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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 construction laborers 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 construction laborer with which the student is likely to be familiar. The next two sections deal with the work environment of the typical construction laborer and the training, education, and experience needed for the occupation. Exercises addressing basic math skills used by construction laborers are provided. Various suggestions are listed for students interested in further exploring the occupation of construction laborer. A glossary and answer sheet conclude the booklet. (KC)

# MATH on the job

## Construction Laborer





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MATH ON THE JOB:

CONSTRUCTION LABORER

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# MATH on the job

## Construction Laborer

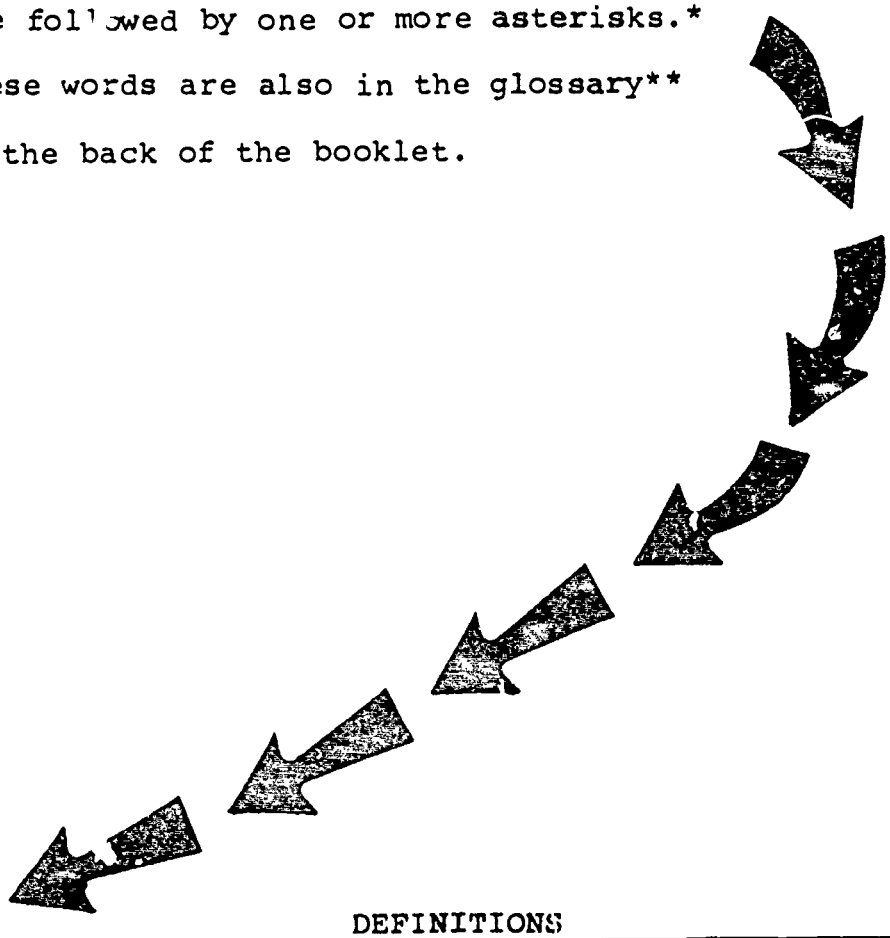
In this booklet, you can--

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

## 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.

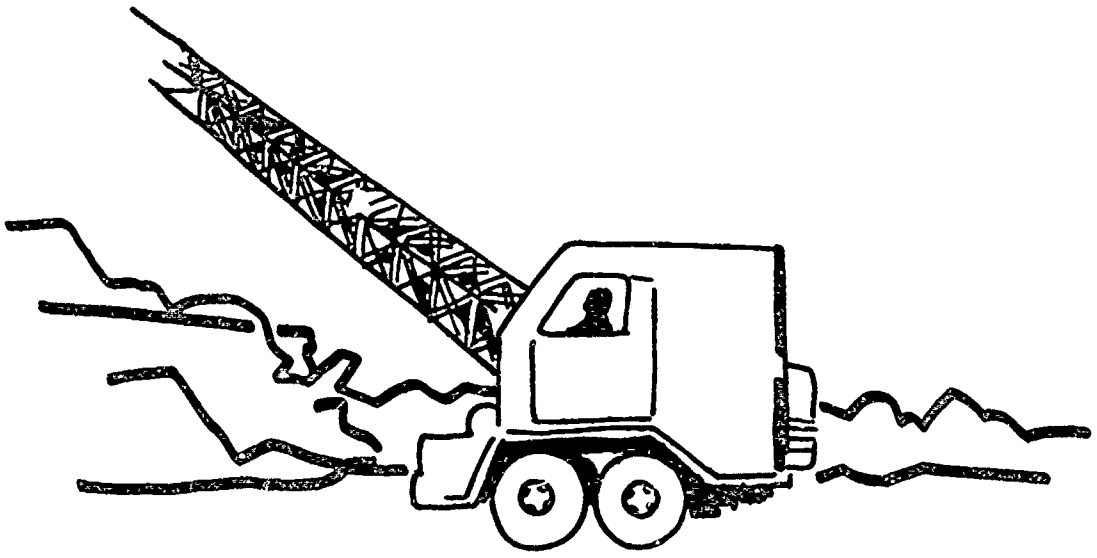
**A glossary is a list of words with their meanings.

CONTENTS

HAVE YOU EVER...

- helped someone load or unload construction materials such as lumber, bricks, or pipe?
- poured or spread concrete?
- watched construction workers tear down a building?
- swept or cleaned a room under construction?

If you have, then you have some idea about the work of a construction laborer. This booklet will help you learn about the work of construction laborers and how math is important to do the job.



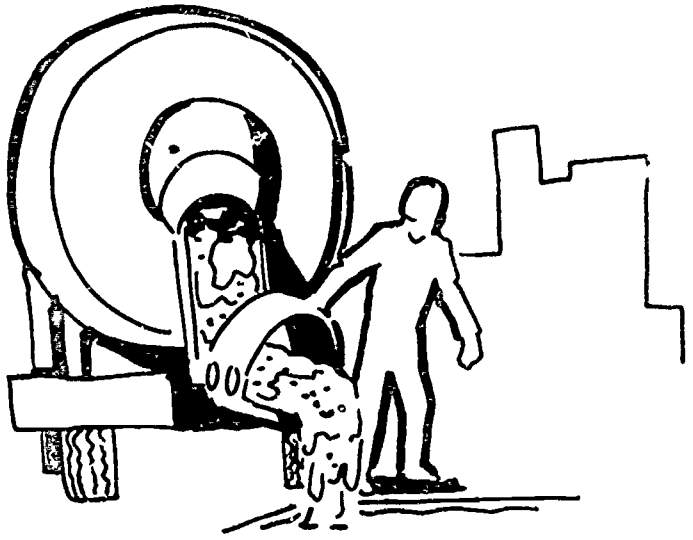
## WHAT DOES A CONSTRUCTION LABORER DO?

A construction laborer's main task is to load and unload construction materials. These construction materials are used to build such things as--

- bridges
- office and apartment buildings
- highways and streets
- railroads

As a construction laborer, you also will--

- put up and take down scaffolds* and ladders
- clean up broken concrete and rubbish
- mix, pour, and spread concrete for sidewalks, driveways, and steps
- carry materials from one part of the worksite to another

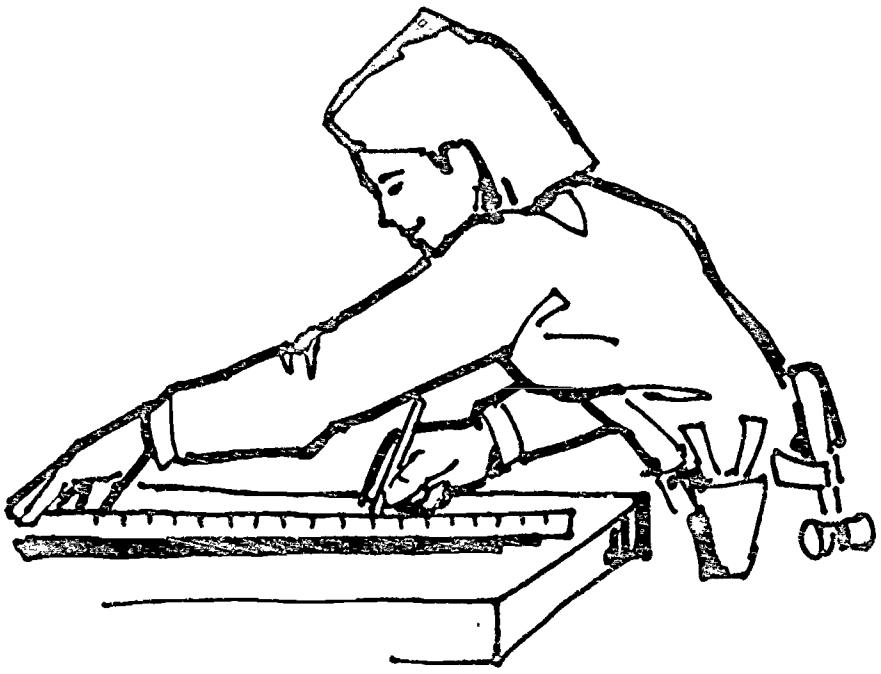


DEFINITION

*A scaffold is a temporary platform used for building.

Construction laborers use math in their work every day. As a construction laborer, you--

- count, add, subtract, multiply, and divide
- use whole numbers, decimals, and fractions
- measure and mix concrete
- estimate* the amount of materials you will need to do a job
- measure distance



DEFINITION

*To estimate is to carefully guess the cost or amount of something.

A construction laborer uses math to measure weights.

EXAMPLE

A construction laborer works with equipment such as wheelbarrows and scaffolds. Construction laborers use wheelbarrows to carry materials. They also place materials on scaffolds.

Wheelbarrows and scaffolds have what is called a maximum weight capacity. A maximum weight capacity is the most that something can carry without breaking. If a wheelbarrow has a maximum weight capacity of 300 pounds, how many 5-pound bricks can it carry? To find this amount, divide the maximum weight capacity of the wheelbarrow by the weight of one brick.

300 pounds ÷ 5 pounds = 60 bricks

The wheelbarrow can carry 60 5-pound bricks.

NOW YOU TRY IT

Practice Exercise A

1. A wheelbarrow has a maximum weight capacity of 400 pounds. A shovel full of dirt weighs 8 pounds. How many shovels full of dirt can the wheelbarrow carry?

2. A wheelbarrow has a maximum weight capacity of 630 pounds. A concrete building block weighs 37 pounds. How many concrete building blocks can the wheelbarrow carry?

3. A scaffold has a maximum weight capacity of 529 pounds. If a brick weighs 8 pounds, what is the maximum number of bricks the scaffold can hold?

4. A scaffold has a maximum weight capacity of 700 pounds. A worker standing on the scaffold weighs 179 pounds. If a pane of glass weighs 65 pounds, how many panes of glass can the worker carry on the scaffold?

5. A wheelbarrow has a maximum weight capacity of 435 pounds. A concrete building block weighs 43 pounds. If a construction laborer has 30 concrete building blocks to move, how many trips must be made?

A construction laborer uses math to figure out volumes.

EXAMPLE

A construction laborer uses concrete for such things as sidewalks, driveways, and steps. To figure out how much concrete is needed, a construction laborer must find the volume of the object being made. Suppose a sidewalk is being made that is 4 feet long, 3 feet wide, and 1 foot deep. How much concrete is needed?

To find this amount, use the formula for finding the volume of a rectangular shaped object. Volume is equal to length times width times height (or depth). This formula can also be written as V = L x W x D. In this example, the length is 4 feet, the width is 3 feet, and the depth is 1 foot.

V = 4 x 3 x 1 = 12 cubic feet

The construction laborer needs 12 cubic feet of concrete to make the sidewalk.

NOTE: Volumes are always measured in cubic units such as cubic inches, cubic feet, or cubic yards.

NOW YOU TRY IT

Practice Exercise B

For this practice exercise, all measurements will be in cubic feet. Remember: V = l x w x d

6. A construction laborer is making a sidewalk that is 9 feet long, 3 feet wide, and 1 foot deep. How much concrete does the construction laborer need?

7. How much concrete is needed to make a sidewalk 19 feet long, 6 feet wide, and 1 foot deep?

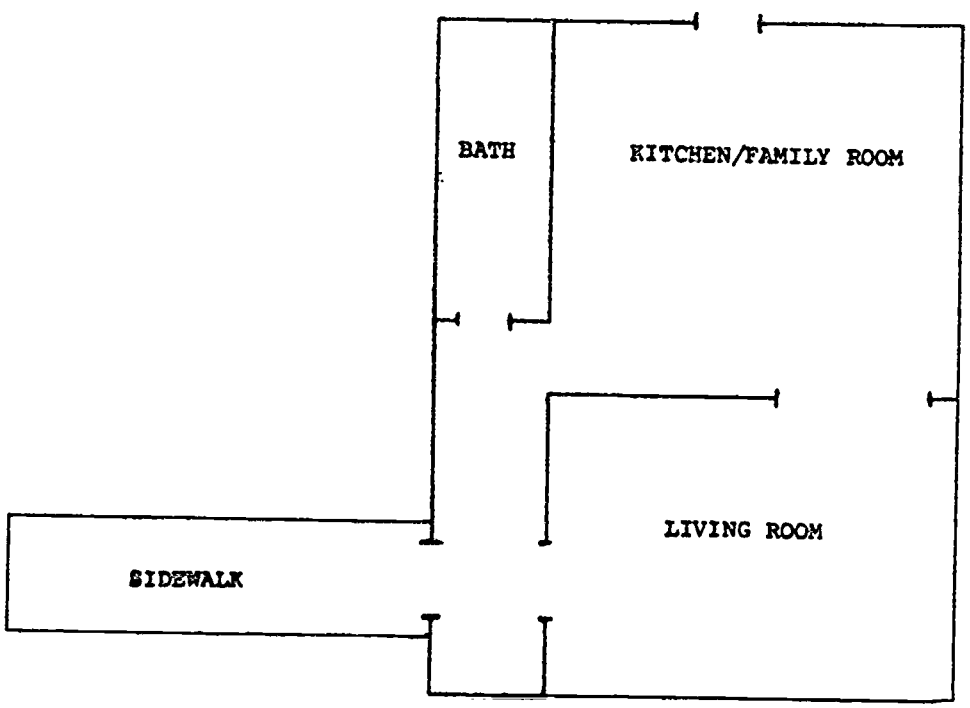
8. A construction laborer is making a driveway that is 47 feet long, 13 feet wide and 1.5 feet deep. How much concrete is needed?

9. How much concrete is needed to make a driveway 51 feet long, 9 feet wide, and 2 feet deep?

10. A construction laborer is making two identical sidewalks. Both sidewalks are 13 feet long, 3 feet wide, and 1 foot deep. How much concrete is needed to make both sidewalks?

A construction laborer uses math to read blueprints and scale drawings.

EXAMPLE




The scale of the drawing above is 1/4" = 1'. On the scale drawing, the length of the sidewalk is 3". What is the actual length?

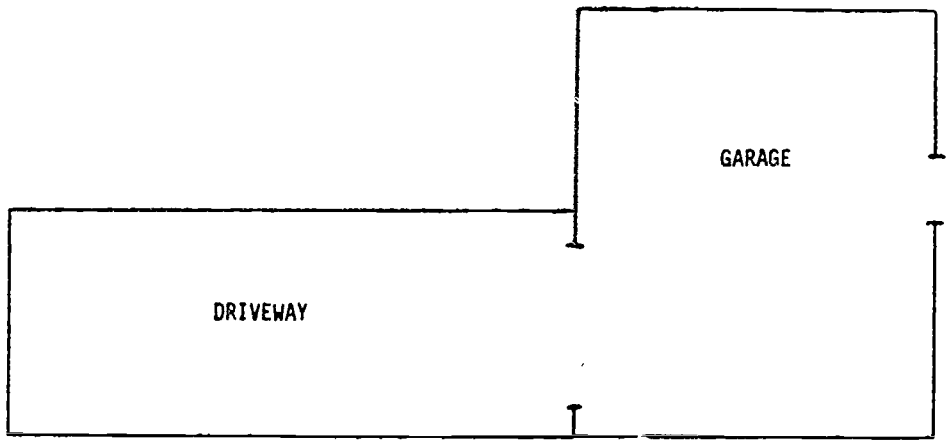
To find the actual length, change 3 to 3/1 and write the ratio

$$\frac{3}{1} : \frac{1}{4} = \frac{3}{1} \times \frac{4}{1} = \frac{12}{1}$$

The actual sidewalk is 12 feet long.

NOW YOU TRY IT

## Practice Exercise C




On the scale drawing above, the length of the driveway is 4". What is the actual length if the scale is--

11. 1/4" = 1'?

12. 1/8" = 1'?

13. 1/16" = 1'?

14. 1/4" = 2'?

15. 1/8" = 2'?

A construction laborer uses math to mix materials.

EXAMPLE

A construction laborer mixes and pours concrete. To make concrete, the construction laborer may mix 1 part (by weight) of cement, 2 parts sand, and 4 parts gravel. If a batch of concrete weighs 28 pounds, how many pounds of each ingredient were used?

Step 1: Add up the number of parts in the entire mixture: 1 + 2 + 4 = 7 parts

Step 2: Divide the total weight of the mixture by the number of parts in the mixture:

$$\frac{28 \text{ lbs.}}{7 \text{ parts}} = 4 \text{ lbs./part}$$

Step 3: Multiply the number of parts of each ingredient by the weight per part:

Cement = 1 x 4 lbs. = 4 lbs.
Sand = 2 x 4 lbs. = 8 lbs.
Gravel = 4 x 4 lbs. = 16 lbs.

A 28-pound batch of concrete requires 4 lbs. of cement, 8 lbs. of sand, and 16 lbs. of gravel.

NOW YOU TRY IT

Practice Exercise D

To make concrete, a construction laborer mixes 1 part cement, 2 parts sand, and 4 parts gravel.

16. If a batch of concrete weighs 147 pounds, how many pounds of each ingredient were used?

17. A batch of concrete weights 441 pounds. How much cement, sand, and gravel were needed?

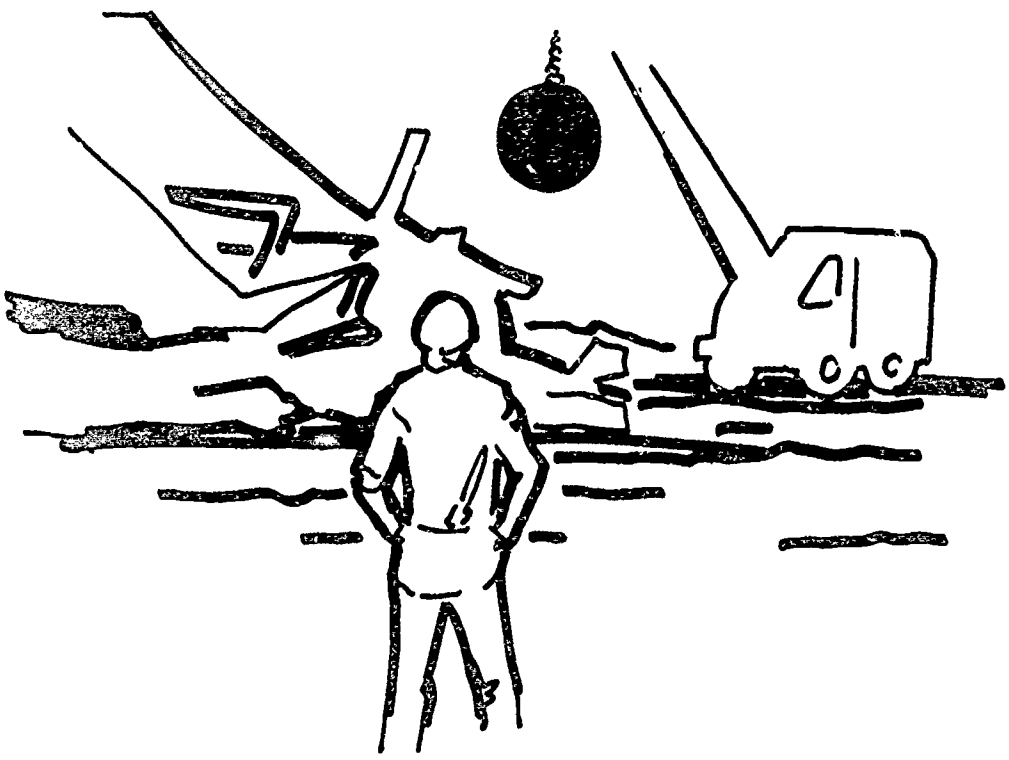
18. A batch of concrete weighs 49 pounds. How many pounds of cement, sand, and gravel were used?

19. A construction laborer used 4 pounds of sand to make a batch of concrete weighing 14 pounds. How much cement and gravel were used?

20. A construction laborer used 7 pounds of cement to make a batch of concrete. How much sand and gravel were used? How much did the batch weigh?

## WHERE DOES A CONSTRUCTION LABORER WORK?

As a construction laborer, you could work for the state or local government on public property such as bridges and highways. You also could work for a private contractor. Private contractors build apartment and office buildings as well as tear down old buildings.



As a construction laborer, you will work as a construction helper or assistant. You will help trained, or skilled, workers do their jobs. The skilled workers will tell you what to do.

Construction laborers use special types of equipment to perform their work. As a construction laborer, you use--

- hand tools such as hammers, screwdrivers, saws, wrenches, and pliers
- concrete mixers which are machines used for mixing materials such as sand, cement, gravel, and water to make concrete
- wheelbarrows to carry or move small loads from one place to another
- power saws which are run by electricity and are used to cut boards

IF YOU ARE INTERESTED IN

THE WORK OF A CONSTRUCTION LABORER

AND WOULD LIKE TO KNOW MORE,

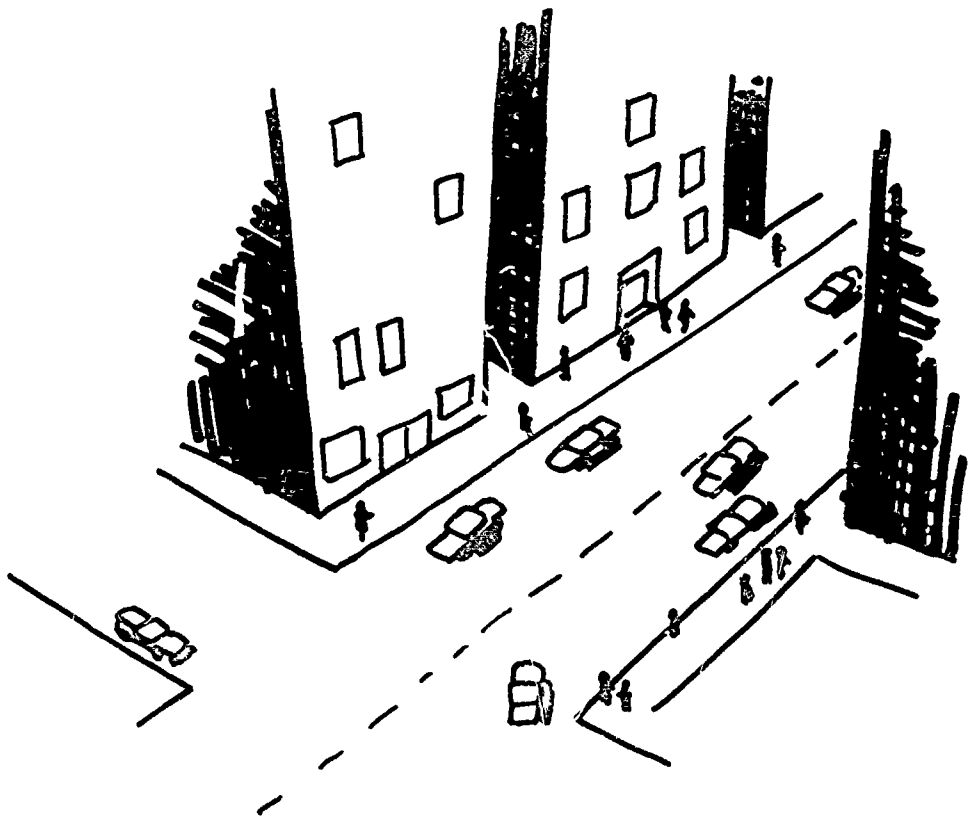
READ ON

## WHAT TRAINING, EDUCATION, AND EXPERIENCE DO YOU NEED TO BECOME A CONSTRUCTION LABORER?

What do you think? Would you like to be a construction laborer? If you would, there are some things you should know.

To get a jcb as a construction laborer, you must be familiar with many of the methods, materials, and operations used in construction work. The best way to learn these things is to take math and shop courses at your high school.

As a construction laborer, you will also learn skills on the job. You will help experienced construction laborers do their work. Experienced construction laborers will show you what to do and train you on the job.



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 construction laborer.

## DO YOU WANT TO DO MORE CONSTRUCTION LABORER'S MATH?

### Practice Exercise E

21. A wheelbarrow has a maximum weight capacity of 300 pounds. How many 6-pound bricks can the wheelbarrow carry?

22. A wheelbarrow has a maximum weight capacity of 500 pounds. A concrete building block weighs 49 pounds. What is the greatest number of blocks the wheelbarrow can carry?

23. A scaffold has a maximum weight capacity of 1,200 pounds. If a pane of glass weighs 92 pounds, what is the greatest number of panes of glass the scaffold can hold?

24. A scaffold has a maximum weight capacity of 872 pounds. A worker standing on the scaffold weighs 173 pounds. How many pounds of materials can the worker carry on the scaffold?

### Practice Exercise F

Remember: Volume is equal to length times width times depth ($V = l \times w \times d$). All answers should be in cubic feet.

25. A construction laborer is making a sidewalk that is 27 feet long, 6 feet wide, and 1 foot deep. How much concrete does the construction laborer need?

26. A construction laborer is making a patio that is 36 feet long, 36 feet wide, and 1 foot deep. How much concrete does the construction laborer need?

27. How much concrete is needed to make a driveway 72 feet long, 18 feet wide, and 2 feet deep?

28. How much concrete is needed to make a driveway 113 feet long, 36 feet wide, and 2 feet deep?

## Practice Exercise G

The chart below is a conversion chart. In the SCALE column, you are given the scale for a drawing or blueprint. In the SCALE MEASUREMENT column, you are given the actual distance measured on a scale drawing in scale measurement. Convert each scale measurement listed below to actual size.

CONVERSION CHART

| | SCALE | SCALE MEASUREMENT | ACTUAL SIZE |
|---|---|---|---|
| 29. | 1/4" = 1' | 4" | ? |
| 30. | 1/8" = 1' | 5" | ? |
| 31. | 1/16" = 1' | 3 13/16" | ? |
| 32. | 1/8" = 1' | 8 1/8" | ? |
| 33. | 1/16" = 1' | 26" | ? |
| 34. | 1/4" = 1' | 2 1/2" | ? |

## Practice Exercise H

To make concrete, a construction laborer mixes:

1 part cement
1 part sand
2 parts gravel

35. If a batch of concrete weighs 116 pounds, how many pounds of each ingredient were used?

36. A construction laborer wants to make 400 pounds of concrete. How much cement, sand, and gravel are needed?

37. A construction laborer used 49 pounds of cement to make a batch of concrete weighing 196 pounds. How much sand and gravel were used?

38. A construction laborer used 148 pounds of gravel to make a batch of concrete. How much cement and sand were used? How much did the batch weigh?

## DO YOU WANT TO EXPLORE SOME MORE?

1. Visit your school library. Ask the librarian for more information about construction laborers and the work they do.

2. Visit a construction site. Watch the construction workers at their jobs. Make a list of the different types of work being performed by the construction workers.

3. Talk to construction laborers. Ask about the work they perform. Ask the construction laborers what they like and dislike about construction work.

4. Most construction workers belong to a union. Contact a construction union representative. Find out if the union has an apprenticeship training program. Find out what is required to become an apprentice. Ask how long the training lasts and what the training includes.

5. Are you interested in other jobs in the construction field?

   - Carpenter helpers select, measure, and cut lumber to the correct length and help put up wooden structures.

   - Brick mason helpers mix mortar and keep brick masons supplied with mortar, bricks, and blocks.

   - Floor covering installers install tile, linoleum, and carpeting in homes and businesses.

   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

| | |
|---|---|
| Asterisk (*): | a mark that tells you to look at the bottom of the page for the meaning, or definition, of the word. |
| Estimate: | to carefully guess the cost or amount of something. |
| Glossary: | a list of words with their meanings. |
| Scaffold: | a temporary platform used for building. |

ANSWER SHEET

Practice Exercise A

1. 50
2. 17
3. 66
4. 8
5. 3

Practice Exercise B

6. 27 cubic feet
7. 114 cubic feet
8. 916.5 cubic feet
9. 918 cubic feet
10. 78 cubic feet

Practice Exercise C

11. 16'
12. 32'
13. 64'
14. 32'
15. 64'

Practice Exercise D

16. 21 lbs of cement;
    42 lbs. of sand;
    84 lbs. of gravel

17. 63 lbs. of cement;
    126 lbs. of sand;
    252 lbs. of gravel

18. 7 lbs. of cement;
    14 lbs. of sand;
    28 lbs. of gravel

19. 2 lbs. of cement;
    8 lbs. of gravel

20. 14 lbs. of sand;
    28 lbs. of gravel;
    49 lbs.

Practice Exercise E

21. 50
22. 10
23. 13
24. 699

Practice Exercise F

25. 162 cubic feet
26. 1296 cubic feet
27. 2592 cubic feet
28. 8136 cubic feet

Practice Exercise G

29. 16'
30. 40'
31. 61'
32. 65'
33. 416'
34. 10'

Practice Exercise H

35. 29 lbs. of cement;
    29 lbs. of sand;
    58 lbs. of gravel

36. 100 lbs. of cement;
    100 lbs. of sand;
    200 lbs. of gravel

37. 49 lbs. of sand;
    98 lbs. of gravel

38. 74 lbs. of cement;
    74 lbs. of sand;
    296 lbs.