

CONSTRUCTION

HANDS-ON WORKSTATIONS

ZONE



Construction Measurement



Construction Measurement

This Construction Zone workstation will teach you the basic fundamentals of measuring in a construction environment, as you acquire skills by performing hands-on activities. No prior knowledge of the trade is required, as the Construction Zone curriculum will introduce you to professional tools and provide step by step instructions to use them in skills practice.

Before working on the activities, you will learn:

- The history of measurements and weights
- The definitions of the terms measurement, units, and standards
- Four ancient measurement systems and their modern day applications

After you have learned about the basic terms and the history of measurement, you will learn to use basic measuring devices such as rulers and tape measures. Then you will advance to more sophisticated measuring devices used in the construction industry.

WORKSTATION OVERVIEW

You will complete the following tasks:

- Make linear measurements with a master ruler
- Read the various scales available on tape measures
- Make accurate measurements with a tape measure
- Convert between SI units (International System of Units or metric units) and English units
- Measure with a metric ruler
- Calculate the perimeter, area, and volume of various objects
- Read a brick mason's scale on a folding ruler
- Make a chalk line between two points
- Use a marking gauge to scribe a straight line
- Check for squareness with a framing square
- Use a line level to achieve a true horizontal line
- Plumb and level fixtures with a torpedo level
- Transfer angles with a sliding T bevel
- Measure angles with a square head protractor
- Use a transit level and calibration rod to measure elevations

CONSTRUCTION MEASUREMENT SKILLS OBJECTIVES

Activity Day 1

- Define units and standards
- Define the term measurement
- List the units of measure that were once associated with body parts
- Name and explain four ancient measurement systems
- List the modern-day applications associated with each ancient measurement system

Activity Day 2

- Define the term master ruler
- List the five increments of measurement illustrated by a master ruler
- Define the term linear measurement
- Choose the appropriate leaf of a master ruler to make linear measurements
- Make accurate linear measurements
- State three of the smaller U.S. standard units of length

Activity Day 3

- Identify the different parts of a tape measure
- Define the term tape measure
- Explain why a tape measure's tip floats
- Distinguish different scales available on conventional tape measures

Activity Day 4

- Define the term SI
- Identify the base unit of measure in the metric system
- List the common metric prefixes and what each represents
- Abbreviate common SI units of length
- Convert between metric units
- Convert between metric and English units
- Read a metric ruler or tape measure

Activity Day 5

- Define the terms perimeter, area, and volume
- Calculate the perimeter of a polygon, rectangle, triangle, and circle
- Calculate the area of a rectangle, triangle, and circle
- Calculate the volume of a rectangular solid, triangular solid, and sphere

Activity Day 6

- Define the term folding ruler
- Determine when to use a folding ruler over a tape measure
- Read a brick mason's scale
- Identify the different parts of a chalk line
- Make a chalk line between two points

Activity Day 7

- Identify the different parts of a marking gauge
- Define the term marking gauge
- Use a marking gauge to scribe a straight line
- Identify the different parts of a framing square
- Use a framing square to check the squareness of a board's corners

Activity Day 8

- Identify the different parts of a line level
- Define the term line level
- Use a line level to achieve a level line
- Identify the different parts of a torpedo level
- Define the term torpedo level
- Use a torpedo level to adjust fixtures to level, plumb, and 45°

Activity Day 9

- Identify the different parts of a sliding T bevel
- Define the term sliding T bevel
- Use a sliding T bevel to transfer angles
- Identify the different parts of a square head protractor
- Define the term square head protractor
- Use a square head protractor to measure angles

Activity Day 10

- Identify the different parts of a transit level
- Define the term transit level
- Set up a tripod for various soil conditions
- Attach a telescope/spirit level assembly to a tripod
- Level a telescope
- Use a transit level to determine elevations
- Read the calibration rod correctly

Activity Day 6

Using a Folding Ruler and Chalk Line

Construction Measurement Skills Objectives

1. Define the term folding ruler
2. Determine when to use a folding ruler over a tape measure
3. Read a brick mason's scale
4. Identify the different parts of a chalk line
5. Make a chalk line between two points

Day 6 Activities

1. Read the sections *Activity Introduction* and *Using the Folding Ruler*.
2. Complete the step-by-step directions to measure predetermined lengths with the folding ruler.
3. Read the section *Using the Chalk Line*, then complete the step-by-step directions to make a horizontal chalk line.
4. Complete the Activity Day 6 workbook questions.



Activity Introduction

In this activity, you will be using the folding ruler to measure predetermined lengths and record measurements. Then you will use a chalk line to snap a straight line between two measured points.




Using a Chalk Line



Put on your safety glasses and wear them until you finish all jobs.

To measure with a folding ruler and make a chalk line, you'll need the tools and materials pictured below. Each is labeled in the tool drawer of the workstation.

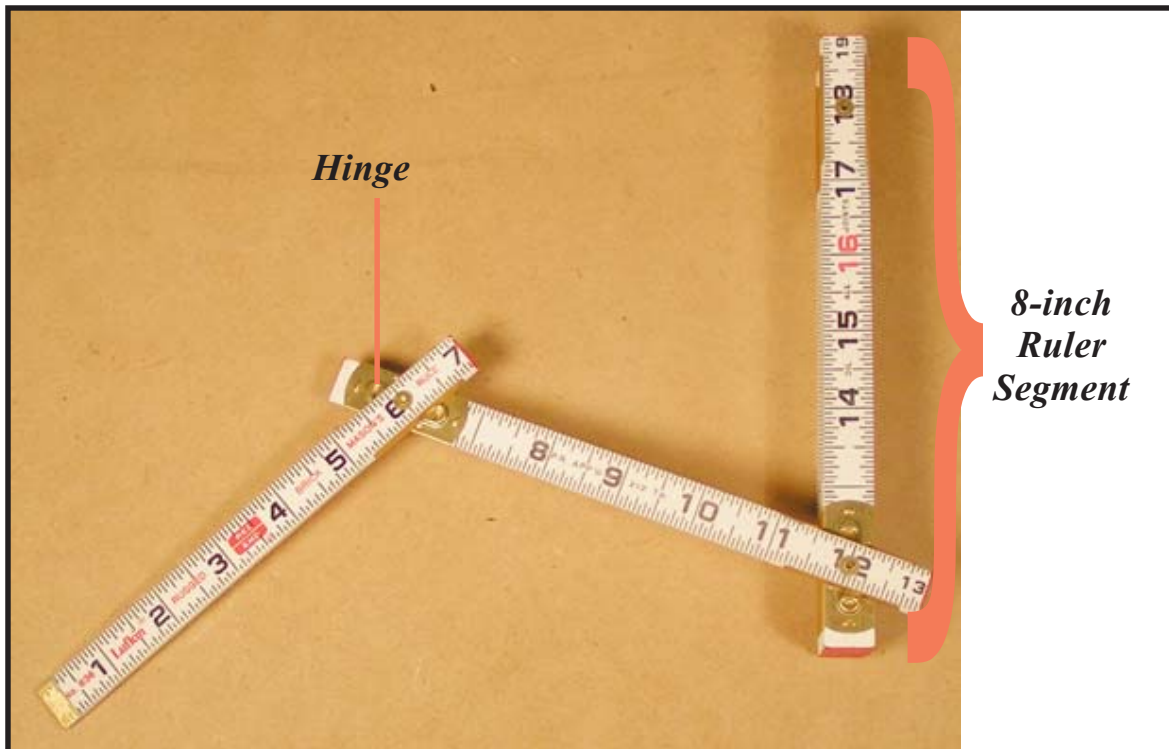
When you have finished using a tool, return it to the labeled tool holder.

Activity Day 6 Tools & Materials	
 <p><i>Safety Glasses</i></p>	 <p><i>Folding Ruler</i></p>
 <p><i>Chalk Line</i></p>	 <p><i>Chalk</i></p>



Using the Folding Ruler

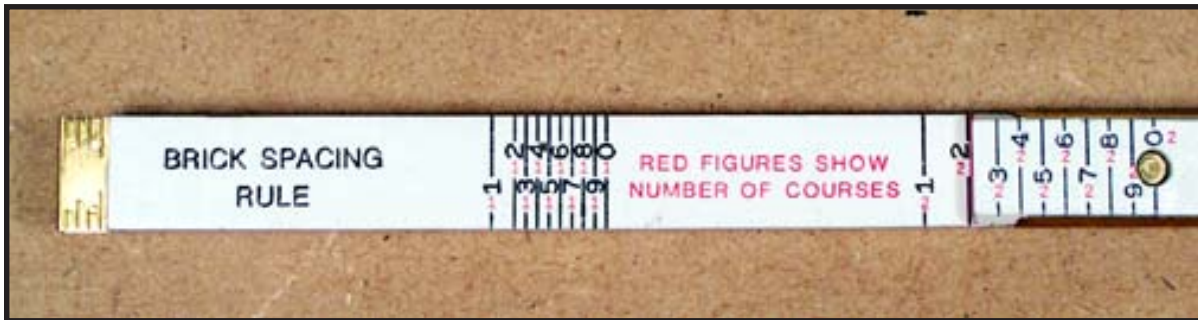
The parts of a folding ruler are called out in the photo below.



Parts of a Folding Ruler

A folding ruler is a 6-foot wood ruler that folds into 8-inch segments for portability. A folding ruler will stay rigid where a tape measure may not. Locking hinges allow the ruler to stay stiff even when it is held vertically. Folding rulers were the standard measurement tools before tape measures came into use, but now they are primarily used by brick masons.

Note that one side of the folding ruler is marked similarly to a standard tape measure. The other side is a brick mason's rule as shown below.



Brick Mason's Rule

Brick masons use special scales designed for marking brick courses (horizontal rows of bricks).

For instance, if you know your bricks are $2 \frac{1}{4}$ " tall and the mortar thickness is $\frac{1}{2}$ ", then the course measurement is $2 \frac{3}{4}$ ". Put your thumbnail on the $2 \frac{3}{4}$ " mark on the standard ruler side of the folding ruler. Without removing your thumb from the ruler, turn it over to the other side. Note that your thumbnail is now on the "6" scale mark.

Every scale has equally marked graduations for each brick course. For example, every time a "6" appears on the mason's rule, it is paired with a red number that gives the number of courses.

Put your thumbnail on the marking for 4 courses on the "6" scale (a black 6 with a red 4). Turning the folding ruler over, note that your thumbnail is on the 11" mark.

$$\text{"6" Scale Course thickness} = 2 \frac{3}{4}" \times 4 \text{ courses} = 11"$$

Step-By-Step Instructions

To measure predetermined lengths with the folding ruler:

1. Retrieve Board B and the folding ruler from the workstation drawer.
2. Measure the lengths of sides B-1, B-2, B-3, and B-4 in inches. Enter the values on your worksheet in the section labeled Folding Ruler.

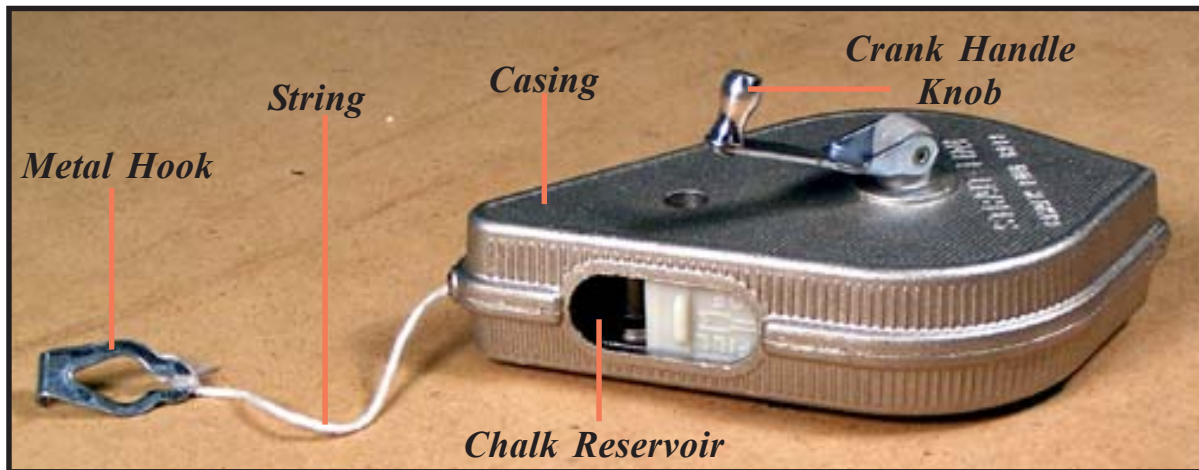


Measuring with a Folding Ruler



Using the Chalk Line

The parts of a chalk line are called out below.



Parts of a Chalk Line

A chalk line is a marking tool used to make an imprint of a straight line between two points that are too far apart to use a straight edge. It is often used when hanging wallpaper or installing tile floors.

To use a chalk line, start by accurately measuring and marking both ends of the line you wish to create. As the string passes through the chalk reservoir, chalk is applied to the line. Pull the chalk-coated string out of the chalk line case by pulling the metal tab, or hook. Pull the line tight at each end; this step is easier with two people. At the center of the string, lift the line away from the surface several inches. Let the line snap back into place. This leaves a chalk line on the surface, which should extend from one mark to the next. To wind the line back into the case, turn the crank handle knob.

Name: _____ Date: _____

Construction Measurement - Activity Day 6 Workbook Questions

1. Define folding ruler.

2. What is the advantage of a folding ruler over a tape measure?

Match the items on the left with their functions on the right

3. Red numbers on a brick mason's rule _____ A. Denotes the number of courses

4. Black numbers on a brick mason's rule _____ B. Denotes the scale being used

5. Define the term brick course.

6. Define chalk line.

True or False

7. When making a chalk line, pull the string loosely from end to end. _____

8. Chalk is applied to the line in the crank handle knob. _____

9. To snap the line, lift the string several inches from the surface, then release. _____

10. When is a chalk line's crank handle used?

Name _____ Class Period _____
Date _____

CONSTRUCTION MEASUREMENT WORKSHEET

Master Ruler

Wrenches A. _____ B. _____ C. _____ D. _____ E. _____
Levels F. _____ G. _____ H. _____ I. _____
Files J. _____ K. _____ L. _____ M. _____
Nuts N. _____ O. _____ P. _____
Nails Q. _____ R. _____ S. _____

Tape Measure

1. _____ 2. _____ 3. _____

Lengths in inches

A-1 _____ in_ A-2 _____ in_ A-3 _____ in_

Metric Ruler

1. _____ 2. _____

Lengths in millimeters

A-1 _____ mm_ A-2 _____ mm_ A-3 _____ mm_

Conversions

Millimeters to inches

A-1 _____ in_ A-2 _____ in_ A-3 _____ in_

Perimeter Calculations

Rectangle _____ Triangle _____ Circle _____

Polygon _____

Area Calculations

Rectangle _____ Triangle _____ Circle _____

Volume Calculations

Rectangular solid _____ Triangular solid _____

Sphere _____