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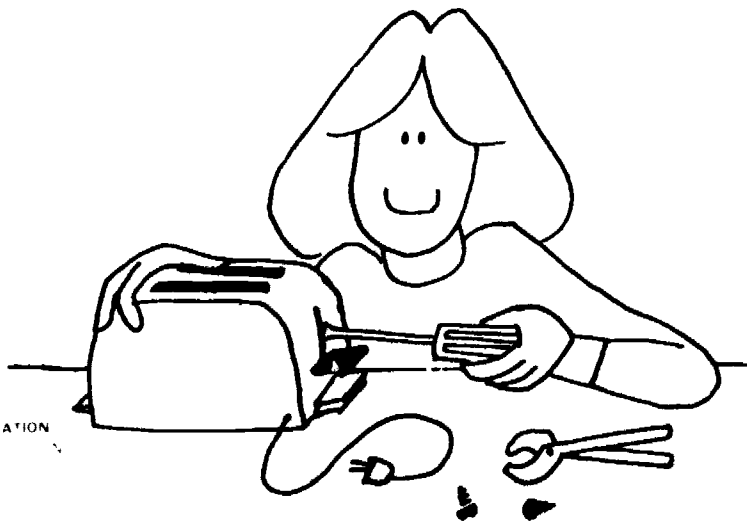
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ABSTRACT

This Job Function Booklet (Maintaining and Repairing) is one of the 14 components (see note) of the Career Alert Planning (CAP) program, a set of individualized materials designed to help participants find out about themselves and about the kind of work for which they are suited. In this program, participants become acquainted with occupations that are representative of 10 basic job functions. They learn how these occupations relate to personal interests, abilities, skills, educational goals, experiences, and training. They consider the working conditions, salary, and employment outlook for each occupation. Finally, participants use this information to make decisions and plans about the careers they will pursue. This Job Function Booklet examines maintaining and repairing occupations, one of the 10 basic job functions explored in the series, and describes four occupations related to this function: auto mechanic, plumber, appliance repairer, and sanitation worker. The booklet contains the following sections: (1) an "explore" section, which describes the maintaining and repairing job function and introduces the four occupations representative of it; (2) four "perform" sections, which contain work simulation activities related to each of the four occupations (e.g., "imagine you are an auto mechanic; your task is to fill in a service order form"); these activities give participants "hands-on" experience in performing work-related tasks; and (3) four "decide" sections, which provide greater detail about the occupations and about working conditions, income, and education and experience required. Education and experience activities that can be undertaken by participants are suggested. (KC)

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U.S. DEPARTMENT OF EDUCATION

MAINTAINING AND REPAIRING

Linda Pfister

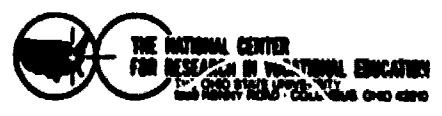
NATIONAL CENTER FOR RESEARCH IN VOCATIONAL EDUCATION

—CAP

Maintaining and Repairing

Job Function

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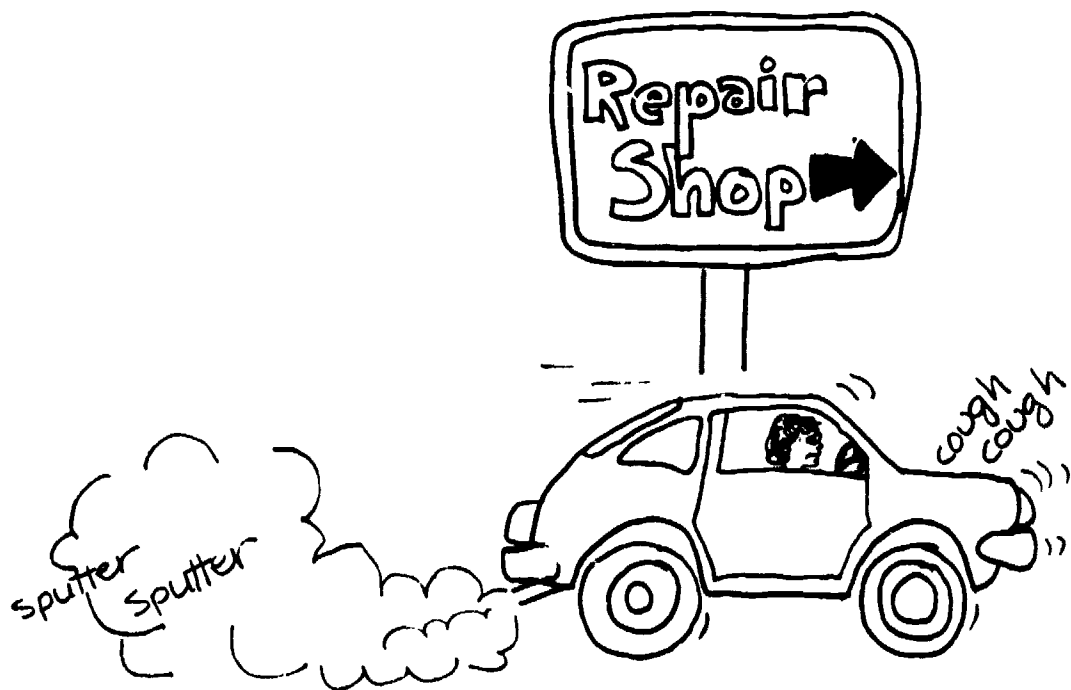
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What is maintaining and repairing?

EXPLORE

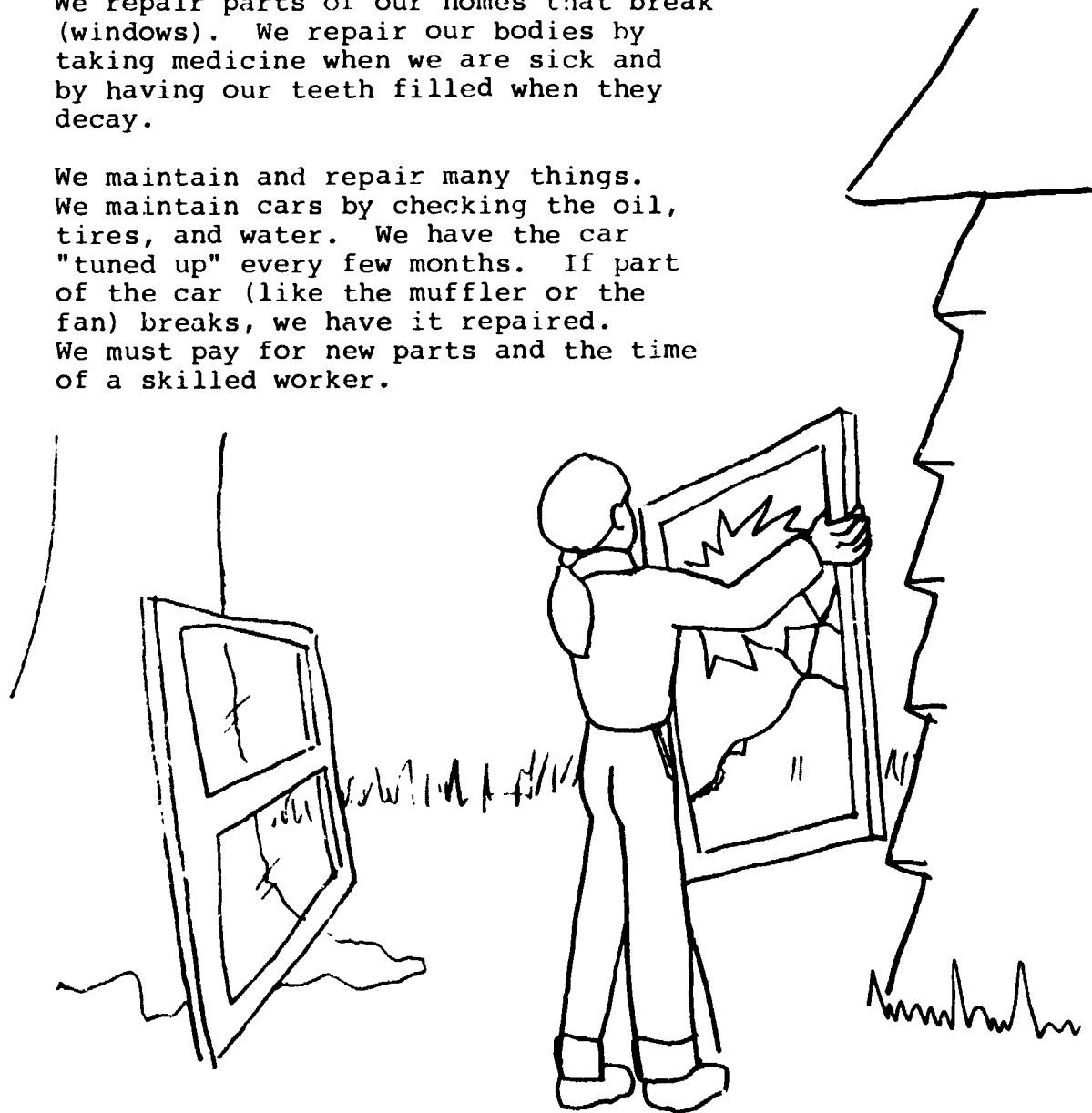
Maintaining means to keep things from breaking. Repairing means to fix something that is broken or worn out. Repairing sometimes costs more money than maintaining.



Maintaining and repairing are important jobs. We maintain clean homes by washing dirty dishes and throwing out trash. We maintain our bodies by taking baths, brushing our teeth, and eating good food.

We repair parts of our homes that break (windows). We repair our bodies by taking medicine when we are sick and by having our teeth filled when they decay.

We maintain and repair many things. We maintain cars by checking the oil, tires, and water. We have the car "tuned up" every few months. If part of the car (like the muffler or the fan) breaks, we have it repaired. We must pay for new parts and the time of a skilled worker.



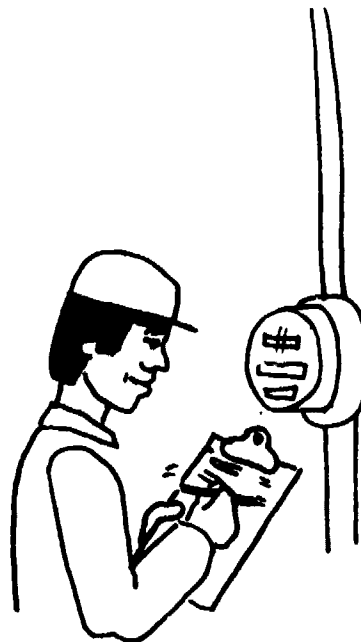
Many people have jobs maintaining and repairing. These people work on . . .

- automobiles
- plumbing pipes and fixtures
- appliances
- equipment
- trash and garbage
- homes
- roads

People who maintain and repair things work alone much of the time. They may work in repair shops. Or, they may go to a customer's home to work. Sometimes they must go into a home when the customer is not at home. These workers are around other people at times. But, they do their work alone.

A person who does maintaining and repairing work must have the following kinds of work maturity skills. They must . . .

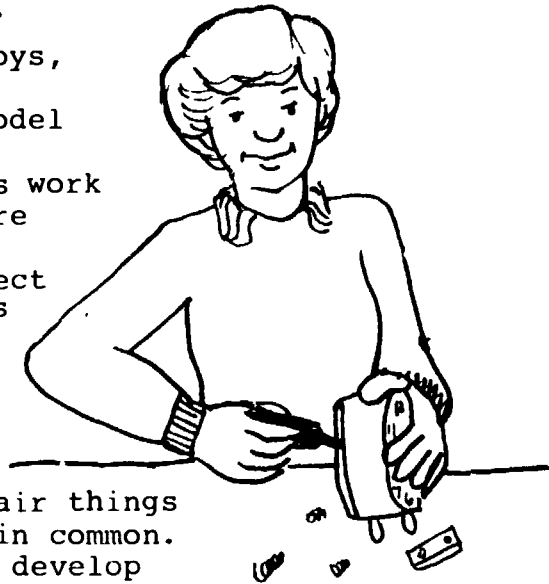
- be responsible for doing accurate work
- respect the property of others
- practice safe use of tools and equipment
- follow company rules
- practice good health habits



Interests

People who work in maintaining and repairing jobs share many common interests. They enjoy . . .

- fixing broken clocks, toys, and other things
- hobbies like building model cars or ship models
- finding out how machines work
- doing things that require physical activity
- working alone on a project
- using mechanical gadgets



Abilities

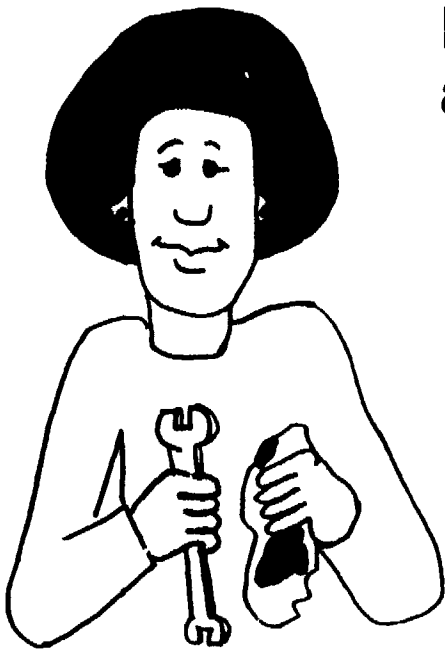
People who maintain and repair things have a number of abilities in common. They use their abilities to develop skills--skills that enable them to do a good job. To develop their job skills, people who work in maintaining and repairing jobs must have the ability to . . .

- work with tools and machines
- work carefully when doing dangerous jobs
- move and lift heavy objects
- do the same task over and over without getting careless
- work to precise measurements
- follow blueprints or diagrams

Do you feel you have some of the interests and abilities of people who maintain and repair things? Turn to the Maintaining and Repairing Reaction form in your Program Guide. Place a check in front of the interests and abilities you share with people who work in maintaining and repairing jobs.

Now you will meet four people in maintaining and repairing occupations. Read about these people. Imagine yourself in their jobs, because . . .

Perhaps you would like a career in maintaining and repairing.



Barbara MacIntosh auto mechanic

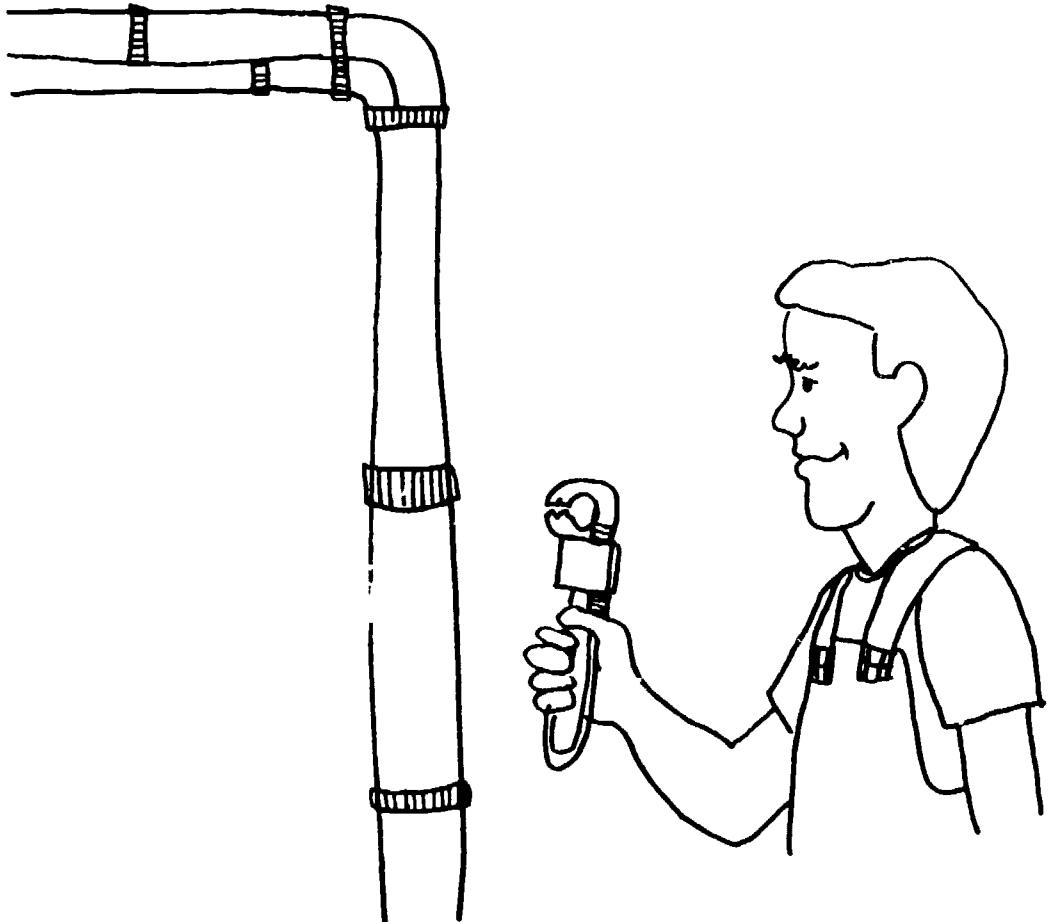
I am an auto mechanic at Bill Maloney's Garage.

I maintain cars by changing the oil, cleaning the windows, putting air in the tires, and checking the water in the radiator. I repair cars by replacing water pumps and fan belts. I fill out a service order form to explain what I have done and what it costs.

Sometimes I repair cars that have been in accidents. Once I worked on a car for one week. Many parts of the engine were damaged and I had to fix them.

Charlie Butray plumber

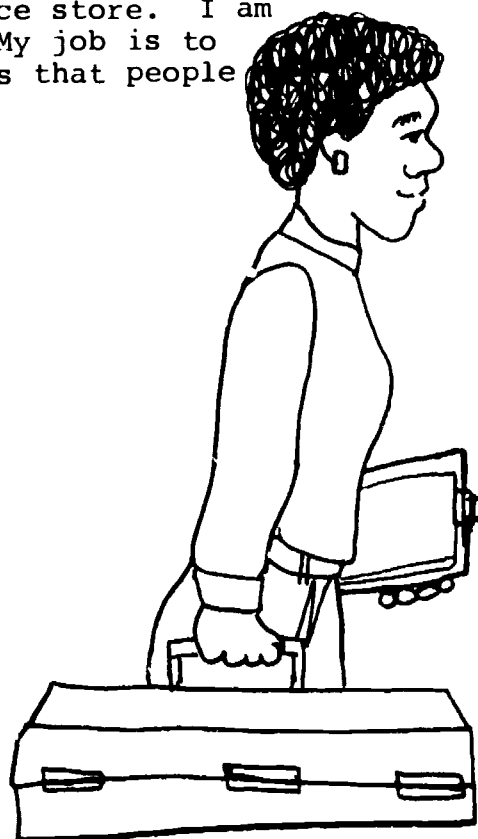
I am a plumber. I know a lot about liquids, gases, and metals. I order the right kind of pipe for each job. Then I cut the pipes to make them fit.



Most of my work involves putting pipes and fittings (sinks, toilets, bath tubs) in new buildings. I also work in old buildings to repair pipes that leak or break.

Carole Montalto appliance repairer

I work for a big appliance store. I am an appliance repairer. My job is to repair washers and dryers that people bought in our store.



I use repair manuals to help me fix each machine. The manuals help me decide how to solve each problem. I work very carefully so I do not hurt myself or other people. I use many different tools to repair the appliances. Sometimes I use the tools to tighten screws or adjust parts. This is called maintaining the washers or dryers. It keeps them from becoming broken.

Matt Ritter sanitation worker

I work outdoors most of the time.
I like that part of my job very much.
I drive a garbage truck around the city.
I put people's garbage in the truck and
take it away from their homes. The city
has rules about what garbage should be
collected. I follow those rules.

People don't realize how important my
job is. If trash was not collected,
their homes, yards, and even the streets
would be dirty and messy. The garbage
could cause disease, too. I am proud
to help keep my city clean and neat.

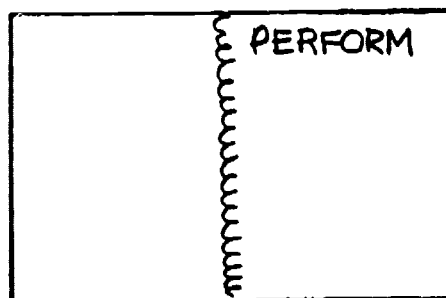


Would you like to try out some jobs that these workers do?

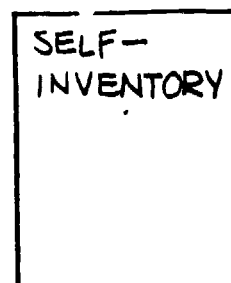
yes ► Choose one of these occupations:

- Occupation 21--Auto Mechanic
- Occupation 22--Plumber
- Occupation 23--Appliance Repairer
- Occupation 24--Sanitation Worker

Then, turn to the proper PERFORM section of this Job Function booklet.



no ► Check your Self-Inventory Chart. Choose your next highest-ranking job function. Get that Job Function booklet and read the EXPLORE section.

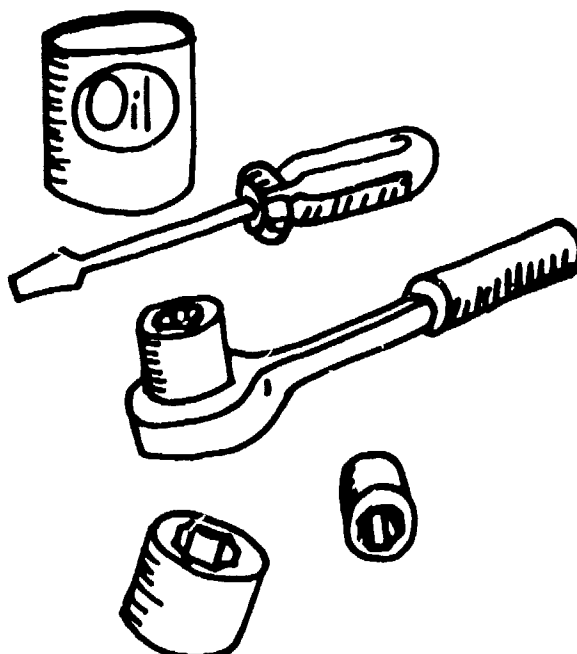


Auto Mechanic

PERFORM 21

Auto mechanics help customers to keep their cars and trucks in good condition. They use hand tools and other machines to do their job.

Mechanics charge customers for the parts used to fix the car and for labor. Labor is the time it takes to do the work.



Auto mechanics have the following responsibilities.

Responsibilities

1. Test drive and examine cars to find out what work must be done.
2. Compute the cost of the work.
3. Repair or replace damaged or worn parts.
4. Install air conditioning, tape decks, and other special parts.
5. Do tune-ups and other types of car maintenance.

You will learn something about computing the cost of the work as you PERFORM the following activity.

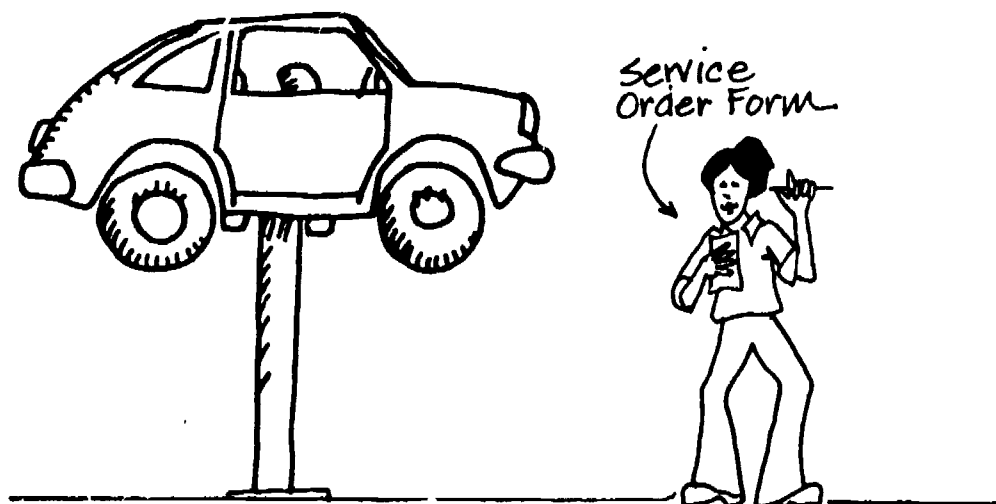
Imagine . . . YOU are an auto mechanic.

You work at Ferguson's Service Station. You have just finished repairs and maintenance on a car. Now you must write a bill to tell the owner of the car . . .

- what work you did and
- how much the work costs

You will use a Service Order Form to list all parts and labor costs.

Your task is to fill in a service order form.



This is what you must do:

Find out the facts about
the work that was done

STEP 1.

Read the information about the
customer.



Your customer

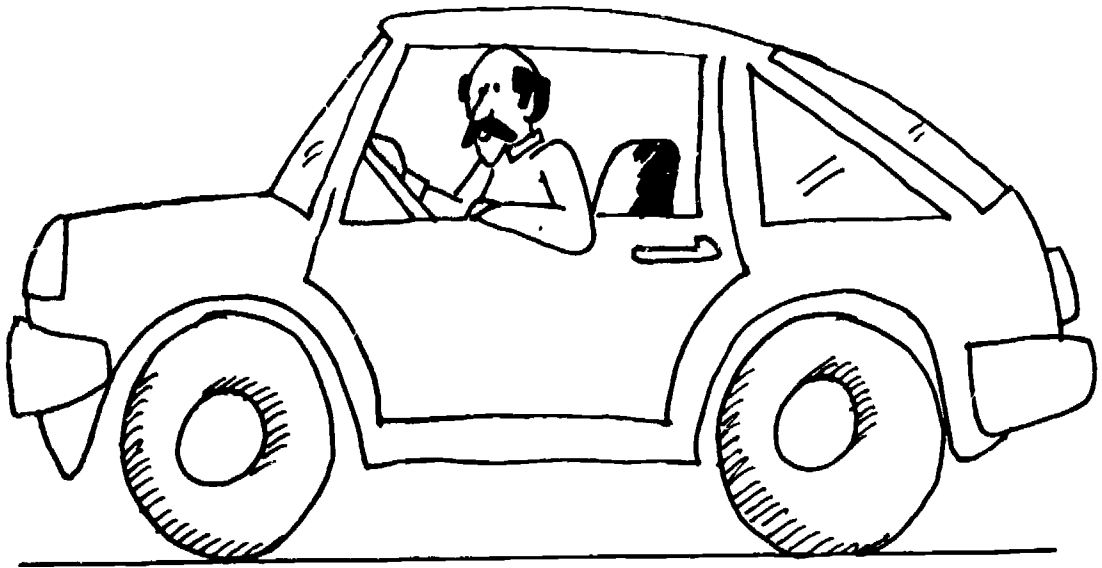
is Ed Herrick. He lives at 221
Bosworth Drive, Arlington, Virginia
22203. His telephone number is
237-5803.

STEP 2.

Read about the customer's car.

his car

is a 1975 Chevrolet with license number L21257. The car has been driven 41,491 miles. (That is the mileage.)



STEP 3.

Look at the list of work you did

Work List

Tune the engine (make the engine run more smoothly):

- Replace spark plugs, points, and condensers
- Time the engine
- Inspect the engine parts

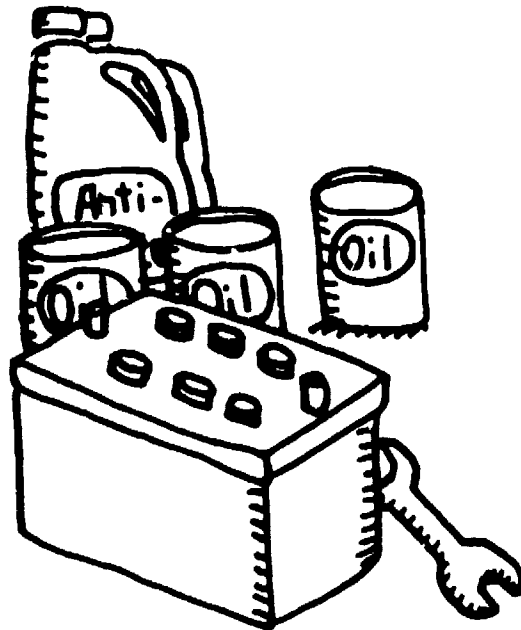
Winterize the car (make the car ready for winter):

- Check all pressure caps
- Check all hoses
- Drain, clean, and replace water in radiator
- Add 2 gallons of fresh antifreeze

Put in a new battery.

Change the oil.

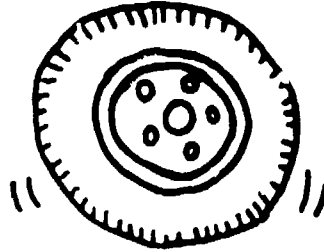
Add 5 gallons of gas.



STEP 4.

Read the price list for parts and labor.

THE SERVICE AND PARTS LIST . . .
tells you the cost of the service and
parts. You will use this list to make
out your customer's bill.



| SERVICE OR PART | COST |
|--------------------------|----------------------------------|
| Winterizing | \$15.00 labor |
| Windshield wiper blades | \$ 4.70 a pair |
| Radiator hose | \$ 4.55 |
| 24-month battery | \$20.00 |
| Tires | \$30.25 a tire |
| Antifreeze | \$ 7.00 a gallon |
| Gasoline | \$ 1.30 a gallon |
| Oil change | \$ 5.00 labor \$ 2.00 for oil |
| Lubrication | \$ 3.00 labor |
| Tune-up | \$25.00 labor \$ 5.00 parts |
| Air conditioning service | \$24.00 labor |

Fill in the information about
the customer and his car

STEP 1.

Get the Service Order Form on
Worksheet 21, Auto Mechanic.

STEP 2.

Write in . . .
-the customer's name
-address
-phone number



STEP 3.

Fill in facts about the car. Write . . .
-the make and year
-the license number
-the mileage
-your name (in the space
marked "Serviced By")

Record the parts and labor

STEP 1.

List the parts you used on the Parts section of the Service Order Form.

List the . . .

- parts for the tune-up
- antifreeze
- battery
- oil
- gasoline

parts

labor

STEP 2.

List the labor or work you did under the Labor section of the Service Order Form. List the work of . . .

- tuning up
- winterizing
- installing battery
- changing oil
- filling the gas tank

List the cost of parts

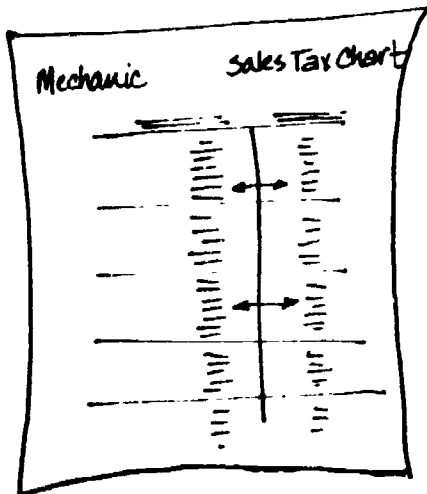
STEP 1.

Write the cost of each part in the "Amount" column on the Service Order Form.

STEP 2.

Add up the prices of all the parts to find the "Parts Subtotal." Write your answer in space (A) on the order form.

| | | |
|----------------|--|-----|
| PARTS SUBTOTAL | | (A) |
| TAX | | (B) |



STEP 3.

Record the sales tax. Your customer must pay a 4 percent sales tax on the price of the parts.

- Get the sales tax chart.
- Find your "Parts Subtotal" in the amount column. Read the tax for that amount in the next column.

For example, if your subtotal is \$5.50, it falls between \$5.31 and \$5.51. The tax is 22¢, found in the next column on the same line as \$5.51.



- Record the amount in space (B) on the order form.

List the cost of labor

STEP 1.

Write the cost of the labor in the "Amount" column.

Mechanic

SERVICE ORDER FORM

Ferguson Service Station

| PARTS | |
|-------|--|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |

| LABOR | |
|-------|--|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |

TOTAL LABOR COST

GRAND TOTAL

A B C D

STEP 2.

Find the "Total Labor Cost." Add the prices of each kind of labor. Write your answer in space (C), "Total Labor Cost."

Find the total cost of parts and labor

STEP 1.

Add the amounts in spaces (A), (B), and (C).

STEP 2. Write your answer in space (D), "Grand Total."

STEP 3.

Look at the key to see if your bill is correct.

| | | | | |
|-----|----|----|----|----|
| (D) | 04 | 4b | | |
| (C) | 00 | 54 | | |
| | | | 00 | 5 |
| | | | 00 | 15 |
| | | | 00 | 25 |
| (B) | | | 90 | 1 |
| (A) | | | 50 | 47 |
| | | | 00 | 5 |
| | | | 00 | 14 |
| | | | 00 | 2 |
| | | | 50 | 6 |
| | | | 00 | 20 |

1971 Chevrolet
L 21257
(today's date)
41,491

Ferguson Service Station
Ed Herrick
221 Bosworth Drive
Richmond, Virginia 22203

PARTS (COSTS INCLUDED)
battery
5 gallons gasoline
oil
2 gallons anti-freeze
tune-up

LABOR
tune-up
winterize
oil change

TOTAL LABOR
TOTAL COST

Key

Now . . .

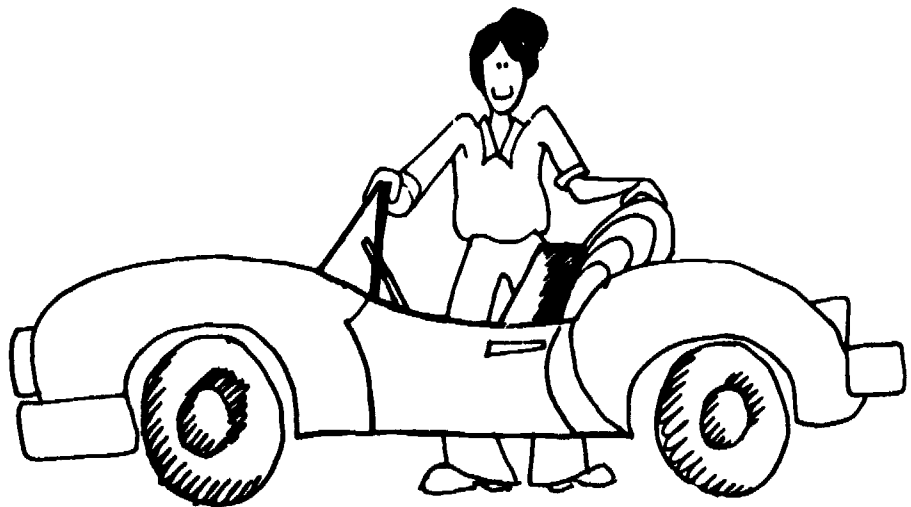
Turn to the Maintaining and Repairing Reaction Form in your Program Guide. Find the Auto Mechanic page. Record your feelings about your interests and abilities in this activity. Return to this page.



Did you enjoy being a mechanic?
Yes? Then here are

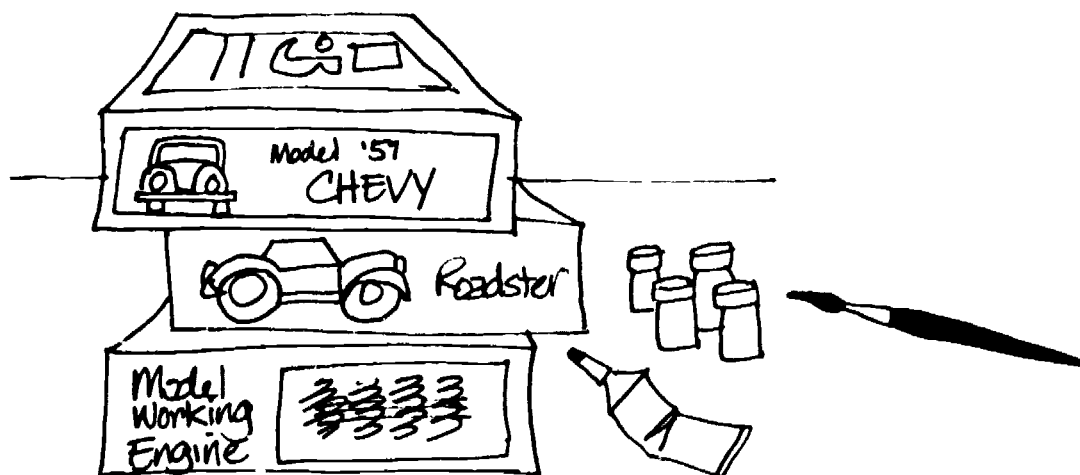
Some other activities:

1. Visit a garage or service station.
Watch a mechanic at work.



2. Go to the library or a newsstand. Find magazines about cars. Some magazines you might enjoy reading are:

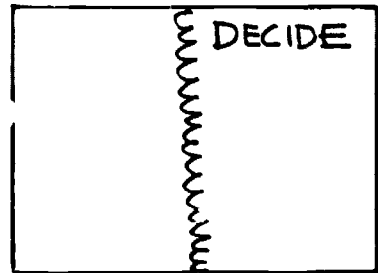
Road and Track
Car and Driver
Mechanics Illustrated
Popular Mechanics
Motor Trend
Hot Rod



3. Go to an auto junk yard. Look at old engines and auto parts. Find someone who can explain to you how they work.

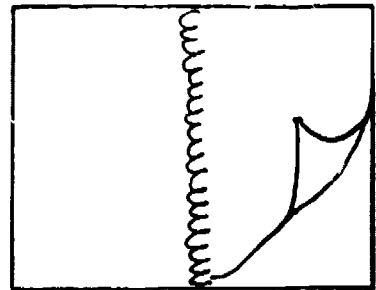
Would you like to find out more about this occupation?

yes ▶ Read DECIDE 21--Auto Mechanic



no ▶ Turn to another Maintaining and Repairing occupation:

Occupation 22--Plumber
Occupation 23--Appliance Repairer
Occupation 24--Sanitation Worker



or ▶ Look at the Self-Inventory Chart in your CAP Program Guide. Select another job function to investigate.



Auto Mechanic

DECIDE 21

You just finished one of the tasks many mechanics do each day. You prepared a bill for a customer. Some of the skills you used to do that job are important to mechanics. You used math to find the total cost of the work done. You followed directions to complete the bill correctly.

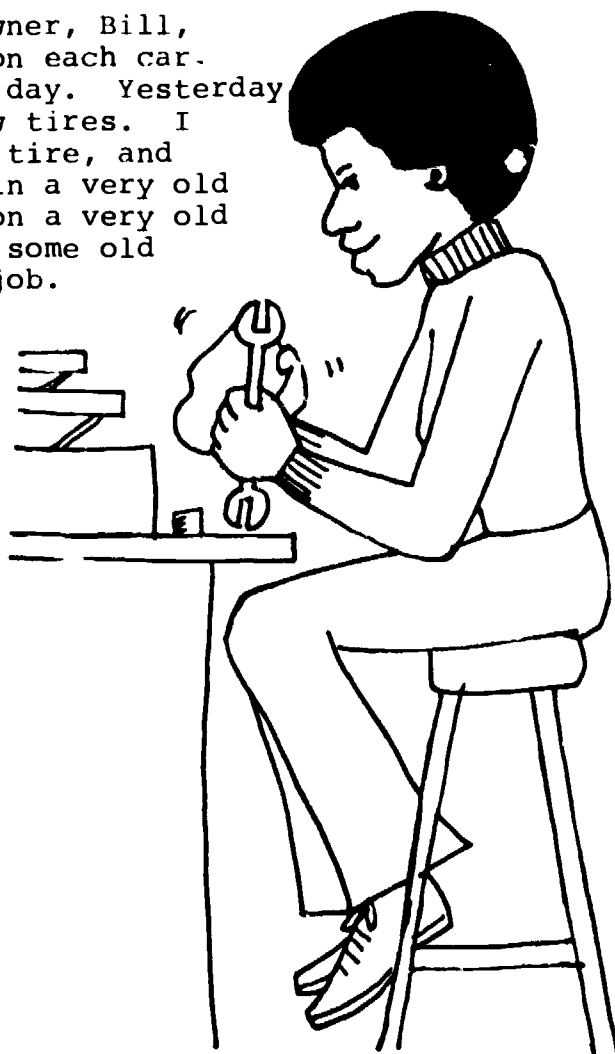
You may want to know more about a job as an auto mechanic. Many of your questions can be answered by . . .



Talking with Barbara MacIntosh, auto mechanic at Bill Maloney's Garage . . .

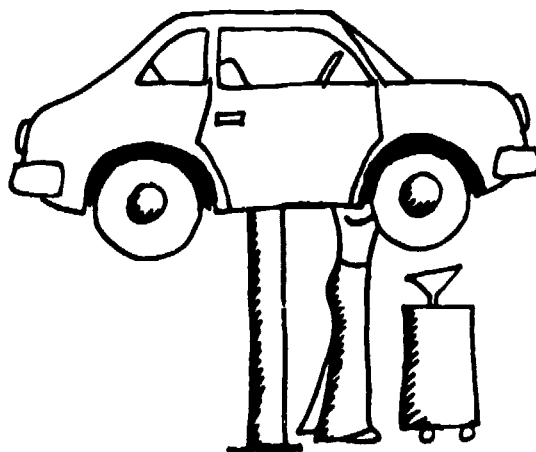
I have worked on cars and engines for a long time. I like to do it. It is fun to find the reason why a car doesn't work. Then I can fix the car.

Each morning the garage owner, Bill, tells me what work to do on each car. My job is different every day. Yesterday I mounted and balanced new tires. I repaired a leak in an old tire, and greased the engine parts in a very old car. I had never worked on a very old car before. I had to use some old repair manuals to do the job.



Part of my job is to answer questions about cars. I always tell the customer what is wrong with the car before I fix it. The customer can decide whether or not to have the work done. I ESTIMATE (make a careful guess about) the cost of fixing a car. Sometimes a customer thinks the repairs cost too much and tells me not to do the work.

When I do work on a car, and the customer comes to get it, I explain what work I did. I tell the customer how to keep the car in good condition. If cars are cared for the right way, they do not need as many repairs.



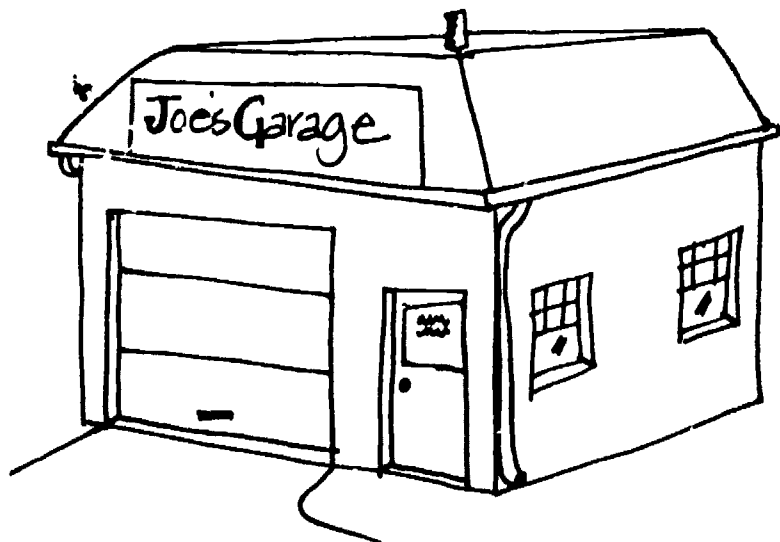
I use different kinds of equipment to find out what doesn't work in the car. I remove and replace worn parts; install air conditioning, tape decks, and other extra parts; and do minor repairs and tune-ups.

How did you prepare for your job?

I went to a vocational high school. Then, I entered an auto mechanic apprentice program. An auto mechanic needs to get good training.

After I finished training, I applied for a job. My vocational high school helped me find this job. If you were an apprentice or had on-the-job training, you might get a job at the garage or shop that trained you. You can also look for jobs that are advertised in the newspaper.

Remember that skilled mechanics must always keep learning. There are always new cars and new ways to repair them!



Do all auto mechanics do the same things that you do?

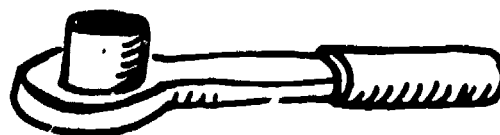
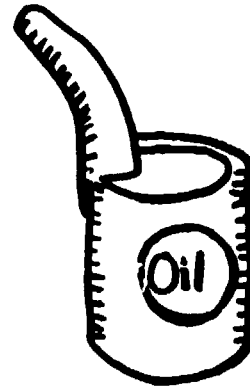
No. Some mechanics have more skills than others. They can do more things. For example, I cannot rebuild an automatic transmission. I hope to get more training so that soon I will be able to do this, too.

Some mechanics who have a lot of experience move to other types of positions. Some become service managers for car dealers. Others start their own garages, repair shops, or auto parts stores.

Auto mechanics have many choices about where and for whom they will work:

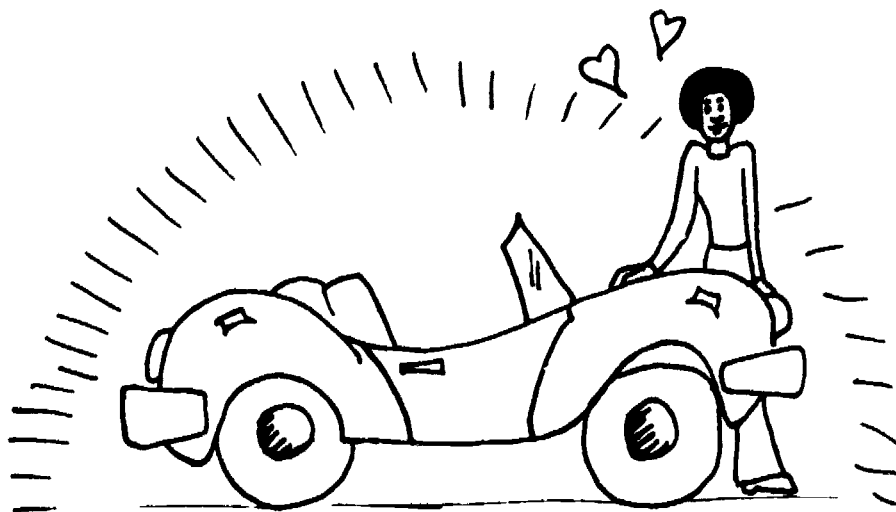
- Garages
- Service departments or car and truck dealerships
- Department stores and automotive service centers
- City and state government agencies
- Truck companies
- Rent-a-car or rent-a-truck companies
- Any companies that own large numbers of trucks and/or cars

You can see that good mechanics can use their skills in many different kinds and types of jobs.



What do you like most about your job?

I really like putting new parts in cars and repairing broken parts. It is a lot of fun to work on different cars and on the different parts that go in the cars. Another thing I like about my job is that I can fix my own car. I know how to keep it in good shape and make it last a long time.



What do you like least?

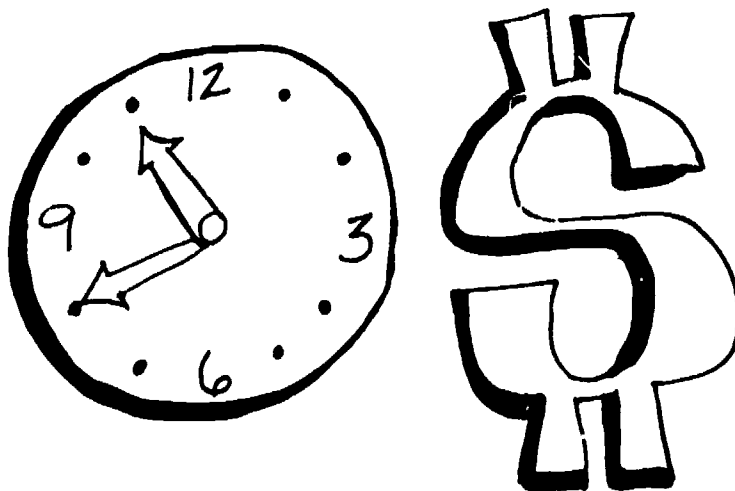
I work with grease, oil, and harsh chemicals each day. They irritate my hands. I also work amidst a lot of banging and clanging noises as we mechanics work to repair cars. This noise bothers me more on days when I am tired and sleepy.

A mechanic must get used to these things or find ways to make them less disturbing. I put a special lotion on my hands before and after I work. That helps a little. I also make sure I get enough sleep every night. Then I feel well and am not disturbed by the garage noises.



What hours do you work?

I work 55 hours a week at Bill's. Mechanics who work at car dealerships do not work as many hours. They work 40 hours a week. All mechanics earn more money when they work overtime (more hours than they should).



How much money do you earn?

Most skilled mechanics (journeyman mechanics) earn about \$9.00 to \$10.00 an hour. The hourly pay for mechanics depends on the city and the size of the repair shop. I earn \$9.35 an hour now. That is almost \$20,000 a year.

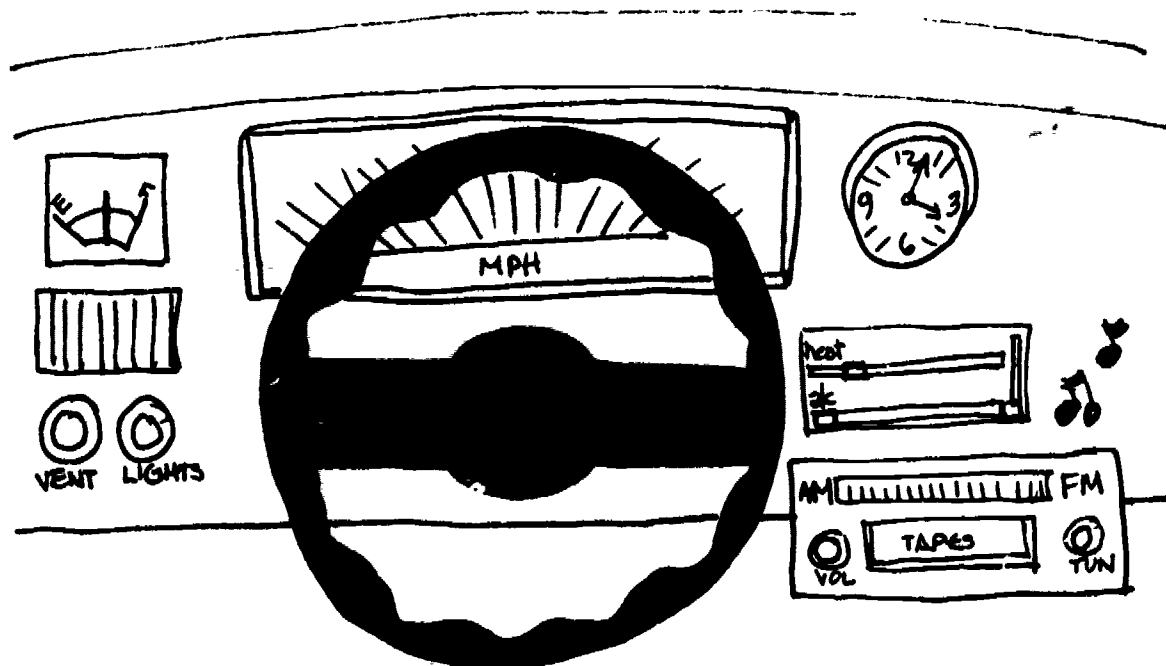
As an apprentice mechanic, I earned much less than a journeyman. I got small raises every six months. When I finished my training, I got more money for my work. Entry-level mechanics now earn about \$4.50 an hour or \$9,360 a year, not counting overtime.

What is the employment outlook?

The outlook is excellent for people who want to work as auto mechanics. This is one occupation that does not depend heavily on the economic condition of the country.

Mechanics are always needed. When people have less money to spend on luxuries, such as shiny new cars, they keep their cars for more years. This means they spend money on car maintenance and repair.

Also, when people have money, they buy cars that are equipped with many extra features. Some of these features are air conditioning, stereo systems, radios, tape players and recorders, power brakes, power windows, and many other devices. These extra features require more maintenance. And, therefore, they require more skilled auto mechanics.



Do you want to learn more about this job?

You can get more education:

- Take the following courses in high school or vocational school.

Metal Shop:

Here you'll learn how to work with metals, special machines, and tools.

Auto Mechanics:

Every mechanic must learn how to repair and maintain a car.

General Business:

This course will show you how the job of an auto mechanic is part of the business world.

Mathematics:

Mechanics must be able to work with numbers and measurements.

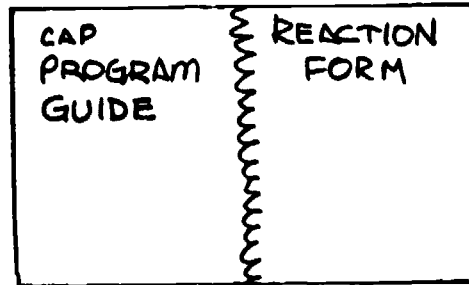
- Learn about jobs that are related to auto mechanic. Some of these jobs include . . .
 - automobile body repairer
 - service station attendant
 - motorcycle mechanic
 - farm equipment mechanic

You can get some experience:

- Get a part-time job at a gas station or auto repair shop.
- Get a part-time job at a store selling auto parts and supplies.
- Join VICA (Vocational and Industrial Clubs of America). Take part in activities related to mechanics.
- Become an apprentice.
- Apply for a job as an auto mechanic.

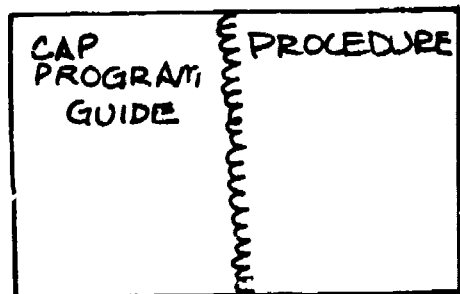
Now . . .

Turn to the Maintaining and Repairing Reaction Form in your Program Guide. Answer the questions on the back of the Auto Mechanic sheet.



What Next?

How many occupations have you investigated so far? Turn to the Procedure section of your Program Guide. Find the directions that apply to you.



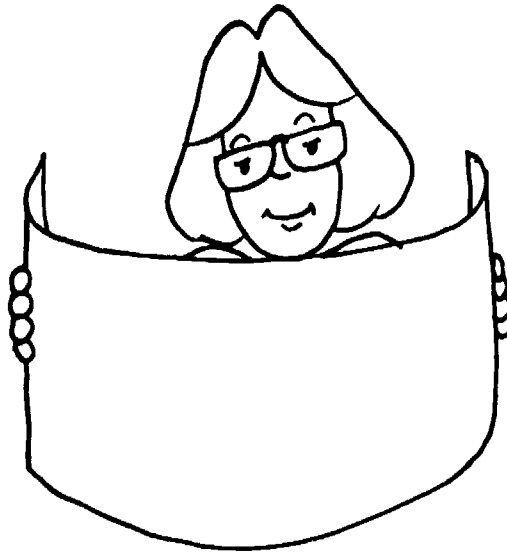
Enjoy the Career Alert Planning program!

Plumber

PERFORM 22

A plumber installs and repairs pipes that carry water and waste materials. Sometimes a plumber works in a new building to install the plumbing. Other times, a plumber repairs old plumbing that leaks or has other problems. A plumber has many responsibilities.

Architect's
Plan →



Responsibilities

1. Read and follow an architect's blueprints or drawings.
2. Install and connect new gas, water, and waste disposal systems.
3. Repair and replace damaged pipes and fittings.
4. Skillfully use hand tools, such as wrenches, reamers, drills, braces, and so forth.
5. Purchase necessary materials.

You will learn something about purchasing necessary materials as you PERFORM the following activity.

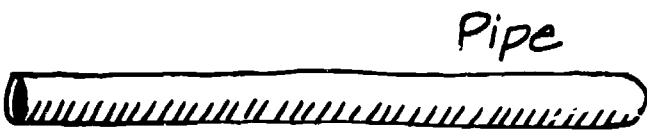
Imagine . . . YOU are a plumber.

Today as a plumber for B.B.D. Plumbing Company, you will start work on a new project. The first thing you must do is order the materials you need to do the job. You will need pipes and pipe fittings. (Pipe fittings are pieces used to fasten pipe lengths together.)



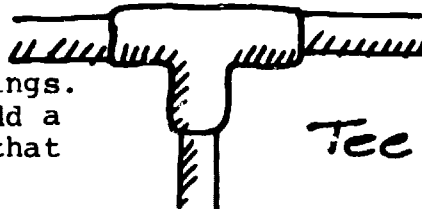
Your task is to order plumbing supplies.

You will use an architect's plan to figure out the amounts of materials you will need . . .

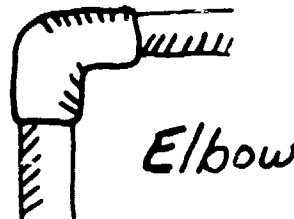
•length of pipe 

There are many different kinds of pipe used in plumbing. For this activity, pretend all the pipes are the same.

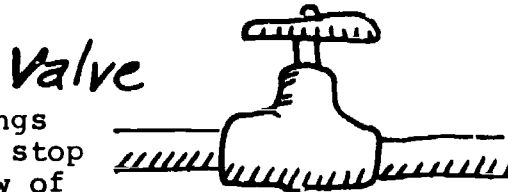
•number of tees
Tees are pipe fittings. Tees are used to add a new piece of pipe that makes a T with the main pipe.



•number of elbows
Elbows are also pipe fittings. Elbows are used to make a turn in direction.



•number of valves
Valves are fittings that are used to stop or start the flow of water. A faucet is one kind of valve.



This is what you must do:

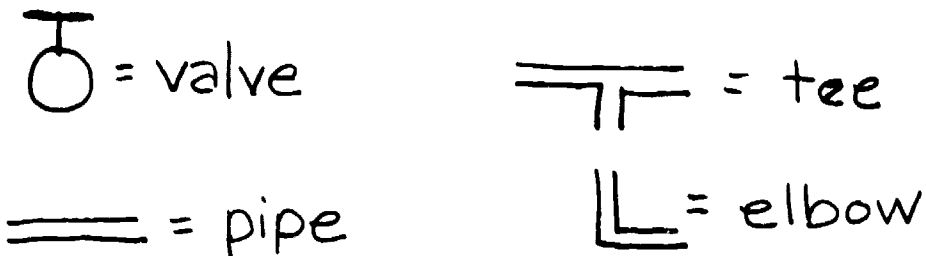
Identify the symbols used for pipe and pipe fittings

STEP 1.

Look at the architect's plan on the next page.



STEP 2.

Read the symbols used for pipe and three kinds of pipe fittings.



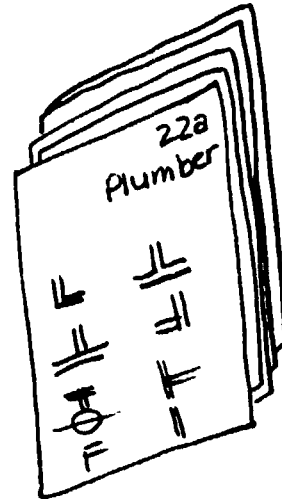
STEP 3.

Find the symbols on the plan.

- Find the valve symbols.
- Next, find the places you need elbows. Every time the pipe turns a corner (like this ) , you need an elbow.
- Now, find where you need tees. Look for this sign  . You need a tee whenever another pipe joins the main pipe.

STEP 4.

Turn to Worksheet 22a, Plumber.

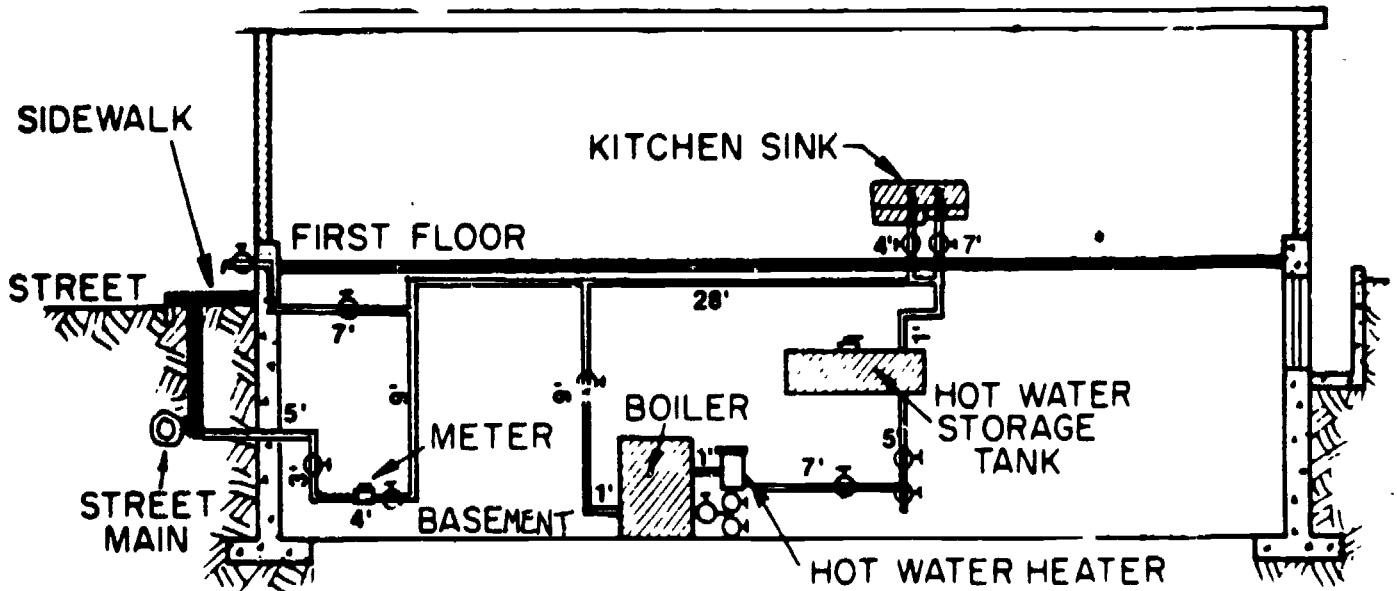
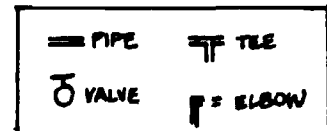


STEP 5.

Complete the worksheet by matching the words to the symbols.

Architect's Plan

Project No.4038



Record the project number
on the order form

STEP 1.

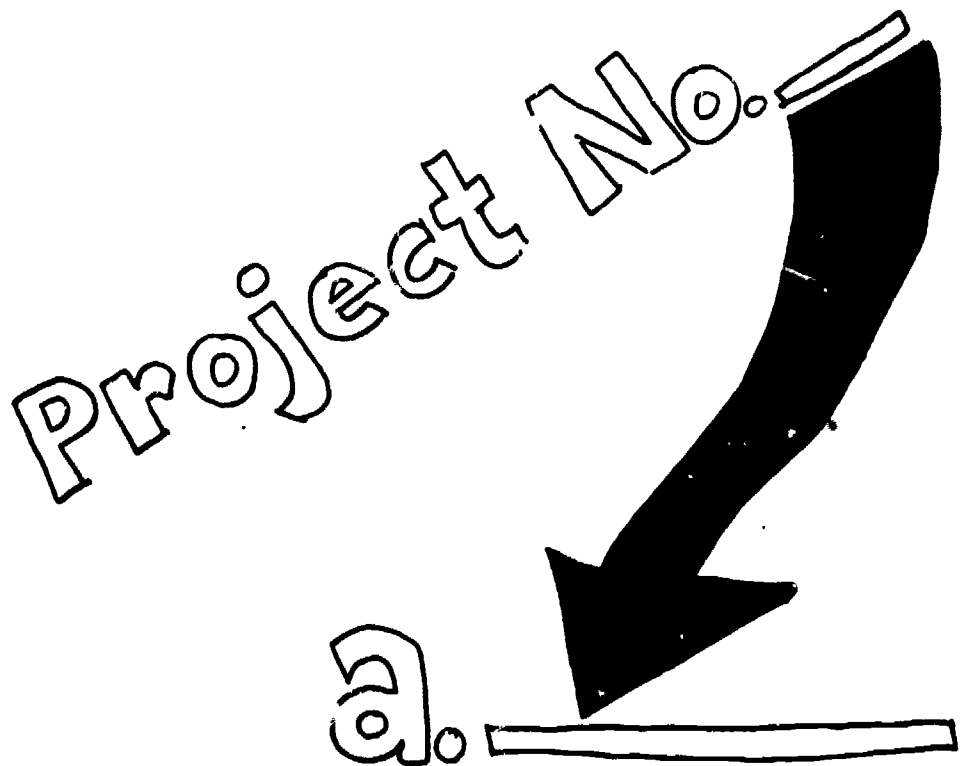
Turn to the order form on Worksheet 22b,
Plumber.

STEP 2.

Find the project number on the archi-
tect's plan. (See the preceding page.)

STEP 3.

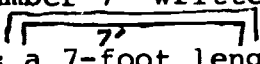
Fill in the number on the letter "a"
line on the order form.



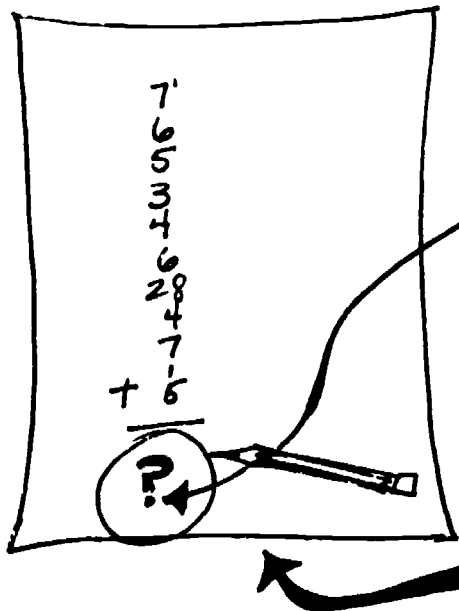
Find the total length
of pipe needed

STEP 1.

Find the numbers next to the pipes
drawn on the architect's plan. Each
number tells how many feet long a given
pipe is.

For example, the number 7' written on
the plan like this 
means that there is a 7-foot length
of pipe between the two corners (or
elbow fittings).

b Estimate of total
length of pipe needed



STEP 2.

Write down all the lengths of pipe used
on the plan. Do your work on a blank
sheet of paper.

STEP 3.

Add the numbers to find the total length
of pipe you will need.

STEP 4.

Write the total on the letter "b"
line on the order form.

Find the number of 22' lengths of pipe

STEP 1.

Divide the total length of pipe by 22.
(The pipe you will use comes in lengths of 22 feet.)

b. $\frac{\text{total length of pipe needed}}{22'} = \text{number of 22' lengths of pipe.}$

STEP 2.

Remember . . . if you get a remainder, it means you will need part of another 22' length . . . and you will have to buy the whole 22 feet.

STEP 3.

Write the number of 22' lengths at letter (c) on the order form.

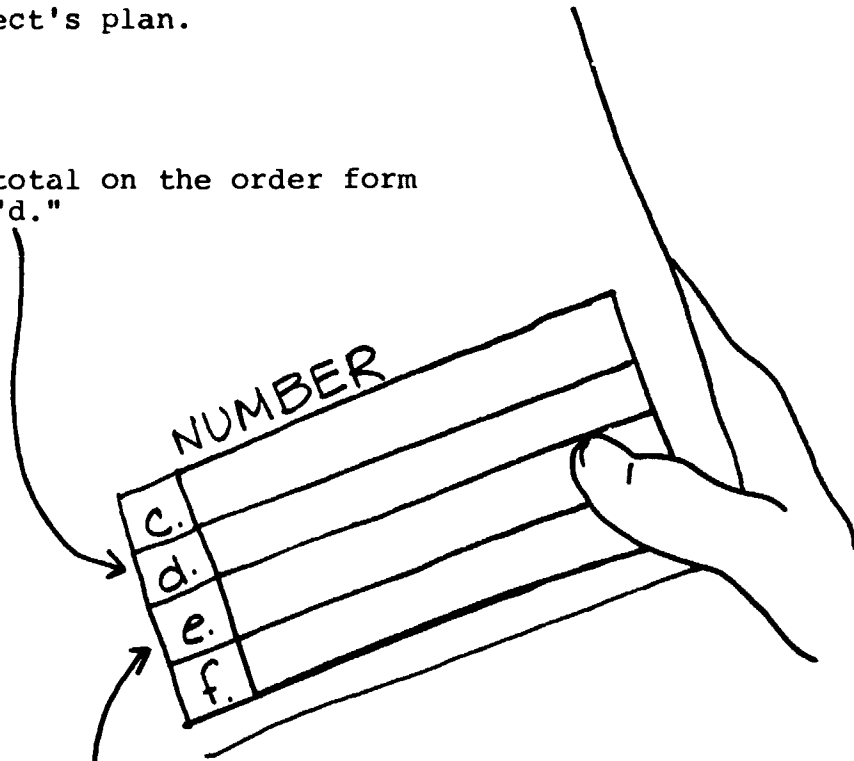
Find the number of tees needed

STEP 1.

Count the number of tees shown on the architect's plan.

STEP 2.

Write the total on the order form at letter "d."



Find the number of elbows needed

STEP 1.


Count the number of elbows shown on the architect's plan.

STEP 2.

Write the total on the order form at letter "e."

Find the number of valves needed

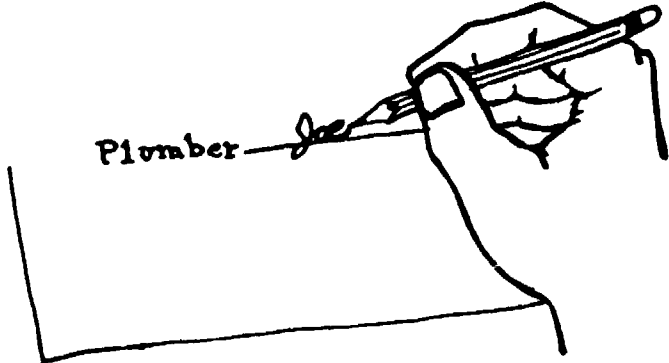
STEP 1.

Count all of the valve symbols on the plan. The symbol  means you need a valve.

| NUMBER | |
|--------|--|
| c. | |
| d. | |
| e. | |
| f. | |

STEP 2.

Write the total number of valves on the order form by letter "f."



Sign the order form

STEP 1.

Check your work by looking at the key on the next page. If you have different answers, try to find your mistakes.

STEP 2.

Sign the order form. Your signature makes the order official. It means you believe the numbers are correct and that the materials should be sent.

Key ↴

Plumber

Order Form

Job No. 4038

Estimate Total Length of Pipe Needed 91 feet

| ITEM | QUANTITY |
|---------------------|-----------|
| 27' Lengths of Pipe | <u>5</u> |
| tees | <u>5</u> |
| elbows | <u>9</u> |
| flanges | <u>13</u> |

Plumber (your name)

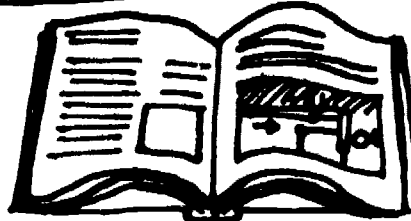
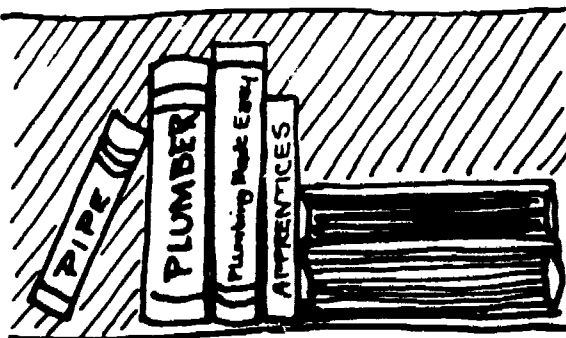
Now . . .

Turn to the Maintaining and Repairing Reaction Form in your Program Guide. Find the Plumber page. Record your feelings about your interests and abilities in this activity. Return to this page.

Did you enjoy being a plumber? Yes?
Then you might like

Some other activities:

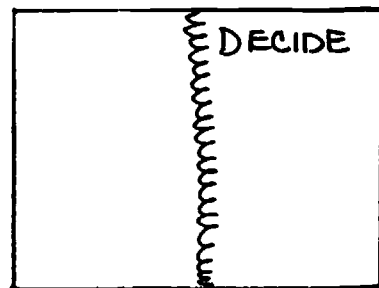
1. Try to find the pipe that brings water into your home. Find the sewer pipe also. Find where they enter and leave your home. See how they fit together.



2. Ask the shop teacher in your school where you can find books on plumbing.
3. Talk to a plumber to find out more about this occupation.

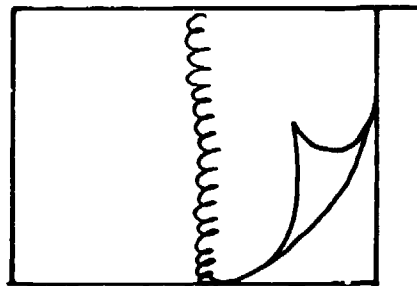
Would you like to find out more about this occupation?

yes ▶ Turn to DECIDE 22--Plumber

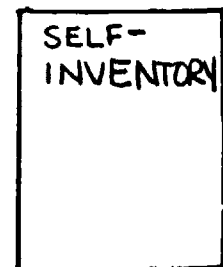


no ▶ Turn to another Maintaining and Repairing occupation:

Occupation 21--Auto Mechanic
Occupation 23--Appliance Repairer
Occupation 24--Sanitation Worker

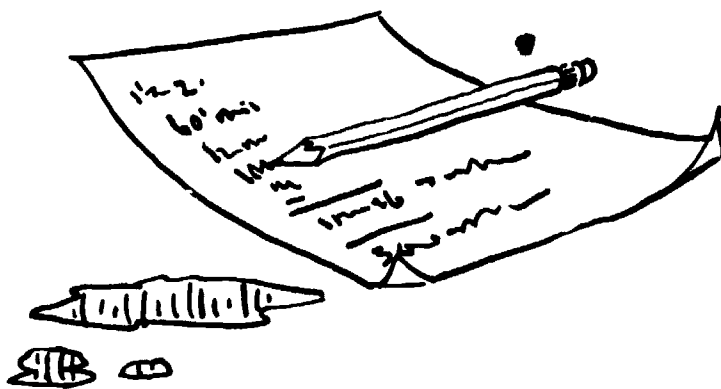


or ▶ Look at the Self-Inventory Chart in your CAP Program Guide. Select another job function to investigate.



Plumber

DECIDE 22



You have just finished one of the tasks a plumber does. You used an architect's plan to help you decide what supplies to order for a new plumbing project. You used math to make estimates (careful guesses) about the numbers of supplies to order. You had to understand the architect's plan. You had to work carefully to do the job right.

You may want to know more about the occupation of plumber. The next pages will tell you more about a plumber's job.

Talking with Charlie Butray, a plumber with Lee Kee Plumbing, Inc....

I started working at Lee Kee nine years ago. There are 20 plumbers in the company. Right now, we are all working on a new apartment building. We will install all the pipes for water, waste, and air vents. We will put in the bathtubs, sinks, showers, and toilets. It is a lot of work!

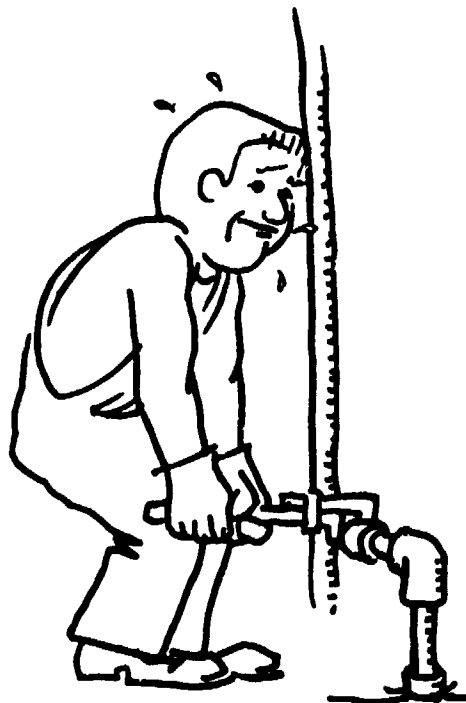


I supervise three apprentices on this project. Apprentices are people who agree to work for one employer for a specific amount of time. In return for this time and work, they receive training. The other plumbers and I show apprentices how to do different tasks. They learn by helping experienced workers like us.

This week the three apprentices will put fittings on the pipes. I must see that they do it the right way.

Most beginning plumbers are between 18 and 26 years old. But, not all plumbers begin as apprentices. Some learn informally on the job. To work as a plumber, you should be a high school graduate. You should also be strong and healthy.

Plumbers must know how to use many different hand and power tools. They must know how to work with a welding torch. Plumbers must work carefully. They must be able to install plumbing that is safe and strong.



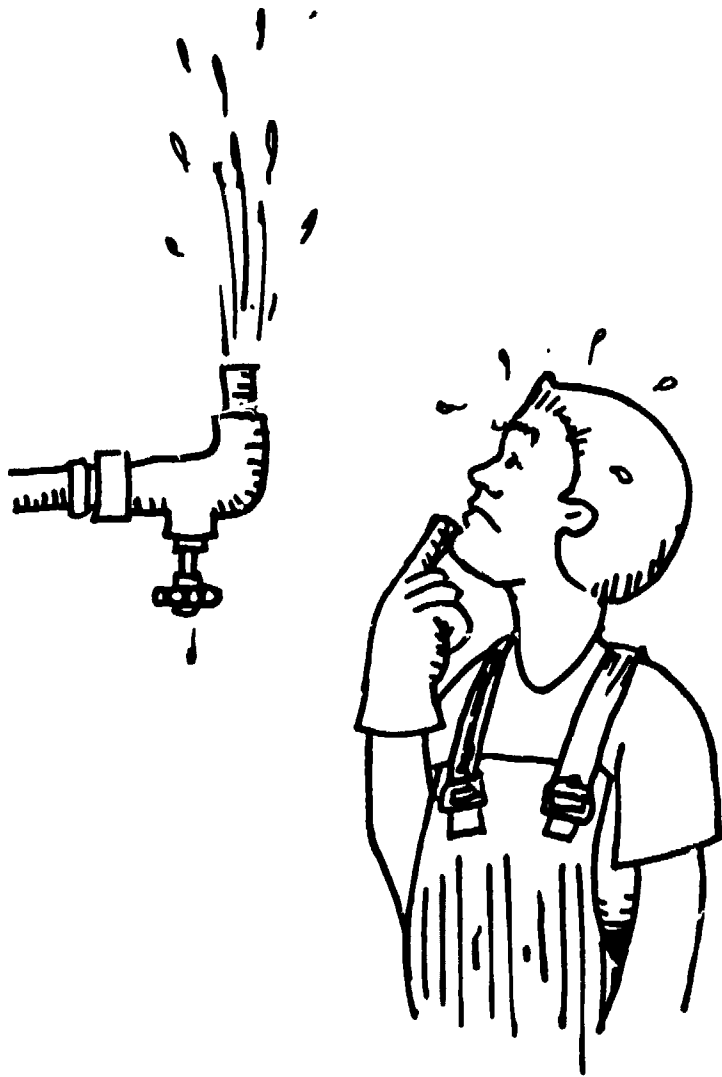
How did you prepare for your job?



For five years, I was an apprentice plumber at Lee Kee. During those years I was paid much less than a skilled plumber (called a journeyman plumber). One of the journeyman plumbers was my teacher. I had classes in plumbing. I also did some things a plumber does. The training takes a long time because plumbers must learn many different skills.

Many young people who want to be plumbers go to vocational high schools or technical colleges. They take courses in subjects like drafting, math, and blueprint reading. These courses are part of the apprenticeship program. The courses and on-the-job training in this program take four or five years to complete.

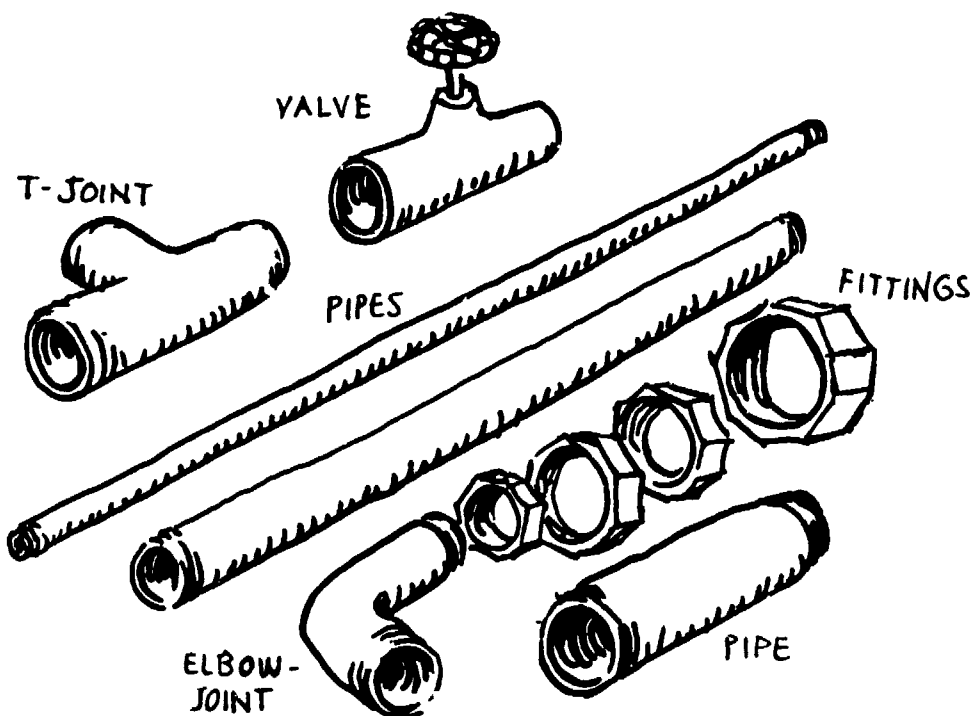
During the program, apprentices work full time for their employers. They must pass a test before they can become journeyman plumbers.



What do you like most about your job?

I enjoy solving different plumbing problems. I must decide which fitting is best to use. I must decide the size of pipe to use for each part of the plumbing work. When I finish a job, I like to know I have done my best work.

My job never gets boring. I work in many different places and no two jobs are exactly the same.



What do you like least?

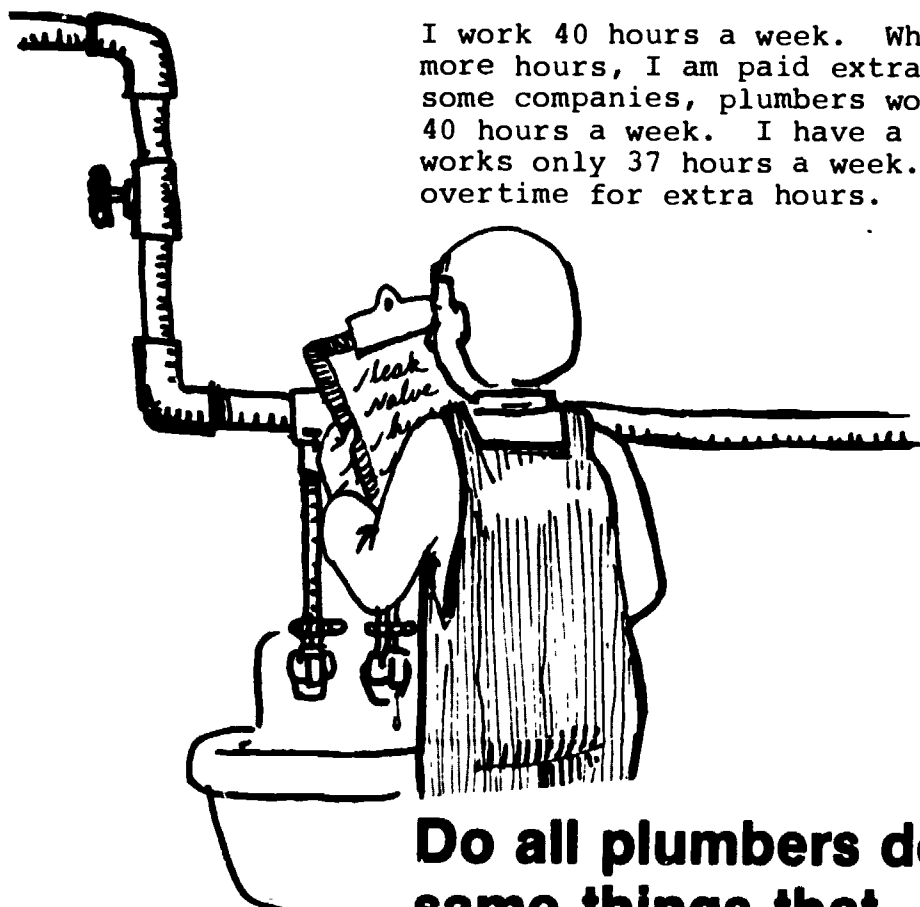
Sometimes I work in very small spaces for a long time. That doesn't feel good. After I have worked under a sink for a couple of hours, it feels great to get up!



Plumbers work with many other people. That can be a problem. I put plumbing in new buildings after the carpenters finish their work. I must finish my job before the plasterers can begin their work. Sometimes we get in each other's way. When this happens, everyone is unhappy.

What hours do you work?

I work 40 hours a week. When I work more hours, I am paid extra money. In some companies, plumbers work less than 40 hours a week. I have a friend who works only 37 hours a week. He is paid overtime for extra hours.



Do all plumbers do the same things that you do?

No. Not all plumbers work as supervisors. You must be a very skilled plumber to become a supervisor. You must also be good at teaching others.

Some plumbers become master plumbers. They must have more training for this work. Master plumbers can own their own businesses. They can hire other plumbers to help them. Each plumbing company must have at least one master plumber.

How much money do you earn?

When I was an apprentice, I earned about \$7.00 an hour. Now I earn \$12.00 an hour--more than \$23,000 a year!

Salaries for plumbers are not always the same. I work in Columbus, Ohio. Plumbers here earn more than plumbers in many other cities. I also work in a large company that pays more money than many small companies. Plumbers earn good pay for their work.



What is the employment outlook?

The outlook is good. Businesses and individuals will continue to need plumbers. Someone must maintain and repair the plumbing systems! And, someone must work to install new plumbing systems. Look into an apprenticeship program in your community. You will find out more about the number of job openings in this field.

Do you want to learn more about this job?

You can get more education:

- Take the following courses in high school and/or vocational school.

General Science, Physics, and Chemistry:

Plumbers must know about liquids, gases, and metals.

Industrial Arts (Drafting, Metals, and Power Mechanics):

Plumbers must be able to read architects' plans. They must know how to work with metals and use tools.

General Math:

Plumbers must know how to be able to solve math problems.

- Attend a vocational high school and get in the plumbing program.
- Ask your school librarian or guidance counselor to help you find information about plumbing.
- Go to a technical school or college to learn plumbing.
- Write to one of the following organizations for more job information:

-National Association of Plumbing-
Heating-Cooling Contractors
1016 20th Street, NW
Washington, DC 20036

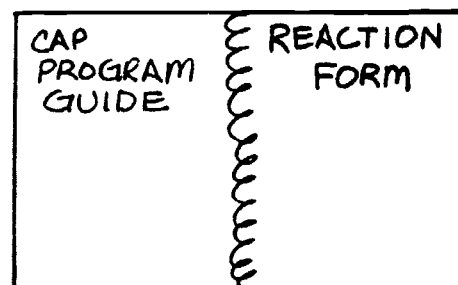
-United Association of Journeymen
and Apprentices of the Plumbing
and Pipe Fitting Industry of
the United States and Canada
901 Massachusetts Avenue, NW
Washington, DC 20001

You can get some experience:

- Get a part-time or summer job as a plumber's helper.
- Apply to be an apprentice at a plumbing firm.

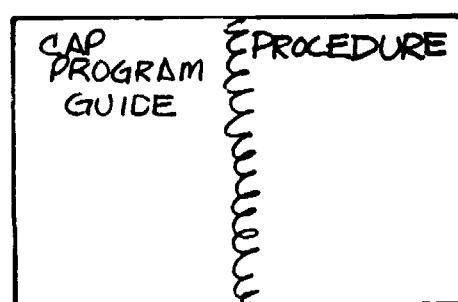
Now . . .

Turn to the Maintaining and Repairing Reaction Form in your Program Guide. Answer the questions on the back of the Plumber sheet.



What Next?

How many occupations have you investigated so far? Turn to the Procedure section of your Program Guide. Find the directions that apply to you.



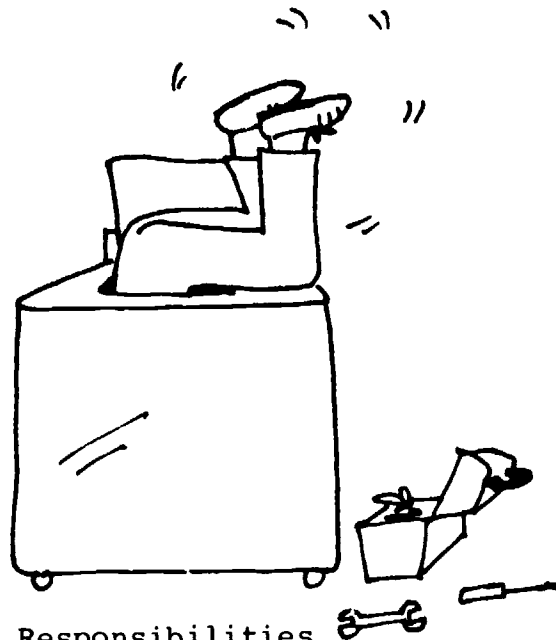
Enjoy the Career Alert Planning program!

Appliance Repairer

PERFORM 23

Appliance repairers fix machines. They usually go to customers' homes to work on the machines.

Appliance repairers must be able to operate machines. They must understand how machines are put together. Appliance repairers must have many skills. Then they can perform their responsibilities.



Responsibilities

1. Diagnose problems.
2. Disassemble appliances.
3. Repair appliances.
4. Replace defective parts.
5. Advise customers on appliance maintenance and repair.

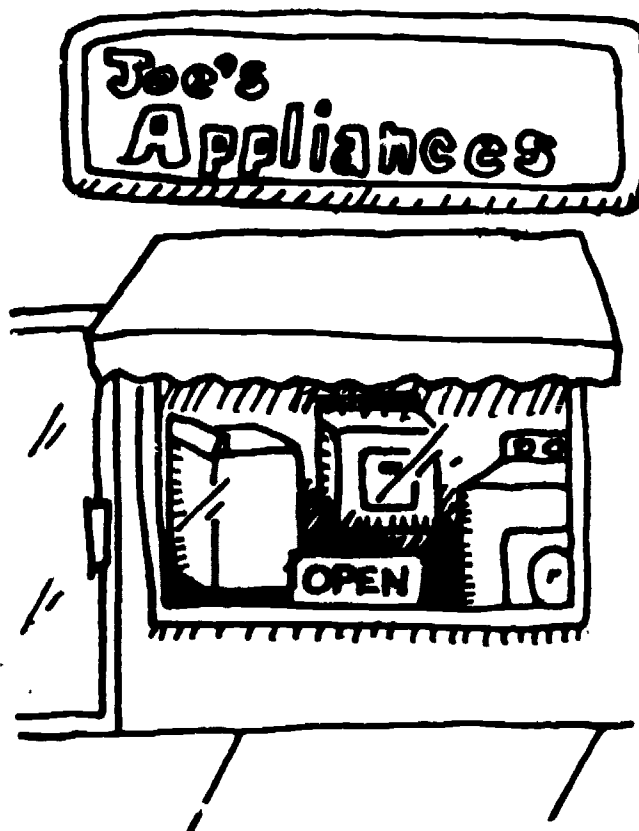
You will learn something about diagnosing problems as you PERFORM the following activity.

Imagine . . . YOU are an appliance repairer.

You are a repairer for Joe's Appliance Sales and Service Company. You repair washing machines in customers' homes.

Today the service manager (your boss) has given you five work orders. A work order is a paper telling, for each broken machine . . .

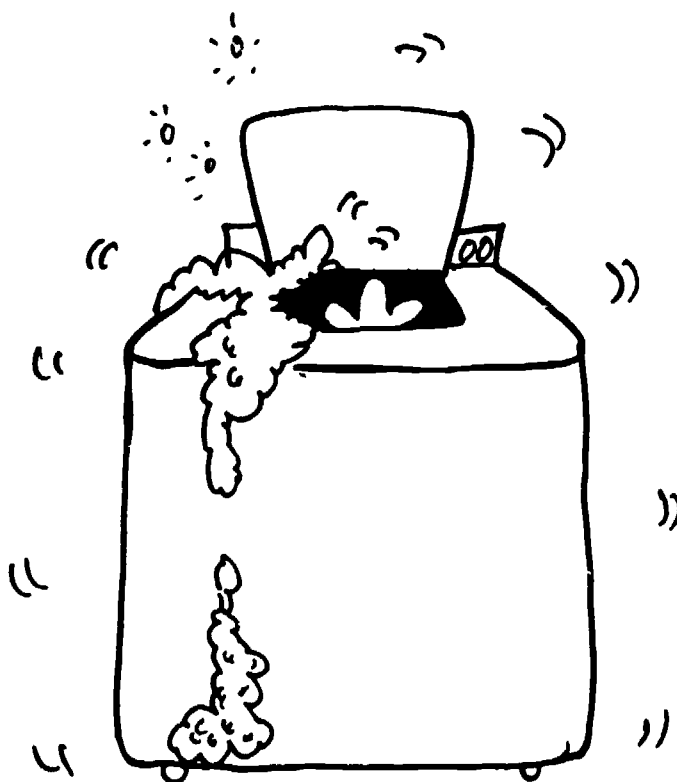
- who owns it
- where he or she lives
- what kind of machine it is



You must repair the machines on these orders. First, you must analyze each machine. That is, you must find out what is wrong with it.

Next, you must draw a conclusion. That is, you must decide how to fix the machine.

Your task is to diagnose each machine.



This is what you must do:

Find out what is wrong with machine A

STEP 1.

Look at the chart on the next page.

STEP 2.

Read the information next to letter A under the heading Problem.



Find the cause of the problem

STEP 1.

Again, look at the chart on the next page.

STEP 2.

Read the information written about machine A under the heading Cause.



List for Appliance Repairer

| PROBLEM | CAUSE | WAYS TO FIX THE MACHINE |
|--|--------------------------------------|--|
| A. WATER DOES NOT DRAIN OUT OF WASHING MACHINE | drain hose is blocked | <ol style="list-style-type: none"> 1. dip suds out of washer and clean out tub with cold water 2. tighten the belt 3. take off hose and clean it out with water |
| B. WASHING MACHINE LEAKS | water hose is loose | <ol style="list-style-type: none"> 1. replace with new hoses 2. tighten pump 3. tighten hose |
| C. WATER NOT HOT ENOUGH | hot and cold water hoses on backward | <ol style="list-style-type: none"> 1. reverse the hoses 2. check water heater 3. replace with new hoses |
| D. BASKET DOES NOT SPIN | broken drive belt | <ol style="list-style-type: none"> 1. tighten the belt 2. put on a new belt 3. balance the load of wash |
| E. WASHER WILL NOT START | wires are not connected | <ol style="list-style-type: none"> 1. tighten pump 2. replace pump 3. connect the wires |

Identify the way to
fix the machine

STEP 1.

On the chart, find the column,
Ways to Fix the Machine.

STEP 2.

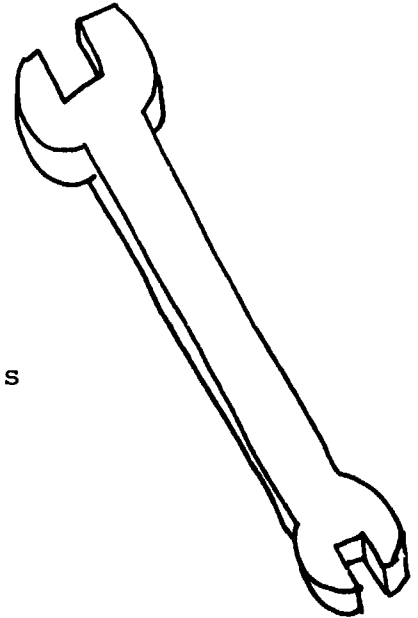
Read the three solutions listed in this
column.

STEP 3.

Decide which one will be the best way
to fix the machine.

STEP 4.

Write your answer on a blank piece of
paper.



the **best** way to
fix the
machine...

Diagnose the problems in the other four machines (B, C, D, and E)

STEP 1.

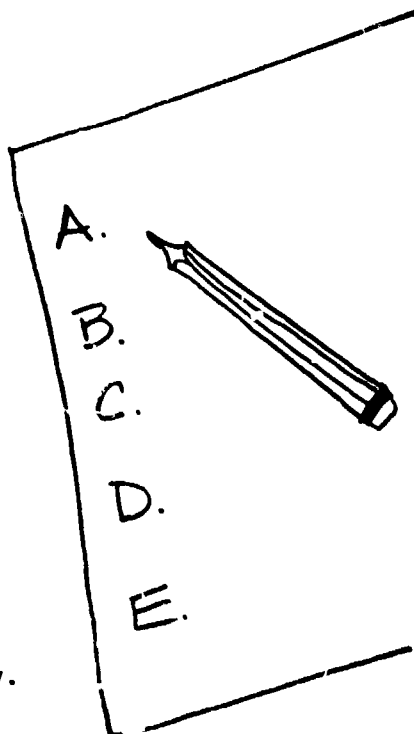
Follow the same steps you did for machine A.

STEP 2.

Write each answer solution--on the blank sheet of paper.

STEP 3.

Check your answers with the key below.



STEP 4.

If your answers are different, go back and read the problems again. Try to see why the problem is solved in another way.

Remember: a real washing machine repairer must find the problem and solution without a list like this one.

Key



A - 3, B - 3, C - 1, D - 2, E - 3

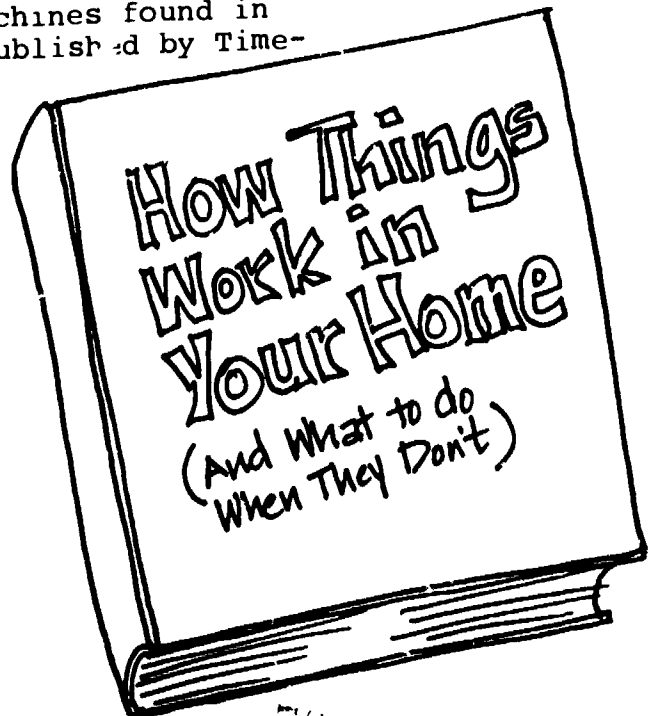
Now . . .

Turn to the Maintaining and Repairing Reaction Form in your Program Guide. Find the Appliance Repairer page. Record your feelings about your interests and abilities in this activity. Return to this page.

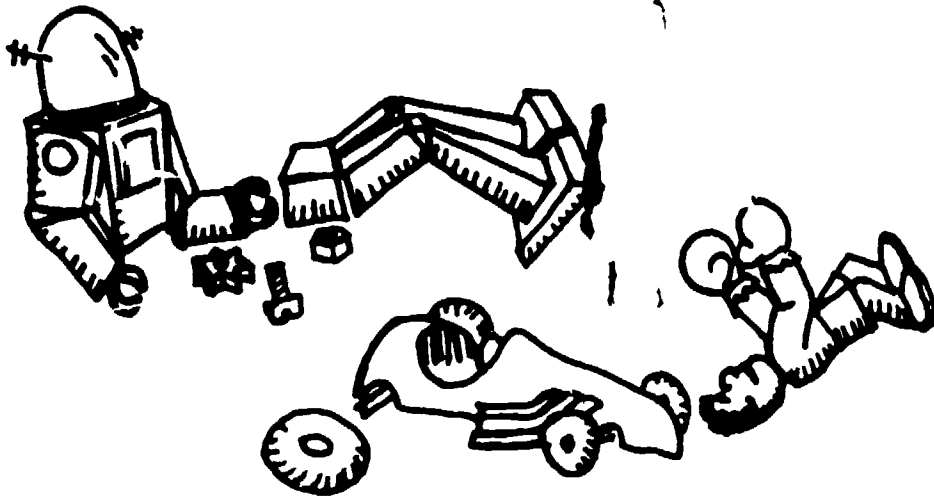
Did you enjoy being an appliance repairer? Yes? Then you might like

Some other activities:

1. Read books about repairing machines. One good book you can find in most libraries is How Things Work in Your Home (And What to Do When They Don't). This book has many pictures of all kinds of machines found in the home. It is published by Time-Life Books.



2. Make plans to visit an appliance repair shop. Talk with a repairer. Watch while a repairer fixes an appliance.

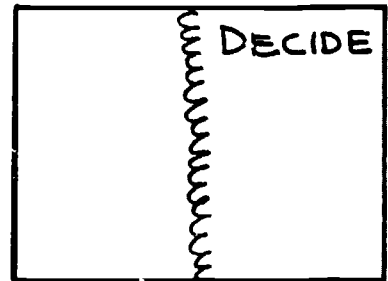


3. Try to repair toys for children in your neighborhood.
4. Write to this address for more information about this job:

National Appliance and Radio-TV
Dealers Association
318 West Randolph Street
Chicago, Illinois 60606

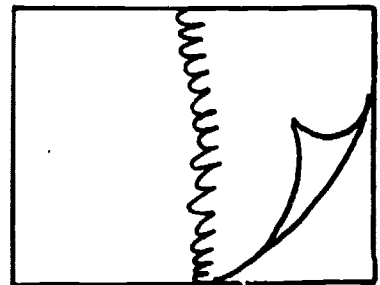
Would you like to find out more about this occupation?

yes ▶ Turn to DECIDE 23--Appliance Repairer.



no ▶ Turn to another Maintaining and Repairing occupation:

Occupation 21--Auto Mechanic
Occupation 22--Plumber
Occupation 24--Sanitation Worker



or ▶ Look at the Self-Inventory Sort Chart in your CAP Program Guide. Select another job function to investigate.



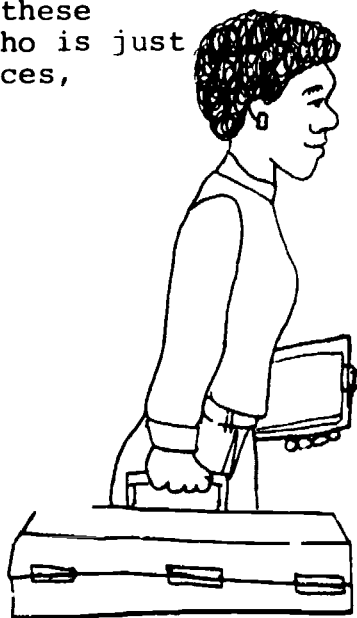


You just finished one of the tasks an appliance repairer does every day. You decided how to repair several washing machines. You had to choose the best way to repair each machine.

You know that appliance repairers do much more than that. The next pages will tell you more about a job as an appliance repairer.

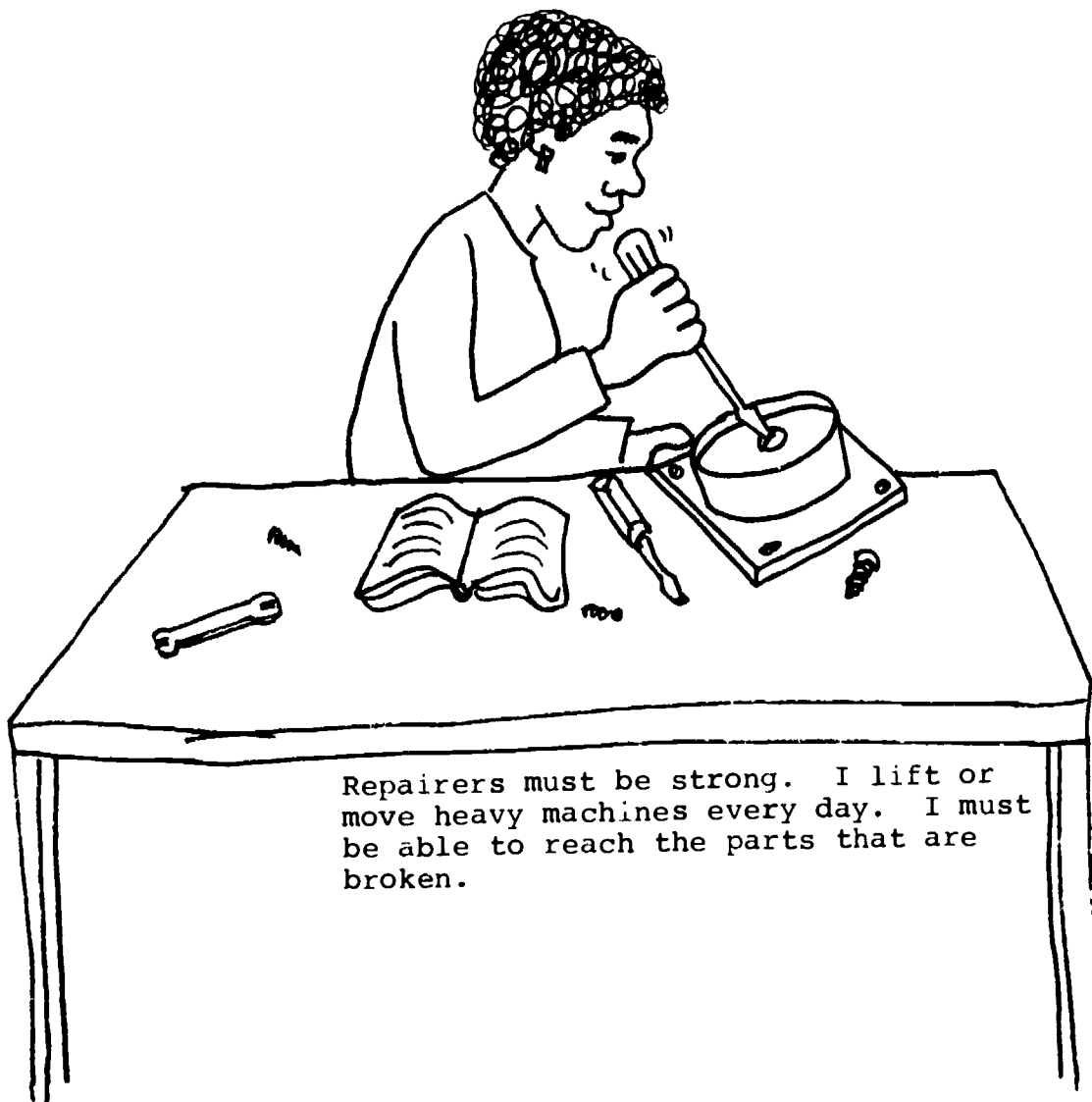
Talking with Carole Montalto, appliance repairer for J.W. Green's Appliance Co. . . .

I install and repair appliances sold by Green's. The service manager gives me a list of repairs to do each day. I drive one of the small company trucks to each customer's home to do these repairs. A trainee, someone who is just learning how to repair appliances, usually works with me.



Yesterday a trainee and I worked in three customers' homes. At the first home, we installed a new refrigerator. At the next home we fixed a washing machine. After lunch, I showed the trainee how to repair an air conditioner in another customer's home. That work took us all afternoon. Sometimes I work all day in customers' homes.

Repairers need to know a lot! I must know how gas and electric appliances work. I must be able to take apart an appliance and put it back together again.



Repairers must be strong. I lift or move heavy machines every day. I must be able to reach the parts that are broken.

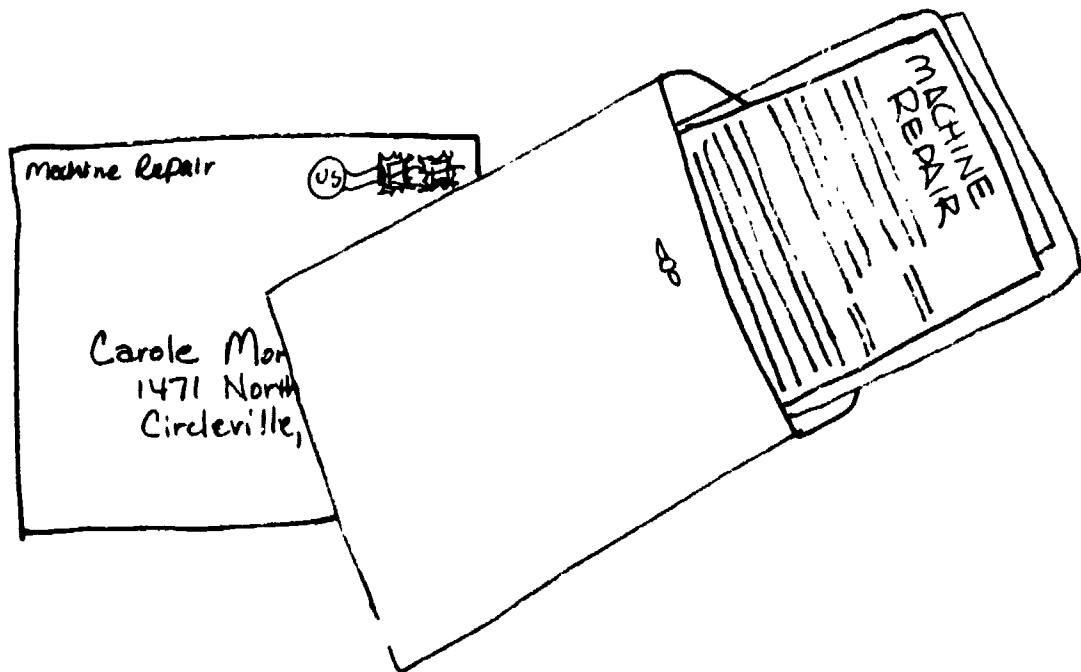
Repairers must be healthy. An important part of my job is to find out why an appliance doesn't work right. Good hearing and eyesight is a big help. Sometimes a broken machine sounds or looks different than a machine that works the right way. I must be able to hear or see these differences. Then I can find the problem and fix the machine.



Repairers must be good at math. Sometimes a customer wants to know the cost of a repair before I begin. Then, I look in my price book. It lists the cost of parts and labor to do the work. This cost is called an estimate. I give the estimate to my customer. If it is high, the customer sometimes decides not to have the machine repaired.

How did you prepare for your job?

I worked at Green's as a trainee for a year. During that year I learned from the experienced repairers. I drove the truck to customers' homes. I also helped with repairs done at Green's. I wanted to learn all about repairing. So, I took a course by mail in machine repair. I learned a lot from the course.

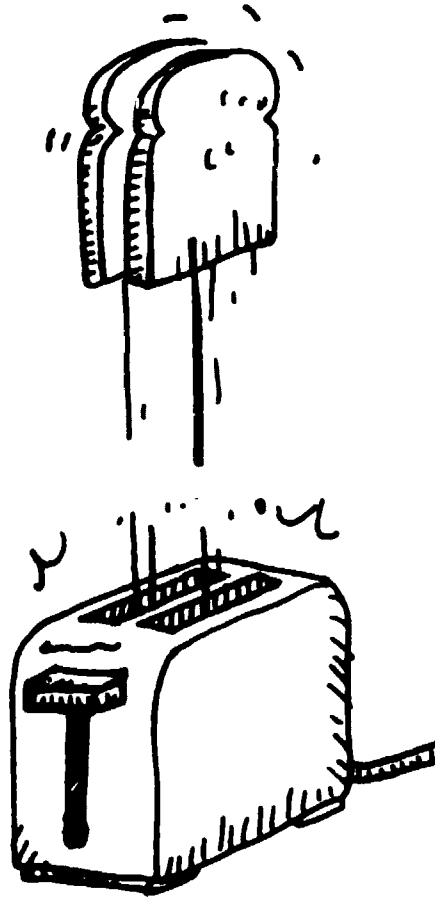


The best way to learn to repair machines is on-the-job training (OJT). After three years of OJT at Green's, I was a qualified appliance repairer. I was able to do good repair work.

What do you like most about your job?

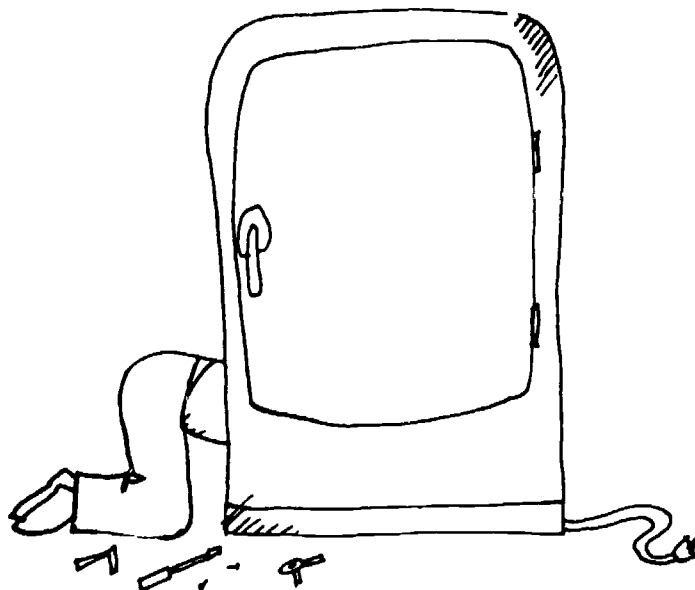
I do many different things in my job.
I like that because I don't get bored!

I like being a repairer because I can
work alone. No one watches me all day.
I like the feeling that I am "on my own."



I also like talking with customers. I
am proud to know so much about my work.
Customers respect my skill. They are
glad I can repair their machines. They
listen carefully when I tell them how
to take care of their machines, too.
They don't want their machines to break
again!

What do you like least?



My job can be very difficult. A machine may have two different things wrong with it. That makes it very hard to find what is wrong. I may try many different new parts before I can repair the machine.

Do all appliance repairers do the same things that you do?

Some appliance repairers work only on small appliances, like toasters or coffee makers. Their job is a little different from mine. That is because the machines they repair are different

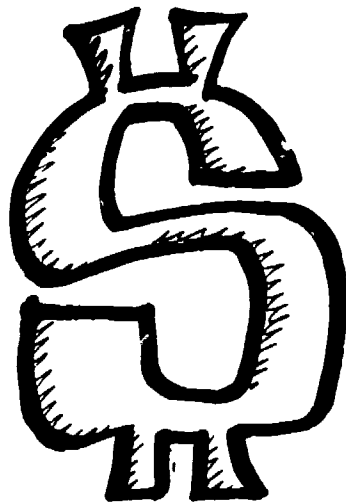
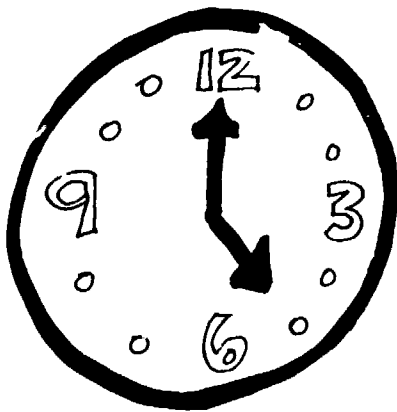
Appliance repairers who work with large appliances do the same things I do. But, their ways of working may be different. Appliance repairers can work for many different kinds of businesses. Each business has its own rules for how things are done. Appliance repairers must follow those rules.

Appliance repairers can work for repair shops, department stores, utility companies, large business corporations, and appliance companies. They work on machines that are used in homes and in businesses. They must be able to fix many different kinds of machines.



What hours do you work?

I work from 8:00 a.m. to 5:00 p.m., Monday through Friday. I also work every other Saturday. Repairers who work in small shops often work more hours than I do.



How much money do you earn?

When I started work at Green's as a trainee, I earned \$3.90 an hour. The repairers here earn more money as they work faster and learn how to repair different machines. After 5 years I now earn \$8.25 an hour or \$17,000 a year.

The amount of money earned by repairers depends on the city and the size of the company. (Large companies often pay more than smaller ones.)

Do you want to learn more about this job?

You can get more education:

- Take the following courses in high school and/or vocational school:

Math:

Repairers need to know about math.

Science:

Repairers work with motors and electricity. They must understand them to do their job safely and well.

Metal Shop:

Repairers must understand how to use and repair metals.

- Write to the following organizations for more information about appliance repairing:

-Gas Appliance Manufacturers' Association
60 East 42nd Street
New York, NY 10017

-National Appliance and Radio-TV Dealers' Association
318 West Randolph Street
Chicago, IL 60606

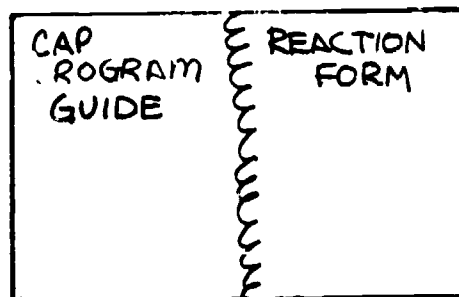
- Learn about jobs that are related to appliance repairer, such as . . .
 - watch repairer
 - vending machine repairer
 - musical instrument repairer
 - business machine repairer

You can get some experience:

- Get a part-time or summer job in an appliance store or an appliance repair shop. This will help you learn about all kinds of appliances.
- Apply for a job at an appliance repair shop.
- Apply for a job in the repair department of a large company.

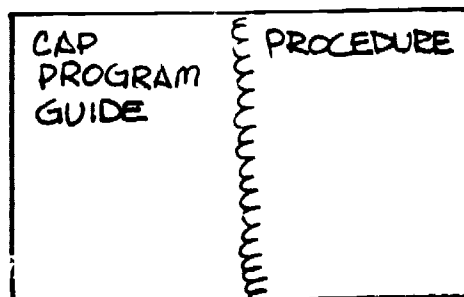
Now . . .

Turn to the Maintaining and Repairing Reaction Form in your Program Guide. Answer the questions on the back of the Appliance Repairer sheet.

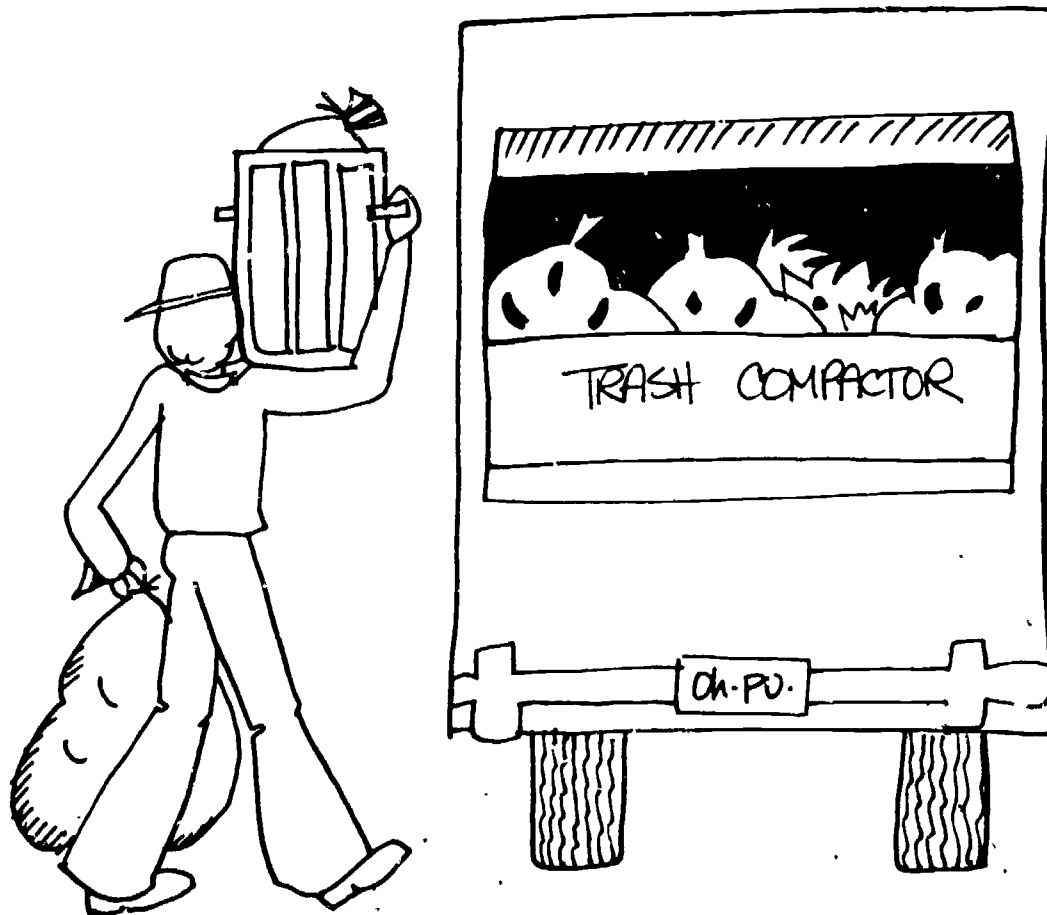


What Next?

How many occupations have you investigated so far? Turn to the Procedure section of your Program Guide. Find the directions that apply to you.



Enjoy the Career Alert Planning program!



Sanitation workers pick up trash and rubbish from homes, businesses, and other places. They have many responsibilities.

Responsibilities

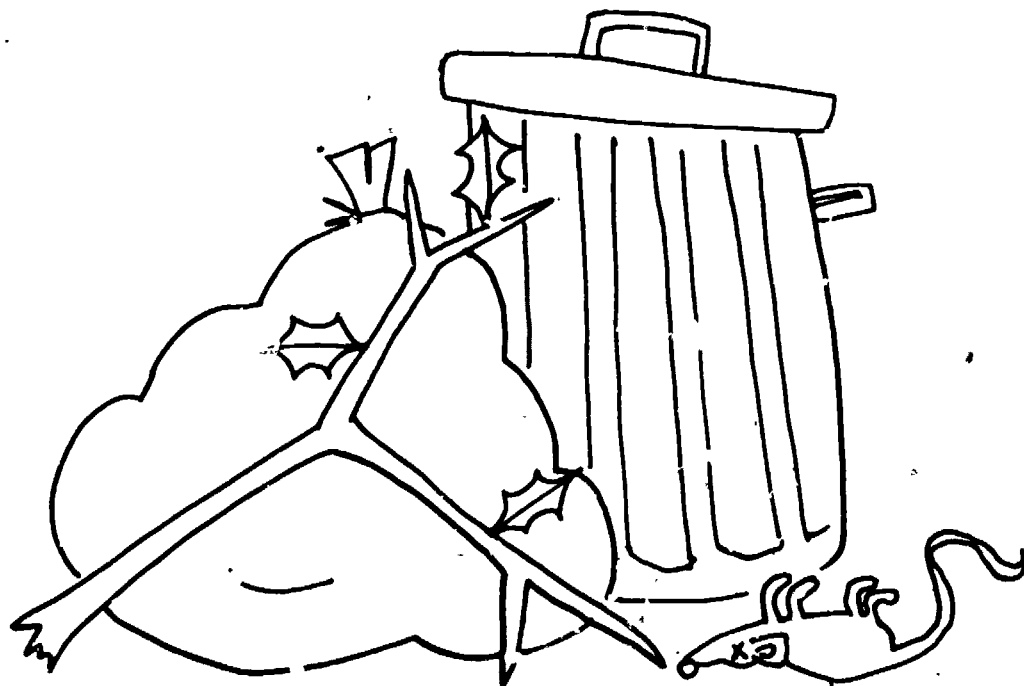
1. Drive truck.
2. Collect trash.
3. Lift and carry trash to truck.
4. Load trash into back of truck.
5. Use compactor.

You will learn about collecting trash as you PERFORM the following activity.

Imagine . . . YOU are a sanitation worker.

You work for the city of Centerville.
Today you will collect trash along a
route in the city. At each stop, you
must decide what trash to pick up.

**Your task is to decide what
trash to collect.**



This is what you must do:

Find out the city trash collection laws

STEP 1.

Read the information below.

STEP 2.

Picture in your mind what each law says.

City Laws

These are the city laws for sanitation workers:

1. Do not go on any private property (houses, lawns, driveways).
2. Do not pick up dead animals.
3. Do not collect sticks or branches longer than 4 feet.
4. Do not pick up bundles of sticks that are larger than 2 feet across.
5. Do not collect furniture or machines.
6. Do not pick up trash cans or bags larger than the 30-gallon size (a size that can hold 30 gallons of trash).

Identify the trash items you can collect

STEP 1.

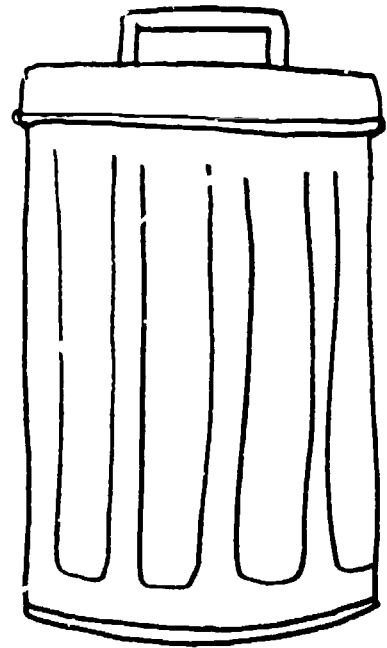
Turn to Worksheet 24a, Sanitation Worker.

STEP 2.

Circle the pictures of trash you are allowed to pick up.

STEP 3.

Check your answers with the key at the bottom of the worksheet.



Identify the trash you can collect at each stop on your route

STEP 1.

Turn to Worksheet 24b, Sanitation Worker.

STEP 2.

Circle the trash items you can pick up at each stop.

STEP 3.

Check your answers with the key on the back of the worksheet page.



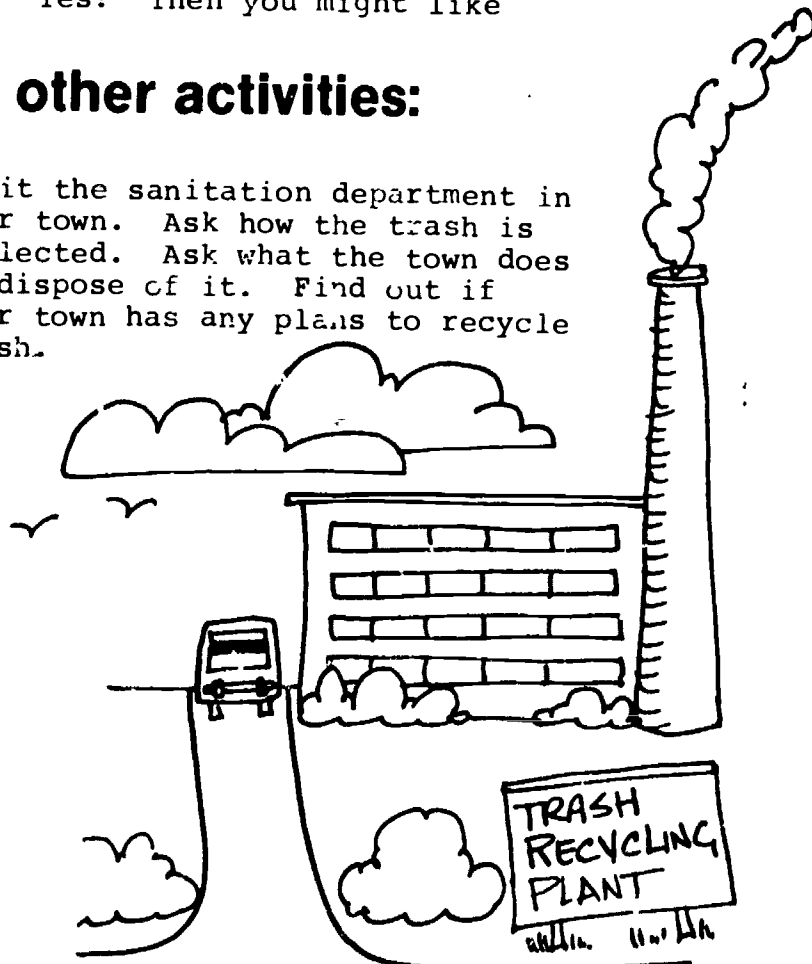
Now . . .

Turn to the Maintaining and Repairing Reaction Form in your Program Guide. Find the Sanitation Worker page. Record your feelings about your interests and abilities in this activity. Return to this page.

Did you enjoy being a sanitation worker? Yes? Then you might like

Some other activities:

1. Visit the sanitation department in your town. Ask how the trash is collected. Ask what the town does to dispose of it. Find out if your town has any plans to recycle trash.



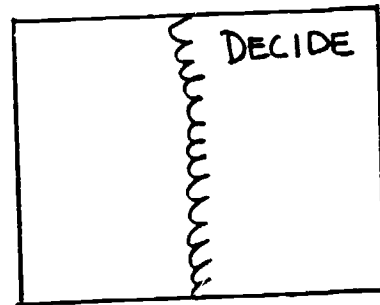
2. Go the library. Find books about how trash is handled. One very interesting book is called Garbage.

Would you like to find out more about this occupation?

yes



Turn to DECIDE 24--Sanitation Worker.

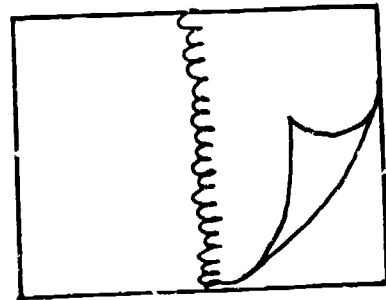


no



Turn to another Maintaining and Repairing occupation:

- Occupation 21--Auto Mechanic
- Occupation 22--Plumber
- Occupation 23--Appliance Repairer



or



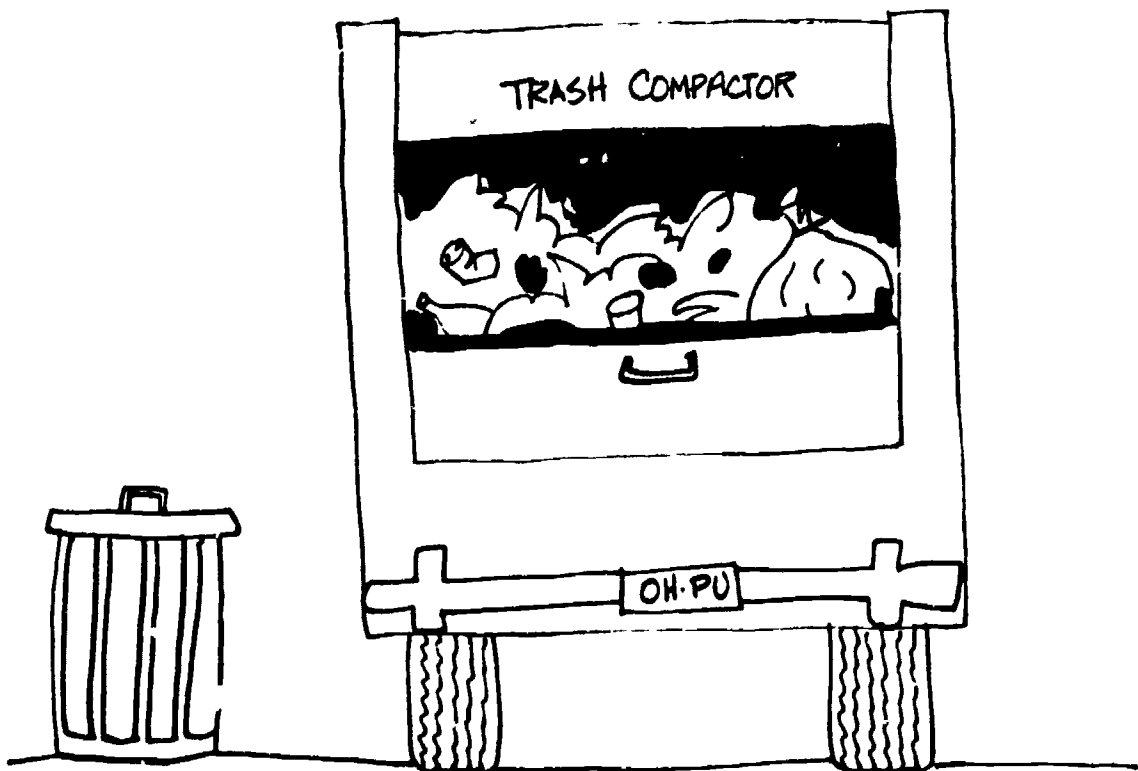
Look at the Self-Inventory Chart in your CAP Program Guide. Select another job function to investigate.



Sanitation Worker

DECIDE 24

You just finished one of the tasks a sanitation worker does each day. You used the city sanitation rules to decide what trash to collect. This is only a part of a sanitation worker's job.



The next pages will tell you more about this job. It will also answer some questions about sanitation work.

Talking with Matt Ritter, sanitation worker for the city of Lancaster . . .

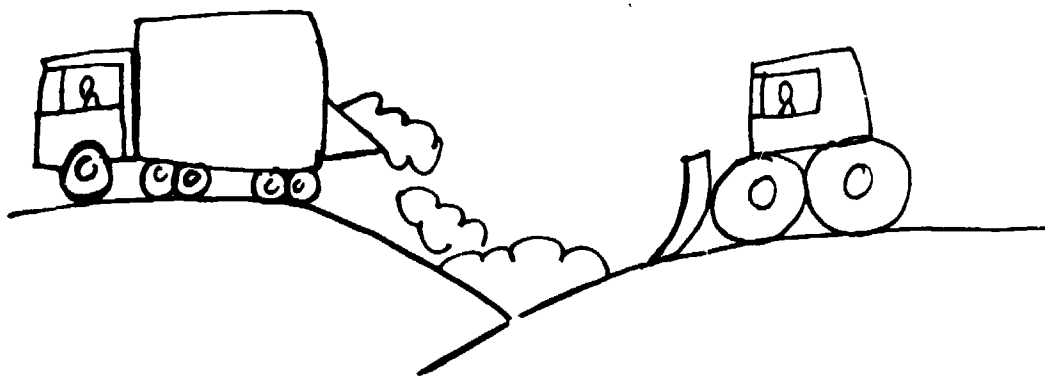
I have worked for the city of Lancaster for three years. I really like the job. I like working outdoors and being active all day.

My job is to ride on the back of the sanitation truck. At each stop, I take the trash from the cans and barrels at the curb. I load it into the back of the truck. Then the truck supervisor uses a compactor to crush the trash into a smaller space.



Many of our trucks hold as much as 16 tons of trash. We dump the trash at least three times a day. We drive to a large area outside the city. This area is called a landfill. It is owned by the city.

At the landfill we dump the trash. Bulldozers flatten it and push it into the earth. When the landfill is full, a new area will be used.



Scientists are trying to find uses for trash. Even now a lot of it is ground up and made into fertilizer. Maybe some day we will have a use for all the trash--then we will not need landfills.

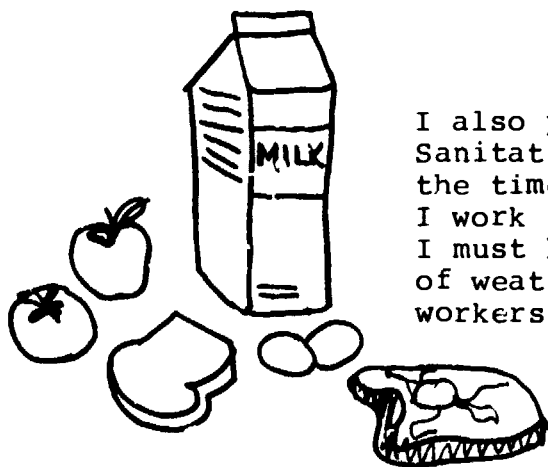
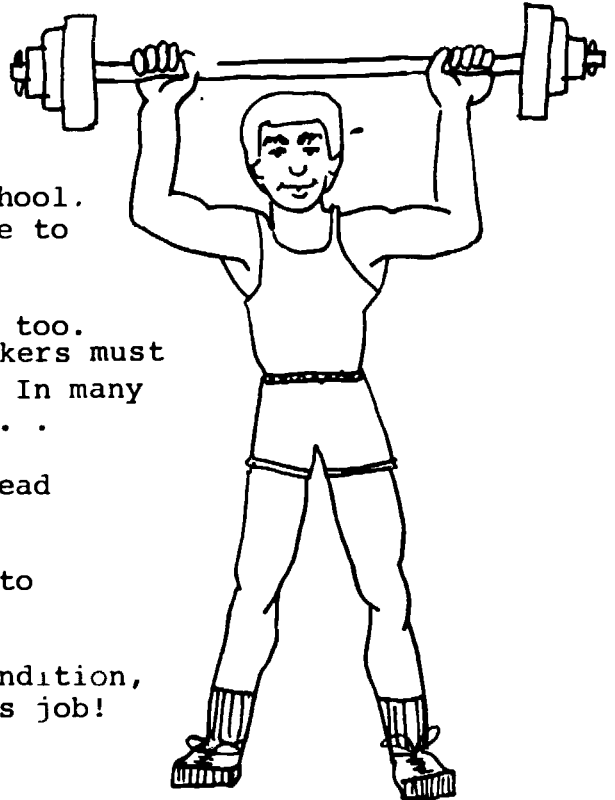
How did you prepare for your job?

First I graduated from high school. Sanitation workers must be able to read and write.

I had to pass a physical exam, too. That is because sanitation workers must be strong and in good health. In many cities, you must be able to . . .

- lift 50 pounds over your head
- carry a 50-pound weight at least 10 yards
- throw a 50-pound weight into a large bin

If your body is not in good condition, you could hurt yourself in this job!



I also practice good nutrition. Sanitation workers are outside all of the time. I work in sunshine and rain. I work in cold weather and in snow. I must be able to work in all kinds of weather and not get sick. Sanitation workers must be in good health.

Do all sanitation workers do the same things that you do?

Yes, although sanitation workers can be promoted to other jobs, such as . . .

- assistant supervisor
- supervisor
- division superintendent
- director of operations
- commissioner of sanitation

The commissioner has the highest position in the department of sanitation. He or she is often chosen by the mayor. This job is not easy to get, but it is possible.

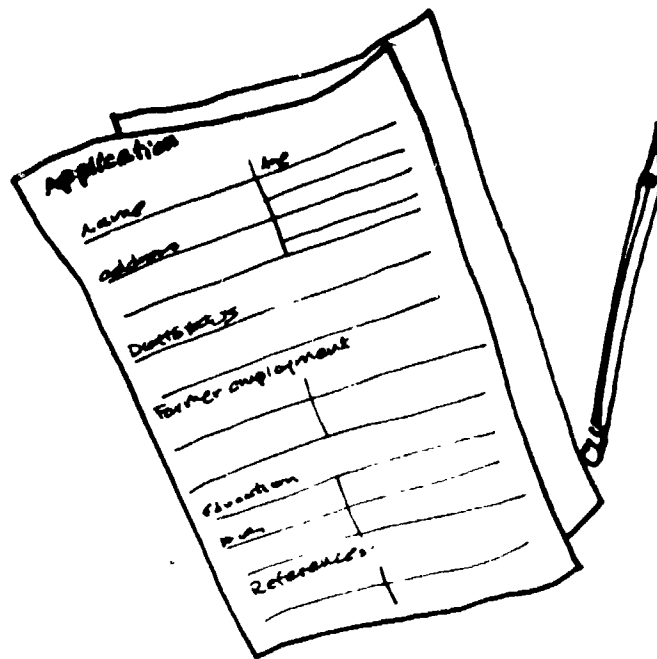
Some sanitation workers do not work for the city. They work for private companies or start their own companies. Promotions are possible in these jobs, too.



What hours do you work?

I work from 7:00 a.m. to 3:00 p.m.,
Monday through Friday.

During the summer and the Christmas
season, I am very busy. Sometimes I
must work overtime and on Saturdays.
When that happens, I am paid extra
money.



What do you like most about your job?

I feel very strong and healthy. My work
keeps me in good physical shape. I like
working in the fresh air. I know my job
is very important. I help to keep my
city clean.

What do you like least?

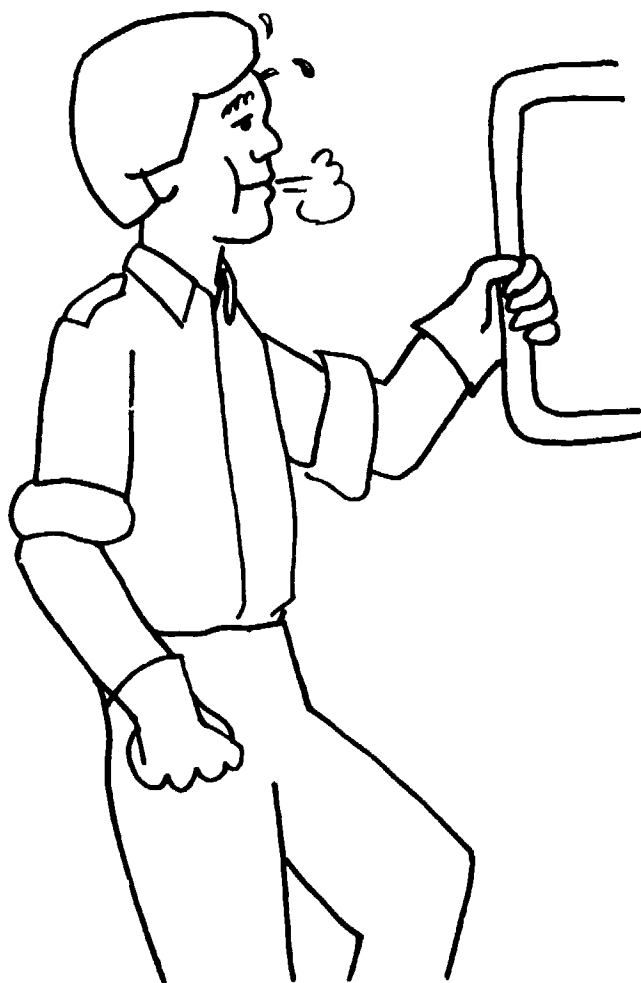
It isn't too nice when we find rotten food in the trash. The smell is not good.

Sanitation work can be dangerous, too. The compactor has very sharp blades that can cut a worker as easily as it cuts the trash! It is easy to hurt your back when you lift the heavy cans of trash. We must work very carefully to not get hurt.



How much money do you earn?

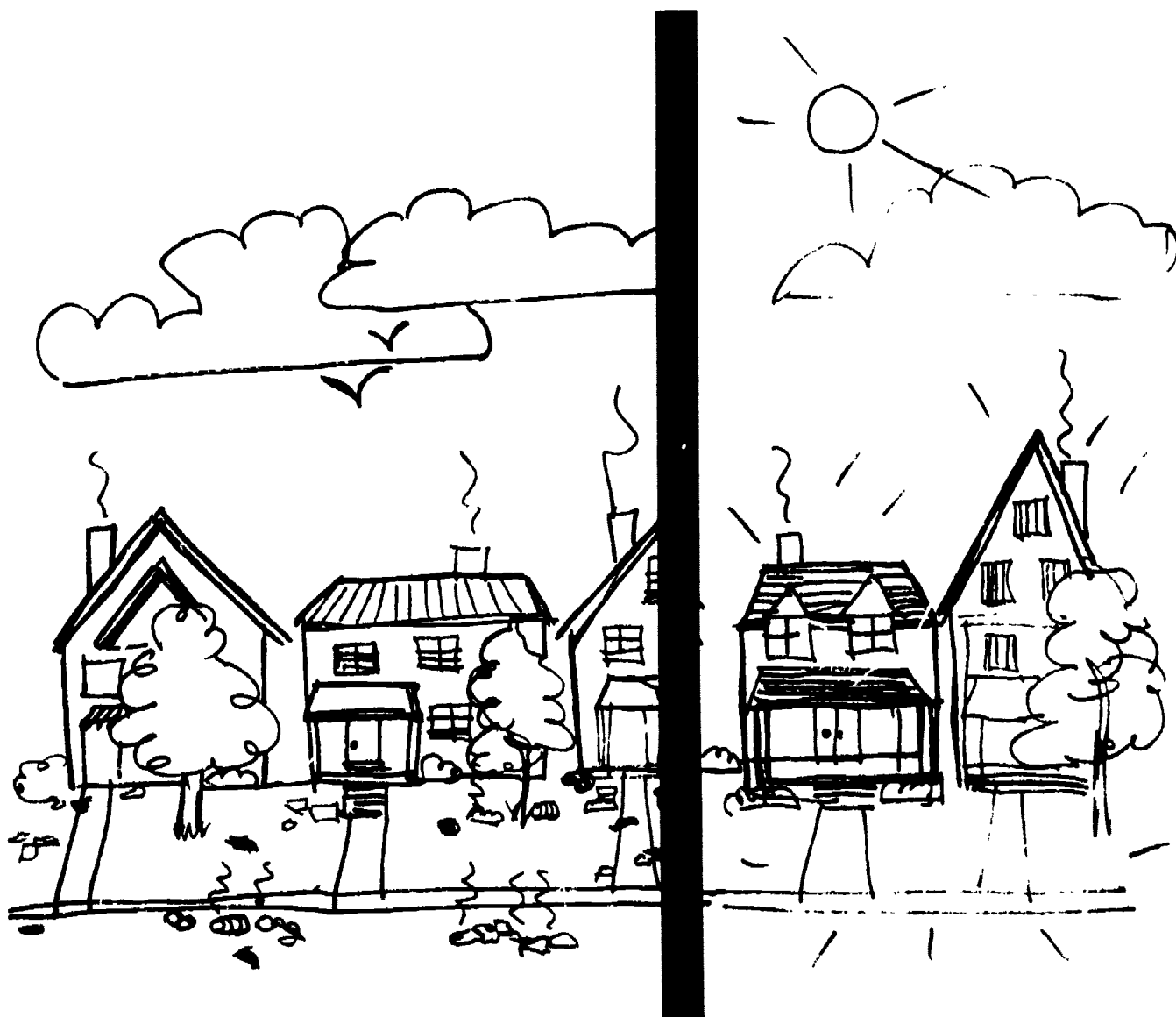
I earn \$7.41 an hour. All of the sanitation workers in Lancaster belong to a union, so our pay is higher than in some other towns. Our union is the American Federation of State, City, and Municipal Employees. The union helps us to get more money and better working conditions. Sanitation workers who do not belong to the union sometimes earn less money.



What is the employment outlook?

Good! There is continuing need for sanitation workers. They must serve our increasing population.

Today, great attention is placed on health and sanitation. This emphasis should continue in the coming years. Sanitation workers will be needed to maintain and improve the standards people expect and demand.



Do you want to learn more about this job?

You can get more education:

- Take the following courses in high school:

Math:

Sanitation workers must know how to figure out the amount of trash a garbage truck can carry.

Physical education:

Sanitation workers should know the proper ways to lift and carry heavy trash cans. They must know how to keep their bodies in good condition.

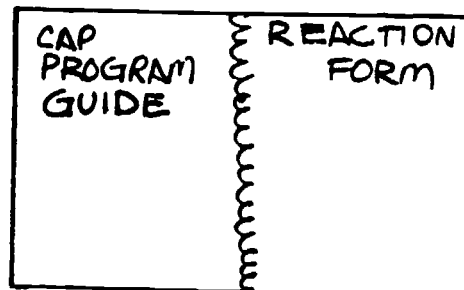
- Learn about jobs that are related to sanitation worker, such as . . .
 - waste water treatment plant operator
 - sewage plant attendant
 - incinerator operator

You can get some experience:

- Get a part-time summer job as a sanitation worker. Summer is a very busy season because the trash trucks pick up grass cuttings and tree limbs.
- Apply for a job as a sanitation worker.

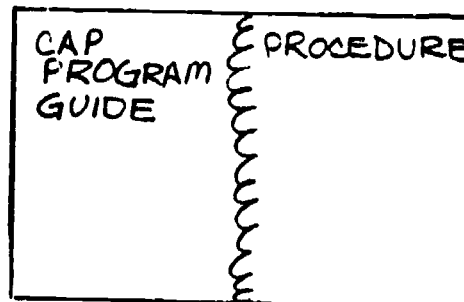
Now . . .

Turn to the Maintaining and Repairing Reaction Form in your Program Guide. Answer the questions on the back of the Sanitation Worker sheet.



What Next?

How many occupations have you investigated so far? Turn to the Procedure section of your Program Guide. Find the directions that apply to you.



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