

# Compass and Pacing



OSU EXTENSION  
4-H YOUTH DEVELOPMENT

## Objectives

- Participants will learn to determine the number of paces in 100 ft.
- Participants will become familiar with parts of a compass.
- Participants will learn to determine direction using a compass.

## Background

Foresters are often asked to locate property boundaries, and to "cruise" timber and other forest resources. To accomplish this, foresters estimate ground distances using a "pacing" method and determine direction of travel using a compass. This exercise is designed to emphasize these two skills by measuring and judging direction of a course of three to four lines. The lines may be level, uphill or downhill, and successive lines may or may not be continuous.

Compass and pacing skills are also useful for activities such as orienteering, hiking, backpacking and camping

## Equipment and Preliminary Procedures

Participants should determine the number of paces he/she takes per 100 feet on a practice course prior to beginning this activity. (If desired, a distance corresponding to a Gunter's chain--66 feet--may also be used.)

For this activity participants should have:

- A compass from which precise bearings may be determined (e.g. Silva Ranger mirror-sighting type azimuth or quadrant compass).
- No compass declinations (declination is the angular difference between true and magnetic north) will be used in this activity.
- A pencil
- Activity Sheet #1 - Compass Traverse

Compasses may be ordered from **Ben Meadows Co. 1-800-241-6401** or **Forestry Suppliers, Inc. 1-800-647-5368**.

## Materials:

- Compass
- 100 ft. tape
- Compass traverse activity sheet
- Pencil

## Life Skill:

- Learning to Learn
- Decision Making
- Problem Solving
- Critical Thinking
- Planning/  
Organizing

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## DEVELOPING COMPASS AND PACING TECHNIQUES

### Compass

A compass is designed to help the user determine his/her direction of travel by estimating the angle deflection from magnetic north. Magnetic north is the direction the compass needle points.

Let's suppose you are told there is a treasure buried near your present location. There are no street sign or road markers to show the way, but directions are simple and easy. The treasure is 40 degrees, 327 feet from a known point. When we know the starting point we can quickly locate the treasure if we know how to use our compass.

First notice there are several parts to the compass. Figure 1

Inside of the **housing** is a red and black needle which swings on a pin. This is the **COMPASS NEEDLE ( or MAGNETIC NEEDLE)**. This is the basic part or heart of the compass and is common to all compasses. It is free to swing and will always be attracted to the **MAGNETIC NORTH POLE** (which constantly shifts). There is another **NORTH POLE**. **TRUE NORTH** does not move and is located geographically about 800 miles north of the magnetic pole.

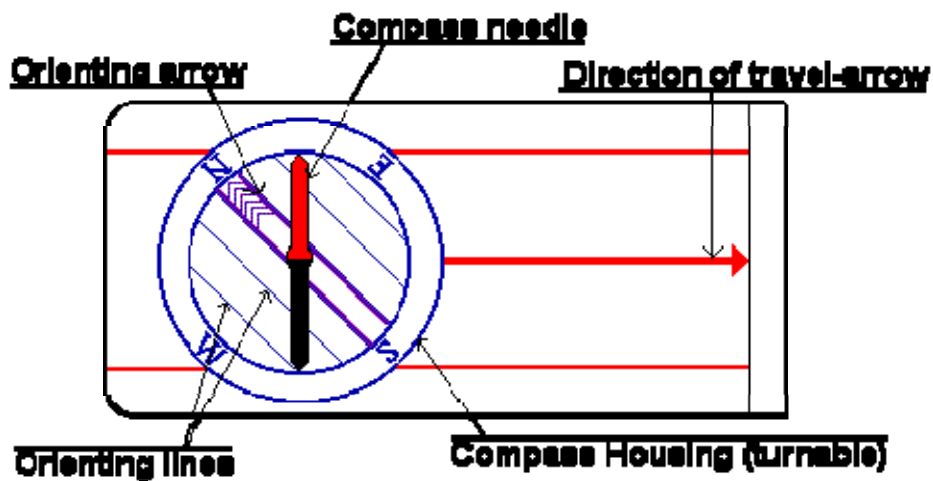


Figure 1: Basic Compass Parts

Since the **COMPASS NEEDLE** always points North, it does not point the way to go because we do not always want to go North. The **DIRECTION OF TRAVEL ARROW** points the way to go, after the compass is set.

The **DIRECTION OF TRAVEL ARROW** is located on the base. This is the arrow that shows which way to travel after our compass is set.

Notice the Compass **HOUSING**.

The numbers around the outside of the HOUSING are called DEGREES. Whichever number is at the base of the DIRECTION OF TRAVEL ARROW is the degree setting of the compass.

We said the treasure is 40 degrees from a known point. Let's determine which way is 40 degrees.

First, turn the dial until the 40 degree is at the base of the DIRECTION OF TRAVEL ARROW.

Second, hold the compass level, about waist high - or a little higher - and be sure the DIRECTION OF TRAVEL ARROW points straight ahead of you, not back toward you nor to one side.

Third, rotate your body and watch your compass. Keep turning until the red end of the MAGNETIC NEEDLE points to the letter "N" on the top of the HOUSING. Some may call this *putting Snoopy in the doghouse or putting red, Fred in the shed*. As you turn, do not twist the compass from your body, but keep the DIRECTION OF TRAVEL ARROW pointed straight ahead of you at all times. When you have turned far enough so that the red end of the NEEDLE points to "N", then you are facing the correct direction to travel. In our example that is 40 degrees.

Look up and sight an object such as a bush or tree in that direction. Then forget the compass and walk to that object. When you arrive there, repeat the process and pick out a new objective. Repeat until you reach your destination.

Pretty simple huh?

But what if you are looking at a point and you want to determine compass direction (or bearing)?

Begin by facing the intended target or point that you want to determine. Point the DIRECTION OF TRAVEL ARROW at your intended target or point. Hold the compass level, but this time hold it up higher than your waist. Experienced compass users hold the compass as close to eye level as possible so they can see "N" and compass needle while still being able to see the DIRECTION OF TRAVEL ARROW.

Keeping the DIRECTION OF TRAVEL ARROW on your target, turn the dial until the north sign "N" lines up with the north or **red** end of the needle (*put Snoopy in the doghouse*). Next, read the bearing at the base of the DIRECTION OF TRAVEL ARROW. This will be the magnetic bearing, or the angle measured between the target and magnetic north. Depending on the particular compass used, bearings may be recorded by azimuth (from 0° to 360°) or by quadrant (N 45° W, S 30° E, etc.).

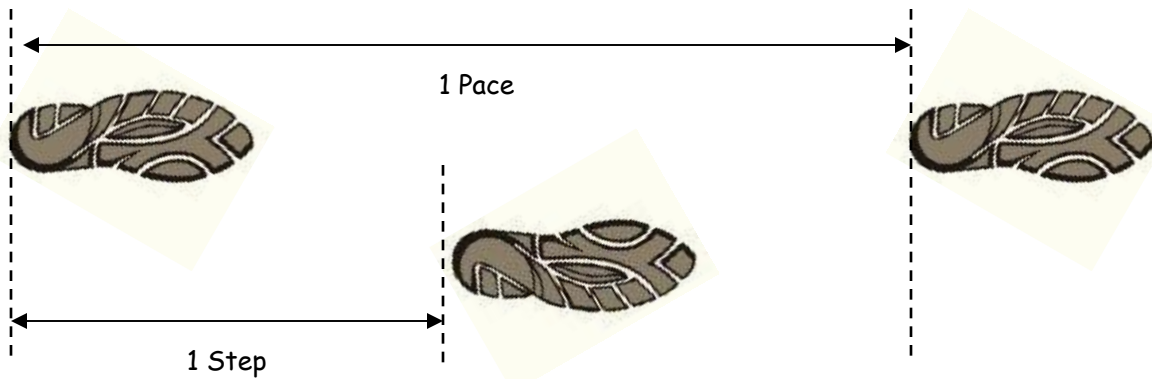
Remember, the key to becoming proficient with a compass is **PRACTICE!!!**

So now we know how to use our compass and have practiced....but our treasure is still out there 327 feet! Without a tape measure, or any other type of measuring equipment, how do you know how far 327 feet is? We will move on to our next section which provides you with a measuring technique that doesn't require you to carry any measuring devices!

**Pacing**

All maps and land surveys express the distance between two points as the horizontal distance, which is the distance measured on the level. Pacing is an easy, but crude, method of determining ground distances. **A pace is two steps (Fig. 2).** On level, open ground, pacing can become fairly accurate, with practice. An individual's pace is generally consistent (for that individual) when walking at a natural stride. However, on slopes or in brushy or rocky areas, its accuracy diminishes; therefore, an individual should practice on different terrain to establish an accurate pace for situations encountered in the field.

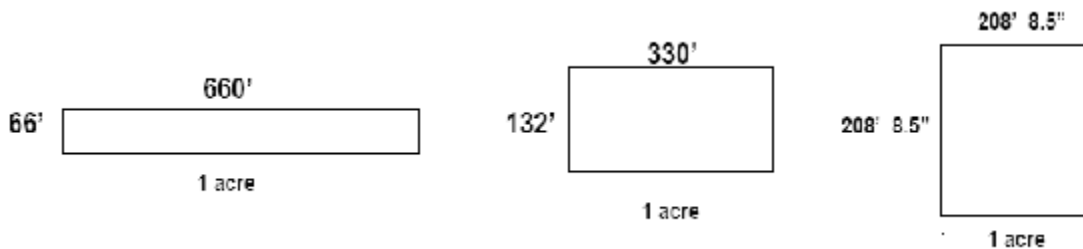
**Figure 2: Illustration showing the difference between a step and a pace.**



To determine the feet covered in one pace, a practice course is very helpful. Mark a starting point and measure 100 feet. Set another marker at this spot. At a normal rate, walk from one point to the other, counting the number of paces. Then, divide the total number of paces into 100 ft., and this gives the number of feet per pace. It is recommended to repeat this process several times to get a more accurate average feet per pace measurement.

$$\text{Total number of paces} \div 100 \text{ ft.} = \text{Number of feet per pace}$$

A course of 66 ft. (one Gunter's Chain) may also be used. Simply divide the total number of paces into 66 feet to determine the number of feet per pace. The Gunter's chain is used by many foresters because of its ease in use to determine distances and areas. One mile contains 80 chains (5280 feet), and this breaks down handily for fractions of a mile (i.e., 40 chains = 1/2 mile or 2640 feet; 8 chains = 1/10 mile or 528 feet). Another feature of this 66 foot Gunter's chain is that ten square chains equal one acre, or 43,560 square feet. Therefore, if an individual paces around a rectangle on the ground that is one chain (66 ft.) wide and ten chains (660 ft.) long, he/she will have walked around one acre of land.



So how many paces do you have to take to determine how far 327 ft. is? Remember our treasure is still out there! Lets say you took 300 paces to cover 100 ft. Using the formula on the previous page, your pace would be:  $300 \text{ paces} \div 100 \text{ ft.} = 3 \text{ ft. per pace}$ . Now we know the how far we need to travel to get to our treasure and we know our pace, we simply divide how far we need to go by our pace or:  $327 \text{ ft.} \div 3 \text{ ft. per pace} = 109 \text{ paces}$ . So, with our compass set at  $40^\circ$ , if we take 109 paces in that direction we should find our treasure!

### Course Set Up and Scoring

An sample compass and pacing course (including compass readings and distances) is depicted in Figure 3.

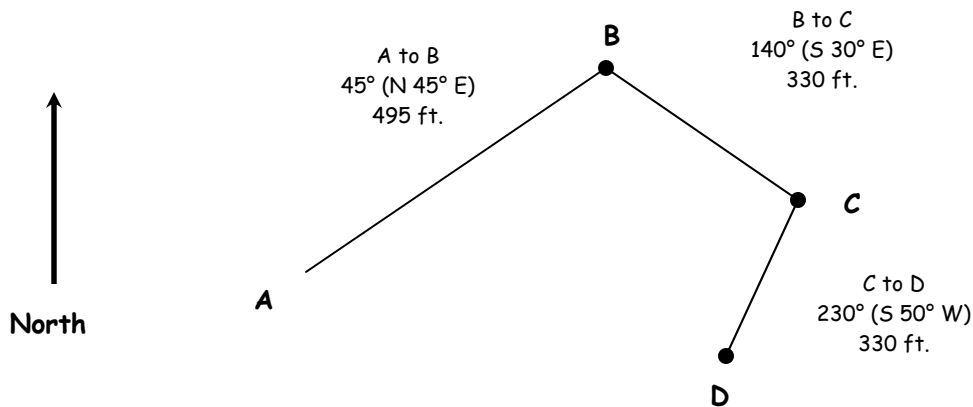


Figure 3: Compass and pacing course example

### Scoring

**Distance:** deduct one point for each foot of error (acceptable error is +/- two feet).

**Compass:** deduct one point for each degree of error using (acceptable error is +/- two degrees).

Below is an example using measurements from Points A to B (also known as Line 1) from Figure 4:

#### Line 1 (Official measurement and compass reading)

Distance (feet) 495 ft. Error (acceptable range = 493-497 ft.)

Bearing (degrees) 45° Error (acceptable range = 43° to 47°)

#### Line 1 (contestant's answer)

Distance (feet) 492 ft. Error -1 point

Bearing (degrees) 44° Error - 0 point

**Instructors Guidelines  
for  
Compass and Pacing Activity**

For this activity:

1. Select a suitable location. Be sure to have a compass and tape measure with you.
2. Determine number of points you will be using and mark them with a wooden stake or other easily identifiable marking. These will be your points. (example: Point A, Point B, etc..)
3. Standing over point A, using your compass, sight in at Point B. to determine the bearing.
4. Record this number on your official score sheet.
5. Using your tape measure, determine the distance from Point A to Point B.
6. Record this distance on your official score sheet.
7. Repeat steps 3-6 for your remaining points.
8. Determine point values for each distance and bearing. No secret here...make them worth whatever you want.

**Line 1**

Distance (feet)\_\_\_\_\_ Error \_\_\_\_\_(deduct 1 pt./ft. in excess of 2 ft. error)

Bearing (degrees)\_\_\_\_\_ Error \_\_\_\_\_(deduct 1 pt./ft. in excess of 2° error)

**Line 2**

Distance (feet)\_\_\_\_\_ Error \_\_\_\_\_(deduct 1 pt./ft. in excess of 2 ft. error)

Bearing (degrees)\_\_\_\_\_ Error \_\_\_\_\_(deduct 1 pt./ft. in excess of 2° error)

**Line 3**

Distance (feet)\_\_\_\_\_ Error \_\_\_\_\_(deduct 1 pt./ft. in excess of 2 ft. error)

Bearing (degrees)\_\_\_\_\_ Error \_\_\_\_\_(deduct 1 pt./ft. in excess of 2° error)

**Line 4**

Distance (feet)\_\_\_\_\_ Error \_\_\_\_\_(deduct 1 pt./ft. in excess of 2 ft. error)

Bearing (degrees)\_\_\_\_\_ Error \_\_\_\_\_(deduct 1 pt./ft. in excess of 2° error)

Activity Sheet #1

COMPASS TRAVERSE

Participants Name: \_\_\_\_\_

Line 1

Distance (feet)\_\_\_\_\_ Error\_\_\_\_\_ (deduct 1 pt./ft. in excess of 2 ft. error)

Bearing (degrees)\_\_\_\_\_ Error\_\_\_\_\_ (deduct 1 pt./ft. in excess of 2° error)

Line 2

Distance (feet)\_\_\_\_\_ Error\_\_\_\_\_ (deduct 1 pt./ft. in excess of 2 ft. error)

Bearing (degrees)\_\_\_\_\_ Error\_\_\_\_\_ (deduct 1 pt./ft. in excess of 2° error)

Line 3

Distance (feet)\_\_\_\_\_ Error\_\_\_\_\_ (deduct 1 pt./ft. in excess of 2 ft. error)

Bearing (degrees)\_\_\_\_\_ Error\_\_\_\_\_ (deduct 1 pt./ft. in excess of 2° error)

Line 4

Distance (feet)\_\_\_\_\_ Error\_\_\_\_\_ (deduct 1 pt./ft. in excess of 2 ft. error)

Bearing (degrees)\_\_\_\_\_ Error\_\_\_\_\_ (deduct 1 pt./ft. in excess of 2° error)

Distance Score\_\_\_\_\_

Bearing Score\_\_\_\_\_

CONTESTANT'S SCORE\_\_\_\_\_

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### References:

Andresen, Steve: **The Orienteering Book**, 1977, World Publications, Box 366, Mountain View, CA 94042.

Bengtsson, Hans and George Atkinson: **Orienteering for Sport and Pleasure**, 1977, The Stephen Greene Press, Brattleboro, VT.

Kjellstrom, Bjorn: **Be Expert with Map & Compass**, 1976, Charles Scribner & Sons, New York, NY.

### Compasses

Compasses may be ordered from **Ben Meadows Co. 1-800-241-6401** or **Forestry Suppliers, Inc. 1-800-647-5368**.

### Additional Resources:

Oklahoma 4-H at <http://oklahoma4h.okstate.edu/index.htm>

Oklahoma 4-H Forestry Judging website at <http://nrem.okstate.edu/Extension/judging.html>

Oklahoma 4-H Forestry Judging Manual. 2007 revision.

4-H Forestry Program—Unit A: Trees

4-H Forestry program—Unit B: Forests

Oklahoma Forestry and Wildlife Camp website at <http://whatisforestry.org/youth-camp.php>

Oklahoma Cooperative Extension Forestry at <http://nrem.okstate.edu/Extension/pubs.html>