CONSTRUCTION ZONE

HANDS-ON WORKSTATIONS

Residential Plumbing

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At this Construction Zone workstation, you will explore the field of residential plumbing using a hands-on approach. You will learn about common pipe fittings and about the three parts of a modern plumbing system.

Next, you will work with the same tools that professional plumbers use to complete your workstation activities.
You'll be given important tips on how to work with the tools and equipment safely. Your activities will include hooking up water supply lines, a gas line, and drains for a bathroom and kitchen.

Before working on the activities, you will learn:

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

WORKSTATION OVERVIEW

You will complete the following tasks:

- Measure the pitch of a drain pipe
- Install a double P-bend trap drain for a kitchen sink
- Measure and cut CPVC plastic pipe
- Hook up water supply lines using straight pipe and various fittings
- Install shower and bathtub fixtures
- Install a bathtub stopper and drain cover
- Hook up a gas line for gas appliances
- Disassemble a bathroom faucet
- Dismantle the Residential Plumbing workstation

RESIDENTIAL PLUMBING SKILLS OBJECTIVES

Activity Day 1
- List four important life skills
- Explain why it is important to keep your home in good condition

Activity Day 2
- 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 five types of pipe used at the Residential Plumbing workstation
- Identify common pipe fittings from photos

Activity Day 3
- Identify a bathtub clean-out and check for clogs
- Describe the flow of water through a bathtub waste tee
- Identify a vent pipe and state its purpose
- Use a pitch level to accurately measure the pitch of a pipe
- Describe how a P-bend trap works to seal out sewer gases
- Install a double P-bend trap kitchen drain

Activity Day 4
- Identify the different parts of tape measure
- Be able to distinguish clockwise rotation from counter-clockwise
- Identify the different parts of a tubing cutter
- Use a tubing cutter to safely cut 1/2" CPVC pipe
- Install water supply line piping for a laundry room

Activity Day 5
- Make accurate measurements using a tape measure
- Use a tubing cutter to safely cut 1/2" CPVC pipe
- Install water supply line piping for a bathtub and shower

Activity Day 6
- Use a tubing cutter to safely cut 1/2" CPVC pipe
- Install water supply line piping for a kitchen sink

Activity Day 7
- Describe the difference between a slotted and a Phillips screwdriver
- Install a bathtub drain stopper and drain cover
- Install shower head components
- Define the term stub pipe
- Install a bathtub spout

Activity Day 8
- Identify the parts of a pipe wrench
- Use two pipe wrenches to safely tighten pipe fittings
- Identify the parts of a crescent wrench
- Use a crescent wrench to safely tighten pipe fittings
- Install gas line pipes and fittings for a laundry room

Activity Day 9
- Identify the parts of a pair of channel lock pliers
- Safely use channel lock pliers to tighten and untighten valve stem nuts
- Explain the function of a valve stem

Activity Day 10
- Use screwdrivers and wrenches correctly to dismantle the Residential Plumbing workstation

Activity Day 3

**Checking a Clean-out,
Measuring the Pitch of a Pipe, &
Installing a Kitchen Sink Drain**

Residential Plumbing Skills Objectives

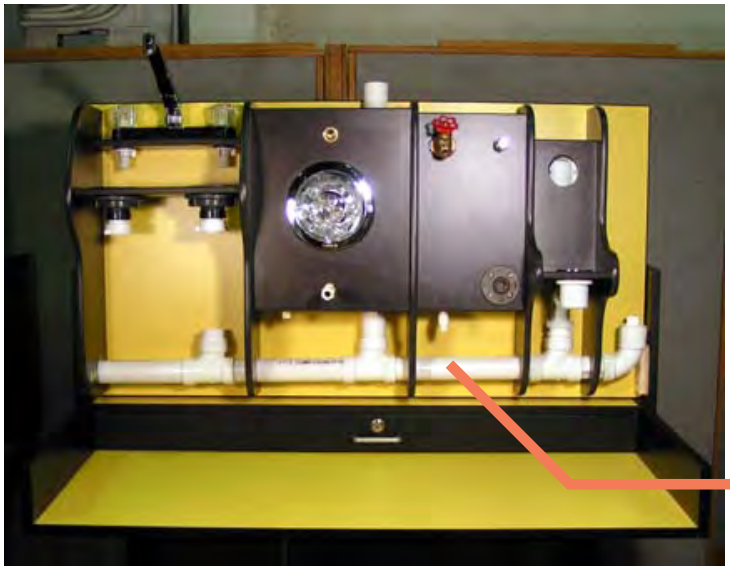
1. Identify a bathtub clean-out and check for clogs
2. Describe the flow of water through a bathtub waste tee
3. Identify a vent pipe and state its purpose
4. Use a pitch level to accurately measure the pitch of a pipe
5. Describe how a P-bend trap works to seal out sewer gases
6. Install a double P-bend trap kitchen drain

Day 3 Activities

1. Read the section *Activity Introduction.*
2. Complete the step-by-step directions to check for clogs in a clean-out.
3. Read the sections *The Bathtub Drain* and *Venting*.
4. Read the section *Using the Pitch Level*, then complete the step-by-step directions to measure the pitch of a pipe.
5. Read the section *The P-Bend Trap*, and complete the step-by-step directions to install a double P-bend trap drain.
6. Complete the Activity Day 3 workbook questions.

Activity Introduction

The 1 1/2" white PVC plastic pipe is the main drainage and venting line for this mock plumbing system.



Residential Plumbing Workstation

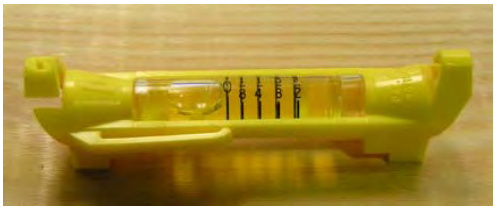
The water has been shut off by closing valves in the basement. Your tasks are to:

- Access the bathtub clean-out and close it with a plug
- Learn how a bathtub drain functions
- Learn how a vent works
- Measure the pitch of the drain pipe
- Learn how a P-bend trap works
- Install double P-bend trap for the kitchen drains

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

To measure the pitch of the drain pipe and to install a kitchen sink drain, 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 3 Tools & Materials	
	
Safety Glasses	***Pitch Level***

Step-By-Step Instructions

To look for clogs in a clean-out:

1. At the right side of the workstation, locate the 90 degree elbow with a thread plug at the top. This is called a "clean-out." It is used as an access point to the drain line so that plumbers can clean out or unclog the drain or make repairs.

2. Using your fingers, unscrew the plug.

3. Examine the opening and the inside of the pipe, looking for clogs.

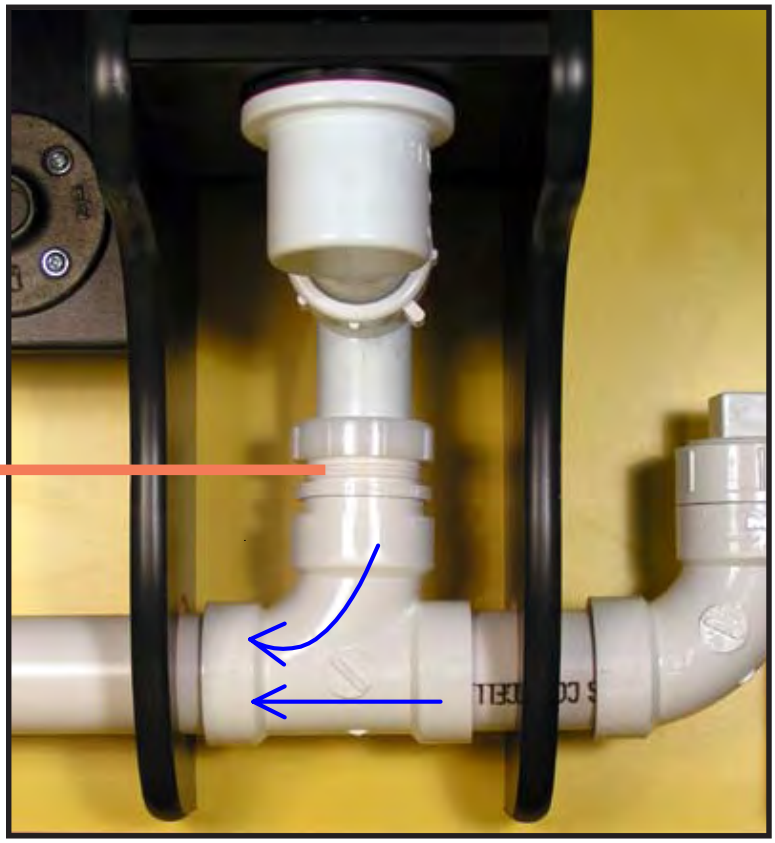
4. Replace the plug and finger tighten **only**.

Checking the Clean-Out for Clogs

The Bathtub Drain

The flow of water in this unit is from right to left. Working from the clean-out, follow the pipe to the left and you will come to the first of three "waste tees." A waste tee directs the flow of water from each fixture to the main drain line. This first waste tee is where the bathtub drain connects to the main drain.

Notice the curve in the tee where the vertical (up and down) opening and the horizontal (side to side) openings meet. See the arrows in the photo below.



Bathtub Drain Waste Tee

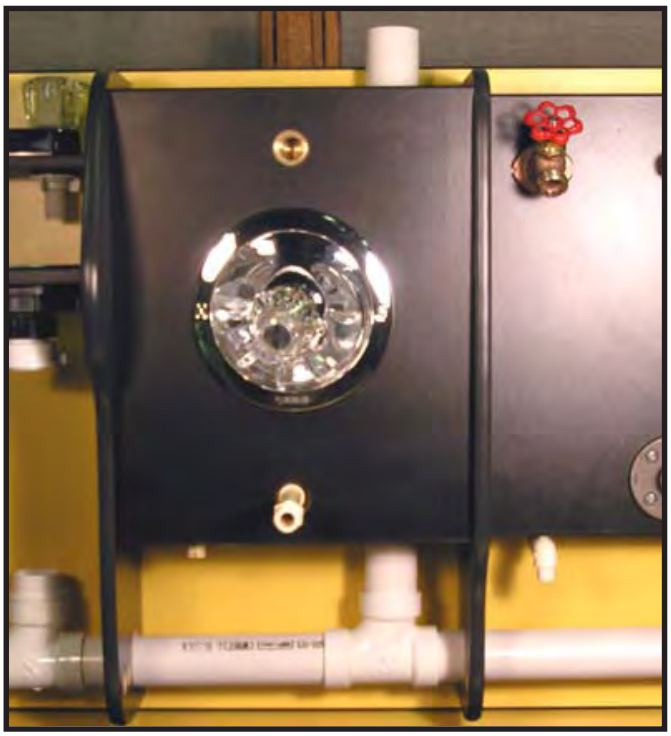
If the tee was installed backward, the water would not flow as smoothly, and this would be a likely place for a clog to form.

Notice the threaded fitting at the top of the waste tee. When tightened, this forms a watertight seal.

Venting

Working from the bathtub drain, follow the pipe to the left as it passes through the wall studs to the next waste tee. This tee is installed to connect the drain system to the outside air. This process is called "venting."

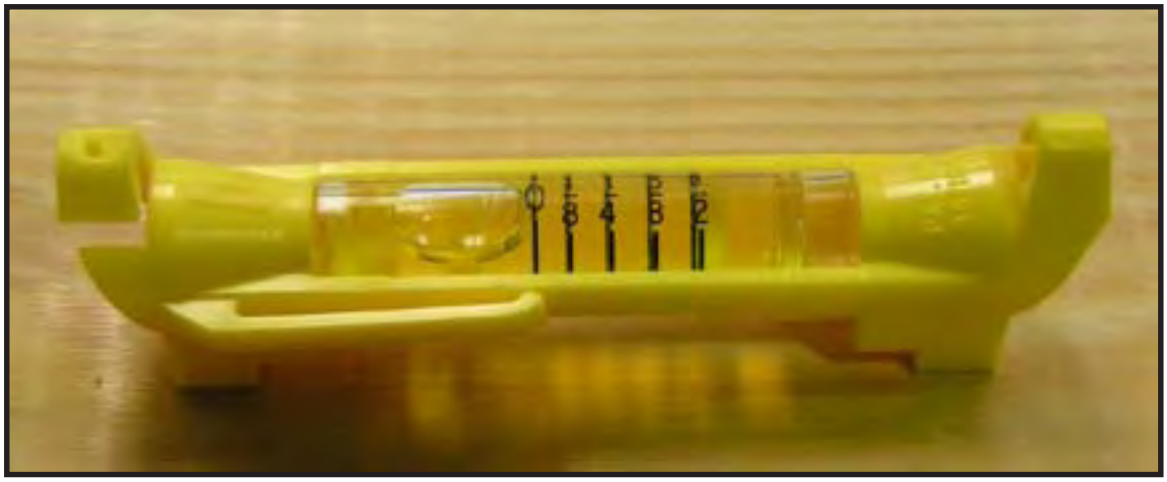
Follow the pipe up past the tub and shower controls to the place where it comes out at the top. In a house or other building, this would be one of the small pipes that you can see extending out through the roof.



Venting

Air pressure or atmospheric pressure is necessary to allow the waste water to flow down the drain pipes. If the drain system was not open to the outside, there would be a vacuum in the pipes, and water would flow very slowly or not at all.

Using the Pitch Level



Pitch Level

Plumbers use pitch levels to measure the pitch of a pipe. The pitch is the downward slope of a drain pipe in the direction of the water flow.

To determine the pitch, read the fractional marking at the right edge of the bubble. If the right edge of the bubble falls between two markings, the pitch of the pipe is in between those values.

Name: _____ **Date:** _____

Residential Plumbing - Activity Day 3 Workbook Questions

1. The drainage and venting line at your workstation is constructed with what material? _____

2. Identify the plumbing configuration at the right:

_____

3. Draw with arrows the direction of water flow through the waste tee:

Complete the following statements:

4. **If a waste tee was installed backward,**

_____

_____

_____

5. **If a drain system is not open to the outside atmosphere,**

_____

_____

_____

6. What is the downward slope of a drain pipe in the direction of the water flow? _____

   A. Plug
   B. PVC
   C. Plain
   D. Pitch

7. Describe how a P-Bend trap works to vent sewer gases.

_____

_____

_____

8. Describe what happens when their is no vent behind a P-Bend trap.

_____

_____

_____

9. Each threaded connection of the kitchen sink drain requires a:

   A. Connecting nut
   B. Washer
   C. Length of teflon tape
   D. Both A and B

10. Why shouldn't you use pliers or wrenches to tighten your kitchen sink drain connections?

Name_____ Class Period_____ Date_____

QUESTECH RESIDENTIAL PLUMBING COMPANY WORK ORDER

Section 1: Material Costs

Material	Amount Used	Unit Cost ($)	Material Cost ($)
DOUBLE P-BEND TRAP DRAIN			
(4") Straight 1 ½" PVC Pipe		0.34 / in.	
P-bend Trap		4.05 ea.	
1 ½" PVC 90° Elbow		1.01 ea.	
1 ½" PVC Tee		1.36 ea.	
Threaded Connecting Nut		0.30 ea.	
Sealing Washer		0.05 ea.	
		TOTAL MATERIAL COSTS	
LAUNDRY ROOM WATER SUPPLY			
Straight ½" CPVC Pipe		0.36 / in	
Required Pipe Length from below		0.36 / in.	
Shut-off valve		2.48	
½" CPVC 90° Elbow		0.90 ea.	
		TOTAL MATERIAL COSTS	
BATHTUB AND SHOWER WATER SUPPLY			
QuarterTurn Shut-off Valve		3.45 ea.	
Straight ½" CPVC Pipe		0.36 / in.	
Required Pipe Length from below		0.36 / in.	
½" CPVC Tee		0.36 / in.	
½" CPVC 90° Elbow		0.42 ea.	
		TOTAL MATERIAL COSTS	
KITCHEN SINK WATER SUPPLY			
Straight ½" CPVC Pipe		0.36 / in.	
Stainless Steel Braided Hose		3.16 ea.	
½" CPVC Tee		0.42 ea.	
CPVC-to-Valve Adaper		0.40	
		TOTAL MATERIAL COSTS	
BATHTUB AND SHOWER FIXTURES			
Drain Stopper Assy		6.93 ea.	
Drain Cover		1.05 ea.	
Shower Head		7.20 ea.	
Bathtub Spout		5.25 ea.	
		TOTAL MATERIAL COSTS	
LAUNDRY ROOM GAS LINE			
Straight Black Pipe		0.79 ea.	
Black 90° Elbow		1.29 ea.	
Ball Valve		3.65 ea.	
½" Pipe Thread to ½" Flare Fitting		0.85 ea.	
Gas Flex Line		11.05 ea.	
		TOTAL MATERIAL COSTS	
		TOTAL MATERIAL COSTS FOR JOB	