

### Lesson 3: Using Plywood to Make Shims

#### SPECIFIC OBJECTIVES

Use multiplication and division of fractions, whole numbers and mixed numbers, calculators and accurate tape measure skills to find products and quotients of materials' measurements.

By the end of this lesson you will understand...

- How to multiply fractions, whole numbers and mixed numbers on the calculator
- How to divide fractions, whole numbers and mixed numbers on the calculator
- There are at least two ways to multiply and divide fractions, whole numbers and mixed numbers

By the end of this lesson you will be able to...

- Correctly multiply fractions, whole numbers and mixed numbers on the calculator
- Correctly divide fractions, whole numbers and mixed numbers on the calculator

#### Problem Situation #1: Using plywood for shims

Sometimes you will use pieces of plywood to raise (or shim) a piece of furniture, a shed or wall. In this activity, you'll be figuring out how many of these shims you need to level a shed that is sitting on a very sloped driveway.

1. Each student, take a piece of plywood in your hand and estimate the thickness of the plywood. Share your estimate with your group and work together to decide the thickness you think the plywood is. Write the estimate below (include units!).

$$\frac{1}{4}'' \quad \frac{3}{8}'' \quad \frac{1}{2}''$$

2. Now take out your tape measure and verify that your thickness estimate is correct/close. Write down your measured value (include units) and verify that everyone in your group got the same number.

$$\frac{3}{8}''$$

3. You think that maybe 7 stacked pieces of plywood (that you have on the table) would give you the right thickness of shim for the shed. **Without using addition**, calculate the thickness of 7 stacked pieces of the plywood. Feel free to either use a calculator or your existing fractions skills. Show work or calculator keystrokes here and write your answer with units.

$$3 \square \div 8 \square \times 7 \square = 2 \frac{5}{8}''$$

4. If you finish before the others in your group, work with them until everyone in the group has finished problem #3.

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5. Now, on your own, measure the total thickness of the stack of 7 pieces of plywood. Write the measurement in the space below.

Total Measured Thickness	$2\frac{5}{8}"$
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$2\frac{9}{16}"$

6. Compare your measured thickness in #5 with that of your group mates. Does it match? If not, work together to determine the correct total measured thickness. Update your answer in #5 if necessary.
7. Compare your measured thickness in #5 with your calculated thickness in #3. Does it match? Why or why not?

Yes, it matched  
We used good math.

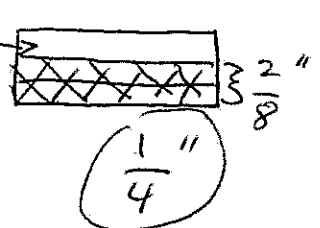
8. You are now ready to create the permanent shim for that shed. The back corner will need an  $8\frac{1}{2}$  inch thick shim. Using the same thickness of plywood as you have on your table, determine how many strips of plywood you will need to make your shim exactly  $8\frac{1}{2}$ " thick. Show work or calculator keystrokes here and include units in your answer:

$$8\frac{1}{2}" \div \frac{3}{8}" = 22.\underbrace{66667}_{\frac{2}{3}} \text{ pieces}$$

9. Were you able to use full thickness pieces of the plywood? If not, how thick does the piece of plywood need to be (that isn't full thickness) to make the shim exactly  $8\frac{1}{2}$  inches thick? Be sure to *show your work or explain* how you determined your answer.

NO.  $\frac{3}{8}" \times 22 \text{ pieces} = 8\frac{1}{4}"$

So  $8\frac{1}{2}" - 8\frac{1}{4}" = \boxed{\frac{1}{4}" \text{ thick}}$



10. Challenge: If you were going to make an  $8\frac{1}{2}$ " thick shim, and you could use any thickness of plywood, what thickness and how many pieces of plywood would you use? (You may combine different thicknesses of plywood for you shim, but you may only use standard thicknesses, which are  $\frac{1}{4}"$ ,  $\frac{3}{8}"$ ,  $\frac{7}{16}"$ ,  $\frac{1}{2}"$ ,  $\frac{5}{8}"$  and  $\frac{3}{4}"$ ).

$22 \rightarrow \frac{3}{8}" \ \& \ 1 \rightarrow \frac{1}{4}"$

$17 \rightarrow \frac{1}{2}"$

$8 \rightarrow \frac{3}{8}"$   
 $8 \rightarrow \frac{5}{8}"$   
 $1 \rightarrow \frac{1}{2}"$

$34 \rightarrow \frac{1}{4}"$

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#### Problem Situation #2: Mastering Fractions on the Construction Master Calculator

Work with your group on the problems below to figure out how to calculate them in your calculator. Write down the buttons you pressed on your calculator to get your answers and make sure your entire group has the same answer for each question.

Fill in the empty boxes for the calculator key strokes and the answer for each fraction problem in the table below:

Fraction Problem	Calculator Key Strokes	Answer from Calculator (with units if there are any)
Example (from #8 above) $8\frac{1}{2}'' \div \frac{3}{8}''$	$8$ [Inch] $1$ [ / ] $2$ [ ÷ ] $3$ [ / ] $8$ = 8 [IN] 1 [ / ] 2 [ ÷ ] 3 [ / ] 8	22.66667
11. $4 \times 3\frac{1}{2}''$	4 [ x ] 3 [ INCH ] 1 [ / ] 2	14''
12. $\frac{7}{8} \times \frac{1}{2}''$		
13. $\frac{1}{2} \times 3\frac{7}{8}''$		
14. $3\frac{1}{2} \times 2\frac{7}{8}''$		
15. $\frac{7}{8}'' \div \frac{1}{4}$		
16. $12\frac{3}{8}'' \div 4\frac{1}{2}$		
17. $10'' \div 2\frac{1}{8}''$		
18. $12' \div 4''$		36

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### MAKING CONNECTIONS

Record the important mathematical ideas from the discussion

### Practice:

Calculators OK--show your work and use units!

Pg 30-32 11, 12, 16, 19, 21, 23, 27

Pg 34-35 12, 20, 21, 25