

**Lesson II** (allow 1 hour 20 minutes or 2 - 45 minute periods)

## **The Outdoor Course**

The basic outdoor course will challenge students further by adding a distance component to their route finding. On the basic outdoor course students will use known degrees and distances to successfully navigate a 4 destination course.

### **Materials**

Large outdoor space including fixed objects (ie school playground, field, park)

Class set of Compasses

Measuring wheel or tape

Discrete outdoor-ready labels (possibilities vary from laminated paper labels with tacks to pavestones labeled with marker)

Student Worksheets on clipboards

Pencils

Teacher Key

Student calculators (optional)

Easel to demonstrate and clarify math concepts to students

### **Teacher Preparation**

#### **1. Setting up the Course**

Using the same principles of course development as the mini course, choose a place to begin all outdoor basic courses. Choose fixed objects in your school landscape as destinations. For example, start 4 courses on the basketball court. Course 1 could be basketball court's NE corner - swing set - sandbox - maple tree. Course 2 could be basketball court's SW corner - bird house - maple tree - swing set. For management purposes, be sure all destination points on the course are visible from the starting point. Use the compass to derive degree coordinates for the outdoor course in the same way you did the indoor course. In addition, use a measuring wheel or measuring tape to determine the distances from point to point. Each course should be assigned a color and destination points can be discretely labeled with the color and destination number. For example the maple tree may be used as destination #1 on the red course and destination #3 on the yellow course.

#### **2. Develop Student Worksheets**

(student worksheet sample follows)

Partner 1

Pace count per 100 ft.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

Partner 2

Pace count per 100 ft.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

Add #1-3 and divide that total by 3 to get pace count average for 100 ft.

Partner 1 100 ft. pace count average is \_\_\_\_\_ ÷ 100 ft. = \_\_\_\_\_ pace count per ft.

Partner 2 100 ft. pace count average is \_\_\_\_\_ ÷ 100 ft. = \_\_\_\_\_ pace count per ft.

## Blue Course

Partner 1

Degrees	Distance x Paces per ft. = Paces to Walk	Destination
60°	230 ft. x _____ = _____	_____
170°	104 ft x _____ = _____	_____
270°	525 ft. x _____ = _____	_____
40°	331 ft x _____ = _____	_____

## Yellow Course

Partner 2

Degrees	Distance x Paces per ft. = Paces to Walk	Destination
160°	146 ft x _____ = _____	_____
300°	556 ft x _____ = _____	_____
90°	307 ft x _____ = _____	_____
350°	187 ft x _____ = _____	_____

## Procedure

### Pace Count

Students can now identify the desired direction, but need a tool to measure distance. If we are in the woods and our goal is north 200ft., how can we measure that distance? Have students suggest possibilities or suggest the ridiculous to get them thinking. Some students may have experienced someone measuring inches/cm with their finger or an outdoor area with their feet. However, it is not practical to measure heel to toe over long distances or uneven terrain. But if this concept is used, and heel to toe is stretched out to natural walking steps, it becomes a more practical tool for measuring long distances. This is called our pace.

A pace is made up of 2 steps. If we start with our left foot this step =  $\frac{1}{2}$  pace, adding our step with our right foot = 1 complete pace. Have students think of their left step as  $\frac{1}{2}$ , and pat their right leg with their right hand to count the right leg's steps only.

On a previously marked 100 foot course, have students count the number of paces necessary to walk this distance. To reduce the consequence of variances in gait and to ensure that students attain a more natural gait for their pace count, have them count and record their paces in the 100 ft course three times and take an average. Remind them to walk naturally and only count each time their right foot steps. Students have probably already had experience in calculating average/mean, this should provide a good opportunity for them to recall the formula.

Dividing the pace count by 100 gives us the paces necessary to walk 1 foot. Multiply the paces per foot by the distance to the destination to calculate the paces necessary to walk to the destination.

Once all the mathematical operations have been performed, students can use their new skills to arrive at an unknown destination! Students should stand at the starting point, dial in the degrees, turn their body to get Red Fred in the shed, and SIGHT their destination. It is important to first visually identify an object in the distance at the desired degree to maintain bearing with a natural gait. Maintaining eye contact with the identified object, walk the calculated number of paces toward that object. When the correct number of paces has been walked, students should record their location as their destination. (ie maple tree, lamp post...). Then standing at this destination, they should repeat the same procedure, dialing the new degree from the most recent destination until they have completed the course. Upon completion of the course, students confirm their destinations with the teacher key. If all destinations were correct they should begin the next course. If not, they should determine where and why errors occurred before continuing. (If you labeled the destinations with discrete markers, students have already self checked at each destination.)

