Grade: 5, Unit: Multiplication of Fractions and Mixed Numbers

Essential Question: How is Fraction Multiplication related to Multiplication of Whole Numbers?

In this series of lessons, students will create paper models to examine fraction multiplication, further develop their conceptual understanding of fraction multiplication, conjecture about products of factors less than 1, solve word problems involving multiplication of whole numbers and fractions, convert mixed numbers to improper fractions, apply fraction multiplication rules to mixed number multiplication, estimate to determine the reasonableness of answers.

Summary

Lesson I:
Students will use paper models to study multiplication of fractions. This visual representation will help students conceptually understand multiplying parts of a whole. Preconceptions such as "the larger the denominator is, the larger the fraction is" and "multiplication always results in a product that is greater than the factors" will be addressed in this lesson.

Students will need the following background knowledge before engaging in this lesson:

- How to correctly read fractions
- An understanding of the role of the numerator and denominator in a fraction
- Any whole number can be expressed as a fraction (the whole number "over 1")
- How to simplify a fraction
- An understanding of how to determine the reasonableness of an answer.

Objectives:

- Create paper models to examine fraction multiplication.
- Explore the outcome when one or more factor in a multiplication problem is less than 1.
- Solve word problems involving multiplication of whole numbers and fractions.
- Transition to using a standard algorithm for fraction multiplication.

Lesson II:
Students will apply their knowledge of converting mixed numbers to improper fractions, and their knowledge of fraction multiplication to multiplying mixed numbers.

Students will need the following background knowledge before engaging in this lesson:

- How to convert mixed numbers to improper fractions
- How to convert improper fractions to mixed numbers
- How to simplify fractions
- How to multiply fractions

Objectives:

- Convert mixed numbers to improper fractions
- Convert improper fractions to mixed numbers
- Multiply mixed numbers using the standard algorithm

Standards:

- 5. NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
- 5.NF.4a Interpret the product of **(a/b) x q** as **a** parts of a partition of **q** into **b** equal parts. Use a model to demonstrate that **(a/b) x (c/d) = ac/bd**.

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Lesson I:

Required Materials:

- Blank copy paper
- Crayons or colored pencils
- Guided and independent practice sheets
- Homework sheets
- Black board and chalk or white board and markers

Procedures

1. Lead- In:

Read Give Me Half by Stuart J. Murphy aloud to class. Ask students to draw a picture to represent each situation of halving that is depicted in the book. Have a student volunteer share one of his or her representations on the front board. Discuss with the class what is happening mathematically in each situation. Elicit from students which symbols could be used to represent each situation. Discuss the relationship between the term "halving" and dividing something by 2. Have students explain why they are the same. Ask students to explain what happened to the number of items in the original group each time the group was halved. Then ask them to write down and complete the following prediction: "When fractions are multiplied, the product will be (greater than or less than) than the original factors because….."

2: Step by Step:

a. Explain to students that today they will be creating a model to find ½ of ¾. (1/2 x ¾)Write the problem on the board. Ask students to predict whether the product of the two fractions will be greater or less than the original factors.
b. Distribute paper and colored pencils to students. Instruct students to fold the piece of paper in half vertically while teacher models same. Then fold vertically again to create four columns. Have students do the same.
c. Instruct students to shade three columns to represent ¾ of the whole paper.
d. Students should then fold the paper in half horizontally and unfold it. Ask students, "How many sections did this new fold just create?" (2) "What are these fractions called?" (Halves) Using a different color, they should shade one of the two rows to show ½. (Model this for the students.)

e. Ask the following questions: "How many small rectangles did you make in all?" (8) "How many small rectangles did you shade twice?" (3) "What fraction of the small rectangles did you shade twice?" (3/8)
f. Refer to the problem ½ of ¾ written on the board. Ask the students how they can use their models to find the product. Ask, "What is the product of ½ x ¾?" (3/8)
g. Put the following on the board: 2/3 x ¼. Use the above described procedure to guide students through creating and using a model to find this product.
h. Put the following of the board: 1/6 x ¾. Guide the students through the process using a diagram instead of a model. Students should create the model in their notebooks at the same time as the teacher creates it on the board. Two different color chalks or white board markers should be used for the demonstration.
i. Discuss with students what patterns they may be seeing through the use of the models and diagrams. Instruct them to, "Write a rule that you think could be used to multiply two fractions without using a model." (Multiply the numerators, then multiply the denominators, then simplify the resulting fraction.) Refer to the latest example that was done via the diagram. Solve the problem at the board using the newly elicited rule (Move the students from the concrete model to the symbolic representation.)
j. Explain to students that the models help us understand what is happening when we multiply fractions; the use of the algorithm is much more efficient. (The models help explain why the algorithm works, which in turn helps the students retain it.)
k. Revisit the two original problems (the two that were solved using the paper models). Instruct the students to solve them symbolically using the rule. They should then compare their answers to the ones arrived at using the models. (They should be the same.)
l. Distribute practice pages to the students. (Students should be ability-grouped for the practice part of the lesson.)
m. Instruct the students to complete the independent practice problems on the worksheet. Remind the students that a denominator of "1" will have to be added to any whole numbers.

*Note: This lesson will very likely take two class periods. It can be taught in its entirety in classes that have a double-period math block. In other classes, it should be broken spread out over two days. The point at which to stop and restart the lesson can be decided by each individual teacher.

3. Closure:

To close the lesson, ask the students to revisit their prediction from the beginning of the lesson. Elicit from students, if necessary, the fact that multiplication of proper fractions does not result in a product greater than the original factors. Ask the students why this is so. (This is a good time to spiral in the Identity Property of Multiplication.)

Differentiation

Students should be grouped for independent work time.

Advanced: Students should complete the independent worksheet labeled "Challenge Practice" and when finished, compare their answers with a classmate. They should work together on any problems where their answers are not the same and come to a consensus about the correct answer.

Average: Students should complete the independent worksheet labeled "Practice" and when finished, compare their answers with a classmate. They should work together on any problems where their answers are not the same and come to a consensus about the correct answer.

Struggling: Students should complete a "Reteach" mini-lesson with the teacher before moving on to completing their independent work. Their sheet is labeled "Reteach".

Homework/Assessment

Differentiation

All students will receive the same homework sheet. Instructions for each group of students may vary by ability group at the discretion of the teacher. (For example, advanced students may be required to write their own additional word problems on the back of the sheet. Struggling students may be instructed to eliminate certain questions.)

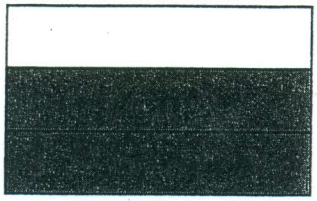
*Assessment of student understanding is an ongoing process throughout the lesson. The teacher should use tools such as observation, awareness of student participation levels, and circulating to see student work in order to have a constant gauge of student understanding. The homework assignment will be collected and used as an additional, more formal assessment piece.

Name _____

Multiplying Fractions

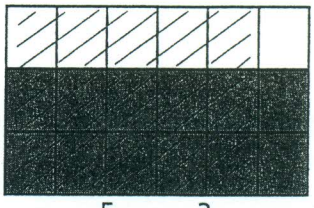
Multiply $\frac{5}{6} \times \frac{2}{3}$.

Draw a picture to show $\frac{2}{3}$.



$\frac{2}{3}$

Divide it into 6 equal parts.
Shade 5 out of the 6 parts.
The overlapping part shows $\frac{5}{6}$ of $\frac{2}{3}$.

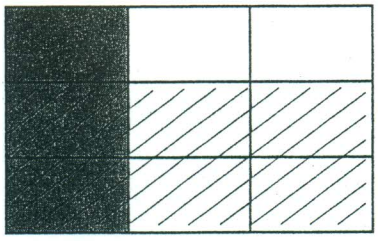


$\frac{5}{6}$ of $\frac{2}{3}$

So, $\frac{5}{6} \times \frac{2}{3} = \frac{10}{18} = \frac{5}{9}$.

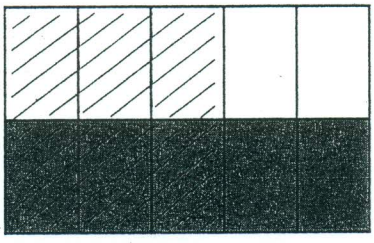
Complete the multiplication for each diagram.

1.



$\frac{2}{3} \times \frac{1}{3} =$ _____

2.



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

3.

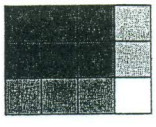
$\frac{1}{8} \times \frac{2}{3} =$ _____

Write an equation for each picture.

4.

_____

5.



_____

Multiplying Fractions

To multiply fractions, multiply the numerators and multiply the denominators.

When multiplying fractions, you can sometimes divide by the GCF to make the problem simpler.

You can divide by the GCF even if the numerator and denominator of the same fraction have a common factor.

$\frac{1}{2} \cdot \frac{2}{3}$

$\frac{1}{\cancel{2}} \cdot \frac{\cancel{2}}{3}$

The problem is now $\frac{1}{1} \cdot \frac{1}{3}$.

$\frac{1 \cdot 1}{1 \cdot 3} = \frac{1}{3}$

So, $\frac{1}{2} \cdot \frac{2}{3} = \frac{1}{3}$

Find each product. Simplify if possible.

6. $\frac{5}{7} \times \frac{3}{10} =$ _____ **7.** $\frac{1}{2} \times \frac{6}{15} =$ _____ **8.** $\frac{4}{7} \times \frac{1}{2} =$ _____

9. $\frac{5}{6} \times \frac{3}{8} =$ _____ **10.** $\frac{6}{7} \times \frac{5}{12} =$ _____ **11.** $8 \times \frac{3}{4} =$ _____

12. Number Sense Can you simplify before multiplying $14 \times \frac{4}{7}$? Explain.

_____

_____

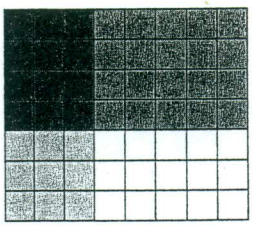
13. $\frac{1}{3} \cdot \frac{6}{7}$ _____ **14.** $\frac{1}{4} \cdot \frac{2}{3}$ _____ **15.** $\frac{3}{4} \cdot \frac{1}{3}$ _____ **16.** $\frac{1}{4} \cdot \frac{1}{8}$ _____

Name _____

Practice

Multiplying Fractions

Write an equation for each picture.

1. 

_____

2. 

_____

3. $\frac{1}{5} \cdot \frac{1}{3}$

_____

4. $\frac{2}{3} \cdot \frac{1}{3}$

_____

5. $\frac{2}{3} \cdot \frac{2}{7}$

_____

6. $\frac{1}{4} \cdot \frac{1}{5}$

_____

7. $\frac{1}{3} \cdot \frac{2}{5}$

_____

8. $\frac{1}{4} \cdot \frac{2}{3}$

_____

9. $\frac{1}{3} \cdot \frac{1}{3}$

_____

Evaluate the expression $x \cdot \frac{1}{2}$ for each value of x. Write the answer in simplest form.

10. $x = \frac{1}{2}$

_____

11. $x = \frac{1}{3}$

_____

12. $x = \frac{1}{4}$

_____

13. $x = \frac{1}{5}$

_____

14. $x = \frac{2}{3}$

_____

15. $x = \frac{3}{4}$

_____

16. In Mr. Sanders's class, $\frac{1}{3}$ of the students are girls. About $\frac{1}{4}$ of the girls want to join the chorus. What fraction of all the students in Mr. Sanders's class want to join the chorus?

_____

17. A recipe for trail mix calls for $\frac{3}{4}$ pound of peanuts. Luiza only wants to make half of the recipe's servings. How many pounds of peanuts should she use?

_____

18. Writing to Explain Without multiplying, tell which is greater: $\frac{55}{6} \times 81$ or $\frac{9}{10} \times 81$. Explain.

_____

_____

19. $\frac{1}{5} \times \frac{5}{12} =$ _____

20. $4 \times \frac{1}{10} =$ _____

21. $\frac{1}{4} \times \frac{8}{12} =$ _____

22. $\frac{1}{2} \times \frac{8}{12} =$ _____

23. $3 \times \frac{2}{3} =$ _____

24. $\frac{3}{4} \times \frac{4}{5} =$ _____

25. $\frac{2}{3} \times \frac{3}{10} =$ _____

26. $4 \times \frac{4}{8} =$ _____

27. $\frac{3}{4} \times \frac{5}{6} =$ _____

28. $\frac{7}{8} \times \frac{3}{5} =$ _____

29. $\frac{3}{5} \times \frac{5}{6} =$ _____

30. $\frac{2}{5} \times \frac{3}{8} =$ _____

Name _____ **Challenge**

Practice

Multiply Fractions

Multiply. Write each answer in simplest form.

1. $\frac{3}{8} \cdot \frac{4}{5}$ _____

2. $\frac{5}{8} \cdot \frac{3}{9}$ _____

3. $\frac{6}{7} \cdot \frac{5}{6}$ _____

4. $\frac{8}{9} \cdot \frac{9}{11}$ _____

5. $\frac{5}{12} \cdot \frac{6}{7}$ _____

6. $\frac{7}{9} \cdot \frac{3}{8}$ _____

7. $\frac{14}{15} \cdot \frac{5}{7}$ _____

8. $\frac{7}{8} \cdot \frac{2}{9}$ _____

9. $\frac{4}{5} \cdot \frac{7}{9} \cdot \frac{1}{7}$ _____

Evaluate the expression $x \cdot \frac{2}{7}$ for each value of x. Write the answer in simplest form.

10. $x = \frac{4}{5}$ _____

11. $x = \frac{7}{8}$ _____

12. $x = \frac{7}{11}$ _____

13. $x = \frac{11}{10}$ _____

14. $x = \frac{8}{9}$ _____

15. $x = \frac{21}{30}$ _____

Compare. Write <, >, or =.

16. $\frac{5}{6} \cdot \frac{3}{4} \square \frac{7}{8} \cdot \frac{4}{5}$

17. $\frac{2}{3} \cdot \frac{6}{7} \square \frac{9}{10} \cdot \frac{1}{3}$

18. $\frac{10}{12} \cdot \frac{5}{6} \square \frac{5}{9} \cdot \frac{1}{4}$

19. $\frac{7}{9} \cdot \frac{3}{4} \square \frac{7}{6} \cdot \frac{1}{2}$

20. $\frac{9}{11} \cdot \frac{1}{2} \square \frac{1}{6} \cdot \frac{3}{11}$

21. $\frac{2}{3} \cdot \frac{9}{10} \square \frac{4}{5} \cdot \frac{7}{8}$

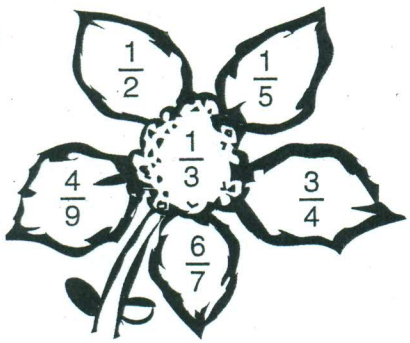
22. Cara bought 1 yard of velvet at the fabric store. She used $\frac{5}{9}$ yard to make a purse. Then she used $\frac{1}{2}$ of the leftover velvet to make a hair band. How much of the velvet did she use to make the hair band? _____

23. A square-shaped park measures $\frac{3}{5}$ mile long on each side. What is the area of the park? _____

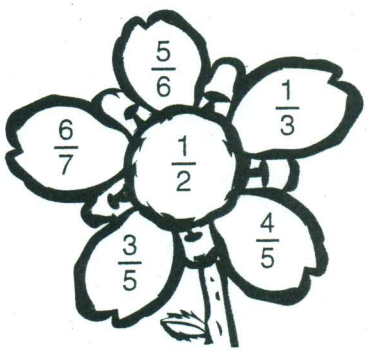
Fractions of Flowers

For each flower below, shade the two petals whose fractions have a product equal to the fraction written in the center of that flower.

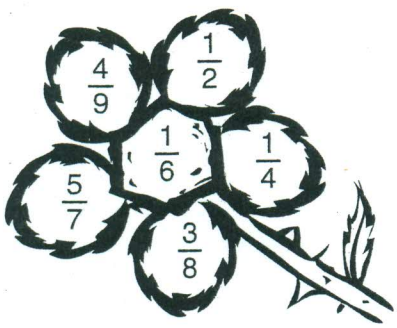
1.



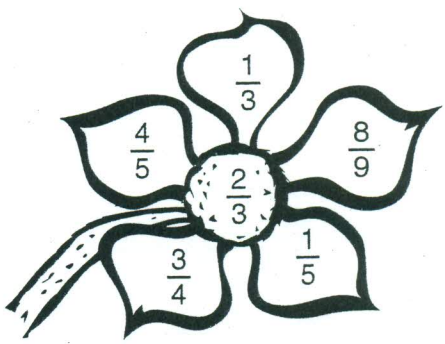
2.



3.



4.



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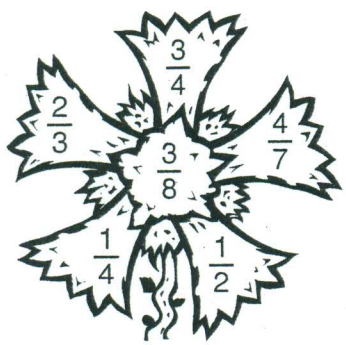
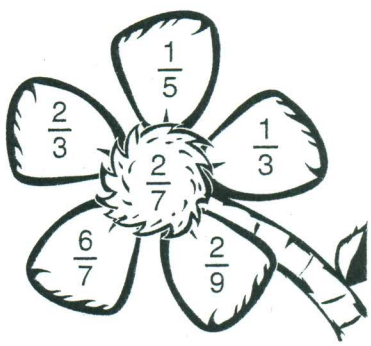
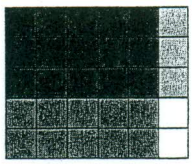


6.



Name _____

1. Which equation is shown by the model?



A $\frac{3}{6} \times \frac{5}{5} = \frac{15}{30}$

B $\frac{2}{5} \times \frac{5}{6} = \frac{1}{3}$

C $\frac{3}{5} \times \frac{5}{6} = \frac{1}{2}$

D $\frac{4}{5} \times \frac{3}{6} = \frac{2}{5}$

2. Mike picked 18 quarts of peaches. When he got home, he discovered that $\frac{1}{3}$ of the peaches were not ripe. How many quarts of peaches were not ripe?

A 10

B 8

C 6

D 4

3. On Sara's computer, $\frac{3}{8}$ of the hard drive is files. Of the files, $\frac{1}{6}$ are games. What part of the hard drive is games?

A $\frac{1}{16}$

B $\frac{3}{16}$

C $\frac{4}{14}$

D $\frac{4}{18}$

4. **Writing to Explain** Find $\frac{9}{16} \times \frac{4}{18}$ by simplifying first and by simplifying last, if possible. Which method do you prefer? Why?

_____

_____

_____

_____

_____

Lesson II:

Required Materials:

- Partner Practice Activity sheets
- Guided and Independent Practice sheets
- Homework sheets
- Blackboard and chalk or whiteboard and markers (or Smart board)

Procedures

1. Lead- In: Break students into pairs. Distribute the Partner Practice Activity sheets. Read and discuss the activity directions with students. Allow the students time to play the game (and review the steps of fraction multiplication.) Once the first few teams have begun to complete the game, draw their attention to the front board where the opening problem is displayed.

2: Step by Step:

a) Display the following problem on the board:

A small can of tomatoes weighs 7 1/3 ounces. Mrs. Smith's spaghetti sauce recipe calls for 4 ½ cans of tomatoes. How many ounces of tomatoes will Mrs. Smith put in her sauce?

Allow students time to decide how to solve this problem. Elicit from them, if necessary, that they will be multiplying the two mixed numbers. Ask, "How do you think mixed number multiplication will be similar to fraction multiplication?"(The steps for fraction multiplication are followed.), "How will it be different?"(Mixed numbers will have to be converted to improper fraction before multiplying.), "How can you know if your answer is reasonable?" (Estimate first.)

b) Instruct students to estimate the answer to the problem. They should round 4 ½ to 5 and 7 1/3 to 7. (Be sure that the students genuinely understand why the numbers are rounded in this manner. They should understand that they are rounding to the whole number that the mixed number is closest to on a number line. If necessary, take the time to demonstrate this using a number line. A thorough understanding of this concept will help ensure correct estimating going forward, which will help students understand the concept of "reasonableness".) Since the product of 5 and 7 is 35, the correct answer to the problem should be about 35 ounces.

c) Explain to students that in order to apply the rules of fraction multiplication, all of the mixed numbers must be converted to improper fractions before multiplying. (This should be a previously learned skill.) Model at the board that the original problem 4 ½ x 7 1/3 should be rewritten as 9/2 x 22/3. At this point they should continue as they would have in yesterday's lesson. (Students who are able to see the connection may simplify the opposite numerator and denominators with common factors before multiplying. Others may wish to multiply across numerators and denominators and save the simplifying for the end. Either way is acceptable. More confident/accomplished math students will realize that simplifying earlier is actually

easier, but strugglers may experience difficulty and will prefer to stick to a more concrete set of steps.) The correct answer is 33 ounces. Since the answer of 33 ounces is close to the estimate, it is reasonable.

d) Display the following problem:

Juanita's dog weighs 2 ½ times as much as Caleb's dog. Caleb's dog weighs 8 ¾ pounds. How much does Juanita's dog weigh?

Allow some time for the students to attempt the problem independently. Circulate as needed to offer assistance. Then model the correct response. (estimate: 3 x 8 = 24 actual: 2 ½ x 8 ¾ = 21 7/8)

e) Distribute practice pages to the students. (Students should be ability-grouped for the practice part of the lesson.)

f) Instruct the students to complete the independent practice problems on the worksheet. Remind the students that a denominator of "1" will have to be added to any whole numbers.

3. Closure: Display the following question for students to answer:

"When multiplying two proper fractions, the product will be less than either of the factors. Is this also true for mixed numbers? Why or why not?"

Differentiation

Students should be grouped for independent work time.

Advanced: Students should complete the independent worksheet labeled "Enrich" and when finished, compare their answers with a classmate. They should work together on any problems where their answers are not the same and come to a consensus about the correct answer.

Average: Students should complete the independent worksheet labeled "Practice" and when finished, compare their answers with a classmate. They should work together on any problems where their answers are not the same and come to a consensus about the correct answer.

Struggling: Students should complete a "Reteach" mini-lesson with the teacher before moving on to completing their independent work. Their sheet is labeled "Reteach".

Homework/Assessment

Differentiation

All students will receive the same homework sheet. Instructions for each group of students may vary by ability group at the discretion of the teacher. (For example, advanced students may be required to write their own additional word problems on the back of the sheet. Struggling students may be instructed to eliminate certain questions.)

*Assessment of student understanding is an ongoing process throughout the lesson. The teacher should use tools such as observation, awareness of student participation levels, and circulating to see student work in order to have a constant gauge of student understanding. The homework assignment will be collected and used as an additional, more formal assessment piece.

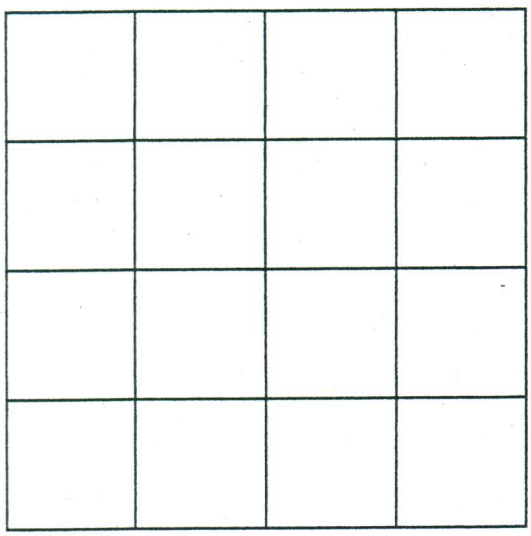
Name _____

Partner Practice Activity

Multiply Fractions

Puzzle Mode

Write each fraction in only one square on your game board.
They can be in any order.



$\frac{1}{10}$ $\frac{4}{11}$ $\frac{13}{20}$

$\frac{16}{25}$ $\frac{5}{22}$ $\frac{7}{11}$ $\frac{12}{55}$

$\frac{3}{10}$ $\frac{6}{25}$ $\frac{6}{121}$

$\frac{1}{4}$ $\frac{3}{8}$ $\frac{8}{15}$

$\frac{1}{24}$ $\frac{3}{5}$ $\frac{1}{7}$

Take turns with a partner. Choose an exercise below. Draw an X over the product on your game board.

The first person to have 4 Xs in a row, column, or diagonal is the winner.

1. $\frac{15}{32} \times \frac{4}{5} =$ _____ **2.** $\frac{1}{10} \times \frac{5}{12} =$ _____ **3.** $\frac{2}{3} \times \frac{21}{22} =$ _____ **4.** $\frac{3}{5} \times \frac{5}{12} =$ _____

5. $\frac{21}{25} \times \frac{5}{7} =$ _____ **6.** $\frac{4}{5} \times \frac{4}{5} =$ _____ **7.** $\frac{21}{40} \times \frac{16}{35} =$ _____ **8.** $\frac{5}{14} \times \frac{21}{25} =$ _____

9. $\frac{2}{3} \times \frac{4}{5} =$ _____ **10.** $\frac{5}{12} \times \frac{6}{25} =$ _____ **11.** $\frac{8}{15} \times \frac{9}{22} =$ _____ **12.** $\frac{10}{11} \times \frac{2}{5} =$ _____

13. $\frac{13}{16} \times \frac{4}{5} =$ _____ **14.** $\frac{5}{14} \times \frac{7}{11} =$ _____ **15.** $\frac{7}{8} \times \frac{8}{49} =$ _____ **16.** $\frac{5}{22} \times \frac{12}{55} =$ _____

Name _____

Multiplying Mixed Numbers

To find $\frac{1}{3}$ of $2\frac{1}{2}$, first change $2\frac{1}{2}$ to an improper fraction.

$2\frac{1}{2} = \frac{5}{2}$

Then multiply as you would with two proper fractions.

Check to see if you can divide by the GCF to make the problem simpler. Then multiply the numerators and multiply the denominators.

The problem is now $\frac{1}{3} \cdot \frac{5}{2}$.

$\frac{1 \cdot 5}{3 \cdot 2} = \frac{5}{6}$

So, $\frac{1}{3} \cdot 2\frac{1}{2}$ is $\frac{5}{6}$.

Rewrite each mixed number as an improper fraction. Is it possible to simplify before you multiply?

1. $\frac{1}{4} \cdot 1\frac{1}{3}$

$= \frac{1}{4} \cdot$ ____

_____

2. $\frac{1}{6} \cdot 2\frac{1}{2}$

$= \frac{1}{6} \cdot$ ____

_____

3. $\frac{1}{8} \cdot 1\frac{1}{2}$

$= \frac{1}{8} \cdot$ ____

_____

4. $\frac{1}{3} \cdot 1\frac{2}{5}$

$= \frac{1}{3} \cdot$ ____

_____

5. $1\frac{1}{3} \cdot 1\frac{2}{3}$

$\frac{}{3} \cdot \frac{}{3}$

_____

6. $1\frac{1}{2} \cdot 1\frac{1}{3}$

$\frac{}{2} \cdot \frac{}{3}$

_____

7. $1\frac{3}{4} \cdot 2\frac{1}{2}$

$\frac{}{4} \cdot \frac{}{2}$

_____

8. $1\frac{1}{6} \cdot 2\frac{2}{3}$

$\frac{}{6} \cdot \frac{}{3}$

_____

Multiply Mixed Numbers

Multiply $7\frac{1}{2} \times 1\frac{4}{5}$.

Step 1

Write the numbers as fractions.

$7\frac{1}{2} \times 1\frac{4}{5}$

$\downarrow \quad \downarrow$

$\frac{15}{2} \times \frac{9}{5}$

So, $7\frac{1}{2} \times 1\frac{4}{5} = 13\frac{1}{2}$.

Step 2

Multiply as you multiply fractions.

$\frac{15}{2} \times \frac{9}{5} = 15 \times \frac{9}{2} \times 5 = \frac{135}{10}$

Step 3

Simplify.

$\frac{135}{10} = 13\frac{5}{10} = 13\frac{1}{2}$

Find each product. Simplify if possible.

1. $2\frac{3}{4} \times 3\frac{1}{2}$ _____ **2.** $2\frac{1}{5} \times 2\frac{2}{3}$ _____ **3.** $6 \times 3\frac{1}{4}$ _____

4. $1\frac{2}{5} \times 3\frac{1}{4}$ _____ **5.** $4\frac{1}{2} \times 16$ _____ **6.** $1\frac{3}{8} \times 2\frac{1}{2}$ _____

Evaluate each expression for $K = 2\frac{1}{3}$.

7. $12K$ _____ **8.** $1\frac{3}{4}K$ _____ **9.** $2\frac{2}{3}K$ _____

Name _____ **Practice**

Multiplying Mixed Numbers

Find each product. Simplify if possible.

1. $3\frac{1}{2} \times 1\frac{2}{3}$ _____ **2.** $1\frac{1}{8} \times 2\frac{1}{3}$ _____ **3.** $7 \times 1\frac{1}{4}$ _____

4. $2\frac{1}{6} \times 1\frac{1}{5}$ _____ **5.** $3\frac{1}{6} \times 18$ _____ **6.** $1\frac{1}{8} \times 2\frac{1}{2}$ _____

7. Ken used a piece of lumber to build a bookshelf. If he made three shelves that are each $2\frac{1}{2}$ ft long, how long was the piece of lumber?

_____

8. Deanna's cake recipe calls for $2\frac{1}{4}$ cups of flour. She needs to double the recipe for a bake sale. How much flour should Deanna use?

_____

9. $15\frac{2}{3} \times 5\frac{5}{7} =$ _____

10. $\frac{1}{4} \times 5\frac{2}{5} =$ _____

11. $\frac{5}{8} \cdot 1\frac{3}{5}$

12. $2\frac{4}{9} \cdot \frac{1}{6}$

Use the table to answer the questions.

13. If Berkeley receives $1\frac{1}{4}$ times its average January rainfall, how much rain will it receive?

_____

14. How much rain will Berkeley receive if it is $2\frac{1}{3}$ times the October average?

_____

15. Which month has about twice the rainfall as April?

_____

Average Rainfall in Berkeley, California	
January	$3\frac{7}{10}$ in.
April	$1\frac{4}{5}$ in.
October	$1\frac{1}{2}$ in.

16. Jessie stacked photographs of 6 zoo animals on top of each other to create a display. Each photo is $14\frac{1}{4}$ in. high. How high is the display?

A $84\frac{2}{3}$ in.

B $85\frac{1}{2}$ in.

C $86\frac{3}{4}$ in.

D 87 in.

17. **Writing to Explain** Explain how you would find $2 \times 2\frac{1}{3}$ using the Distributive Property.

_____

_____

lame _____ ENRICH

Multiply Mixed Numbers

Multiply. Write each answer in simplest form.

1. $\frac{5}{9} \cdot 2\frac{2}{7}$ _____

2. $1\frac{11}{12} \cdot \frac{6}{7}$ _____

3. $2\frac{4}{9} \cdot \frac{7}{8}$ _____

4. $3\frac{2}{3} \cdot \frac{3}{5}$ _____

5. $\frac{13}{14} \cdot 1\frac{3}{4}$ _____

6. $2\frac{3}{10} \cdot \frac{5}{6}$ _____

7. $1\frac{7}{8} \cdot \frac{3}{5}$ _____

8. $3\frac{2}{7} \cdot \frac{3}{10}$ _____

9. $4\frac{2}{3} \cdot \frac{8}{9}$ _____

Find each product. Write the answer in simplest form.

10. $\frac{10}{11} \cdot 3\frac{3}{7} \cdot 2$ _____

11. $2\frac{4}{7} \cdot \frac{4}{5} \cdot 1\frac{1}{2}$ _____

12. $\frac{9}{12} \cdot 2\frac{3}{5} \cdot 3\frac{1}{4}$ _____

13. $6\frac{1}{5} \cdot 10 \cdot 3\frac{4}{5}$ _____

14. $1\frac{7}{9} \cdot \frac{2}{5} \cdot 5\frac{1}{10}$ _____

15. $2\frac{6}{7} \cdot 1\frac{8}{9} \cdot \frac{7}{8}$ _____

Evaluate each expression.

16. $\frac{3}{4} \cdot c$ for $c = 4\frac{4}{5}$ _____

17. $1\frac{3}{10} \cdot x$ for $x = 2\frac{2}{3}$ _____

18. $\frac{2}{9} \cdot h$ for $h = 3\frac{5}{6}$ _____

19. $\frac{3}{4} \cdot q$ for $q = 2\frac{7}{8}$ _____

20. A train travels at $110\frac{3}{10}$ miles per hour. At this rate, how far will the train travel in $2\frac{1}{2}$ hours?

_____

21. A sandbox is $1\frac{1}{3}$ feet tall, $1\frac{5}{8}$ feet wide, and $4\frac{1}{2}$ feet long. How many cubic feet of sand is needed to fill the box?
(Volume = length • width • height)

_____

Name _____

Enrichment

Multiplying Mixed Numbers

Picture This

Match each product.

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

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

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

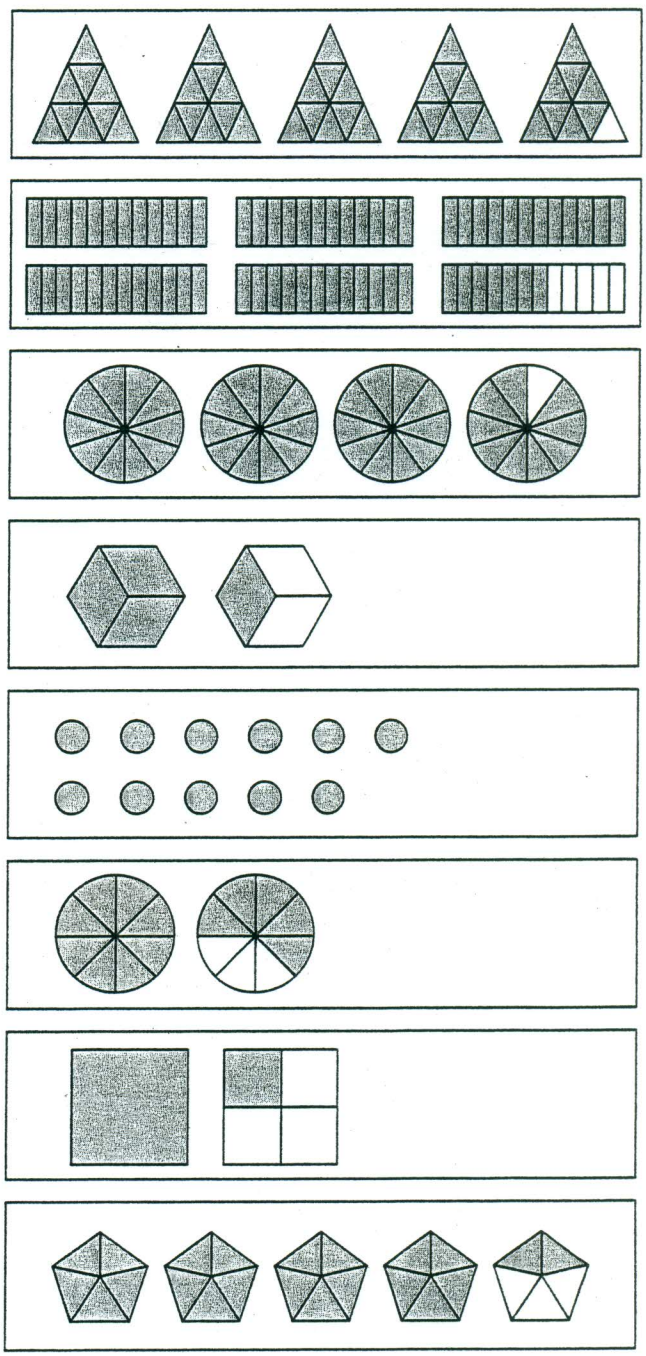
$1\frac{3}{7} \times \frac{7}{8}$

$6\frac{1}{11} \times \frac{11}{12}$

$1\frac{1}{6} \times 1\frac{1}{7}$

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

$\frac{1}{5} \times 8\frac{1}{8}$



Name _____

Multiplying Mixed Numbers

1. Jennie ran $2\frac{1}{4}$ miles on Monday. She ran $2\frac{1}{2}$ times as far on Tuesday. How far did she run on Tuesday?

   A $4\frac{1}{8}$ mi
   B $4\frac{5}{8}$ mi
   C $4\frac{3}{4}$ mi
   D $5\frac{5}{8}$ mi

2. An Asian Longhorned Beetle can measure $1\frac{1}{4}$ in. long. The Hercules Beetle can grow up to $5\frac{3}{5}$ times as long. What is the length of a Hercules Beetle that is $5\frac{3}{5}$ times as long as $1\frac{1}{4}$ in.?

   A $7\frac{1}{3}$ in.
   B 7 in.
   C $6\frac{3}{20}$ in.
   D $5\frac{1}{3}$ in.

3. The bricks in a walkway are $6\frac{7}{8}$ in. long. If 4 bricks are placed end-to-end, how wide is the walkway?

   A $27\frac{1}{2}$ in.
   B $28\frac{3}{8}$ in.
   C $30\frac{3}{4}$ in.
   D 31 in.

4. **Writing to Explain** Mr. Ekeledo is designing a fort for his children. The dimensions are shown in the table. Redesign the fort by increasing the length $1\frac{1}{4}$ times, the width $1\frac{1}{2}$ times, and the height 2 times. Write the new dimensions in the table. Explain how you found the new dimensions. Show your work.

Fort Dimensions

Length	$4\frac{1}{2}$ ft	
Width	$3\frac{2}{3}$ ft	
Height	$2\frac{1}{4}$ ft	

_____

_____

_____

_____

Find each product. Write the answer in simplest form.

5. $\frac{2}{5} \cdot 1\frac{1}{2}$

$\frac{2}{5} \cdot \frac{}{2}$

_____

6. $1\frac{3}{5} \cdot \frac{1}{3}$

$\frac{}{5} \cdot \frac{1}{3}$

_____

7. $\frac{2}{7} \cdot 1\frac{1}{4}$

_____

8. $\frac{2}{3} \cdot 1\frac{1}{10}$

_____

9. $\frac{1}{8} \cdot 1\frac{1}{2}$

_____

10. $\frac{4}{5} \cdot 1\frac{1}{6}$

_____

11. $\frac{3}{5} \cdot 1\frac{1}{4}$

_____

12. $1\frac{3}{4} \cdot \frac{1}{3}$

_____

13. $2 \cdot 1\frac{1}{2}$

_____

14. $4 \cdot 2\frac{1}{4}$

_____

15. $5 \cdot 1\frac{1}{5}$

_____

Name _____

Multiplying Mixed Numbers

CHOCOLATE CHIP COOKIES Servings: 1 batch
$1\frac{2}{3}$ cups flour
$\frac{3}{4}$ teaspoon baking soda
$\frac{1}{2}$ cup white sugar
$2\frac{1}{3}$ cups semisweet chocolate chips
$\frac{1}{2}$ cup brown sugar
$\frac{3}{4}$ cup butter
1 egg
$1\frac{1}{4}$ teaspoons vanilla

Use the recipe to answer the questions.

1. If you want to make $2\frac{1}{2}$ batches, how much flour would you need?

_____

2. If you want to make only $1\frac{1}{2}$ batches, how much chocolate chips would you need?

_____

3. You want to bake $3\frac{1}{4}$ batches. How much vanilla do you need in all?

_____

Choose the letter for the best answer.

4. If you make $1\frac{1}{4}$ batches, how much baking soda would you need?

A $\frac{3}{16}$ teaspoon **C** $\frac{3}{5}$ teaspoon

B $\frac{5}{16}$ teaspoon **D** $\frac{15}{16}$ teaspoon

5. How many cups of white sugar do you need to make $3\frac{1}{2}$ batches of cookies?

F $3\frac{1}{2}$ cups **H** $1\frac{1}{2}$ cups

G $1\frac{3}{4}$ cups **J** $1\frac{1}{4}$ cups

6. Dan used $2\frac{1}{4}$ cups of butter to make chocolate chip cookies using the above recipe. How many batches of cookies did he make?

A 3 batches **C** 5 batches

B 4 batches **D** 6 batches

7. One bag of chocolate chips holds 2 cups. If you buy five bags, how many cups of chips will you have left over after baking $2\frac{1}{2}$ batches of cookies?

F $4\frac{1}{6}$ cups **H** $2\frac{1}{3}$ cups

G $5\frac{5}{6}$ cups **J** $\frac{1}{3}$ cup

Rami was carrying a set of cards, but he tripped. The cards fell on the floor and are all mixed up. Help Rami put them in order by solving each problem.

Once you have solved the problems, place the cards in order from least to greatest. When in order, the letters will spell out a message!

B	O	J	O
$6 \bullet 2\frac{2}{3}$	$3\frac{1}{4} \bullet 3\frac{2}{5}$	$2\frac{3}{4} \bullet 3\frac{2}{3}$	$1\frac{1}{2} \bullet 4\frac{5}{6}$

D	O	G
$5\frac{1}{2} \bullet 1\frac{2}{5}$	$\frac{4}{5} \bullet 3\frac{5}{6}$	$\frac{5}{7} \bullet \frac{1}{8}$

The message is... _____.