



Lesson #5: Plumbing (10 class periods)

Objectives

Students will be able to...

- Understanding the history of plumbing
- Use plumbing tools and identify them
- Apply plumbing safety
- Install a toilet
- Calculate volume
- Install a sink
- Work with a team by communicating effectively, collaborating, and problem solving.

Standards

LS 11-12.6
RSIT 11-12.2
RLST 11-12.2
Writing 9-10.5
Geometry 5 & 8
Residential and Commercial Construction Pathway- D2.1, D2.2, D2.3, D3.1, D3.3, D3.5, D3.7, D4.4, D6.2, D6.3, D6.4
Problem Solving and Critical Thinking 5.1, 5.2, 5.3
Health and Safety 6.2, 6.6, 6.7, 6.8, 6.10, 6.12
Responsibility and Leadership 7.3, 7.4, 7.5, 7.6, 7.7, 9.2, 9.3, 9.6, 9.7

Materials

Plumbing History Hand out
Plumbing History Worksheet
Plumbing Tools Handout
Plumbing Tools Worksheet
Plumbing safety hand out
Plumbing safety test
Installing a Toilet Handout
Installing a sink handout
Plumbing Unit Test

Lesson Sequence

- Read the *Plumbing History Hand out* and complete the *Plumbing history Worksheet*.
- Read the *Plumbing Tools Hand out* and complete the *Plumbing Tools Worksheet*.
- Read *Plumbing Safety Hand out*. Answer any questions students may have.
- Have students take the *Plumbing Safety Test*.
- Use the *Installing A Toilet Handout* and practice installing a toilet.
- Use the *Installing A Sink Handout* and practice installing a sink.
- Review plumbing skills and answer any questions students may have.
- Pass out *Plumbing Unit Test* and have students take test.

Assessment

Informal assessment throughout lesson.
Check for understanding
Observe students installing toilet and sink.
Use plumbing unit test to assess student learning.

Accommodations/Modifications

Check for Understanding
One on One Support
Peer Support
Visuals
Extra Time If Needed

Plumbing History Handout

Civilization has not always had such things as indoor plumbing; in fact, many areas of the world still don't!

Early Plumbing

When did indoor plumbing first appear in homes? Water pipes have been discovered in an Egyptian tomb that still fills a deep moat with water from the Nile. The tomb was built 5,000 years ago! Water changed desert to fertile farmland. The ancient Egyptians were expert builders of not only pyramids, but canals and deep wells. Water was brought up from the wells using a "water wheel", clay pots tied to a rope that circulated in and out of the well to bring up life-giving water. It was stored in earthen pots and carried by hand to homes.



The palace of King Minos (1500 B.C.) of the Minoan civilization on the island of Crete, had floor drains connected to a sewer system made from clay pipe. The queen's bathroom featured a 5-foot-long terra cotta bathtub. The tub had no drain and was filled and emptied by hand. In a room nearby, was the world's earliest flushing water closet. This consisted of a shallow basin with a drain and pipes built into the wall that would wash away the waste. The water came from rainwater, or by the hands of slaves dumping water into the pipes above.



Ancient Greeks set high standards of cleanliness and physical fitness for themselves. Having created the first Olympic Games in 776 B.C., every large city in Greece featured a gymnasium with hot and cold shower baths. Tiled bathtubs were common in private homes, complete with a drain connected to the city sewer system. Many homes also had latrines connected to the sewer. They had to be flushed with the household wastewater dumped by hand.

In Mesopotamia, plumbing was important to early development. The Assyrian king Sennacherib (705-681 B.C.) developed a 10-mile-long aqueduct in three stages with two dams and a chain of canals, an important engineering feat. Sargon the Great, an Assyrian king (721 – 705 B.C.) had an indoor six hole "privy", connected to a 164-foot sewer. Most well to do citizens of that time also had a privy, but

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they were mere holes in the floor with a cesspool underneath (imagine cutting a hole in your floor, with a pit underneath in which to relieve yourself each morning). The smell from the sewer however was overwhelming. The poor of that time, however, were not so lucky. They would dump their waste outside on the streets. Over time, the waste was covered over, rather than removed. As the streets rose from the repeated dumping and covering, stairs were built to get down into houses. It was common in most societies throughout the middle ages to use bed pans for human waste and dump it from windows out into the street. Can you imagine the smell of ancient cities?

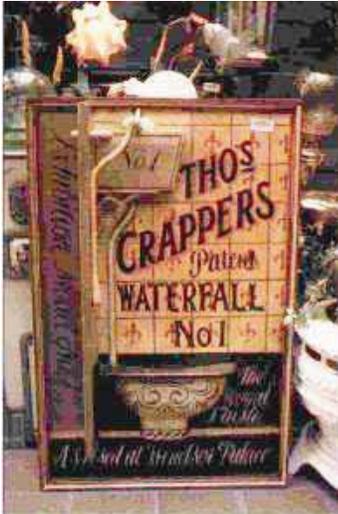
The Romans

It is to the Old Roman Empire that modern plumbers owe their name as well as much of their tradecraft. Most early pipe was crafted from wood or clay. The Romans refined pipe with the use of lead. Lead was soft, could be flattened, then rolled into pipe. It could be made watertight and was easily worked. Craftsmen who were skilled in the working of lead were highly prized. The Latin term "plumbus" means lead. A plumber was a worker in lead who created pipe, soldered it, installed it and repaired it. He also worked on rain gutters and down to sewers. Plumbers were responsible for everything that had to do with the supply of fresh water to the removal of wastewater. Sounds just like the job description of a modern-day plumber.



Roman plumbers perfected the use of hot water communal steam baths. One such bath, that of Diocletian, seated over 3,000 people! It was a huge complex with hot, tepid and cold baths complete with walls covered in mosaic tile. Furnaces below baths heated hollow bricks to provide heat for the hot rooms. The supply of fresh water, as with all civilizations, was critical. The Romans accomplished this with a series of aqueducts totaling an incredible 220 miles. Water flowed from mountain water supplies by gravity to the cities. In low areas, the aqueduct would have to be raised to keep the supply running. The longest overhead section was 14 miles long! For all their plumbing prowess engineering skill, the Romans never managed to solve that age-old problem of disposing of human waste. You see, even when a plumbing system used a sewer, it smells... it smells bad! Decomposing matter creates methane and other harmful gases, and methane gas not only has a bad odor, it is also dangerous. It is combustible, even explosive when enclosed. Open holes or even sewers allowed the gas to vent back into the house. For this reason, most pit toilets are outside of the house. Have you ever thought about why you have water in the bottom of your toilet at home? That water forms what is

called a “trap seal”. It blocks sewer gas for entering your home. The trap is the key to having a clean and odor free house. In fact, all plumbing fixtures with a drain are required by the plumbing code to have a trap.



The Toilet

Although the first true flushing toilet was invented 1596, only two were made. They were for the use by the inventor Sir John Harrington, and his godmother, Queen Elizabeth I. The Queen’s water closet was even gilded with gold. He never made any more because he was ridiculed by his peers. They thought it was a ridiculous invention. It would be another 180 years before another inventor, Alexander Cummings, reinvented the water closet. Others soon followed suit and toilets started gaining favor. These toilets used a variety of valve designs to flush the waste and keep the sewer gases from entering the house. It was not

until 1852 that the predecessor to today’s toilet was invented. That design used an “S” trap to hold water in the bowl. When water is added, it flushes the bowl out by a siphoning action, without any valve mechanism. This simplified the toilet greatly. The first all ceramic toilet was invented in 1885 by Thomas Twilley. That revolutionized the plumbing industry because all previous designs were made from a combination of materials and prone to leaks. From that point on, reliable toilets have been made that were affordable for the masses. That design of the all ceramic toilet bowl with “S” trap, has seen little change to now.

You may have heard that the inventor of the modern toilet was an Englishman by the name of Thomas Crapper. Also, that his name gave rise to a common euphemism associated with the toilet. As to the first part, no he did not invent the toilet. He was however a plumber; in fact, he was a very successful plumber. He owned three plumbing shops in his lifetime. He also has several plumbing patents including two for water closet designs. His water closets were very common in England and his company name was printed on the tank of all of them. World War I American soldiers passing through England saw the words “T. Crapper --- Chelsea” and coined the slang term “crapper” meaning toilet.

Fresh Water Supply

The fresh water supply to the house is equally as important as waste disposal. Originally humans settled close to rivers, lakes or streams in order to have a supply of fresh water. Over time, they found

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that water could be brought up from the ground by digging a well in areas that the ground water was close to the earth's surface. These shallow open wells, however, were prone to contamination from the local privies! A system was needed to transport clean water from a source to the settlement. Water pipes were and still are the best answer.



Many materials were used to make water pipe in the past; iron, steel, copper, lead, stone, tin, clay, even hollowed out trees! Natural materials were the first products used to make pipe. While using stone to transport water may last thousands of years, it is very difficult to work with and expensive. Trees on the other hand are readily available, and not as difficult to drill out, but they won't last very long underground. Metallic pipes became the best choice for plumbing pipes. Rust in iron and steel is the biggest problem, however, some cast iron pressure water pipes have been used continually for almost 200 years without major problems. Pretty amazing when you compare it to a modern system that has a life expectancy of 50 to 80 years (although water quality has improved immensely with modern materials and techniques!) Copper has been the best choice when it comes to clean freshwater delivery.

One of the most important factors in increasing both the lifespan of humans and the quality of life, has been improved personal hygiene. What more important invention has there been than the flush toilet and a clean fresh water supply? Is it any wonder that the average lifespan of humans has increased from about 35 years in the 19th century to over 80 years now? Diseases like Cholera, typhoid and many others are directly related to unsanitary conditions. Plumbers help to keep our homes and our environment clean.

Tools, techniques and materials have greatly changed over the years. However, skilled Plumbers continue to be highly valued and in demand today. So, tomorrow morning when you trudge into the bathroom half awake, take a moment to thank the plumber who make it possible for you to go through your morning routine, without having to walk to the privy out back!

Plumbing History Worksheet

Use the "History of Plumbing" to answer the following questions.

1. Where would you find the earliest known flushing toilet?
2. What is a "privy?"
3. For most of the world prior to the 19th century, how did city dwellers dispose of human waste?
4. In history, which civilization could boast at being the champion builders of aqueducts?
5. Where does the word "Plumber" come from?
6. What is the name of the gas that is responsible for sewer smell?
7. How do modern plumbing fixtures block sewer gas from entering the building?
8. Which royal person got the first true flushing "throne?"
9. What plumbing fixture has made the biggest impact on personal hygiene?

Plumbing History Worksheet – *Answer Key*

1. The Egyptian Civilization
2. Crete
3. A toilet. In Ancient Assyria, most privies were mere holes in the floorboards with a cesspool underneath
4. By dumping it onto the streets
5. The Romans
6. “Plumber” comes from the Latin word “plumbus” meaning lead. A plumber was someone who worked with lead to create, solder, install, and repair pipes.
7. Methane gas
8. Modern plumbing utilizes “trap seals” such as the water at the bottom of your toilet bowl, to block sewer gas from entering buildings
9. Queen Elizabeth I
10. The flush toilet and clean fresh water supply

Plumbing Tools Handout

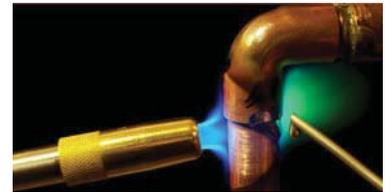
Pipe Wrench:

- This wrench clamps down tighter on the pipe as you turn.
- The jaws are hardened and will bite into the steel pipe allowing you to turn it with great force.
- Pipe wrench should not be used on exposed pipe such as chrome plating
- If used on copper tube, the copper will crush.



Propane Torch:

- Used to heat copper pipe and fittings hot enough that solder will melt into the joint.
- Propane canister is replaceable when empty.
- The torch assembly has many different tips available.
- Some torches come with self-igniters.



Solder and Flux:

- Solder is the bonding agent for copper tubing and fittings
- Solder must fill the gap between the fitting and the tube
- Flux is a chemical compound meant to keep the copper from oxidizing during heating
- Flux also assist the solder in flowing into the joint
- Flux must be applied to both the tube and the fitting before heat is applied.



Nipple Extractor:

- Also known as an internal pipe wrench.
- Used to remove pieces of pipe that have broken off.
- Has a rigid cylinder with a moving part that bits into the inside of the pipe and is used with pliers to turn it.



Chain Vise:

- Helps hold pipe when cutting or reaming pipe.
- Smaller than the yoke vise. Has a fixed V-shaped jaw with teeth on where the pipe is laid, and a bicycle-type chain fastened to one end. When the pipe is inserted, the chain is placed over it and locked in a slot on the opposite side.



Yoke Vise:

- Helps hold pipe when cutting or reaming pipe.
- Has V-shaped jaws that grip pipe from above and below. The lower jaw is fixed, while the upper jaw is raised or lowered by a screw.
- Holds pipe with the inverted V-shaped yoke that unlatches on one side and tilts to accommodate long pipe.



Reamer:

- Removes burrs from the inside of the pipe. Burrs are the flakes of metal or plastic on the outside and inside of the pipe after the pipe is cut.
- Cone-shaped, with ratchet handles.
- Cutting edges can be sharpened, but this is difficult and time-consuming, and the small replacement cost usually makes it impractical.
- Straight-fluted reamers have straight cutting edges. They can be used by hand or in a power drive unit.
- Spiral-fluted reamers have spiral-shaped cutting edges. They cut more easily, save time but are far more expensive than straight-fluted cutters. They are for hand use only.



PVC Cutter:

- Used for cutting ABS, PVC and PE pipe.
- Makes clean cuts with one-handed operation.



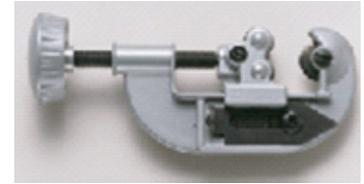
Handle Puller:

- Also known as a faucet handle puller.
- Used to remove corroded or frozen handles without scarring the chrome.
- Has two hook-like jaws with a center rod that turns.
- Use penetrating oil to help loosen the handle before pulling.



Tubing Cutter:

- Primarily used to cut copper pipe.
- Easier to use than an ordinary hacksaw, and it makes a cleaner cut.
- Has a single cutting wheel and two rollers that make smooth right-angle cuts.
- Some have a triangular blade-type reamer that folds out of the way when not in use.
- Sized to cut material with outside diameters ranging from 1/8" through 4-1/2".
- Major points of wear are rollers, wheels and pins on which they are mounted. When cutter wheels are worn out, they should be replaced; sharpening them is not advisable.
- Separate cutting wheels for plastic pipe are also available.



Pipe Threader:

- Uses a die head to create threads on unthreaded pipe ends
- The hand tool type revolves around a stationary pipe. It is good for threading pipe on the job.
- With the powered type, the tool stays stationary while the pipe revolves into the die.
- Always use thread cutting oil for best results



Seat Dresser:

- Also known as a faucet seat reamer or valve seat-grinding tool.
- Used to smooth a faucet seat. Seats may not operate properly if they collect corrosion or calcium deposits or they become rough with wear.
- Inexpensive ones often only have 1/2" and 5/8" cutters



Flaring Tool:

- Use to flare the end of a pipe before joining it with a flared fitting.
- The two flat bars of the tool (the yoke) clamp around the pipe at the appropriately sized hole. Then the cone-shape, powered by the drive screw, forces its way into the pipe and creates a flare.



Valve Seat Wrench:

- "L" shaped round stock with squared ends in different sizes.
- Four or six different size squared ends allow one tool to remove and replace many different size valve seats.



Faucet Wrench:

- The long handle and self-tightening jaws allow the plumber to remove and replace faucet hold-down nuts under an existing sink.
- The jaws flip from side to side to tighten or loosen nuts.
- Another version of this tool is a cylinder with different sized ends. The ends are notched to match the plastic wing nuts commonly used on modern faucets. Since these plastic wing nuts are hand tightened only, no handle is necessary.



ABS Reamer

- Like the pipe reamer, but the lightweight cutters on this tool are only meant to clean the burs from the inside and outside of ABS plastic pipe.



Pressure Gage:

- Pressure gage attached to a threaded cap.
- When attached to water or gas piping in a structure, it helps to check for leaks.
- Most building inspectors require an air pressure check to verify in integrity of gas piping.



Plumbing Safety Handout

Personal Safety

A plumber installs, repairs, and maintains plumbing fixtures or systems in businesses, industries, or residences. The job may include installation and repair of pipes, fittings, and fixtures servicing the water supply, waste disposal, and heating systems. Plumbers must also haul supplies, cut and assemble plumbing materials, and use equipment and tools. Plumbing is a simple name for a job that has a wide variety of duties.

Hazardous Materials

Chemical and material exposures are common for plumbers, so get training on the potential hazards at the job sites that you are assigned. Find out if your jobsite has asbestos, lead paint, or mold. Make sure that it is abated and cleaned up before you begin any work that may disturb it. If you must disturb lead, asbestos, or mold, get certified for the work and use the required work practices.

Be familiar with chemicals like solder, adhesives, and solvents that you use on the job. Use material safety data sheets (MSDS) to learn about the chemical properties, health hazards, and required personal protective equipment (PPE) that you will need.

Avoid exposure to sewage by wearing gloves, coveralls, washing your hands, and decontaminating your equipment after use.

Plumbing work areas are not always easy to access or work in. Learn how to identify confined spaces and follow confined space procedures if you must enter one. Avoid oxygen deficient atmospheres and be aware that hydrogen sulfide, a byproduct of sewage decomposition, can build up to unhealthy levels. Use air monitors to assure your safety.

Hazardous Environments

Plumbers work in wet environments, so wear appropriate footwear to avoid slips, trips, and falls. Make sure you have a sturdy shoe with a protective toe box and a non-slip sole. Keep your work areas clear of clutter and equipment to make it easier to move around and avoid a fall. You can get burns from hot equipment parts, steam lines, and the release of hot water or steam. Use heat-insulating gloves and eye/face shields and make sure to drain pipes before you open them up.

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To avoid electric shock, only use power tools that are safe for a wet environment and that have a ground fault circuit interrupter (GFCI). Be cautious when working on metal pipes; if you feel tingling when touching a metal pipe, stop work immediately.

Tool Safety

A variety of hand tools, pipe cutting and bending equipment, and power tools is necessary for working on plumbing materials. Keep your tools and equipment, and their safety features, in good working order. Keep cutting equipment sharp so it will work properly. Cut away from your face and body to avoid cuts and punctures. Use eye protection when cutting or grinding to avoid eye injuries from flying particles.

When you work in awkward positions or perform repetitive manual tasks, you are at risk for a musculoskeletal disorder. Make sure to use proper lifting techniques and keep your back straight while working. Try to rotate your tasks and take a quick break every 30 minutes. ⁽¹⁾

Job Site Safety

Fire safety

New plumbers are taught that almost every year they will hear a news story relating an accidental fire on a construction site caused by a plumber's torch. Many times, the fire started after all the workers had left for the day!

Accidental fires are a major hazard that a plumber must guard against whenever a soldering copper pipe fitting inside wood frame walls. Whenever a torch is being used to solder copper pipe fittings, the excess heat can easily set the surrounding materials on fire. Plumbers are taught to keep a squirt bottle filled with water in order to moisten and cool the area around the joint. Also, a fully charged fire extinguisher should be within easy reach in case a fire does start.

A plumber told me of his experience on a job site soldering pipe fitting. The tarpaper on the back side of the wall caught fire. He turned around and grabbed the fire extinguisher, but it was empty! As the fire was getting bigger, he ran to the other side of the job site to get another extinguisher. By the time he got back, the whole wall was on fire and the extinguisher was useless. When the fire department got there, half the building was on fire. All because he was not prepared.

There are other methods to protect against fire. Many plumbers use a fire cloth (nonflammable cloth) or sheet metal behind the fitting to protect the flammable part of the building. Even sheet metal is not foolproof though, as it transfers heat very quickly. Another method is to use a damp cloth behind the fitting to protect the flammables.

Good Housekeeping

Plumbers also need to be aware of the amount of pipe, fittings and tools they have on the job site. Good housekeeping is important in order prevent tripping hazards. Pipe should be stacked out of walkways. Cutting oil should be protected to prevent spills that could be dangerous as well as damaging to flooring and other building materials.

Natural Gas

Many plumbers also install natural gas appliances such as water heaters and heaters. It is very important to vent them properly and ensure that the gas lines do not leak. The exhaust from gas appliances can produce carbon monoxide. This is a very dangerous gas, as it does not smell, and is colorless. When it is inhaled, it blocks the oxygen transfer to your bloodstream. So even after moving to fresh air, a person can still die from asphyxiation (lack of oxygen to the brain).

Plumbing Safety Test

Air Monitors	Asbestos	Carbon Monoxide	Eye Protection	Fire Cloth	Fire Extinguisher	GFCI
Heat-Insulating Gloves	Hydrogen Sulfide	Lead	MSDS	Non-Slip Workbooks	PPE	Water Squirt Bottle

1. Plumbers must be careful working around hazardous materials such as lead and _____.
2. In order to learn about the hazardous chemicals and materials that plumbers commonly use, they should read the _____.
3. Plumbers should make sure that electric tools are plugged into _____ protected outlets.
4. When sewage decomposes, an unhealthy gas is produced called _____.
5. When using power tools, all workmen should use _____.
6. When working with steam lines, workers should use face shields and _____.
7. One of tools plumbers use to prevent fires by cooling the surrounding area is a _____.
8. When using a soldering torch, a fully charged _____ should always be available within easy reach.
9. One method used by plumbers to prevent a fire, is to back the pipe fitting with a _____.
10. A dangerous by product of gas burning appliances can be _____.

Plumbing Safety Test – *Answer Key*

1. Asbestos
2. MSDS
3. GFCI
4. Hydrogen sulfide
5. Eye protection
6. Heat insulating gloves
7. Water squirt bottle
8. Fire extinguisher
9. Fire cloth
10. Carbon monoxide

Installing a Toilet Handout

Use the Toilet Installation mock-up and these instructions to first assemble, then install a toilet.

- Acquire the following materials and tools from your instructor.
 - Toilet installation mock-up kit.
 - Adjustable wrench or the proper open-end wrenches
 - Plastic nut basin wrench
 - Toilet bowl and tank.
 - Rubber toilet gasket.

- Review the DVD section on Water Closet Installation

- Assemble the toilet first before installing it. The tank has four holes in the bottom of it. The large center hole is the waterway into the bowl. The two smaller holes outside of the center are for the tank bolts to attach to the bowl. The single 1" diameter hole on the outside is for the water inlet.
- Place the sponge rubber bowl gasket on the inlet to the bowl.

- Insert the flat rubber washers on the tank bolts.
- Place the tank on the bowl, then insert the tank bolts through the holes in the tank and bowl.

- Put the washer and plastic wing nuts on the tank bolts and hand tighten. The tank should be a little loose, as the sponge washer pushes the tank away from the bowl. The nuts must be tightened further until the tabs on the bottom of the tank just touches the bowl. ***Remember if you tighten the nuts any further, you will break the ceramic flange.***
- Now insert the inlet valve with a rubber washer on the bottom of it, into the proper hole. From below, install the washer and plastic nut on the inlet valve and hand tighten. Continue to tighten 1/4 turn beyond hand tight with the special plastic nut wrench.

- The toilet is now ready to install. Place a reusable toilet gasket on the floor flange and place the two brass "T" bolts in the slots in the floor flange. Now place the plastic keeper washers over the brass bolts to hold them in place.
- Now place the completed toilet over the bolts. Add the washers and nuts then hand tighten. Again, do not over tighten the nuts, as it will break the ceramic flange.

- The last step is to install the water supply tube. Hand tighten both end of the water supply tube, then turn 1/4 turn more.
- Have your instructor check your completed work.

- Once your work is checked, disassemble all the parts to return them to the original condition you found them.

Installing a Sink Handout

Use the sink installation mock-up and these instructions to first assemble, then install a sink.

- ___ 1. Review the "Sink Installation" PowerPoint presentation on the Module CD
- ___ 2. Acquire the following materials and tools from your instructor.
 - A. Sink installation mock-up kit (counter-top, sink, faucet, drain, & supply lines)
 - B. Adjustable wrench or the proper open-end wrenches
 - C. Slip groove pliers.
 - D. Plastic nut basin wrench.
- ___ 3. Assemble the sink before installing it. The sink has three pre-cut holes on top, those are for the faucet. The two in the bowls, are of course for the drains. You will start assembly with the faucet.
- ___ 4. The faucet should come with a rubber gasket that fits between the faucet body and the sink. Place the gasket over the threaded supply connections. With the sink upside down on the counter, push the connectors through the top sink holes and hold it in place with one hand. Now on the underside of the sink, place the washers, then the plastic holds down nuts on each connector. Hand tighten the hold down nuts. With the faucet wrench, tighten 1/4 turn only.
- ___ 5. Connect the water supply lines to the faucet. One end of the supply lines will match the faucet connectors, the other will match the angle stops. Remember to tighten only 1/4 turn past hand tight!
- ___ 6. Now carefully turn the sink over and place it in the countertop.
- ___ 7. Now you will install the strainer baskets in the sink. The strainer has a large washer and nut that will hold it in place on the underside of the sink. However, it needs a seal in the sink side. This is accomplished with "Plumbers Putty". Take a spoon sized amount of putty in your hand and lightly roll

it into rope the diameter of a pen. Wrap this around in underside of the strainer flange. Add enough to wrap all the way around the flange and with your fingers, connect the two ends.
- ___ 8. Insert the basket into the sink hole and add the washer and nut from underneath. As you tighten the strainer nut, the plumber's putty should squish out the top. Hand tighten until the strainer cannot be turned from the top side. Clean off excess putty and return into the container. Repeat this process for both strainers.

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- ___ 9. Install the flanged downspouts on the bottom of both strainers. Hand tighten only.
- ___ 10. Start the drains with the "P" trap. Install the lateral off the wall, then add the "P" trap to it. Keep all the joints loose so that they can still be adjusted.
- ___ 11. Now add the "Tee" to the top of the "P" trap. Connect the laterals with the 1/4 turns facing up to the strainers. Once connected, adjust all drains then tighten.
- ___ 12. Have your instructor check your completed work.
- ___ 13. Once your work is checked, disassemble all the parts to return them to the original condition you found them.

Plumbing Unit Test

1. This civilization used the earliest known pipes:
 - a. Egyptians
 - b. Greeks
 - c. Romans
 - d. Minoans
2. Which of the following trades is not related to the plumbing trade?
 - a. Steamfitter
 - b. Pipefitter
 - c. Pipelayer
 - d. Pipe maker
3. Which civilization was known for building extensive aqueduct systems?
 - a. Egyptians
 - b. Greeks
 - c. Romans
 - d. Minoans
4. How do modern plumbing fixtures block sewer gas from entering the building?
 - a. Sewer blocks
 - b. Trap
 - c. Flush valve
 - d. Vent pipe
5. What does the term "Potable Water" mean?
 - a. Drinking water
 - b. Sewer water
 - c. Treated wastewater
 - d. Irrigation water
6. What is the most common use for cast iron pipe?
 - a. Irrigation water
 - b. Potable water
 - c. Steam pipes
 - d. Waste lines

7. What is the purpose of a Faucet Wrench?
 - a. Removing faucet handles
 - b. Install faucet aerators
 - c. Install and remove hold-down nuts
 - d. Removing valve stems

8. What is the proper tool to use to remove a pipe broken off in a fitting?
 - a. Pipe wrench
 - b. Nipple Extractor
 - c. Chain vise
 - d. Reamer

9. Why is a plumber taught to keep a squirt bottle of water handy when soldering copper joints?
 - a. To keep the plumber cool
 - b. To keep the pipe cool
 - c. To keep the pipe moist
 - d. To keep the flammable surrounding materials wet

10. Calculate the volume of a 2-inch diameter cylinder that is 5 feet long
 - a. 188.52 cubic inches
 - b. 377.04 cubic inches
 - c. .21 cubic feet
 - d. 15.71 cubic feet

Plumbing Unit Test – *Answer Key*

1. B
2. D
3. D
4. B
5. A
6. A
7. C
8. B
9. B