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ABSTRACT

This booklet is intended to help mainstreamed mentally retarded, emotionally disturbed, or learning disabled high school students acquire a basic understanding of the responsibilities and working conditions of radio-TV service persons and to practice basic math skills necessary in the occupation. The first section provides a brief introduction to the occupation by focusing upon those job tasks of a radio-TV service person with which the student is likely to be familiar. The next two sections deal with the work environment of the typical radio-TV service person and the training, education, and experience needed for the occupation. Exercises addressing basic math skills used by radio-TV service persons are provided. Various suggestions are listed for students interested in further exploring the occupation of radio-TV service person. A glossary and answer sheet conclude the booklet. (KC)

MATH on the job

Radio-TV Service Person

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MATH ON THE JOB:

RADIO/TV SERVICE PERSON

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MATH on the job

Radio-TV Service Person

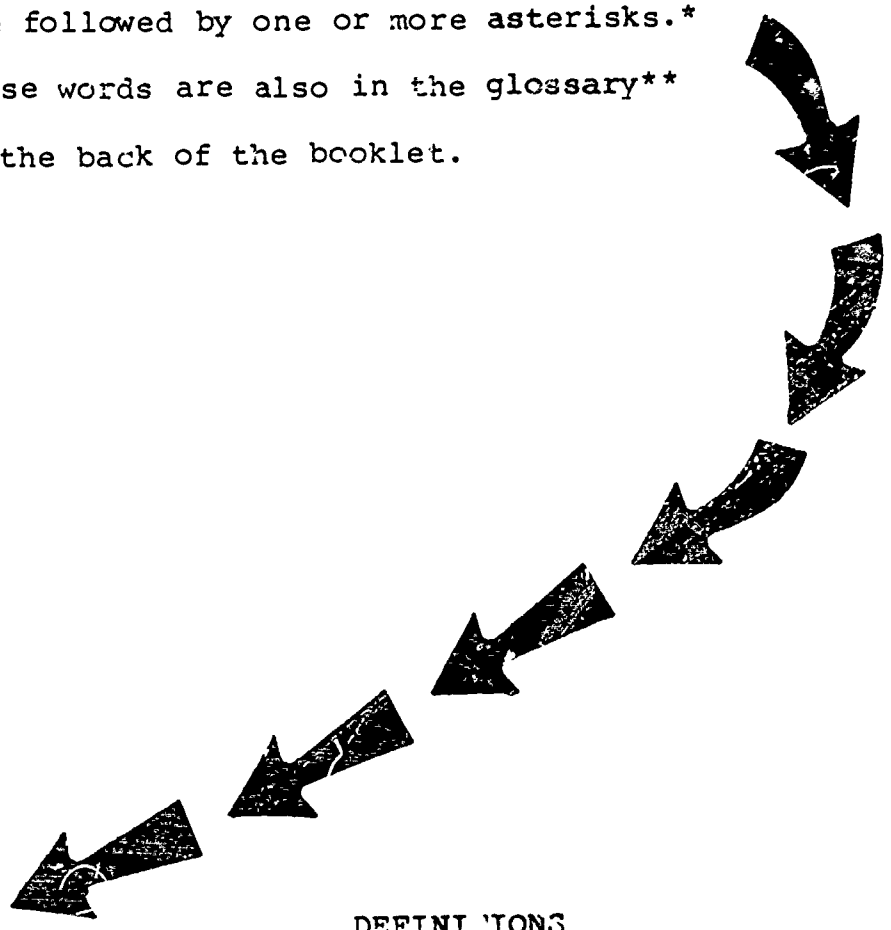
In this booklet, you can--

- find out what a radio and television service person does
- see how a radio and television service person uses math
- get a chance to use math as a radio and television service person
- find out the types of things a radio and television service person needs to know
- find out what courses, training, and experience you need to become a radio and television service person

SPECIAL WORDS USED IN THIS BOOKLET

Workers in many jobs use special words or special meanings for words. Learning these words helps you to learn about a job.

You will find some of these special words in this booklet. When these words, and some hard words, are used for the first time, they are followed by one or more asterisks.* These words are also in the glossary** at the back of the booklet.



DEFINITIONS

*An asterisk (*) is a symbol that tells you to look at the bottom of the page for the meaning, or definition, of the word.

**A glossary is a list of words with their meanings.

CONTENTS

HAVE YOU EVER...

- put together a science kit to make a radio or other piece of electronic equipment*?
- watched someone repair a television, radio, or other piece of electronic equipment?
- changed the controls on a television set to get the best picture possible?
- been involved in amateur radio**?

If you have, then you have some idea about the work of a radio and television service person. This booklet will help you learn about the work of a radio and television service person and how math is important to do the job.

DEFINITIONS

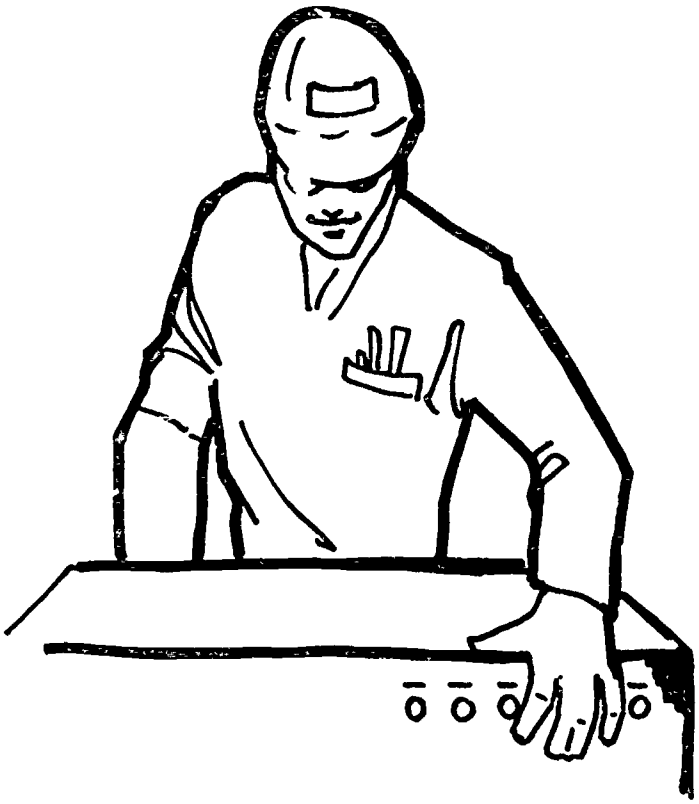
*Electronic equipment is any type of machinery which works by using electrical parts such as circuits and wiring. Examples of electronic equipment are radios, televisions, and computers.

**Amateur radio is the use of radio equipment to communicate with other people around the world.

WHAT DOES A RADIO AND TELEVISION SERVICE PERSON DO?

A radio and television service person repairs and services electronic equipment such as television sets, radios, phonographs, and tape recorders. How does a radio and television service person do this? As a radio and television service person, you--

- make service calls to homes or businesses to make repairs
- listen to customers when they explain what is wrong with their radios or televisions
- determine possible trouble areas based on what the customer told you
- do routine checks to find common causes of problems such as loose connections
- repair or replace faulty parts



Radio and television service persons use math in their work every day. As a radio and television service person, you--

- count, add, subtract, multiply, and divide
- use whole numbers, decimals, and fractions
- order replacement parts and supplies
- keep records of the work you do
- give estimates* of how much a job will cost
- figure out how much the customer owes

DEFINITION

*An estimate is a careful guess of the amount or cost of something.

A radio and television service person uses math to compare part numbers.

EXAMPLE

As a radio and television service person, you will use manufacturers' service manuals and parts lists. You will use these to find the correct part numbers to get the replacement parts.

A sample parts list is shown below. The name and description of the part is in the first column. The part number is in the second column.

Parts List

Picture Tubes	Part Number
Black/White 10"	TR3206-001
Black/White 12"	TR3207-002
Black/White 13"	TR3208-003
Black/White 15"	TR3209-004
Black/White 17"	TR3210-005
Black/White 21"	TR3211-006
Black/White 25"	TR3212-007
Color 10"	TR4206-001
Color 12"	TR4207-002
Color 13"	TR4208-003
Color 15"	TR4209-004
Color 19"	TR4210-005
Color 21"	TR4211-006
Color 25"	TR4212-007

You need a picture tube for a 13" black and white television. What is the part number? You're right if you said TR3208-003.

NOW YOU TRY IT

Practice Exercise A

Directions: Use the parts list shown on the preceding page to answer the following questions:

1. You need a picture tube for a 13" color television. What's the part number?

2. You need a picture tube for a 15" black and white television. What is the part number?

3. You need a picture tube for a 21" color television. What is the part number?

4. What is the part number for a 10" color television picture tube?

5. What is the part number for a 12" black and white picture tube?

6. A picture tube is marked with the number TR3206-001. What size television will it fit?

7. A picture tube is marked with the number TR4212-007. What size television will it fit?

8. A picture tube is marked with the number TR3210-005. What size television will it fit?

9. A picture tube is marked with the number TR4210-005. What size television will it fit?

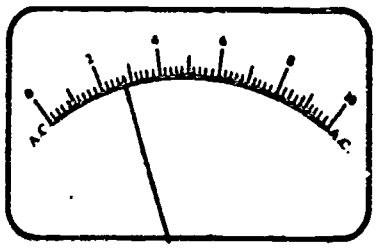
A radio and television service person uses math to read measuring instruments.

EXAMPLE

As a radio and television service person, you will use a voltmeter to determine the problem. The voltmeter tests voltages in electrical circuits.

The meter shown below has a scale divided into equal parts. There are ten large marks on this scale with each large mark representing 1 unit. There are 4 small marks between the large marks with each small mark representing .2 of a unit.

What is the reading on the voltmeter?



The needle is between 2 and 3. It is also 4 small units to the right of 2.

$$2 + (4 \times .2) = 2.8$$

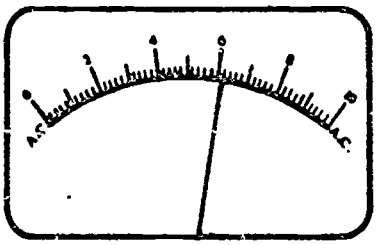
The reading is 2.8.

NOW YOU TRY IT

Practice Exercise B

What is the reading on each voltmeter?

10.



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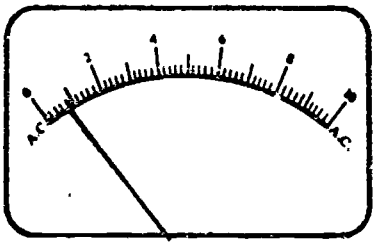

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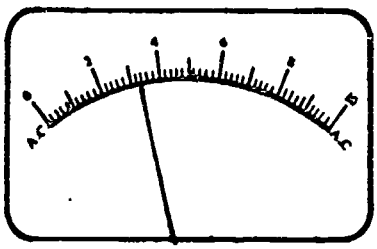

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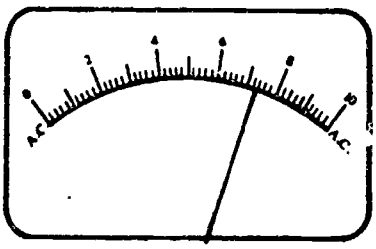

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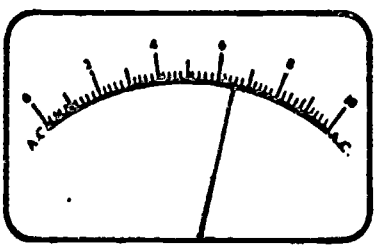

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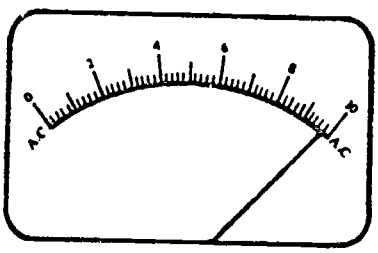


A radio and television service person uses math to determine if a meter reading is acceptable.

EXAMPLE

The measurement readings on the voltmeter do not always have to be exact. There is often an allowable difference. This allowable difference is called a tolerance and is written in the service manual. A tolerance is written as $\pm$ and measures plus or minus a specific amount. The reading is acceptable if it falls within this range.

If the desired reading is 7.4 and the allowable difference or tolerance is $\pm$ .4, what is the allowable range?

Step 1. To find the lowest acceptable reading, subtract the tolerance from the desired reading:

$$7.4 - .4 = 7.0$$

Step 2. To find the highest acceptable reading, add the tolerance to the desired reading.

$$7.4 + .4 = 7.8$$

The allowable range is from 7.0 to 7.8.

NOW YOU TRY IT

Practice Exercise C

16. The target reading is 5.0. The tolerance is $\pm$ .6. What is the allowable range?

17. The target reading is 8.8. The tolerance is $\pm$ 1.0. What is the allowable range?

18. The target reading is 9.0. The tolerance is $\pm$ .2. What is the allowable range?

19. What is the allowable range if the target reading is 6.6 and the tolerance is -.6 and +.8?

20. What is the allowable range if the target reading is 4.5 and the tolerance is -.5 and +1.0?

A radio and television service person uses math to figure out the operating costs of radio and television sets.

EXAMPLE

You may be asked to figure out the operating costs of radios and televisions. To calculate the cost, you need to know the number of watts the set uses, the number of hours the set is used, and the cost of electricity for each kilowatt hour. Let's assume a radio uses 3 watts and is played for 10 hours. Electricity costs $0.0204 for each kilowatt hour. How much does it cost to play the radio for 10 hours?

Step 1. Multiply the number of watts times the number of hours used times the cost of electricity:
3 x 10 x $0.0204 = $0.612

Step 2. Divide the result by 1,000 since the amount paid is based on each 1,000 watts used:
$0.612 : 1,000 = $0.000612

It costs less than 1¢ to play the radio for 10 hours.

↓ NOW YOU TRY IT

Practice Exercise D

21. A color television uses 24 watts of electricity, which costs $0.0204 for each kilowatt hour. How much does it cost to have the TV on for 5 hours?

22. A radio uses 100 watts of electricity, which costs $0.30 for each kilowatt hour. How much does it cost to have the radio on for 3 hours?

23. A black and white TV uses 1,250 watts. Electricity costs $0.0402 for each kilowatt hour. How much does it cost to have the TV on for 15 minutes?

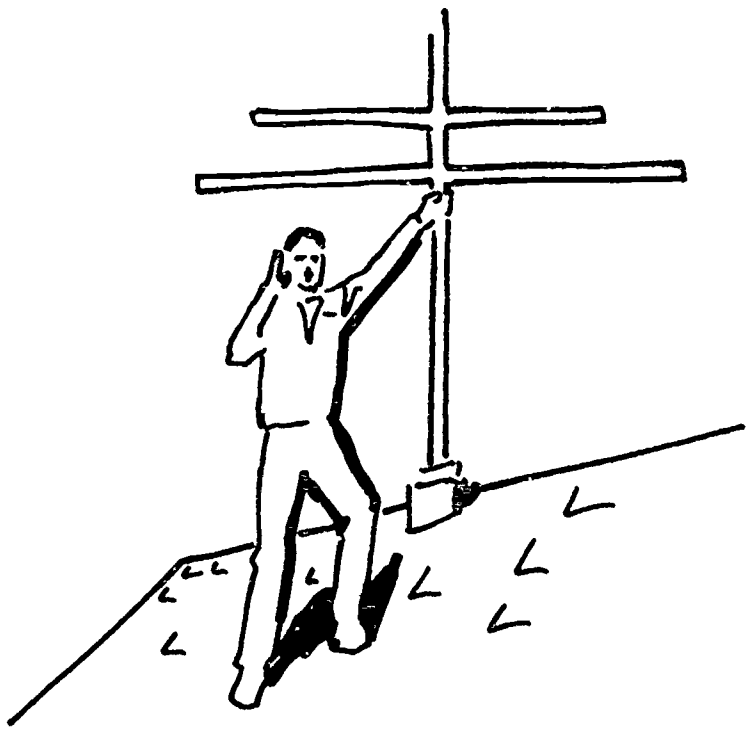
24. Your service shop has 5 televisions and 3 radios. Two televisions use 15 watts an hour. The other three televisions use 20 watts an hour. The radios use 5 watts an hour. Electricity costs $0.0204 for each kilowatt hour. How much does it cost to have everything on for 8 hours?

WHERE DOES A RADIO AND TELEVISION SERVICE PERSON WORK?

As a radio and television service person, you could be an outside worker, an inside worker, or both. An outside worker makes service calls to a customer's house. During service calls, you will do such minor repairs as--

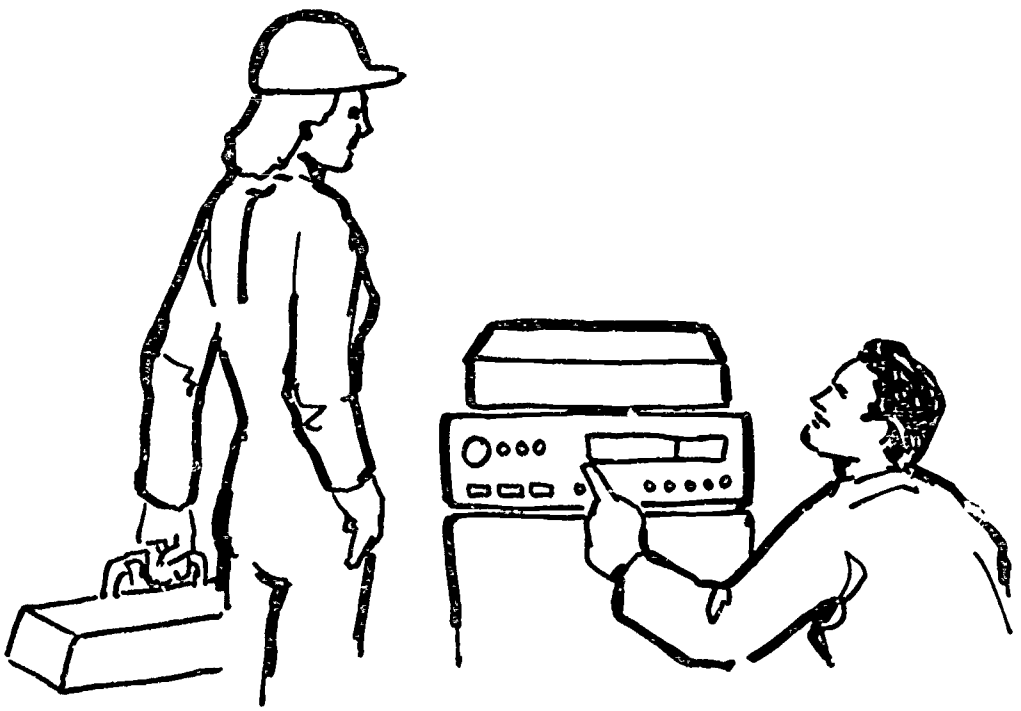
- checking tubes
- correcting color balance
- adjusting antennas

An inside worker works at a bench in a repair shop. Faulty equipment or parts are brought into the shop. An inside worker must perform more complex repairs than the outside worker.



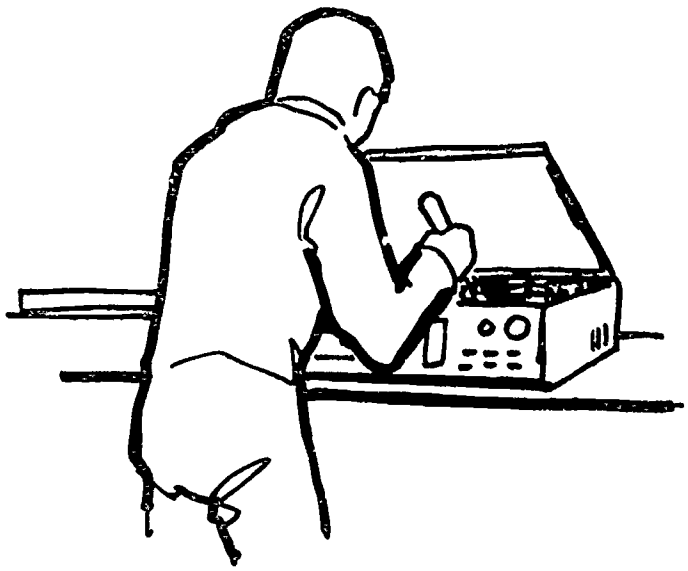
As a radio and television service person, you will work with customers. If you are an inside worker, customers will bring their broken radios or televisions to your shop. If you are an outside worker, you will visit the customers' homes. To make the needed repairs, you must--

- listen carefully to the customer's explanation of the problem
- ask the customer questions about the radio or television
- use testing equipment to find possible causes of problems
- repair or replace faulty parts



Radio and television service persons use special types of equipment to perform their work. As a radio and television service person, you use--

- socket wrenches
- soldering irons* to connect wires to other parts of the radio or television set
- various types of screwdrivers and pliers
- complicated testing equipment such as multimeters, voltmeters, and oscilloscopes



DEFINITION

*A soldering iron is a heated rod used to melt a soft metal called solder. This melted solder flows between the wires and fastens them together.

IF YOU ARE INTERESTED IN

THE WORK OF A RADIO AND TELEVISION SERVICE PERSON

AND WOULD LIKE TO KNOW MORE,

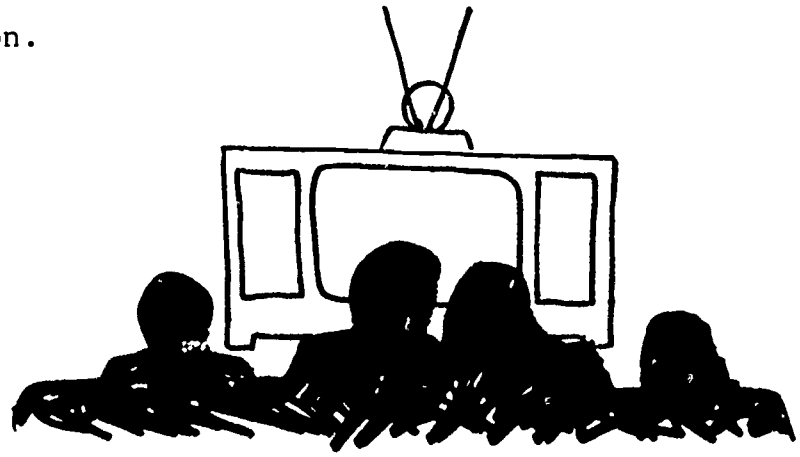
READ ON

WHAT TRAINING, EDUCATION, AND EXPERIENCE DO YOU NEED TO BECOME A RADIO AND TELEVISION SERVICE PERSON?

To be a radio and television service person, you must have a good understanding of electronics and electronic equipment. The best way to learn more about electronics is to take courses in mathematics, science, mechanical drawing, and electric shop at your high school or vocational education center.

You can also learn skills on the job. You can work as an antenna installer, delivery helper, or stockperson while being trained for the work of a radio and television service person. You will work with experienced radio and television service persons. You will probably be required to take some courses at a trade or technical school. An on-the-job training program could take from one to two years and you are paid for the work you do.

Taking every chance to learn new skills and tasks will help you do a better job. Good math skills will also help you perform your work as a radio and television service person.



DO YOU WANT TO DO MORE RADIO AND TELEVISION SERVICE PERSON'S MATH?

Practice Exercise E

Directions: A sample parts list is shown below. The name and description of the part is in the first column. The part number is in the second column. Use the parts list to answer questions 25-29.

Parts List

Picture Tubes	Part Number
Black/White 10"	TR3206-001
Black/White 12"	TR3207-002
Black/White 13"	TR3208-003
Black/White 15"	TR3209-004
Black/White 17"	TR3210-005
Black/White 21"	TR3211-006
Black/White 25"	TR3212-007
Color 10"	TR4206-001
Color 12"	TR4207-002
Color 13"	TR4208-003
Color 15"	TR4209-004
Color 19"	TR4210-005
Color 21"	TR4211-006
Color 25"	TR4212-007

25. What is the part number for a 12" color picture tube?

26. You need a picture tube for a 19" color television. What is the part number?

27. A picture tube is marked TR3212-007. What size television will it fit?

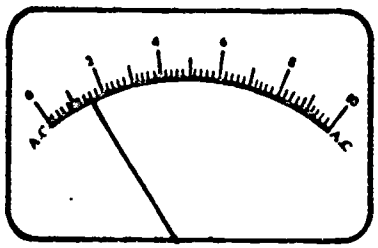
28. A picture tube is marked TR3210-006. What size television will it fit?

29. A picture tube is marked TR3212-007. What size television will it fit?

Practice Exercise F

What is the reading on each voltmeter?

30.



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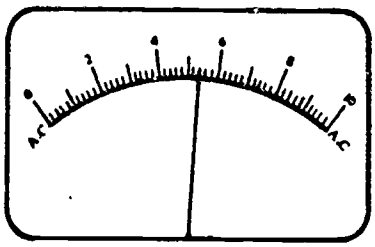

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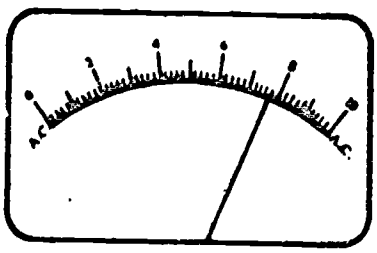

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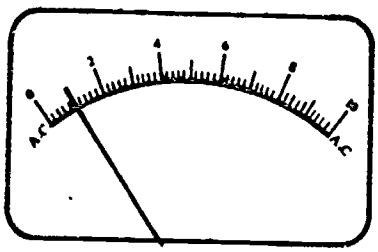

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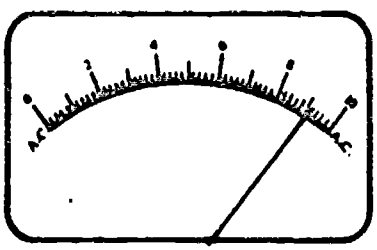

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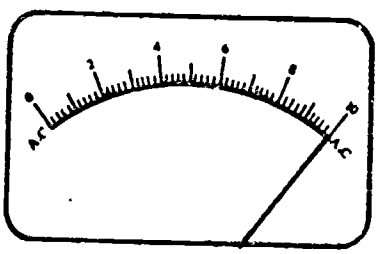

Practice Exercise G

For problems 36-42, figure out the allowable range. The target reading is given in column 1. The tolerance is given in column 2.

	Column 1 Target Reading	Column 2 Tolerance	Allowable Range
36.	6.0	$\pm$ .8	?
37.	7.4	$\pm$ 1.0	?
38.	9.4	$\pm$ .4	?
39.	3.6	- .8 and + 1.0	?
40.	1.5	- .3 and + 1.4	?
41.	8.8	- .8 and + 1.2	?
42.	9.2	- .6 and + .8	?

Practice Exercise H

For problems 43-50, figure out how much it would cost to operate the appliance. The number of watts used is in column 1. The number of hours the set is used is in column 2. The cost of electricity for each kilowatt hour is in column 3.

	Column 1 Watts	Column 2 Hours	Column 3 Cost Per Kilowatt Hour	Cost to Operate
43.	42	8	$ 0.0462	?
44.	16	12	$ 0.0839	?
45.	10	24	$ 0.0721	?
46.	26	48	$ 0.0642	?
47.	100	14	$ 0.0398	?
48.	1,250	10	$ 0.0546	?
49.	90	63	$ 0.0983	?
50.	1,500	100	$ 0.0891	?

DO YOU WANT TO EXPLORE SOME MORE?

1. Visit your school library. Ask the librarian for materials about radio and television service persons and the work they do.

2. Visit a local radio and television service shop. Ask to watch some service technicians doing their jobs. Ask them about the work of a radio and television service person. Find out how they use math in their work.

3. Find out if your school or community has an amateur radio club. If there is one, ask to talk to one or more of the members about the equipment they use and the things they do with the equipment. Does this interest you?

4. If possible, put together a radio from a kit. You can get various electronic kits at a local radio or television store. Do you like working with wires and electricity?

5. Radio and television service persons repair electronic equipment and make sure that they are running properly. Other workers who perform similar work include--

    - Appliance repairers
    - Business machine repairers
    - Computer service technicians
    - Electronic organ technicians
    - Television installers

    You must have good math skills to do these jobs well. Most of these workers add, subtract, multiply, and divide every day on the job.

GLOSSARY

Amateur radio:	the use of radio equipment to communicate with other people around the world.
Asterisk (*):	a mark that tells you to look at the bottom of the page for the meaning, or definition, of the word.
Electronic equipment:	any type of machinery which works by using electrical parts such as circuits and wiring. Examples of electronic equipment are radios, televisions, and computers.
Estimate:	a careful guess of the amount or cost of something.
Glossary:	a list of words with their meanings.
Soldering iron:	a heated rod used to melt a soft metal called solder. This melted solder flows between the wires and fastens them together.

ANSWER SHEET

Practice Exercise A

1. TR4208-003
2. TR3209-004
3. TR4211-006
4. TR4206-001
5. TR3207-002
6. 10" black and white
7. 25" color
8. 19" black and white
9. 19" color

Practice Exercise B

10. 6.2
11. .8
12. 3.4
13. 7.4
14. 6.6
15. 9.8

Practice Exercise C

16. 4.4 to 5.6
17. 7.8 to 9.8
18. 8.8 to 9.2
19. 6.0 to 9.4
20. 4.0 to 5.5

Practice Exercise D

21. $ 0.0024
22. $ 0.0092
23. $ 0.0126
24. $ 0.0065

Practice Exercise E

25. TR4207-002
26. TR4210-005
27. 19" black and white
28. 21" black and white
29. 25" black and white

Practice Exercise F

30. 1.6
31. 5.4
32. 7.8
33. 1.0
34. 9.2
35. 10.0

Practice Exercise G

36. 5.2 to 6.8
37. 6.4 to 8.4
38. 9.0 to 9.8
39. 2.8 to 4.6
40. 1.2 to 2.9
41. 8.0 to 10.0
42. 8.6 to 10.0

Practice Exercise H

43. $ 0.0155
44. $ 0.0161
45. $ 0.173
46. $ 0.0801
47. $ 0.0557
48. $ 0.5574
49. $ 0.5574
50. $13.37