

grade 6 MATH
COURSEBOOK
SAMPLE



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INDEPENDENT LEARNING SINCE 1975

Grade 6 Math

Oak Meadow Coursebook

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Grade 6



Multiplying Fractions and Mixed Numbers

Mental Math

Version 1: Put a pile of pennies, nickels, dimes, and quarters into a bag. Without looking, reach in and grab a handful. Add up the total amount. Remember this number. Drop the coins back in the bag and grab another handful. Add this amount and then add it to your first number. Do this a few times.

Version 2: Using the bag of coins, reach in and grab a handful. Add them up. If the total is less than one dollar, figure out how much more money you would need to make one dollar. What are the possible coin combinations that would amount to this total? If the total is more than one dollar, figure out how much more money you would need to make five dollars. What combination of bills and coins would you need? Do this a couple of times.

Skills Check

Complete the following worksheet to practice some of the skills you have learned.

- Lesson 7 Skills Check

New Skills

Multiplying Simple Fractions

So far we've been adding and subtracting fractions, but sometimes we need to multiply and divide fractions. To multiply simple fractions, you just multiply the numerators to get a new numerator, then multiply the denominators to get a new denominator.

Example: $\frac{3}{5} \times \frac{2}{3}$

ASSIGNMENT SUMMARY

- Play mental math games.
- Complete the Skills Check worksheet.
- Read New Skills instruction.
- Complete New Skills Practice.
- Complete Lesson 7 Test and Learning Checklist.

Lesson 7

(continued)

Say to yourself, “3 times 2 is 6,” and write that as the numerator in the answer. Then say, “5 times 3 is 15,” and write that as the denominator. Then reduce the answer to lowest terms, if necessary.

$$\frac{3}{5} \times \frac{2}{3} = \frac{6}{15}$$

Example: $\frac{4}{10} \times \frac{5}{9}$

$$\frac{4}{10} \times \frac{5}{9} = \frac{20}{90} = \frac{2}{9}$$

When we multiply whole numbers and simple fractions, we first have to convert the whole number into a fraction. To do this, we simply put the whole number over the number 1.

Example: $7 \times \frac{4}{5}$

First, we change the whole number 7 to the fraction $\frac{7}{1}$. Notice that this doesn't change the value of the number; $\frac{7}{1}$ is just an improper fraction, and if we reduce it we get 7 again. All we have done is to rename it as a fraction instead of a whole number.

$$7 \times \frac{4}{5} = \frac{7}{1} \times \frac{4}{5}$$

Now we can multiply the numerators and then multiply the denominators. Finally, reduce the answer to lowest terms.

$$7 \times \frac{4}{5} = \frac{7}{1} \times \frac{4}{5} = \frac{28}{5} = 5\frac{3}{5}$$

Fractions in Word Problems

In word problems, multiplication of fractions is often indicated by the word *of*. Look at the following example:

Example: What is $\frac{2}{3}$ of 20?

$$\frac{2}{3} \text{ of } 20 = \frac{2}{3} \times 20 = \frac{2}{3} \times \frac{20}{1} = \frac{40}{3} = 13\frac{1}{3}$$

Example: Rachel collected 24 colored rocks on the beach. If $\frac{1}{3}$ of the rocks are green, how many green rocks were collected?

$$\frac{1}{3} \text{ of } 24 = \frac{1}{3} \times 24 = \frac{1}{3} \times \frac{24}{1} = \frac{24}{3} = 8$$

Rachel collected 8 green rocks.

Multiplying Fractions and Mixed Numbers

To multiply a fraction and a mixed number, we first have to change the mixed number to an improper fraction. Then we multiply the fractions as usual:

Example: $\frac{3}{4} \times 2\frac{1}{2}$

The first step is to change the mixed number to an improper fraction. To do this, multiply the denominator of the fraction by the whole number, add the numerator, and put that over the denominator. Say to yourself, “2 times 2 is 4, plus 1 is 5.” Put the 5 over the 2 to make $\frac{5}{2}$, then rewrite the problem using the improper fraction:

$$\frac{3}{4} \times 2\frac{1}{2} = \frac{3}{4} \times \frac{5}{2}$$

Now we can multiply the fractions as usual, then reduce.

$$\frac{3}{4} \times 2\frac{1}{2} = \frac{3}{4} \times \frac{5}{2} = \frac{15}{8} = 1\frac{7}{8}$$

Example: $4\frac{5}{6} \times \frac{1}{3}$

Change the mixed number to an improper fraction. Say to yourself, “4 times 6 is 24, plus 5 is 29.” Put the 29 over the 6 to make $\frac{29}{6}$, then rewrite the problem with the improper fraction:

$$4\frac{5}{6} \times \frac{1}{3} = \frac{29}{6} \times \frac{1}{3}$$

Lesson 7

(continued)

Lesson 7

Multiply the fractions as usual, then reduce.

(continued)

$$4\frac{5}{6} \times \frac{1}{3} = \frac{29}{6} \times \frac{1}{3} = \frac{29}{18} = 1\frac{11}{18}$$

To multiply mixed numbers, we simply change both mixed numbers into improper fractions, then multiply as usual:

Example: $3\frac{1}{2} \times 2\frac{2}{3}$

Change both mixed numbers to improper fractions. $3\frac{1}{2}$ becomes $\frac{7}{2}$, and $2\frac{2}{3}$ becomes $\frac{8}{3}$. Rewrite the problem with the new fractions:

$$3\frac{1}{2} \times 2\frac{2}{3} = \frac{7}{2} \times \frac{8}{3}$$

Multiply the fractions as usual, then reduce.

$$3\frac{1}{2} \times 2\frac{2}{3} = \frac{7}{2} \times \frac{8}{3} = \frac{56}{6} = 9\frac{2}{6} = 9\frac{1}{3}$$

Example: $4\frac{4}{5} \times 7\frac{1}{3}$

Change both mixed numbers to improper fractions.

$$4\frac{4}{5} \times 7\frac{1}{3} = \frac{24}{5} \times \frac{22}{3}$$

Multiply the fractions as usual, then reduce.

$$4\frac{4}{5} \times 7\frac{1}{3} = \frac{24}{5} \times \frac{22}{3} = \frac{528}{15} = 35\frac{3}{15} = 35\frac{1}{5}$$

As you can see, it might take several steps to reduce an answer to lowest terms—just keep going until you can't reduce the number any further.

Grade 6



Canceling Fractions

Mental Math

Version 1: Choose a mixed number and convert it to an improper fraction in your head. Repeat this at least five times.

Version 2: Think of an improper fraction and convert it to a mixed number in your head. You may find this to be a greater challenge than the previous exercise! Repeat it several times.

Skills Check

Complete the following worksheet to practice some of the skills you have learned.

- Lesson 8 Skills Check

New Skills

Multiplying Whole and Mixed Numbers

To multiply a whole number and a mixed number, we follow the same process we've used so far. We change the whole numbers and mixed numbers to improper fractions, then multiply the fractions as usual:

Example: $3 \times 1\frac{1}{4}$

First, change both terms to improper fractions. The whole number 3 is converted to an improper fraction by putting it over 1 to make $\frac{3}{1}$. The mixed number $1\frac{1}{4}$ is converted to the improper fraction $\frac{5}{4}$:

$$3 \times 1\frac{1}{4} = \frac{3}{1} \times \frac{5}{4}$$

ASSIGNMENT SUMMARY

- Play mental math games.
- Complete the Skills Check worksheet.
- Read New Skills instruction.
- Complete New Skills Practice.
- Complete Lesson 8 Test and Learning Checklist.

Lesson 8

Now you can multiply the fractions as usual, then reduce.

(continued)

$$3 \times 1\frac{1}{4} = \frac{3}{1} \times \frac{5}{4} = \frac{15}{4} = 3\frac{3}{4}$$

Example: $2\frac{1}{8} \times 5$

Change both terms to improper fractions.

$$2\frac{1}{8} \times 5 = \frac{17}{8} \times \frac{5}{1}$$

Multiply the fractions as usual, then reduce.

$$2\frac{1}{8} \times 5 = \frac{17}{8} \times \frac{5}{1} = \frac{85}{8} = 10\frac{5}{8}$$

Canceling Fractions

When you multiply fractions, you often end up with very large fractions to reduce. To avoid this, you can reduce some fractions before multiplying.

This process is called *canceling*.

Example: $\frac{7}{8} \times \frac{4}{5}$

If you solved this the way you've done so far, you would end up with the fraction $\frac{28}{40}$, which you would then have to reduce to $\frac{7}{10}$. By canceling before you multiply, however, you end up with a smaller fraction and don't have to reduce to get the final answer. Here's how you do it:

Step 1: Look for a numerator and a denominator in the problem that can be divided by the same number. In this example, 4 can divide into both the numerator 4 (in the second fraction) and the denominator 8 (in the first fraction).

Step 2: You look at the 4 in $\frac{4}{5}$ and say to yourself, "4 goes into 4 one time," and you mark through the 4 and write a small number 1 next to it. Then you look at the 8 in $\frac{7}{8}$ and you say, "4 goes into 8 two times," and you mark through the 8 and write a small 2 next to it. When you're finished with this step, the problem looks like this:

$$\frac{\cancel{7}}{\cancel{2} \cancel{8}} \times \frac{\cancel{4}^1}{5}$$

Step 3: Use the new terms and multiply as usual. You multiply 7 times 1 to get 7, and 2 times 5 to get 10 for an answer of $\frac{7}{10}$:

$$\frac{\cancel{7}}{\cancel{2} \cancel{8}} \times \frac{\cancel{4}^1}{5} = \frac{7}{10}$$

There are two important rules to follow when you are canceling:

First, you can only cancel a numerator and a denominator. You can't cancel two denominators or two numerators.

Second, you have to divide both by the same number. So you can't divide the numerator by one number and the denominator by another.

You can also use canceling when you are multiplying mixed numbers. The only difference is that you change the mixed numbers or whole numbers to improper fractions first, and then you cancel.

Example: $4\frac{1}{2} \times 2\frac{1}{3}$

Step 1: Change both mixed numbers to improper fractions.

$$4\frac{1}{2} \times 2\frac{1}{3} = \frac{9}{2} \times \frac{7}{3}$$

Step 2: Look for a numerator and a denominator in the problem that can be divided by the same number. In this example, 3 can divide into both 9 and 3, so you divide by 3 and the problem looks like this:

$$4\frac{1}{2} \times 2\frac{1}{3} = \frac{\cancel{9}^3}{2} \times \frac{7}{\cancel{3}_1}$$

Step 3: Use the new terms, multiply as usual, and reduce if necessary.

$$4\frac{1}{2} \times 2\frac{1}{3} = \frac{\cancel{9}^3}{2} \times \frac{7}{\cancel{3}_1} = \frac{21}{2} = 10\frac{1}{2}$$

Lesson 8

(continued)

Lesson 8

(continued)

Some problems will enable you to cancel twice, but the same rules apply each time: **you can only cancel a numerator and a denominator, and you have to divide both by the same number.** If you cancel twice, you can use different numbers each time you cancel, as in the following example:

Example: $1\frac{2}{3} \times 1\frac{4}{5}$

$$1\frac{2}{3} \times 1\frac{4}{5} = \frac{\overset{1}{\cancel{5}}}{\underset{1}{\cancel{3}}} \times \frac{\overset{3}{\cancel{9}}}{\underset{\cancel{5}}{1}} = \frac{3}{1} = 3$$

In this example, we used a 5 to cancel one pair (the 5 and the 5), and we used a 3 to cancel the other pair (the 3 and the 9). You can also use canceling when you're multiplying fractions by whole numbers; just remember to convert both terms to improper fractions first.

Some problems won't allow you to cancel because they don't contain a numerator and a denominator that can be divided by the same number. But in those problems that allow it, canceling can save you a lot of time and frustration.

New Skills Practice

Complete the following worksheets in your math workbook:

- Lesson 8 New Skills Practice: Multiplying Whole and Mixed Numbers, Canceling Fractions
- Lesson 8 Test

Show all your work and check your answers, reworking any incorrect problems.

For Enrolled Families

At the end of this lesson, please submit the following to your Oak Meadow teacher:

- Lesson 7 Test
- Lesson 8 Test
- Lesson 8 B-test

