

# Lesson 3

## Changing by Multiplying

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a. (Write on the board:)  $\frac{5}{3}(\quad) = \frac{1}{4}$

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- b. What does the problem say?(Signal)  
"Five thirds times some fraction equals one fourth."

- c. You have to figure out that fraction. What do I write first? (Signal)  
"Three fifths."

(Write:)  $\frac{5}{3}\left(\frac{3}{5}\right) = \frac{1}{4}$

- d. What do I write next? (Signal)  
"Times one fourth."

(Write:)  $\frac{5}{3}\left(\frac{3}{5} \times \frac{1}{4}\right) = \frac{1}{4}$

- e. Look inside the bracket. When you multiply, what is on the top? (Signal)  
"Three."

(Write:)  $\frac{5}{3}\left(\frac{\cancel{3}^3}{5} \times \frac{1}{4}\right) = \frac{1}{4}$

- f. What is on the bottom? (Signal)  
"Twenty."

(Write:)  $\frac{5}{3}\left(\frac{\cancel{3}^3}{\cancel{5}_5} \times \frac{1}{4}\right) = \frac{1}{4}$

- g. We're done. Five thirds times some fraction equals one fourth.  
What is that fraction? (Signal)  
"Three twentieths."

## Changing by Multiplying - Proof

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a. (Write on the board:)  $\frac{2}{1}(\quad) = \frac{8}{1}$

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- b. You know the answer to this problem. Two times how many equals eight? (Signal)  
*"Four."*

- c. You know the answer has to be four.  
 Let's work the problem the new way and see if we get a fraction that is equal to four.  
 What does the problem say? (Signal)  
*"Two over one times some fraction equals eight over one."*

- d. To figure out that fraction, what do I write first? (Signal)  
*"One half."*

(Write:)  $\frac{2}{1} \left( \frac{1}{2} \right) = \frac{8}{1}$

- e. What do I write next? (Signal)  
*"Times eight over one."*

(Write:)  $\frac{2}{1} \left( \frac{1}{2} \times \frac{8}{1} \right) = \frac{8}{1}$

- f. When you multiply inside the brackets, what is on the top? (Signal)  
*"Eight."*

(Write:)  $\frac{2}{1} \left( \frac{1}{2} \times \frac{8}{1} \right) = \frac{8}{1}$

- g. What is on the bottom? (Signal)  
*"Two."*

(Write:)  $\frac{2}{1} \left( \frac{1}{2} \times \frac{8}{2} \right) = \frac{8}{1}$

- h. Two over one times some fraction equals eight over one.  
 What is that fraction? (Signal)  
*"Eight over two."*

- i. How many times bigger is the top of that fraction than the bottom? (Signal)  
*"Four."*

- j. So what number does eight over two equal? (Signal)  
*"Four."*

- k. The answer is right. We know that two times four equals eight. And that is the answer we got.

a. (Write on the board:)  $\frac{3}{1} ( \quad ) = \frac{9}{1}$

You know the answer to this problem. Three times how many equals nine? (Signal)  
*"Three."*

- b. You know the answer has to be three.  
 Let's work the problem the new way and see if we get a fraction that is equal to three.  
 What does the problem say? (Signal)  
*"Three over one times some fraction equals nine over one."*

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- c. To figure out that fraction, what do I write first? (Signal)  
*"One over three."*

(Write:)  $\frac{3}{1} \left( \frac{1}{3} \right) = \frac{9}{1}$

- d. What do I write next? (Signal)  
*"Times nine over one."*

(Write:)  $\frac{3}{1} \left( \frac{1}{3} \times \frac{9}{1} \right) = \frac{9}{1}$

- e. When you multiply inside the brackets, what is on the top? (Signal)  
*"Nine."*

(Write:)  $\frac{3}{1} \left( \frac{1}{3} \times \frac{9}{1} \right) = \frac{9}{1}$

- f. What is on the bottom? (Signal)  
*"Three."*

(Write:)  $\frac{3}{1} \left( \frac{1}{3} \times \frac{9}{1} \right) = \frac{9}{1}$

- g. Three over one times some fraction equals nine over one.  
 What is that fraction? (Signal)  
*"Nine over three."*

- h. The top of nine over three is how many times bigger than the bottom? (Signal)  
*"Three."*

- i. So what number does nine over three equal? (Signal)  
*"Three."*

- j. The answer is right. We know that three times three equals nine.  
 And that is the answer we got.

### Changing by Multiplying - Reverse

a. (Write on the board:)  $\frac{5}{2} = \left( \quad \right) \frac{1}{4}$

- b. The new way for changing numbers works both directions.  
 The arrow always shows you which way to work.  
 In this problem, you start with one fourth.  
 Read this problem by following the arrow. (Signal)  
*"One fourth times some fraction equals five halves."*  
 (Repeat until firm.)

- c. You have to figure out that fraction. What do I write first to change one fourth into one?  
 (Signal)  
*"Four over one."*

(Write:)  $\frac{5}{2} = \left( \frac{4}{1} \right) \frac{1}{4}$

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- d. What does the side with the bracket equal? (Signal)  
"One."

- e. One times what fraction equals five halves? (Signal)  
"Five halves."

(Write:)  $\frac{5}{2} = \left( \frac{5}{2} \times \frac{4}{1} \right) \frac{1}{4}$

- f. Look inside the brackets. When you multiply, what is on the top? (Signal)  
"Twenty."

(Write:)  $\frac{5}{2} = \left( \frac{20}{2} \times \frac{4}{1} \right) \frac{1}{4}$

- g. What is on the bottom? (Signal)  
"Two."

(Write:)  $\frac{5}{2} = \left( \frac{20}{2} \times \frac{4}{2} \right) \frac{1}{4}$

- h. We're done. One fourth times some fraction equals five halves.  
What is that fraction? (Signal)  
"Twenty halves."

### Changing by Multiplying

- a. Turn to Worksheet 3 . Copy this problem in Part A.

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(Write on the board:)  $\frac{4}{1} = \left( \quad \right) \frac{7}{6}$

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To tell what the problem says, start with seven sixths and follow the arrow.

What does the problem say? (Signal)

"Seven sixths times some fraction equals four over one."

(Repeat until firm.)

- b. You have to figure out the fraction. First you have to change seven sixths into one.  
Write the fraction that changes seven sixths into one. Write it next to the seven sixths. (Pause)  
How many do you have on the side with the bracket? (Signal)  
"One."
- c. One times how many equals four over one? (Signal)  
"Four over one."
- d. What are you going to write? (Signal)  
"Times four over one."
- e. Write it. (Pause)  
Multiply and figure out the fraction inside the bracket. (Pause)  
Seven sixths times some fraction equals four over one. What is that fraction? (Signal)  
"Twenty-four sevenths."

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- a. Copy this problem.

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(Write on the board:)  $\frac{1}{3} = \left( \quad \right) \frac{4}{5}$

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Read the problem. Start on four fifths and follow the arrow. (Signal)  
*"Four fifths times some fraction equals one third."*

- b. You have to figure out the fraction. First you have to change four fifths into one. Write the fraction that changes four fifths into one. Write it next to the four fifths. (Pause)  
 How many do you have on the side with the bracket? (Signal)  
*"One."*
- c. One times how many equals one third? (Signal)  
*"One third."*
- d. What are you going to write? (Signal)  
*"Times one third."*
- e. Write it. (Pause)  
 Multiply and figure out the fraction inside the brackets. (Pause)  
 Four fifths times some fraction equals one third. What is that fraction? (Signal)  
*"Five twelfths."*

- a. What does the next problem say? (Signal)  
*"Three fourths times some fraction equals two fifths."*

$$\frac{2}{5} = \left( \quad \right) \frac{3}{4}$$

- b. What do you change three fourths into first? (Signal)  
*"One."*
- c. Do it. (Pause)  
 How many do you have on the side with the brackets? (Signal)  
*"One."*
- d. What do you write next? (Signal)  
*"Times two fifths."*
- e. Do it. Then figure out the fraction in the brackets. (Pause)  
 Three fourths times some fraction equals two fifths. What is that fraction? (Signal)  
*"Eight fifteenths."*

- a. Go across. What does the next problem say? (Signal)  
*"Five over one times some fraction equals two thirds."*

$$\frac{5}{1} \left( \quad \right) = \frac{2}{3}$$

- b. What do you change five over one into first? (Signal)  
*"One."*
- c. Do it. (Pause)  
 How many do you have on the side with the brackets? (Signal)  
*"One."*

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- d. What do you write next? (Signal)  
"Times two thirds."
- e. Do it. Then figure out the fraction in the brackets. (Pause)  
Five over one times some fraction equals two thirds. What is that fraction? (Signal)  
"Two fifteenths."
- f. Finish the rest of the problems in Part A. Watch which way the arrow goes.

### Simple Ratios

- a. Touch the first problem in Part B.  
You have to find the missing numbers. To do that, you have to figure out the fraction of one. First draw the arrows. Make both arrows point to the side with the empty box. (Pause, Check)
- b. Where do you work first in that problem, on the top or the bottom? (Signal)  
"On the bottom."
- c. Follow the arrow and figure out what you multiply by. (Pause)  
What do you multiply by on the bottom? (Signal)  
"Four."
- d. Write that number in the bracket. (Pause)  
What do you write in the bracket on the top? (Signal)  
"Four."
- e. Write it. (Pause)  
What is the fraction of one that you multiply five fourths by? (Signal)  
"Four fourths."
- f. Follow the arrow and write the missing number. (Pause)  
What is the missing number? (Signal)  
"Twenty."

$$\begin{array}{r} 5 \\ \hline 4 \end{array} \quad \begin{array}{c} ( ) \\ = \\ ( ) \end{array} \quad \begin{array}{r} \square \\ \hline 16 \end{array}$$

- a. Touch the next problem. Draw the arrows. Make them point to the side with the empty box. (Pause)  
Where do you work first in that problem? (Signal)  
"On the top."
- b. Follow the arrow and figure out what you multiply by. (Pause)  
What do you multiply by on the top? (Signal)  
"Three."
- c. Write that number in the brackets. Then fill in the other bracket. (Pause)  
What is the fraction of one that you multiply seven fifths by? (Signal)  
"Three thirds."
- d. Follow the arrow and write the missing number. (Pause)  
What is the missing number? (Signal)  
"Fifteen."
- e. Work the rest of the problems in Part B. Draw the arrows so they point to the side with the empty box. Then figure out the fraction of one and fill in the empty box.

$$\begin{array}{r} 21 \\ \hline \square \end{array} \quad \begin{array}{c} ( ) \\ = \\ ( ) \end{array} \quad \begin{array}{r} 7 \\ \hline 5 \end{array}$$

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### Substitution

- a. Look at the first problem in Part C.  
What does the problem say? (Signal)  
"Five times M."  $5 \times M =$
- b. What's another way of writing five times M? (Signal)  
"Five M."
- c. Write that. (Pause)  
Go down.  
What does the next problem say? (Signal)  
"Eight times R."  $8 \times R =$
- d. What's another way of writing eight times R? (Signal)  
"Eight R."
- e. Write that. (Pause)  
What does the next problem say? (Signal)  
"Eight R."  $8R =$
- f. Think about it. What's the other way of writing eight R? (Signal)  
"Eight times R."  
(To correct:) Eight times R. That's the other way of writing it. One way is eight R.  
The other way is eight times R.
- g. Write eight times R. (Pause)  
What does the next problem say? (Signal)  
"Eighteen C."  $18C =$
- h. What's the other way of writing eighteen C? (Signal)  
"Eighteen times C."
- i. Write it. (Pause)  
Work the rest of the problems in Part C. Write each problem the other way.

### Workcheck

- a. Exchange workbooks and get ready to check the answers. (Pause)  
Put an X next to any problems that the person misses.  
(Read the entire problem with the answer.)
- b. Figure out how many problems the person missed.  
Then write the number of errors at the top of the worksheet. (Pause)  
Return the workbooks.
- c. Everybody turn to your chart. Write the number of errors on your chart.  
Then figure out how many points you get and write that on your chart. (Pause)  
Under group points, everybody gets \_\_\_\_\_ points. (Pause)  
Add up your points for today.

**Worksheet 3**

errors: \_\_\_\_\_

A.

$$\frac{2}{5} = \left( \frac{\quad}{\quad} \right) \frac{3}{4}$$

$$\frac{5}{1} \left( \frac{\quad}{\quad} \right) = \frac{2}{3}$$

$$\frac{1}{7} = \left( \frac{\quad}{\quad} \right) \frac{5}{1}$$

$$\frac{3}{7} = \left( \frac{\quad}{\quad} \right) \frac{1}{2}$$

$$\frac{2}{3} \left( \frac{\quad}{\quad} \right) = \frac{8}{1}$$

$$\frac{9}{4} \left( \frac{\quad}{\quad} \right) = \frac{4}{5}$$

B.

$$\frac{5}{4} = \frac{\quad}{16}$$

$$21 = \frac{\quad}{5}$$

$$\frac{\quad}{12} = \frac{4}{3}$$

$$\frac{3}{4} = \frac{9}{\quad}$$

$$\frac{\quad}{8} = \frac{12}{4}$$

$$\frac{6}{5} = \frac{36}{\quad}$$

$$5 \times M = \frac{3}{5} \times B = F \times D =$$

$$8 \times R = 12Y = \frac{7}{9}T =$$

$$8R = CB = 3R =$$

$$18C = \frac{7}{6} \times F = 5 \times B =$$