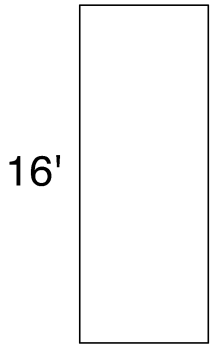
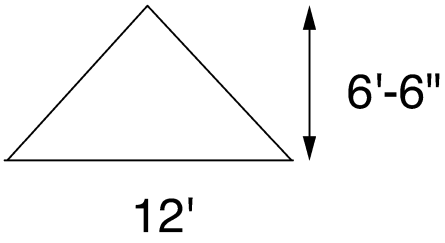
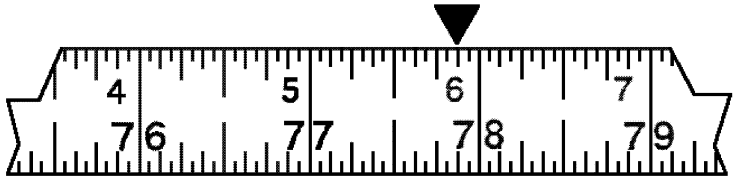
503

CONSTRUCTION MATH

FOR INSULATORS & FIRESTOP







Carpenters Training Committee for Northern California (CTCNC)

INSULATOR APPRENTICESHIP PROGRAM

Course of Instruction

(For indentures after 03/01/09)

Year	Class#	Class Title (All classes 36 hours - Four (4) Days - 7:00am - 4:30pm)
1	000	◆ Introduction to Apprenticeship, *Fall Protection, *Scaffold User Safety (C)
	503	Construction Math for Insulators and *Firestop/P
	504	Residential Blueprint Reading for Insulators, *Fork Lift, *Driver Safety Training/P
	505	Residential Insulation Installation and Weatherization/P
2	506	Commercial Blueprint Reading for Insulators, *Welded Frame-Mobile Tower Scaffolds/P
	507	Commercial & Industrial Insulation Installation, *Aerial Lift/P
	508	Energy Conservation Codes and Standards for Insulators, *Green Advantage®, CalGreen

* = Qualification or Certification requirement

◆ Required for Apprentices indentured through "exceptions"

(C) = Core Carpenter Class

/P = Taught at the Pleasanton Training Center only

503

CONSTRUCTION MATH FOR INSULATORS & FIRESTOP

Carpenters Training Committee
for Northern California

This material was produced using the following elements:
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06/25/07 Revised 5.11

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UNIT OBJECTIVES

Upon successful completion of this unit, the student will have the basic math skills needed to be effective as an installer. In addition, the student will have the math skills that are required to be successful in future units of the installer program. The student will also have a basic understanding of firestopping, including why it is necessary and how it is correctly installed.

SPECIFIC OBJECTIVES

Upon the completion of this unit the student will be able to:

1. Read a tape measure to feet, inches and fractions of an inch to the nearest sixteenth of an inch.
2. Measure selected objects accurately to the nearest sixteenth of an inch.
3. Add and subtract feet, inches and fractions of an inch.
4. Convert fractions to decimals.
5. Convert inches to decimals.
6. Convert decimal parts of an inch to fractions of an inch.
7. Convert decimal parts of a foot to inches and fractions.
8. Calculate the perimeter of various square or rectangular objects.
9. Calculate the area, in square feet, of various square, rectangular and triangular objects.
10. Use area to estimate the amount of insulation needed for a specific job.
11. Calculate the volume of square or rectangular objects in cubic feet.
12. Use volume to estimate the amount of insulation needed for a specific job.
13. Identify all the components of a firestop system and how they are used.
14. Explain the importance of firestopping and the techniques, products and systems used to firestop a building.
15. Describe the elements of fire control.
16. Identify types of penetrations and joints requiring firestopping.
17. Discuss areas and conditions requiring firestopping.

CARPENTERS TRAINING COMMITTEE

FOR NORTHERN CALIFORNIA

SEXUAL HARASSMENT & APPRENTICE CONDUCT

Sexual harassment in any form or degree by an employee or apprentice against another individual, regardless of their relationship or respective status, is strictly against the policy of the Carpenters Training Committee for Northern California and will not be tolerated. Any such action or activity shall be reported immediately to the person in charge of the training facility. The matter will be promptly investigated and appropriate action will be taken. Copies of all complaints and actions are to be forwarded to the Director of Field Operations.

Apprentices shall not use lewd and vulgar language while they are on the premises of the Carpenter s Training Center. Any such action shall be reported immediately to the person in charge of the training facility. The matter will be promptly investigated and appropriate action will be taken.

Any person violating the above policies shall be subject to disciplinary action, which may include suspension or expulsion from the training center and/or cancellation from the program.

Form 154A JB:llr
opeiu-3-afl-cio-211-3/11/99
Revised 1-31-07 sls

503 - CONCTRUCTION MATH FOR INSULATORS

➪TRAINING CENTER RULES

1. OSHA approved hard hats and safety glasses are **mandatory** at **all** training centers
2. Work clothes and work boots are to be worn to class. No tank tops, shorts or sport shoes
3. Do not bring alcohol or drugs on campus
4. Be in class on time
5. Observe specified break and lunch times
6. Park only in designated areas

➪ BOOKS & CERTAIN REQUIRED ITEMS (OTHER THAN TOOLS) MAY BE PURCHASED:

None needed.

➪ BRING THE FOLLOWING PERSONAL PROTECTIVE EQUIPMENT (PPE) AND TOOLS TO CLASS:

(It is suggested that you now begin to assemble your hand tool collection by purchasing at least one tool per week until you have collected all the tools listed in the *Carpenters Apprentice Tool List*.)

1. OSHA approved hard hat
2. OSHA approved eye protection
3. Pencil
4. Calculator w/square root function

➪ WEAR PERSONAL PROTECTIVE EQUIPMENT (PPE) AND CLOTHING YOU WEAR TO WORK:

OSHA approved hard hats and safety glasses are mandatory and are to be worn at all times in all shops and outside areas where manipulative instruction is being conducted.

Work clothes and work boots are to be worn at all times while attending class.

Tank tops or sleeveless shirts, shorts or cut-off pants, and soft topped or soft soled shoes are not permitted.

➪ WORK RECORD BOOK:

Your Work Record Book will be requested on Monday morning. Make sure your hours are correct and up-to-date! Review your book before you turn it in. If it is full, contact the office immediately to request a new one.

opeiu-3-afl-cio-211/llr 03/01/05/llr Revised 5.16.11 sls
Form #165I - 504

CARPENTERS GRADING AND EVALUATION SCHEDULE

Grading

A uniform weighing system will be used as follows:

1. Class Participation and Attitude. 10%
2. Manipulative Lessons 10%
3. All Tests Except for the Final Exam 40%
4. Final Exam 40%

Assignment of grades will be as follows:

1. 92 -100% = **A**
2. 82 - 91% = **B**
3. 73 - 81% = **C**
4. 68 - 72% = **D**
5. Less than 68% = **F**

Criteria for Evaluation

1. Accuracy
2. Completion of assignments
3. Following instructions
4. Working safely
5. Participation

Date Instructor Name

503 - CONSTRUCTION MATH FOR INSULATORS

PRE-TEST

Instructions: In the following true/false questions circle the correct answer.

1.	T	F	The area of an object is found by adding the length and the width.
2.	T	F	The term intumescent means something that expands when exposed to heat.
3.	T	F	$6'\text{-}\ 3\ ^{1}/_{2}'' + 4'\text{-}\ 2\ ^{1}/_{2}'' = 10'\text{-}5''$.
4.	T	F	The volume of an object is found by multiplying the length x width x the height.
5.	T	F	The elements needed to sustain a fire are fuel, heat and oxygen.
6.	T	F	$^{1}/_{4}''$ converts to .25″.
7.	T	F	A building that is 40′ x 50′ has an area of 20,000 square feet.
8.	T	F	$^{5}/_{8}'' - {}^{5}/_{16}'' = {}^{3}/_{8}''$.
9.	T	F	A sprinkler is an example of a fire suppression system.
10.	T	F	The perimeter of a room that is 15′-6″ by 12′ is 55 lineal feet.
11.	T	F	The volume of an object is expressed in square feet.
12.	T	F	Four bundles of insulation are needed for a wall that is 10′ high and 38′ long if the coverage of the bundles is 97 square feet per bundle.
13.	T	F	9″ converted to decimal parts of a foot is .90′.
14.	T	F	.5′ is equal to 6 inches.
15.	T	F	A membrane penetration is when there is an opening on only one side of a wall.
16.	T	F	16′- 9″ - 8′- 10″ = 8′-11″.
17.	T	F	The area of an object is expressed in cubic feet.

18.	T	F	Compartmentalization is when a building is divided into separate sections to restrict the spread of fire.
19.	T	F	Fire typically kills more people per year than all natural disasters combined.
20.	T	F	10′-3 $^{1}/_{2}$″ converts to 10.35′.
21.	T	F	3″ is equal to .25′.

Chapter 1 MEASURING

THIS CHAPTER IS PLANNED TO PROVIDE ANSWERS TO THE FOLLOWING QUESTIONS:

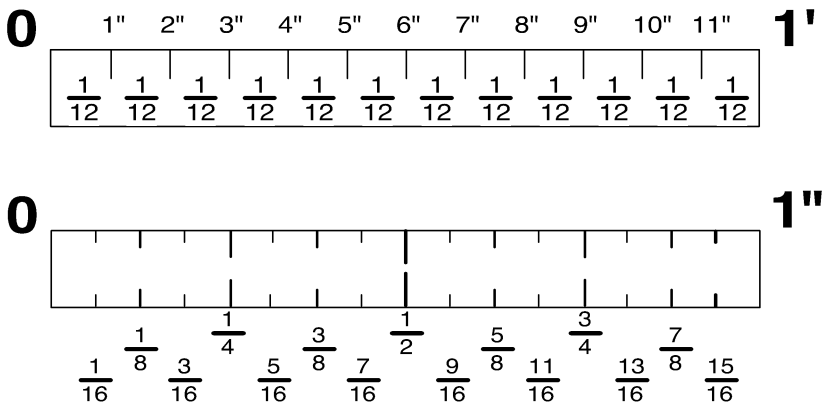
- **Why is mathematics important to the trade?**
- **What measurement system do we use?**
- **One (1) inch is what fraction of a foot?**
- **What is a lineal measurement?**

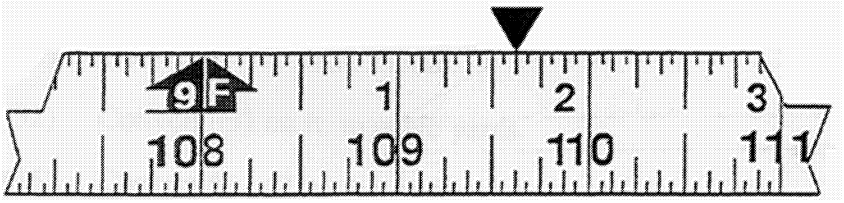
INTRODUCTION

All of the building trades involve mathematics, and the insulation trade is no different. Whether it is figuring how many bags of insulation are needed for a house or measuring and cutting pieces to fit, math is needed. In this course we will cover some of the math used by insulators so that you can be more employable and more productive for the employer. The topics include measuring, conversions, mixed numbers, perimeter, area and volume. Knowledge of these basics can make your job easier and costly errors can be eliminated. The first essential tool skill is the ability to read the tape measure.

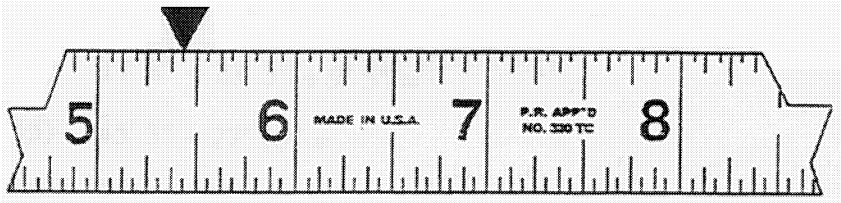
LINEAL MEASUREMENT

In order to read the tape measure effectively, we must understand the system of measurement that is used in our country. The U.S. is one of only three countries that does not use the metric system of measurement. Instead, we use what is known as the English or standard system of measurement. The metric system is based on 10 and works much like our money; pennies, dimes and dollars. Our system is based on 12 rather than 10. The basic unit of measurement is the foot and there are 12 even pieces in one foot. Each of these pieces, known as inches, is $^1/_{12}$ of a foot. In addition, each inch is divided into smaller increments, known as fractions of an inch. The most common of these fractions are halves ($^1/_2$), quarters ($^1/_4$), eighths ($^1/_8$) and sixteenths ($^1/_{16}$).

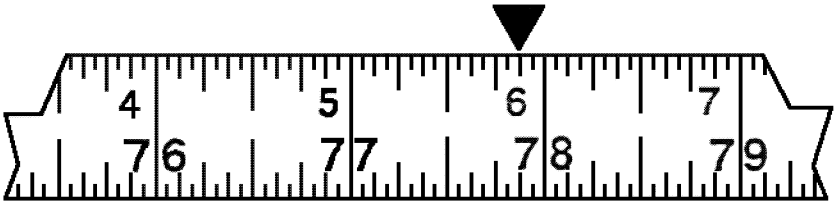




This tape reading is 9′-1 $^{5}/_{8}$″



This tape reading is 5 $^{7}/_{16}$″



This tape reading is 77 $^{7}/_{8}$″
or 6′-5 $^{7}/_{8}$″

Any measurement that is made with a tape measure is known as a lineal (line) measurement. The length of batt of R-19 or the width of a stud bay are examples of lineal measurements.

Chapter 2 MIXED NUMBERS

THIS CHAPTER IS PLANNED TO PROVIDE ANSWERS TO THE FOLLOWING QUESTIONS:

- **What are mixed numbers?**
- **How are fractions added and subtracted?**
- **How are inches added and subtracted?**
- **How are feet, inches and fractions added or subtracted from feet, inches and fractions?**

INTRODUCTION

When we measure, the dimensions take many different forms. It might be fractions, it might be inches, it might be inches and fractions or it might be feet, inches and fractions. When there is a whole number and a fraction, that is known as a mixed number. For example, 6 $^{1}/_{2}$″ is a mixed number, as is 11 $^{1}/_{4}$″. If we need to add up several measurements or subtract measurements, we need to know how to arrive at the answer and that is the goal of this chapter.

ADDING AND SUBTRACTING FRACTIONS

The key to adding and subtracting fractions is that the bottom number of each fraction must be the same. For instance, adding $^{2}/_{8} + {}^{3}/_{8}$ is easy because the bottom number (the denominator) is the same. In such a case the two top numbers are added and the 8 remains unchanged; 2 + 3 = 5 over 8 or $^{5}/_{8}$″.

Example 1

$^{2}/_{4} + {}^{1}/_{4} = {}^{3}/_{4}$. The top numbers are added, the bottom number stays the same.

Example 2

$^{1}/_{4} + {}^{1}/_{8} = ?$ Before the problem can be done, the bottom numbers need to be the same.

This can be achieved by realizing that $^{1}/_{4}$ is the same size as $^{2}/_{8}$, it has been reduced to what is known as its lowest terms. If the top and bottom numbers of a fraction can be evenly divided by a common number, this should be done until it cannot be done again. Thus, the 2 and the 8 of the $^{2}/_{8}$ can both be divided by 2, and the result is the reduced $^{1}/_{4}$. So:

$^{2}/_{8}$ ($^{1}/_{4}$) + $^{1}/_{8} = {}^{3}/_{8}$

If the top number of the fraction is an odd number (1, 3, 5, 7, 9, 11, 13 or 15) it cannot be reduced.

Remember that in construction we are only using $^{1}/_{2}$'s, $^{1}/_{4}$'s, $^{1}/_{8}$'s and $^{1}/_{16}$'s, so the number two (2) will divide into any of those.

PRACTICE

Add or subtract the fractions and give the answer in the lowest terms.

1. $^{1}/_{4} + {}^{1}/_{4} =$ _____
2. $^{1}/_{4} - {}^{1}/_{4} =$ _____
3. $^{5}/_{8} + {}^{3}/_{8} =$ _____
4. $^{5}/_{8} - {}^{3}/_{8} =$ _____
5. $^{1}/_{2} + {}^{7}/_{16} =$ _____
6. $^{1}/_{2} - {}^{7}/_{16} =$ _____
7. $^{5}/_{8} + {}^{5}/_{16} =$ _____
8. $^{5}/_{8} - {}^{5}/_{16} =$ _____
9. $^{3}/_{4} + {}^{1}/_{8} =$ _____
10. $^{3}/_{4} - {}^{1}/_{8} =$ _____

IMPROPER FRACTIONS

When the top number of a fraction is smaller than the bottom number, such as $^{1}/_{2}$, that is known as a proper fraction. When the top number of a fraction is larger than the bottom number, such as $^{5}/_{4}$, it is called an improper fraction. Improper fractions are usually written as a whole number and a fraction.

$^{5}/_{4} = 1\ ^{1}/_{4}$ since $^{4}/_{4}$ equals 1, and there is $^{1}/_{4}$ remaining.

$^{15}/_{8} = 1\ ^{7}/_{8}$ since $^{8}/_{8}$ equals 1, and there is $^{7}/_{8}$ remaining.

PRACTICE

Change the improper fractions into whole numbers and fractions reduced to their lowest terms.

1. $^{3}/_{2} =$ _____
2. $^{9}/_{8} =$ _____
3. $^{21}/_{16} =$ _____
4. $^{7}/_{4} =$ _____
5. $^{14}/_{8} =$ _____
6. $^{28}/_{16} =$ _____
7. $^{5}/_{2} =$ _____
8. $^{12}/_{4} =$ _____
9. $^{20}/_{8} =$ _____
10. $^{36}/_{16} =$ _____

ADDING AND SUBTRACTING MIXED NUMBERS

When adding or subtracting mixed numbers, begin with the fractions first, then repeat the process with the whole numbers.

ADDING

Example 1

$4\ ^{3}/_{8}'' + 2\ ^{1}/_{8}''$

First add the fractions $^{3}/_{8}'' + {}^{1}/_{8}'' = {}^{4}/_{8}''$ which reduces to $^{1}/_{2}''$.

Next add the inches $4'' + 2'' = 6''$.

Combine the $^{1}/_{2}$″ and the 6″ and the answer is 6 $^{1}/_{2}$″.

Example 2

5 $^{3}/_{4}$″ + 5 $^{3}/_{4}$″

First add the fractions $^{3}/_{4}$″ + $^{3}/_{4}$″ = $^{6}/_{4}$″ which is 1 $^{1}/_{2}$″.

Next add the inches 5″ + 5″ = 10″.

Combine the 1 $^{1}/_{2}$″ and the 10″ and the answer is 11 $^{1}/_{2}$″.

PRACTICE

Add the following mixed numbers:

1. 3 $^{1}/_{8}$″ + 7 $^{5}/_{8}$″= _____
2. 4 $^{3}/_{8}$″ + 6 $^{7}/_{8}$″ = _____
3. 2 $^{1}/_{4}$″ + 4 $^{1}/_{2}$″ = _____
4. 7 $^{5}/_{8}$″ + 3 $^{1}/_{2}$″ = _____
5. 5 $^{7}/_{8}$″ + 3 $^{1}/_{8}$″ = _____

SUBTRACTING

Example 1

9 $^{15}/_{16}$″ – 4 $^{3}/_{16}$″

First subtract the fractions $^{15}/_{16}$″ – $^{3}/_{16}$″ = $^{12}/_{16}$″ which is $^{3}/_{4}$″.

Next subtract the inches 9 – 4 = 5

Combine the $^{3}/_{4}$″ and the 5 and the answer is 5 $^{3}/_{4}$″.

Example 2

10 $^{1}/_{4}$″ – 4 $^{3}/_{4}$″

First subtract the fractions $^{1}/_{4}$″ – $^{3}/_{4}$″ . This does not work, therefore borrow 1″ ($^{4}/_{4}$) from the 10″ (which is now 9″) and add it to the $^{1}/_{4}$″ . This gives an improper fraction of $^{5}/_{4}$″. $^{5}/_{4}$″ – $^{3}/_{4}$″ = $^{1}/_{2}$″.

Next subtract the inches 9″ – 4″ = 5″

Combine the $^{1}/_{2}$″ and the 5″ and the answer is 5 $^{1}/_{2}$″.

PRACTICE

Subtract the following mixed numbers:

1. 10 $^{7}/_{16}$″ – 4 $^{5}/_{16}$″ = _____
2. 8 $^{1}/_{16}$″ – 4 $^{9}/_{16}$″ = _____
3. 9 $^{7}/_{8}$″ –1 $^{3}/_{4}$″ = _____
4. 11 $^{1}/_{8}$″ – 9 $^{5}/_{16}$″ = _____
5. 4 $^{1}/_{4}$″ – 3 $^{7}/_{8}$″ = _____

ADDING AND SUBTRACTING FEET AND INCHES

Example 1

2′-3″ + 4′-11″

Add the inches first. 3″ + 11″ = 14″ this is equal to 1′- 2″.

Next add the feet. 2′ + 4′ = 6′

Combine the 1′- 2″ and the 6′ and the answer is 7′-2″.

Example 2

8′- 4″ – 4′-10″

First subtract the inches 4″ –10″. This does not work, therefore borrow 1′ (12″) from the 8′ (which is now 7′) and add it to the 4″. This creates 16″ and now the problem can be done. 16″ – 10″ = 6″

Next subtract the feet 7′ – 4′ = 3′.

Combine the 6″ and the 3′ and the answer is 3′-6″.

PRACTICE

1. 7′-1″ + 2′-10″ = _____
2. 9′-10″ – 4′-8″ = _____
3. 6′-8″ + 8′-6″ = _____
4. 10′-4″ – 7′-7″ = _____
5. 4′-11 $^{1}/_{8}$″ + 5′-3 $^{5}/_{8}$″ = _____
6. 8′ - 2$^{3}/_{4}$″ – 4′ - 7 $^{1}/_{4}$″ = _____

7. You make a list of all the cut pieces of insulation that will be needed to fill the gaps on a wall installation. Your list reads 2′- 3 $^{1}/_{2}$″, 7′- 8″, 5 ′- 5 $^{3}/_{4}$″ and 6′- 1″ . What is the total amount of insulation that is needed?

   _____

8. A stud bay is 18′- 7 $^{1}/_{2}$″ high. You install one piece of R-19 that is 9′- 9 $^{3}/_{4}$″ long. How long of a piece is needed to complete the bay?

   _____

9. You are insulating a floor bay that measures 26′- 4 $^{3}/_{8}$″ long. You have leftover pieces of insulation that measure 7′- 6″, 8′- 9 $^{1}/_{2}$″ and 6′- 3’ that your boss wants you to use. After installing those pieces, how long of a piece will you need to fill the rest of the bay?

   _____

Chapter 3 CONVERSIONS

THIS CHAPTER IS PLANNED TO PROVIDE ANSWERS TO THE FOLLOWING QUESTIONS:

- **How are fractions converted to decimals?**
- **How are inches converted to decimals?**
- **How are decimals converted to fractions of an inch**
- **How are decimal parts of a foot converted to inches and fractions of an inch**

INTRODUCTION

As we have seen when measuring, our system of measurement, unlike the metric system, is based on 12. As stated, the metric system uses 10 as its base and is easier to use than our system. Engineers and other designers often use a decimal system where measurements are given in feet, tenths and hundredths of a foot. Many times measurements on blueprints will be given in feet and decimals and it is then necessary to convert this to a tape measure measurement of feet, inches and fractions. The word convert simply means change, in other words, you are changing from one system to another much as you might translate one language to another. This chapter will demonstrate how to navigate from inches and fractions into decimal parts of a inch or decimal parts of a foot. Likewise, we will demonstrate how to convert from decimals to inches and fractions.

FRACTION OF AN INCH TO DECIMAL PART OF AN INCH

To convert any fraction to decimals (based on tenths and hundredths), divide (÷) the upper number by the lower number.

Examples:

To convert $^{1}/_{8}''$ to decimals, take 1÷ by 8= .125″

To convert $^{5}/_{16}''$ to decimals, take 5÷ by 16= .3125″

PRACTICE

1. $^{1}/_{2}'' =$ _____
2. $^{1}/_{4}'' =$ _____
3. $^{13}/_{16}'' =$ _____
4. $^{7}/_{8}'' =$ _____
5. $^{1}/_{16}'' =$ _____
6. $^{3}/_{4}'' =$ _____
7. $^{15}/_{16}'' =$ _____
8. $^{5}/_{8}'' =$ _____
9. $^{11}/_{16}'' =$ _____
10. $^{3}/_{8}'' =$ _____
11. $^{7}/_{16}'' =$ _____
12. $^{9}/_{16}'' =$ _____

INCHES TO DECIMAL PART OF A FOOT

To convert inches into decimal parts of a foot, divide (÷) the inches by 12, because there are 12 inches in a foot.

Examples:

To convert 6″, take 6″ ÷ 12 = 0.5′

To convert 10″, take 10″ ÷ 12 = 0. 8333′

PRACTICE

Convert each inch to decimal part of a foot (carry the answer out at least 3 places to the right of the decimal).

1. 3″ = _____
2. 8″ = _____
3. 11″ = _____
4. 4″ = _____
5. 1″ = _____
6. 12″ = _____
7. 9″ = _____
8. 2″ = _____
9. 7″ = _____
10. 5″ = _____

INCHES AND FRACTIONS OF AN INCH TO DECIMAL PART OF A FOOT

In order to convert inches and fractions of an inch to decimal part of a foot, it is necessary to do two steps. Step one is to convert the fraction (the top ÷ by the bottom). Step two is to take the converted fraction, add it to the whole inches and then divide (÷) those numbers by 12.

Example 1:

Convert $4\ ^{1}/_{2}$ ″ to decimal part of a foot.

Begin by converting the fraction

$1 \div 2 = 0.5$ ″

Next add the whole inches

+ 4″ = 4.5″

Finally divide (÷) this number by 12

4.5″ ÷ 12 = 0.375′

$4\ ^{1}/_{2}$ ″ = 0.375′

Example 2:

Convert $6\ ^{3}/_{4}$ ″ to decimal part of a foot

Begin by converting the fraction

3 ÷ 4 = 0.75″

Next add the whole inches

+ 6″ = 6.75″

Finally divide (÷) this number by 12

6.75″ ÷ 12 = 0.5625′

$6\ ^{3}/_{4}$ ″ = 0.5625′

PRACTICE

Convert inches and fractions into decimal parts of a foot (carry out your answer at least 3 places).

1. $3\ ^{1}/_{2}$ ″ = _____
2. $7\ ^{1}/_{8}$ ″ = _____
3. $10\ ^{3}/_{16}$″ = _____
4. $9\ ^{1}/_{4}$″ = _____
5. $3\ ^{5}/_{16}$″ = _____
6. $1\ ^{3}/_{8}$″ = _____
7. $5\ ^{7}/_{8}$″ = _____
8. $8\ ^{1}/_{2}$″ = _____
9. $11\ ^{5}/_{8}$″ = _____
10. $2\ ^{9}/_{16}$″ = _____

FEET, INCHES AND FRACTIONS TO FEET AND DECIMAL PARTS OF A FOOT

Feet remain the basic unit and they do not need to be converted. When doing the problem, put the feet aside and add in the feet at the conclusion.

Example1:

Convert 7′-5 $^{7}/_{8}$″ to feet and decimal parts of a foot.

7 ÷ 8 = 0.875″

+ 5″ = 5.875″

5.875″ ÷12 = 0.4895′

0.4895′ + 7’ = 7.4895’

7’-5 $^{7}/_{8}$″ = 7.4895’

Example 2:

Convert 11′-7 $^{1}/_{4}$″ to feet and decimal parts of a foot.

1 ÷ 4 = 0.25″

+ 7″ = 7.25″

7.25″ ÷ 12 = 0.604′

0.604′ + 11′ = 11.604′

11′-7 $^{1}/_{4}$″ = 11.604′

PRACTICE

Convert to feet and decimal parts of a foot.

1. 5′-7 $^{3}/_{8}$″= _____
2. 13′-10 $^{1}/_{2}$″= _____
3. 22′-3 $^{13}/_{16}$″= _____
4. 17′-11 $^{11}/_{16}$″= _____
5. 1′-5 $^{7}/_{16}$″= _____
6. 44′-6 $^{5}/_{8}$″= _____
7. 2′-1 $^{1}/_{2}$″=_____
8. 30′-0 $^{7}/_{8}$″= _____
9. 7′-7 $^{7}/_{16}$″= _____
10. 8′-9 $^{3}/_{4}$″ = _____

DECIMAL PART OF AN INCH TO FRACTION OF AN INCH

The tape measure has feet, inches and fractions on it, so if the given dimension is in decimals, it is necessary to convert the decimals to inches and fractions.

To convert decimal parts of an inch to fractions, multiply (x) the decimal times 16. This will give the number of 16ths. We use 16ths because that is the smallest measurement that is used on the jobsite.

Example 1:

Convert .375″ into fractions of an inch.

.375″ x 16 = 6 This means that there are 6 16ths in .375″

$^{6}/_{16}$ reduces to $^{3}/_{8}$″ (6÷2= 3 and 16÷2= 8)

.375″ = $^{3}/_{8}$″

Example 2:

Convert .792″ into fractions of an inch.

.792″ x 16 = 12.672 /16ths

Is 12.6 closer to 12 or 13?

Round up if the decimal is .5 or greater, round down if the decimal is less than .5.

12.672 rounds up to 13

.792″ = $^{13}/_{16}$″

PRACTICE

Convert to fractions of an inch.

1. 0.875″ = _____
2. 0.3125″= _____
3. 0.79″ = _____
4. 0.255″ = _____

5. 0.966″ = _____

6. 0.625″ = _____

7. 0.375″ = _____

8. 0.8125″ = _____

9. 0.45″= _____

10. 0.111″ = _____

DECIMAL PART OF A FOOT TO INCHES AND FRACTIONS

To convert decimal part of a foot to inches multiply (x) by 12. If there is a decimal left over, multiply (x) by 16.

Example 1:

Convert .125′ into inches and fractions of an inch

.125′ x 12 = 1.5″ This means that there is one inch in .125′, however there is .5″ left over

.5″ x 16 = 8 $^{8}/_{16}$ reduces to $^{1}/_{2}$

.125′ = 1 $^{1}/_{2}$″

If there are feet in the question, simply do the decimal conversion part of the problem and then add in the feet 7.125′ = 7 ′-1 $^{1}/_{2}$″

Example 2:

Convert 12.87′ to feet, inches and fractions of an inch.

Set aside the 12′

.87′ x 12 = 10.44″ The 10 is the number of inches in .87′

.44 x 16 = 7.04 16ths—round this down to $^{7}/_{16}$

12.87′ = 12′-10 $^{7}/_{16}$″

PRACTICE

Convert to inches and, if needed, fractions of an inch.

1. .46′ = _____

2. .75′= _____

3. .574′= _____

4. .88′= _____

5. 9.90′= _____

6. 1.57′= _____

7. 33.12′= _____

8. 11.65′= _____

9. 16.8′= _____

10. 9.53′= _____

11. 22.25′= _____

12. 54.5′= _____

Chapter 4 PERIMETER

THIS CHAPTER IS PLANNED TO PROVIDE ANSWERS TO THE FOLLOWING QUESTIONS:

- **What is perimeter?**
- **How is perimeter calculated?**

INTRODUCTION

The perimeter is the distance around the edge of any flat object. It is used extensively in construction by estimators to calculate the amounts of material needed for some tasks. Insulators may need to know the length of a foundation in order to install foam board insulation on the foundation wall. It is also, along with the height of the walls, a part of figuring the area needed to be insulated.

To figure the perimeter of a rectangle or a square, add together all of the sides. This is a lineal measurement.

Example 1

To find the perimeter of this rectangle, add all the sides together: 14′ + 14′ + 22′+ 22′ = 72′

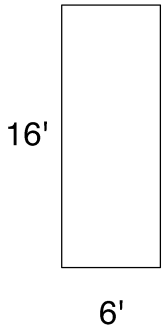
Example 2

To find the perimeter of this rectangle, add all the sides together: 4′-6″ + 4′-6″+ 18′ + 18′ = 45′

PRACTICE

Find the perimeter of these objects:

1.



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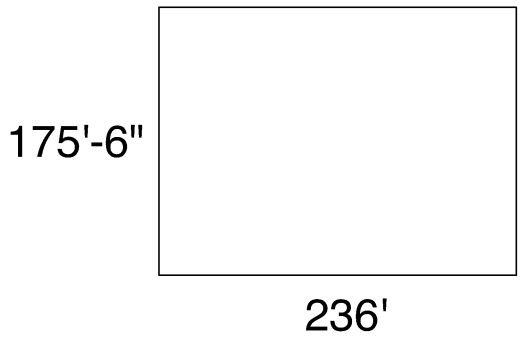

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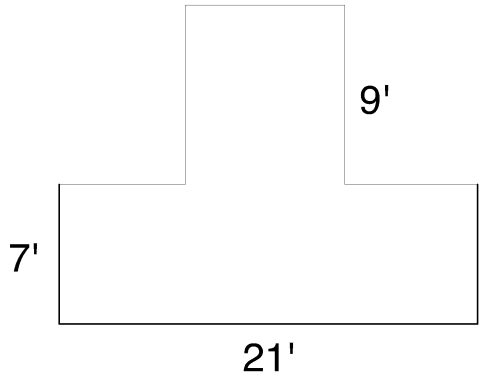

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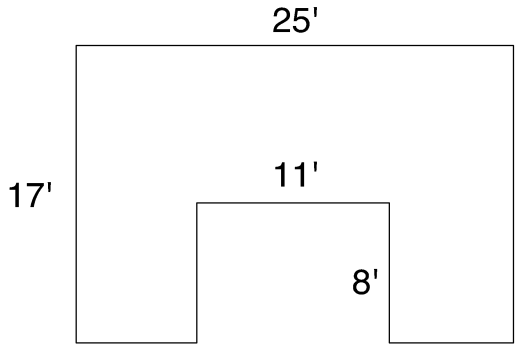
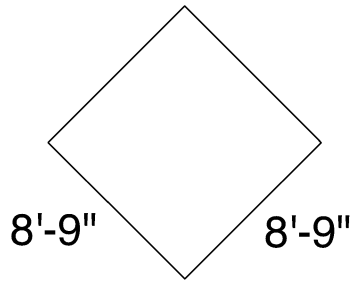


5.



6. A building is 56′ long and 36′ wide. How many pieces would be needed to insulate the outside foundation wall with 8′ long pieces of board insulation?

Chapter 5 AREA

THIS CHAPTER IS PLANNED TO PROVIDE ANSWERS TO THE FOLLOWING QUESTIONS:

- **What is area?**
- **How is area calculated?**
- **What are square units?**
- **How is area useful to insulators?**

INTRODUCTION

In the last chapter we figured the outside or perimeter of objects. Area tells us how much flat or surface space there is inside of the object. For rectangles and squares the area is found by multiplying (x) one side times the other side (length x width). The answer will be expressed in square units such as square feet, square yards or square inches.

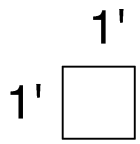
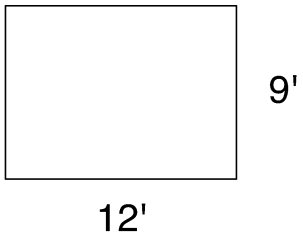


Fig. 5-1 One square foot

Area is used constantly in building. Houses are figured on a square footage basis. A carpenter would use area to figure out how many sheets of plywood are needed to cover a roof, how many pieces of drywall are needed to cover a wall or how much flooring is needed in a room. The insulator calculates the amount of rolls or batts by the square footage for the bundle.

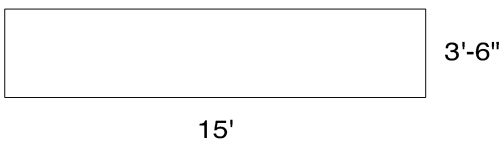
When calculating area, your answer will be in whole units and decimal parts of a unit. The decimal part of the answer does not get converted.

Example 1



9′ x 12′ = 108 square feet (or ft ^{2})

Example 2

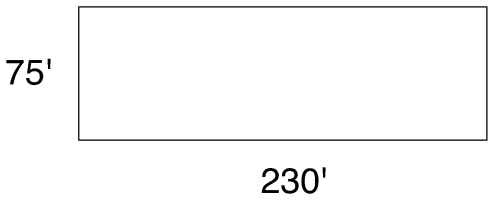


3.5′ x 15′ = 52.5 square feet

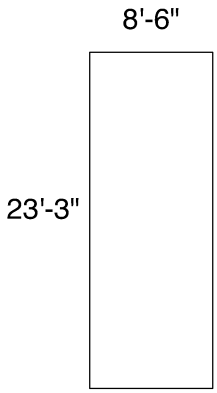
PRACTICE

Find the area of the following in square feet:

1.



2.



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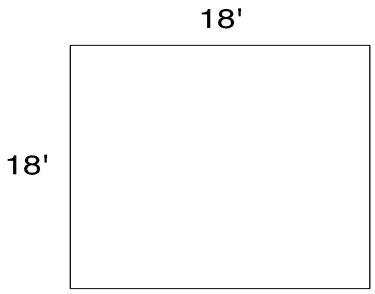

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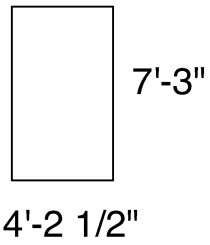
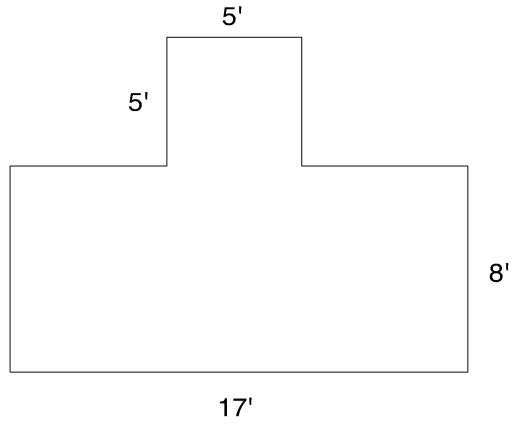


When you have shapes that are several squares or rectangles connected, find the area of each piece and then add or subtract the pieces from the whole.

Example 3

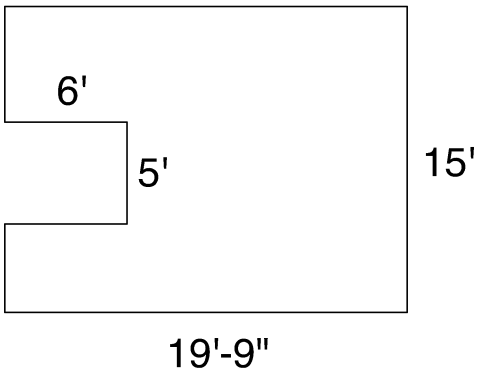
In this example, find the area of the large box, 8′ x 17′ = 136 square feet. Next find the area of the little box, 5′ x 5′ = 25 square feet. Now add the two together, 136 + 25 = 161 square feet.



PRACTICE

Find the area of the following in square feet:

5.



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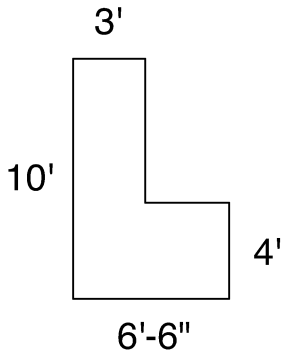

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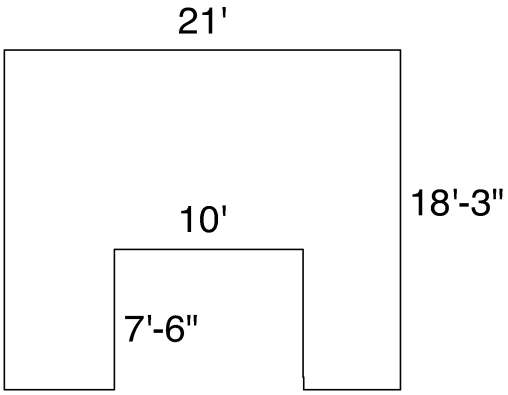

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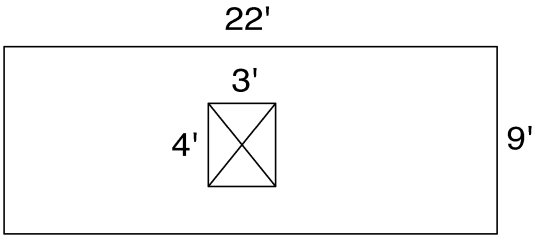
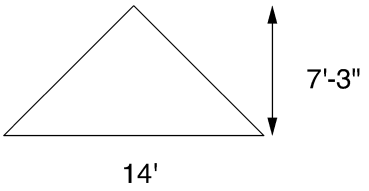


Area of a Triangle

To find the area of a triangle, whether it is a right triangle (90°) or any other type of triangle, the formula is: **A = Altitude x Base**

2

Example 4

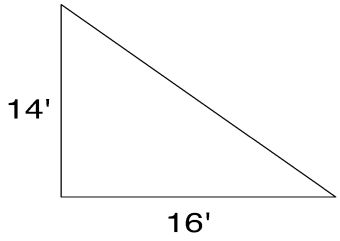


The area of this triangle is found by taking 14′ x 7.25′ = 101.5 sq. ft. Next, DIVIDE BY 2 = 50.75 sq. ft.

PRACTICE

Find the area of the following triangles in square feet:

9.



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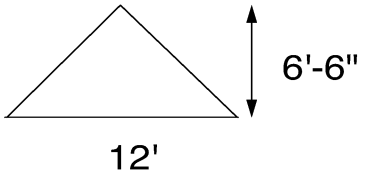

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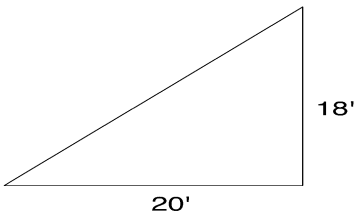
11.



_____

12.

R-11
3 1/2" x 16" x 96"
170.66 sq. ft.

This is the label on the bundles to be used under the floor of a building that measures 75′-9″ x 41′. How many bundles will be needed to insulate the floor area? (do not take off anything for the joists) Round up to the next whole bundle.

_____

13.

R-15
3 1/2" x 15 1/4" x 93"
58.13 sq. ft.

This is the label on the bundles to be used in the roof of a building that measures 37’ x 57’-6". How many bundles will be needed to insulate the roof area? (do not take off anything for the rafters) Round up to the next whole bundle.

_____

Chapter 6 VOLUME

THIS CHAPTER IS PLANNED TO PROVIDE ANSWERS TO THE FOLLOWING QUESTIONS:

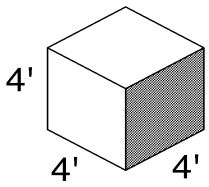
- **What is volume?**
- **How is volume calculated?**
- **What are cubic units?**
- **How is volume useful to insulators?**

INTRODUCTION

As we have learned, area is a 2 dimensional measurement that is used in construction to figure how much material it will take to cover an object. However, we often need to know how much it takes to fill up an object. In order to do this, we need to know how to calculate the volume of an object. Volume is a 3 dimensional measurement that includes the length, width and the depth of the object. The most obvious use of volume is calculating how much concrete it will take to fill up a trench or a form, but insulators use it to know how much loose fill insulation is needed for a project.

To calculate volume you multiply (x) the length times the width times the depth. Since we have already learned to figure area, you can simply multiply (x) the area of an object times the third dimension. The answer will be in cubic units such as cubic inches, cubic feet or cubic yards.

Example 1

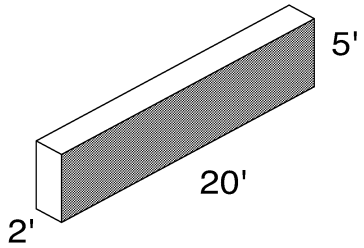


This is a 4′ cube. A cube is when the sides of a 3 dimensional object are all the same dimension. The volume of this cube is 4′ x 4′ x 4′ = 64 cubic feet. One cubic foot is a cube that is 1 foot by 1 foot by 1 foot.

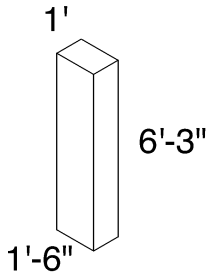
PRACTICE

Find the volume of the following shapes in cubic feet:

1.



2.



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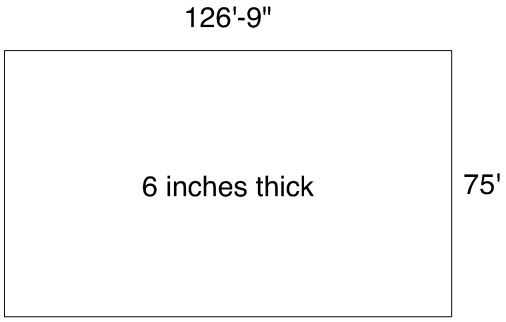
3.



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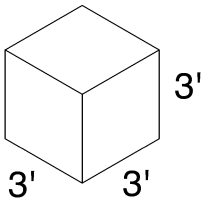

_____

Practice problem #4 is cubic yard since 3′= 1 yard. Cubic yards are the measurement commonly used to order concrete since cubic feet is too small of an amount of concrete.

5. A metal stud bay is 6″ deep, 13 ′ high and 2′ wide. How many cubic feet of space is there?

_____

6. A wooden wall is 28′ long, 8′ high and 5 $^{1}/_{2}$″ thick. How many cubic feet of loose fill are needed to insulate the wall? (Do not allow for the studs)

_____

7. A trussed floor that is 10 $^{1}/_{2}$″ thick, 43′-10″ long and 28′ wide has how many cubic feet of space to be insulated? (Do not allow for the joists)

_____

8. An attic space is 35′ x 39′. It is to be blown-in insulated at a depth of 7″ deep. How many cubic feet of insulation is needed?

_____

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