

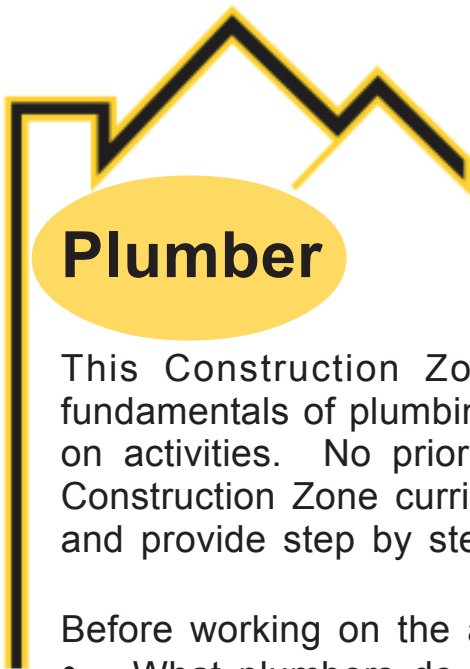
CONSTRUCTION

HANDS-ON WORKSTATIONS

ZONE



Plumber



Plumber

This Construction Zone workstation will teach you the basic fundamentals of plumbing, 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:

- What plumbers do
- What job opportunities exist for plumbers
- How the three parts of a modern plumbing system work together to supply water, carry away waste, and vent sewage gases safely

After you have learned about the three parts of a modern plumbing system, you will assemble components from each. Working with the same tools that professional plumbers use, you will hook up a hot and cold water supply and a standpipe for a laundry room.

WORKSTATION OVERVIEW

You will complete the following tasks:

- Measure, cut, ream, thread, and assemble galvanized pipe
- Measure, cut, ream, solder, and assemble copper pipe
- Measure, cut, lubricate, and assemble PVC plastic pipe
- Name and price the types of pipe and fittings
- Figure total labor and material costs
- Fix a leaky faucet
- Disassemble the installation as a remodeling experience

PLUMBER SKILLS OBJECTIVES

Activity Day 1

- Name eight pipe systems a plumber may specialize in
- Identify four jobs a plumber may do
- List seven tools that plumbers use
- Identify and state the purpose of the three parts of a building's plumbing system
- Explain why a building's drainage and venting systems are connected with one another
- Name and describe the advantages of the three types of pipe used in this workstation

Activity Day 2

- Locate and name the tools and equipment at the workstation
- Identify common pipe fittings from diagrams
- Find costs of pipe fittings using the plumber's price lists
- State the purpose of a work order
- Complete work order calculations

Activity Day 3

- Make accurate measurements using a tape measure
- Distinguish clockwise rotation from counter-clockwise
- Safely operate a chain vise
- List four reasons for using cutting oil
- Use a 2 inch pipe cutter to cut galvanized pipe
- Use a pipe reamer to remove burrs

Activity Day 4

- Identify the different parts of a pipe threader
- Thread a piece of galvanized pipe
- Identify the different parts of a pipe wrench
- Safely operate a pipe wrench
- Use a piping diagram to assemble and secure a hot water supply line

Activity Day 5

- Make accurate measurements using a tape measure
- Use a tubing cutter to cut copper pipe
- Use a reamer to remove burrs
- Use emery cloth to clean the pipe and coupling
- Apply flux and connect the pipe to the coupling

Activity Day 6

- Describe the safety precautions when using a propane torch
- Safely ignite the torch and turn it off
- Solder the copper pipe and coupling
- Use a piping diagram to assemble and secure a cold water supply line

Activity Day 7

- Describe how a P-bend trap works to vent sewer gases
- Make accurate measurements using a tape measure
- Safely use a pipe saw to cut PVC pipe

Activity Day 8

- Identify the different parts of a pipe threader
- Thread a piece of galvanized pipe
- Identify the different parts of a pipe wrench
- Safely operate a pipe wrench
- Use a piping diagram to assemble and secure a hot water supply line

Activity Day 9

- Identify the parts of a faucet on a diagram
- Explain the function of a seat gasket
- Safely use a crescent wrench to tighten and untighten a packing nut
- Replace a seat gasket

Activity Day 10

- Demonstrate the correct method for using two pipe wrenches to remove fittings
- Disassemble the hot water supply line
- Disassemble the cold water supply line
- Disassemble the standpipe

Activity Day 3

Measuring, Cutting, and Reaming Galvanized Pipe

Plumbing Skills Objectives

1. Make accurate measurements using a tape measure
2. Distinguish clockwise rotation from counter-clockwise
3. Safely operate a chain vise
4. List four reasons for using cutting oil
5. Use a 2 inch pipe cutter to cut galvanized pipe
6. Use a pipe reamer to remove burrs

Day 3 Activities

1. Read the sections *Activity Introduction* and *Using the Tape Measure*.
2. Complete the step-by-step directions to measure straight pipe.
3. Read the section *Directional Symbols*.
4. Complete the step-by-step directions to secure the pipe in the chain vise.
5. Read the sections *Using a Pipe Cutter* and *Using Cutting Oil*.
6. Complete the step-by-step directions to cut the steel pipe.
7. Read the section *Using a Pipe Reamer*.
8. Complete the step-by-step directions to deburr the pipe.
9. Complete the Activity Day 3 workbook questions.



Activity Introduction

Look at the three open pipes set in the sole plate at the base of the construction platform.



Three Pipe Connections in Sole Plate

All run into the basement where the galvanized steel and copper pipes connect with the water supply and the plastic pipe connects with the drain. The water has been shut off by closing valves in the basement.



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

Your task is to measure, cut, and ream a straight piece of 1/2 inch galvanized steel pipe. You may wish to wear gloves to protect your hands. Photos showing students without gloves are used to more accurately illustrate the use of hand tools.



Cutting Pipe

To measure, cut, and ream galvanized pipe, you'll need the tools and materials pictured below. Each is either labeled in the tool module or is kept in the drawers at the base of the workstation.

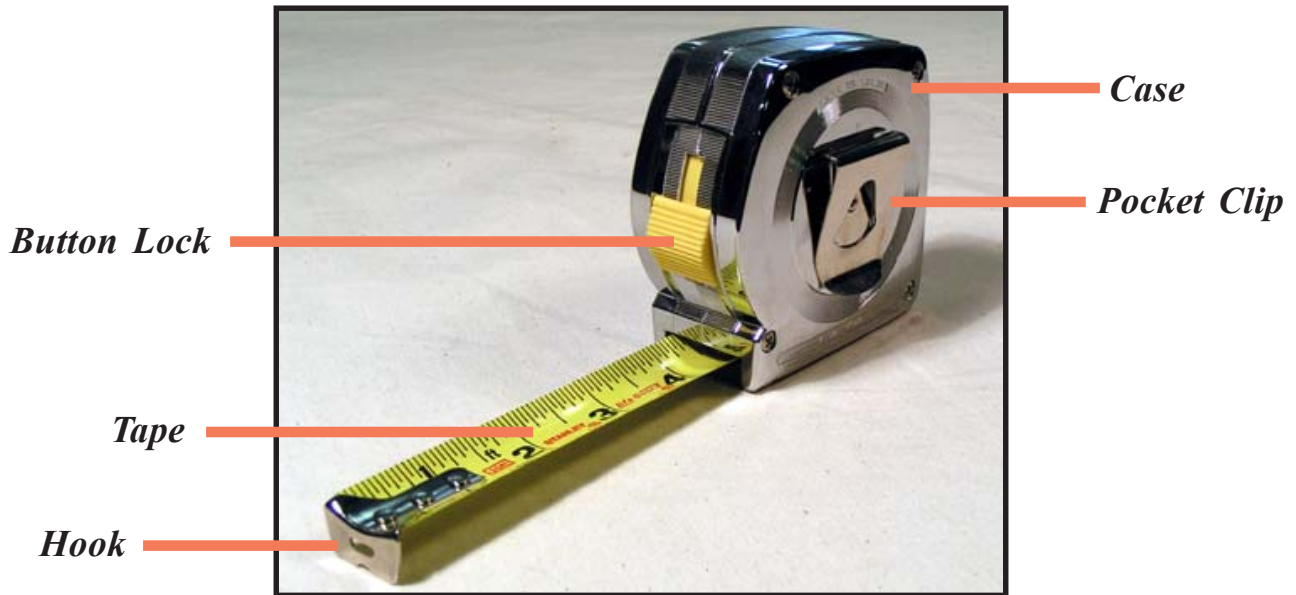
When you have finished using a tool, clean it with paper towel and return it to the labeled tool holder.

Activity Day 3 Tools & Materials	
 <i>Gloves</i>	 <i>Safety Glasses</i>
 <i>Tape Measure</i>	 <i>Straight Piece of Galvanized Pipe</i>
 <i>Pipe Cutter</i>	 <i>Cutting Oil</i>
 <i>Drip Pan</i>	 <i>Paper Towel</i>
 <i>Reamer</i>	



Using the Tape Measure

The parts of a tape measure are called out in the photo below.



Parts of a Tape Measure

The steel tape winds into the metal case when not in use. The hook is used to hold the end of the tape in place.

Do not bend the steel tape too sharply. It may break if you do. To keep the tape from slipping back into the case before you are through using it, press the button lock on the side or hold your thumb in the groove as shown below.



Handling a Tape Measure

Remember the symbol for inches is ("), and the symbol for feet is ('). The abbreviation for millimeters is mm.

Step-By-Step Instructions

To measure the galvanized steel pipe:

1. Look at the clock and write down the time in on line (E) of the work order.
2. Get the tape measure and a section of galvanized pipe. Measure the pipe.
3. Fill in the length of the pipe on your work order in box (A).
4. On one pipe end, measure off a 1 1/4 inch section. Make a mark on the pipe at that point.



Marking the Measurement

5. Fill in the length of the piece of pipe you will cut off in box (B) on your work order.
6. Subtract (B) from (A) to figure the new pipe length and write this in box (C) on your work order.
7. If you prefer to wear gloves while you work, put them on.

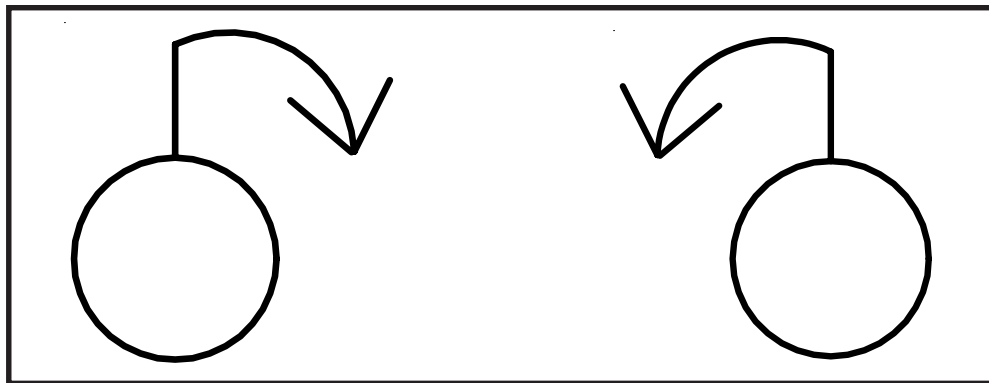


Directional Symbols

You are now ready to use some of the tools used by professional plumbers in their daily work.

These tools and their application (work) will require you to apply them in two directions: clockwise and counter-clockwise.

Think about the way the hands of a clock turn--that is the clockwise direction. Counter-clockwise is the opposite direction--the hands of a clock turning backwards. The symbols for these two directions are below.



Clockwise

Counter-clockwise

You will see these symbols in the workbook instructions whenever turning in a specific direction is required.

Step-By-Step Instructions

To lock the pipe into the chain vise:

1. Lay back the vise handle and lift up the vise chain with one hand. With your other hand, place the pipe into the groove provided, with the marked end out.




Placing the Pipe in the Chain Vise

2. Lay the chain over the pipe and firmly pull the chain down below the bottom of the vise.



Pulling the Chain Downward

3. With one hand still holding down the chain, use your other hand to turn the vise handle clockwise  until the chain catches on the retaining lip under the vise.
4. Continue to turn the handle until the chain tightens securely around the pipe, locking it into place.

Name: _____ Date: _____

Plumber - Activity Day 3 Workbook Questions

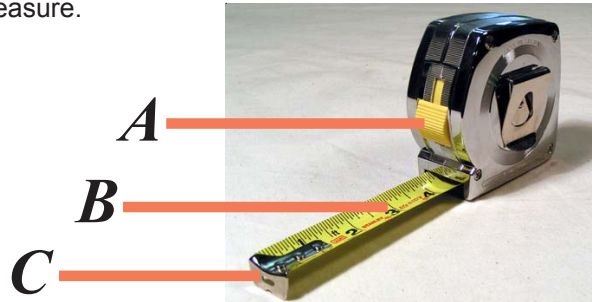
1. What direction does the symbol below designate? What direction does the symbol below designate?





Match the terms on the left with the parts of a tape measure.

2. Button Lock _____
3. Tape _____
4. Hook _____

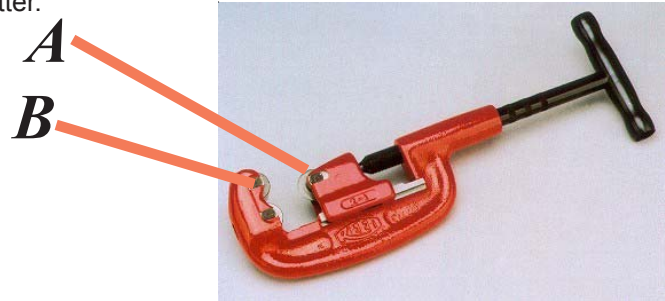


5. True or False:
It is safe to use tools that are just slightly nicked or damaged. _____

6. The part of a pipe cutter that does the cutting is called the _____.

Match the terms on the left with the parts of a pipe cutter.

7. Cutting Wheel _____
8. Flat Roller _____

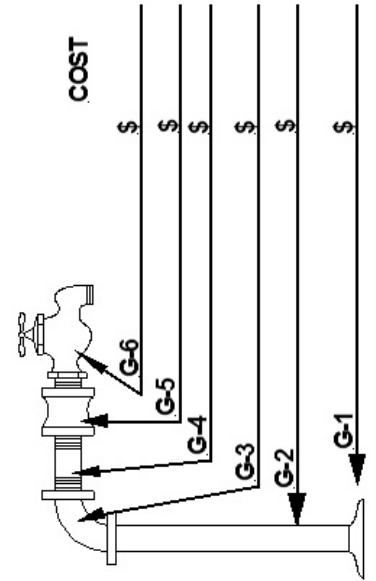
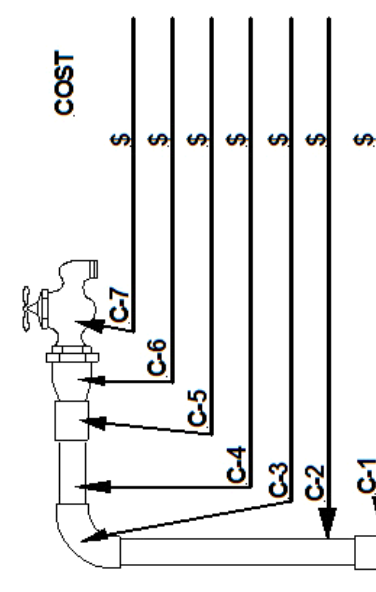
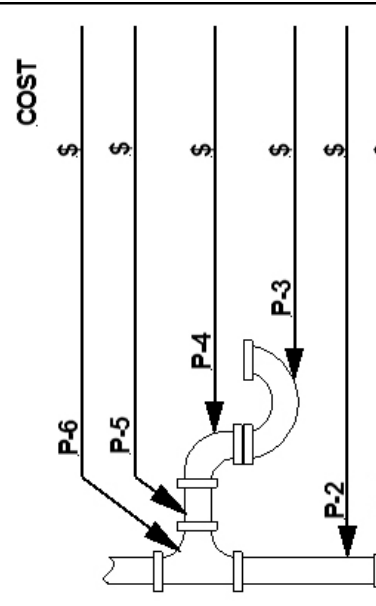


9. What direction would you turn the handle of a pipe cutter to tighten it after a complete rotation around the pipe?

10. Define the term pipe reamer.

WORK ORDER – PLUMBER

Name _____ Class Period _____ Date _____

Galvanized Pipe Assembly		Rigid Copper Pipe Assembly		PVC Plastic Pipe Assembly	
Length Now (A)		Length Now (G)		Length Now (M)	
Length Cut Off (B)		Length Cut Off (H)		Length Cut Off (N)	
New Length (C)		New Length (I)		New Length (O)	
					
Total Pipe Costs (D) \$	Total Pipe Costs (J) \$	Total Pipe Costs (P) \$			
Labor Time In _____ Time Out _____ Time Worked _____ (in hours)	Labor Time In _____ Time Out _____ Time Worked _____ (in hours)	Labor Time In _____ Time Out _____ Time Worked _____ (in hours)			
Time Worked x Hourly Wage = (E) \$	Time Worked x Hourly Wage = (K) \$	Time Worked x Hourly Wage = (Q) \$			
Total Costs (F) \$	Total Costs (L) \$	Total Costs (R) \$			
(F) + (L) + (R) = Job Total \$					