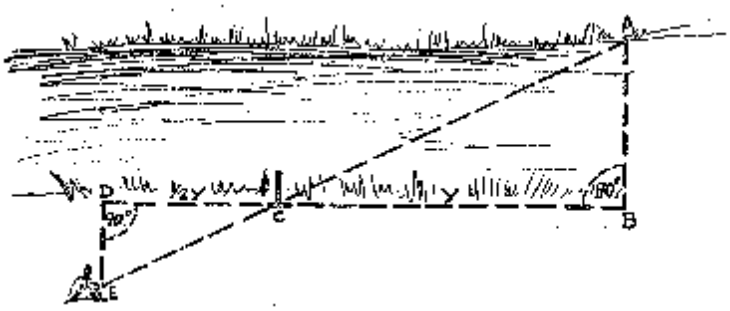
MEASURING – Level 2

"Who has measured the waters and the hollows of his hand with the breadth of his hand, marked off the heaven? Who has held the dust of the earth in a basket or weighed the mountains on the scales and the hills in a balance." Isaiah 40: 12.

SIMILAR TRIANGLE METHOD

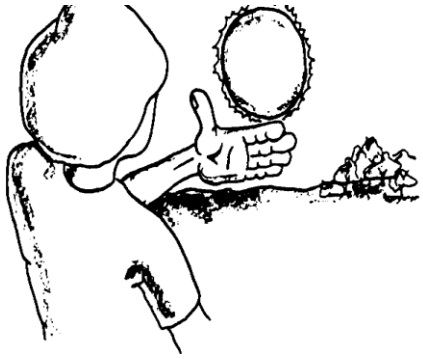
You can measure many distances simply by pacing them off. However there are distances that are impossible to measure by pacing off such as rivers. This is when you can use the SIMILAR TRIANGLE method. Stand on the bank and sight across the river to an object (rock or tree) on the opposite bank. We will call this point A.

The spot where you are standing we will call point B. Drive a peg into the ground here (B). Turn 90 degrees and walk along the bank a given number of paces (say 50) and drive a peg in the ground here, which will be point C. Continue pacing along the bank half the number of paces as before (25) and drive a peg into the ground at this point which is point D. Make a 90 degree turn and walk away from the river (counting your paces) until you arrive at a point that is in direct line with point A and peg C. Drive another peg in the ground here and call it point E. Now the formula. If the distance from A to B is X and the distance from B to C is Y, then you know the distance from C to D is 1/2 of Y because you went 1/2 the paces. (25 versus 50). The distance from D to E is 1/2 of A to B. (similar triangles) So double the paces you counted when you paced off D to E multiply by your pace length and divide by 12 and you will know how many feet it is across the river. If you wanted to eliminate the doubling of D to E you could walk the same number of paces from C to D as you did B to C (50 and 50) then you would make triangles the same size and A to B and D to E would be the same distance. See now why the length of your pace is important?



HORIZON METHOD

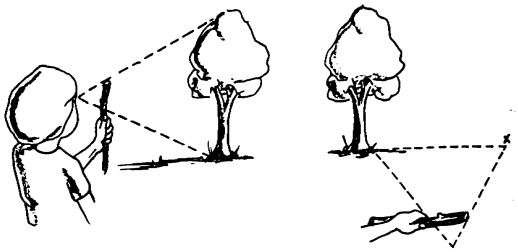
There is an easy way to tell time in the early evening, just before sunset using your hand. Just extend your arm in front of you and place your hand on the horizon as shown in the figure below. For each finger between the horizon and the sun, there is 15 minutes of sunlight left.



These simple methods for measuring height, distance and time can be used almost anywhere. They are fast and fairly accurate. Try any of them out on some known measurements and you will be surprised at the accuracy. As you continue in this chapter you will learn a couple more methods of measuring height and distance that are just as easy to do and just as accurate.

STICK METHOD

Another method for measuring height is the Stick Method. Ask another Lutheran Pioneer, whose height you know, to stand at the base of the object you want to measure (such as a tree), or make a mark on the tree at your own height. Step back. Hold a stick up before you in your outstretched hand. With one eye closed, measure off the stick, with your thumbnail, the height of the Lutheran Pioneer or your mark. then move the stick up the tree to see how many times this measurement goes into the height of the tree. Now it is just a matter of multiplying the height of the Lutheran Pioneer (or your height) times the number you found. Now you have the height of the tree.



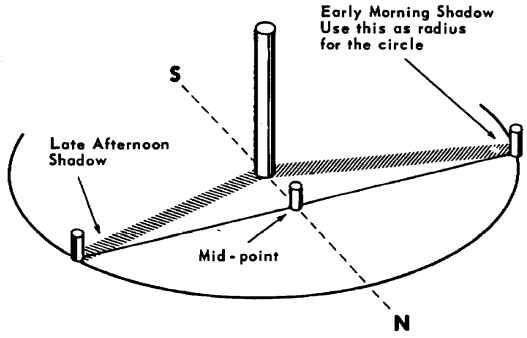
NAPOLEAN METHOD

There are a couple more ways to measure distances and they are the Napoleon Method and the Compass Method.

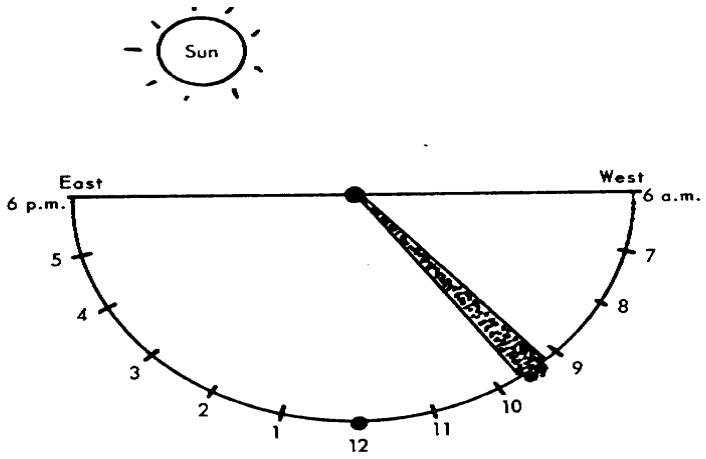
In the Napoleon Method of measuring distance (such as across a river) stand on the bank. Bow your head with your chin against your chest. Hold your hand to your forehead, palm down. Move your hand down until the front edge of it seems to touch the opposite bank. Now, make a half turn (90 degrees), "transferring" the distance to your bank. The distance to the point which the edge of your hand seems to touch is the width of the river. Mark that spot and pace it off. If you wear your Pioneer baseball cap, you could use the brim of the cap instead of your hand. Napoleon would have used the brim of his hat instead of his hand.

SUNDIALS

Now that the fun is just beginning, you will have to keep track of the time. There is a way to do that without a watch by making your own sundial. Of course it all depends on a sunny day. Sundials were used for a long time before clocks were invented. At first people measured the length of a man's shadow, but that soon proved to be very inaccurate because the length of the shadow changes as seasons change. Therefore the position of the shadow became more important than the length of the shadow.



A simple sundial can be made by driving a stick into the ground and then drawing a semicircle around it. Take your first shadow length measurement in the morning just after sunrise. The shadow will be the longest then and you can use that length for the radius of the semicircle. The sun rises in the East , moves South and sets in the West. At noon the shadow cast by the stick would point North and will be the number 12 on the dial (12 noon). Starting at North divide the semicircle into 12 equal parts and mark them as seen on the next page, being careful to mark the numbers on the correct side of 12. Numbers 1 through 6 are marked on the East side of 12. You can now tell the time during daylight hours, for the rest of the campout with this simple sundial. When it gets close to sunset, use the hand on the horizon method you learned to see how much time is left before the sun will set. See if it matches your sundial.



You may want to perfect one or two of these methods of measuring, but it is fun to use them all and seeing if the answers come out close to each other.

Now keep your Pioneer Staff and a compass with you on your Pioneer outings and you should be able to measure anything that you would like to. How are you going to know how you measure up? You need something to tell you how you are doing. The BIBLE is your tool, there is where you will find the answers. Paul says in Romans 7:7. What shall we say then? Is the law sin? Certainly not! Indeed I would not have known what sin was except through the law. For I would not have known what it was to covet if the law had not said , "Do not covet."

You can find the law in the Bible, but what's more important you can also find the Gospel. Use your Bible, the tools to measure how we should conduct ourselves as Christians is in there as is the Good News of Jesus Christ.

Don't forget to keep your most important measuring tools with you also, your Bible and your Lord and Savior. Jesus, He is with you at all times and isn't that great.

Measuring Requirements – Level 2:

1) **Demonstrate the Triangulation method**
2) **Horizon method**
3) **Stick Method**
4) **Napoleon Method**
5) **Sundial Method**