other procedures.

Definitions:

An **azimuth** is the direction or degree reading from one station to another. For example, to go from Point A to Point B at an azimuth of 90° means that starting at Point A, you must travel due East (90°) to reach Point B.

Declination is the variation between true north and magnetic north. Declination changes gradually over time because the earth wobbles slightly as it spins on its axis. The declination of the compass arrow can be adjusted to permit running compass lines on "true north" azimuth or "magnetic" north.

Note: *To use most compasses correctly, you must be familiar with the concept of declination, but you will not be asked about it at the Forestry Contest.*

There are two different types of compasses used at the contest. Rookies will use a baseplate compass, and Juniors and Seniors will use a mirror sighting compass.

Taking an Azimuth with a Baseplate Compass (Rookies)

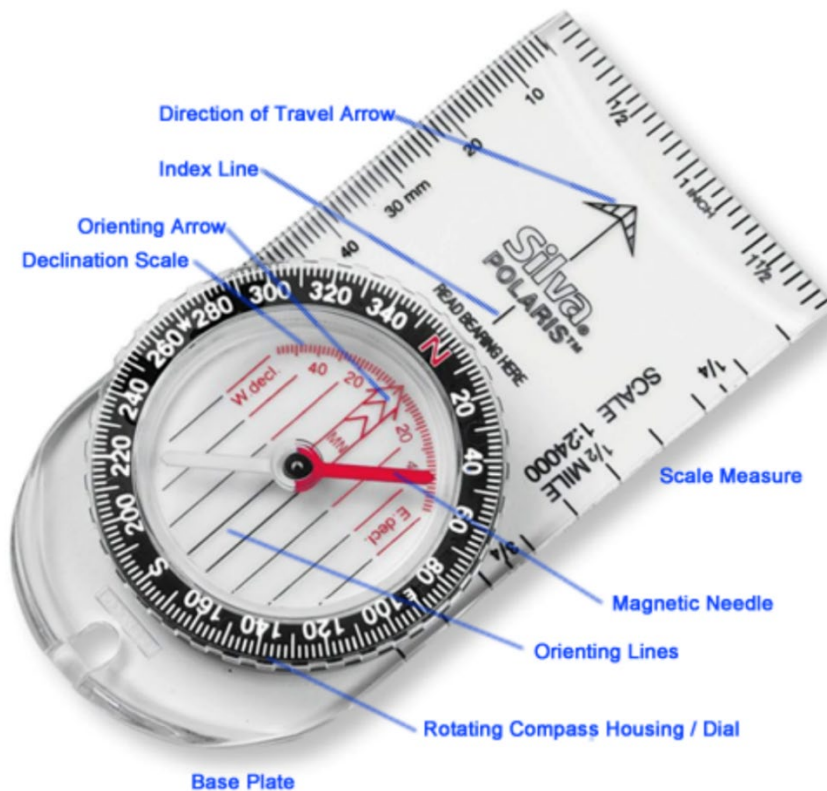
Rookies will be asked to find the azimuths and distances to two stations (survey stakes) using an **Orienting** or **Baseplate Compass** as shown below.



To use this compass to take an azimuth:

1. Hold the **Baseplate** at your waist positioned directly perpendicular to your body with the **Direction of Travel Arrow** pointing toward the object that you are sighting (a survey stake will be used at the contest).
2. Holding the compass level, turn the **Housing** or **Dial** until the red **Orienting Arrow** lines up under the **Magnetic Needle**. Notice the magnetic needle always points in the same direction, which is called magnetic north.
3. Read the **Azimuth** found on the dial just below the **Index Line**.
(Every little hash mark on the dial equals 2 degrees.) Be sure to keep the compass level in your hand and the magnetic needle directly above the orienting arrow.
4. Record this azimuth and pace toward the object of your destination (the survey stake). Follow the pacing instructions described later in this chapter.

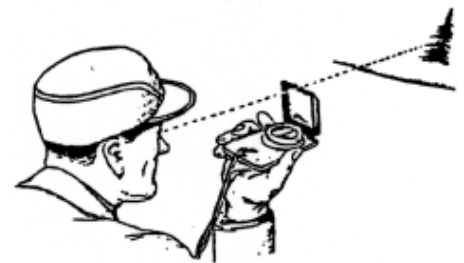
5. Once you have calculated and recorded your paced distance repeat this procedure to the next destination (the next survey stake).



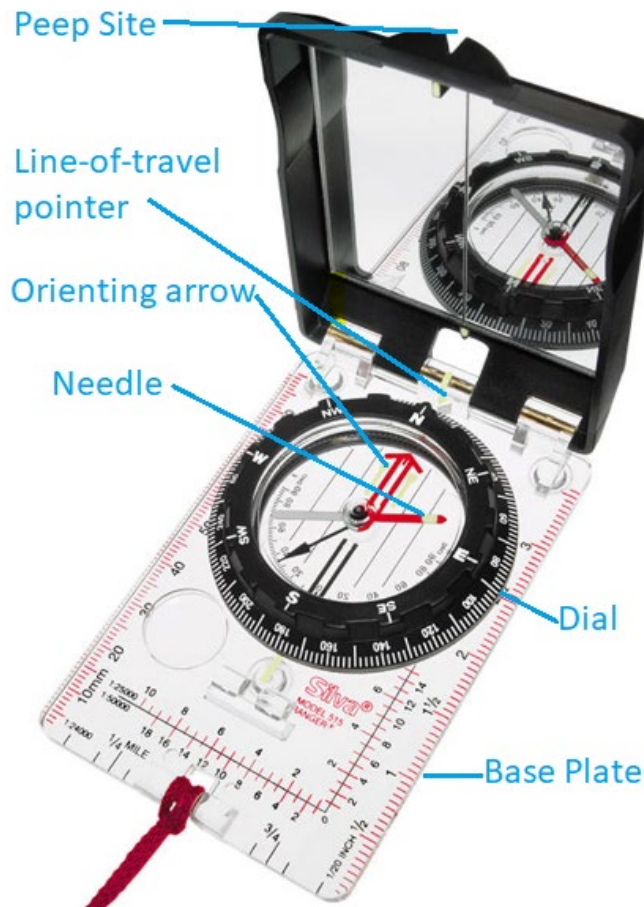
Taking an Azimuth with a Mirror Sighting Compass (Jr/Sr)

The Silva Ranger (or similar styles of compass made by different brands) is the most common type of mirror sighting compass used by foresters. It has a rectangular baseplate with a graduated dial that houses the needle and can be rotated. The mirror, line, and peep sight on the hinged cover help with sighting the compass. The graduated dial is filled with liquid to dampen the quivering of the needle. This compass is fast to use, particularly on straight cruise lines, and is accurate enough for most forestry applications.

1. Face the object you are aiming at.
2. Holding the compass **level** at eye level and at arm's length, look at the dial of the compass in the mirror reflection.
3. Next, line up your objective through the peep sight on the compass.
4. While continuing to hold the compass level, look at the compass dial in the mirror reflection and turn the dial until the orienting arrow (the arrow on the bottom of the dial) is lined up with the compass needle and the red part of the needle is underneath the orienting arrow.



5. Make sure you keep the compass baseplate level throughout this operation. You are still sighting on the objective through the peep sight, keeping the needle and the orienting arrow lined up exactly.
6. Adjust as necessary and keep double-checking that everything is lined up.
7. Finally, read the **azimuth** at the **line-of-travel pointer** (the little triangle or mark on the baseplate by the hinge). The markings on the dial are graduated to 2° . Estimate the azimuth to the nearest 1° .



Pacing

Pacing is the technique of measuring distances by knowing the length of your pace and counting the number of paces you take. Each two steps is called a **pace**. It is easier and more accurate to count the number of paces rather than individual steps.

Determining the Length of Pace

People's average length of pace differs. To determine your own average length of pace, measure 100 feet on level ground using a tape measure. Using a normal stride, walk the 100-foot distance, counting the number of paces (i.e., if you

started pacing with your right foot, count every time your left foot touches the ground as one pace.) Walk the 100-foot distance two more times, then take the average of the three pace counts. That is your average number of paces for 100 feet.

Now, divide your average number of paces into 100 feet to determine your average length of pace.

EXAMPLE A

You paced the 100-foot line three separate times. The walks resulted in 21 paces, 19 paces and 20 paces, respectively. Your average number of paces for 100 feet is

$$21 + 19 + 20 = 60 \text{ divided by } 3 = 20 \text{ paces for } 100 \text{ ft.}$$

Now determine your average length of pace:

$$100 \text{ feet divided by } 20 \text{ paces} = 5 \text{ feet per pace}$$

Once you know your average length of pace, you can calculate the distance from one point to another by pacing. To determine the distance between points, count the number of paces and multiply by the length of your pace.

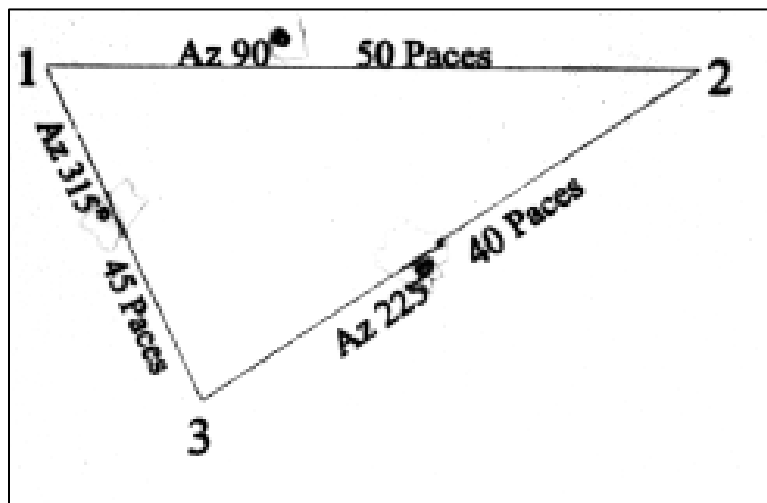
EXAMPLE B

A $\xrightarrow{\leftarrow 25 \text{ paces} \rightarrow}$ B

$$25 \text{ paces} \times 5 \text{ feet/pace} = 125 \text{ feet from Point A to Point B}$$

Combining Compass Reading and Pacing

The compass reading and pacing portion of the forestry contest will combine both skills. Here is a sample layout of a compass course:



(Assuming your average pace is 5 feet)

Stations	Compass Azimuth	Measured Distance
1 to 2	90°	250 feet (50 paces X 5 feet)
2 to 3	225°	200 feet (40 paces X 5 feet)
3 to 1	315°	225 feet (45 paces X 5 feet)