

Multiplying Fractions

Unit 8 Overview: 8 lessons

Students see a fraction as a division: 3 pizzas shared equally by 4 friends is $3 \div 4$, or $3/4$ of a pizza each. Then they multiply: a fraction of a whole number on tape diagrams, a fraction of a fraction on area models, where the overlap is the product, and then by the rule, numerators times numerators and denominators times denominators, in simplest form. They find areas of rectangles with fraction sides by tiling them with unit-fraction squares, multiply mixed numbers, decide without multiplying whether a product is more or less than a factor, and solve story problems and recipes. Ask “is the product more or less than what you started with?” every day: times a fraction less than 1 makes a number smaller.

THE UNIT, DAY BY DAY

Day 1	Pre-Check	What students already know, before the first lesson.
Day 2	8.1 A fraction is a division	I can write a sharing problem as a division and a fraction.
Day 3	8.2 A fraction of a whole number	I can find a fraction of a whole number.
Day 4	8.3 A fraction of a fraction	I can multiply fractions on an area model.
Day 5	8.4 Multiply fractions	I can multiply fractions and simplify the product.
Day 6	8.5 Area with fraction sides	I can find the area of a rectangle with fraction sides.
Day 7	8.6 Multiply mixed numbers	I can multiply mixed numbers.
Day 8	8.7 Multiplying as scaling	I can tell if a product is more or less without multiplying.
Day 9	8.8 Fraction multiplication stories	I can solve story problems that multiply fractions.
Day 10	Unit Review	The review, to go over together.
Day 11	Unit Test	Form A; Form B (other numbers) is for a retest.

GET READY FOR THE UNIT

- Paper squares and rectangles to fold and shade, and colored pencils in two colors
- Paper circles and strips to cut and share, and scissors
- Grid paper with 1 inch squares (the Graph Paper maker prints it) and rulers
- Whiteboards and dry erase markers
- Measuring cups and a simple recipe card for the last lesson

HOW EACH LESSON GOES

- 1. Warm up** (5 min)
- 2. Teach** (10 min)
- 3. Try it together** (10 min)
- 4. Practice** (15 min)
- 5. Exit ticket** (5 min): a quick check on the lesson.

Each lesson page ends with the Animal Math sheets, makers, tools and quizzes for it. “Sheet 3” is the third worksheet of a pack; a color pack prints each sheet again in black and white.

CHECKING AS YOU GO

PRINTABLE	Pre-Check: Day 1, with a key	EXIT TICKET	Exit Tickets: one a lesson, two to a page
PRINTABLE	Unit Review: the day before the test	PRINTABLE	Unit Test: Forms A and B, with keys



Multiplying Fractions

Lesson 8.1: A fraction is a division

GOAL Students see that sharing things equally is a division, and that each share is the fraction things over people, even with fewer things than people.

About 45 minutes

I can write a sharing problem as a division and a fraction.

THE LESSON

- 1 Warm up** (5 min) Share 12 crackers among 4 friends. Then share 2 crackers among 4 friends. What does each friend get? (3 crackers, then half a cracker.)
- 2 Teach** (10 min) Share 4 sandwiches equally among 5 friends. Cut each sandwich into 5 equal parts: each friend gets 1 part of each sandwich, 4 fifths in all. So $4 \div 5 = 4/5$: the fraction bar means divided by. Then 9 crackers shared by 2 friends: each gets 4 whole crackers and half of the last one, so $9 \div 2 = 9/2 = 4 \frac{1}{2}$. Check by multiplying: $4 \frac{1}{2} \times 2 = 9$.
Say: "Sharing things equally is dividing. The things shared go on top and the number of people on the bottom: each share is that fraction."
- 3 Try it together** (10 min) Pairs cut paper circles to share 2 among 7 and then 5 among 3, writing each share as a division and a fraction, and the second as a mixed number too. Then they write a sharing story for $6 \div 5$.
- 4 Practice** (15 min) Students write shares as divisions, fractions and mixed numbers on sheet 1 of Dividing Unit Fractions and Whole Numbers, then solve the sharing stories at the bottom of sheet 4 of Fraction Word Problems for 5th Grade (its top half is a later unit).
- 5 Exit ticket** (5 min) Students do **Exit Ticket 8.1** and circle a face beside the "I can" line. Question 1: $8 \div 3 = 8/3$, or $2 \frac{2}{3}$ pancakes; $3/8$ means the division was turned around, and $2 \text{ R } 2$ means the leftovers were not shared. Question 2: $7/10$, and $11/4$ or $2 \frac{3}{4}$; $10/7$ is turned around.

Need help? Cut real paper circles and deal the parts out one at a time.

Ready for more? Write two sharing stories whose shares are both $1 \frac{3}{5}$, with different numbers of people.

ON ANIMAL MATH

PRINTABLE

Dividing Unit Fractions and Whole Numbers: sheet 1

PRINTABLE

Fraction Word Problems for 5th Grade: sheet 4, the sharing stories

QUIZ

Multiplying and Dividing Fractions Quiz: the Fractions as Division level

EXIT TICKET

5th Grade Multiplying Fractions Exit Tickets: Exit Ticket 8.1

GET READY

- Paper circles and rectangles to cut and share, and scissors
- Counters
- Whiteboards and markers

WORDS TO USE

share equally: give everyone the same amount

quotient: the answer to a division

fraction bar: the line in a fraction: it means divided by

ASK

- How many things are shared? Among how many people?
- Is each share more or less than 1 whole? How do you know?
- How can multiplying check the share?

WATCH FOR

Turns the division around ($3 \div 5$ for 5 among 3).

The things shared come first: 5 circles $\div$ 3 people.

Writes a remainder ($5 \div 3 = 1 \text{ R } 2$). Share the leftovers too: cut them into thirds.

Thinks a share must be less than 1. More things than people means more than 1 each.

Multiplying Fractions

Lesson 8.2: A fraction of a whole number

GOAL Students find a fraction of a whole number on a tape diagram: cut the whole into as many equal parts as the denominator and take as many parts as the numerator. Then they multiply by the numerator and divide by the denominator, writing a product that is not whole as a mixed number.

About 45 minutes

I can find a fraction of a whole number.

THE LESSON

- 1 Warm up** (5 min) What is $\frac{1}{4}$ of 20? $\frac{1}{3}$ of 18? Then $\frac{3}{4}$ of 20? Use counters or a drawing.
- 2 Teach** (10 min) Find $\frac{2}{3} \times 21$. Draw a tape for 21 and cut it into 3 equal parts of 7. Take 2 parts: 14, so $\frac{2}{3} \times 21 = 14$. Without a tape: $2 \times 21 = 42$ and $42 \div 3 = 14$, or $21 \div 3 = 7$ and $7 \times 2 = 14$. Then $\frac{3}{8} \times 12$: $3 \times 12 = 36$, and $36/8 = 4 \frac{4}{8} = 4 \frac{1}{2}$. Turned around, $12 \times \frac{3}{8}$ is the same product.
Say: "To find $\frac{2}{3}$ of a number, I cut it into 3 equal parts and take 2 of them. That is the same as multiplying by 2 and dividing by 3."
- 3 Try it together** (10 min) Pairs draw tapes for $\frac{3}{5} \times 20$ and $\frac{5}{6} \times 30$, then multiply $7 \times \frac{3}{5}$ and write the product as a mixed number.
- 4 Practice** (15 min) Students use the tapes to find one part and then the parts taken, then multiply by the numerator and divide by the denominator, on sheet 1 of Multiplying Fractions. For review, sheet 3 of Multiplying Fractions by Whole Numbers multiplies on strips.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 8.2** and circle a face beside the "I can" line. Question 1: 15 cut into 5 parts of 3, two parts taken: 6; 3 means only one part was found. Question 2: 10 and $8 \frac{1}{3}$ (or $25/3$); $80/128$ or $50/60$ means the whole number was multiplied into the denominator too.

Need help? Use counters: deal the whole number into as many equal groups as the denominator, then count the groups taken.

Ready for more? Find a fraction of 36 that is 27, and another fraction of 36 that is 30.

GET READY

- Blank tape diagram strips
- Counters
- Whiteboards and markers

WORDS TO USE

of: times: $\frac{3}{4}$ of 20 means $\frac{3}{4} \times 20$

tape diagram: a bar cut into equal parts

product: the answer when we multiply

ASK

- How many equal parts does the denominator cut the whole into?
- How big is one part? How many parts do you take?
- Should the answer be more or less than the whole number?

WATCH FOR

Multiplies the whole number into the denominator too ($\frac{3}{8} \times 12 = \frac{36}{96}$). Draw the tape: 12 cut into 8 parts, take 3.

Divides by the numerator ($21 \div 2$). The denominator tells how many equal parts.

Leaves $\frac{36}{8}$ as the answer. Divide: $36 \div 8$ is 4 with 4 eighths left, or $4 \frac{1}{2}$.

ON ANIMAL MATH

PRINTABLE

Multiplying Fractions: sheet 1

PRINTABLE

Multiplying Fractions by Whole Numbers: sheet 3 for review

QUIZ

Fraction Operations Quiz: the Times a Whole Number level

EXIT TICKET

5th Grade Multiplying Fractions Exit Tickets: Exit Ticket 8.2

Multiplying Fractions

Lesson 8.3: A fraction of a fraction

GOAL Students multiply fractions on an area model: one fraction in columns, the other in rows; the overlap is the product, a part of a part, less than each fraction. **About 45 minutes**

I can multiply fractions on an area model.

THE LESSON

- 1 Warm up** (5 min) Fold a paper square in half and shade one half. Fold it in half the other way. What part of the whole square is half of the shaded half? ($1/4$.)
 - 2 Teach** (10 min) Find $3/4 \times 5/6$. Cut a square into 4 columns and shade 3 of them. Cut it into 6 rows and shade 5 the other way. The square now has $4 \times 6 = 24$ small parts, and 15 are shaded twice, so $3/4 \times 5/6 = 15/24$. Then $1/3 \times 2/5$: 1 of 3 columns and 2 of 5 rows overlap in 2 of 15 parts, so $2/15$. The overlap is inside both fractions, so it is less than each.
- Say:** "I shade one fraction one way and the other fraction the other way. The overlap, out of all the small parts, is the product."
- 3 Try it together** (10 min) Pairs fold and shade paper squares for $1/2 \times 3/8$ and $1/4 \times 4/5$, writing each product as the overlap out of all the parts. Then they explain why $1/4 \times 4/5$ is less than both fractions.
 - 4 Practice** (15 min) Students shade both fractions and write the products on the area models at the top of sheet 2 of Multiplying Fractions, then shade half of each amount on sheet 3 of Recipe Math.
 - 5 Exit ticket** (5 min) Students do **Exit Ticket 8.3** and circle a face beside the "I can" line. Question 1: $2/5 \times 2/3 = 4/15$, in either order; $12/15$ means every shaded part was counted. Question 2: one column of 4 and 2 rows of 3 shaded, $2/12 = 1/6$; $9/12$ is the same mistake.

Need help? Fold real paper: fold and shade one fraction, then fold the other way and shade again.

Ready for more? Find two different fraction multiplications whose overlap is 6 of 20 parts.

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PRINTABLE

Multiplying Fractions: sheet 2, the area models

PRINTABLE

Recipe Math: sheet 3

QUIZ

Multiplying and Dividing Fractions Quiz: the Multiply Fractions level

EXIT TICKET

5th Grade Multiplying Fractions Exit Tickets: Exit Ticket 8.3

GET READY

- Paper squares to fold, and colored pencils in two colors
- Grid paper
- Whiteboards and markers

WORDS TO USE

area model: a square cut one way for one fraction and the other way for the other

overlap: the parts shaded twice: they show the product

of: $1/2$ of $1/3$ means $1/2 \times 1/3$

ASK

- Which fraction did you shade in columns? Which in rows?
- How many small parts is the whole square cut into?
- Why is the product less than each fraction?

WATCH FOR

Counts every shaded part, not just the overlap. Shade in two colors: only the parts with both colors count.

Counts the overlap out of one fraction's parts (2 of 5). Count every small part: 3×5 of them.

Adds the fractions ($1/3 + 2/5$). Of means times: the overlap is part of a part.

Multiplying Fractions

Lesson 8.4: Multiply fractions

GOAL Students multiply fractions by the rule, numerators times numerators over denominators times denominators, say why it matches the area model, and write the product in simplest form.

About 45 minutes

I can multiply fractions and simplify the product.

THE LESSON

- 1 **Warm up** (5 min) Draw an area model for $1/2 \times 1/5$. How many small parts? How many are shaded twice? (10 and 1.)
- 2 **Teach** (10 min) Look back at $3/4 \times 5/6 = 15/24$: 15 is 3×5 , the parts shaded twice, and 24 is 4×6 , all the small parts (in simplest form, $5/8$). So multiply the numerators and multiply the denominators. Then $3/4 \times 2/9 = 6/36$, and the GCF of 6 and 36 is 6, so the product is $1/6$. With a whole number, write it over 1: $4 \times 5/6 = 4/1 \times 5/6 = 20/6 = 3 \frac{1}{3}$.
Say: "To multiply fractions, I multiply the numerators and multiply the denominators. Then I write the product in simplest form."
- 3 **Try it together** (10 min) Pairs multiply $4/5 \times 5/9$ and $7/8 \times 2/7$, writing each product in simplest form. Then they check $4/5 \times 5/9$ with an area model.
- 4 **Practice** (15 min) Students multiply the numerators and the denominators and simplify on the top half of sheet 3 of Multiplying Fractions.
- 5 **Exit ticket** (5 min) Students do **Exit Ticket 8.4** and circle a face beside the "I can" line. Question 1: $1/4$ and $3/5$; $10/40$ and $18/30$ are not in simplest form, and $7/13$ or $11/13$ means the tops and bottoms were added. Question 2: 7, as $3 \times 7 = 21$; 18 means 3 was subtracted.

Need help? Draw the area model for each product before using the rule, and match the numbers.

Ready for more? Multiply $8/9 \times 3/4$ by first dividing a numerator and a denominator by a common factor. Why is the product the same?

GET READY

- Paper squares for area models
- A chart: multiply the tops, multiply the bottoms, simplify
- Whiteboards and markers

WORDS TO USE

numerator: the top number: how many parts

denominator: the bottom number: what size the parts are

simplest form: no number but 1 divides the top and the bottom

ASK

- What do the top and the bottom of the product count on the model?
- Can the product be simplified? What is the GCF?
- Is the product less than both fractions? Should it be?

WATCH FOR

Adds the denominators ($3/4 \times 2/9 = 6/13$).

Draw the area model: there are 4×9 small parts.

Finds a common denominator first, as for adding. No common denominator is needed: tops times tops, bottoms times bottoms.

Leaves $6/36$. Divide the top and the bottom by the GCF.

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PRINTABLE

Multiplying Fractions: sheet 3, problems 1 to 6

QUIZ

Multiplying and Dividing Fractions Quiz: the Multiply Fractions level

EXIT TICKET

5th Grade Multiplying Fractions Exit Tickets: Exit Ticket 8.4

Multiplying Fractions

Lesson 8.5: Area with fraction sides

GOAL Students tile a rectangle with fraction sides with unit-fraction squares, name each tile as a part of a square unit, and see that the area is the sides multiplied.

About 45 minutes

I can find the area of a rectangle with fraction sides.

THE LESSON

- 1 Warm up** (5 min) A rectangle is 3 feet by 5 feet. What is its area, and how do you know? How many 1 foot squares cover it?
- 2 Teach** (10 min) Cut a square foot into thirds both ways: 9 tiles, each $\frac{1}{3}$ foot on a side and $\frac{1}{9}$ square foot. A rectangle $\frac{2}{3}$ foot by $\frac{1}{3}$ foot covers 2 tiles, $\frac{2}{9}$ square foot, and $\frac{2}{3} \times \frac{1}{3} = \frac{2}{9}$. On a square foot cut into sixths both ways (36 tiles), a rectangle $\frac{5}{6}$ foot by $\frac{1}{2}$ foot covers $5 \times 3 = 15$ tiles, $\frac{15}{36}$ square foot, and $\frac{5}{6} \times \frac{1}{2} = \frac{5}{12}$, the same amount.
Say: "I tile the rectangle with squares that fit both sides, count them, and name each one as a part of a square unit. The area is the side lengths multiplied."
- 3 Try it together** (10 min) On 1 inch grid paper, pairs outline a 4 by 4 block as 1 square foot, each grid square a tile of $\frac{1}{16}$ square foot. They draw rectangles $\frac{3}{4}$ by $\frac{1}{4}$ foot and $\frac{3}{4}$ by $\frac{2}{4}$ foot and check each area by multiplying.
- 4 Practice** (15 min) Students count the tiles and find each area two ways at the bottom of sheet 2 of Multiplying Fractions (its rectangles have mixed-number sides, counted the same way), then draw rectangles of their own on grid paper.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 8.5** and circle a face beside the "I can" line. Question 1: $\frac{12}{25}$ square foot, 12 tiles of $\frac{1}{25}$; $\frac{7}{5}$ means the sides were added. Question 2: $\frac{14}{24} = \frac{7}{12}$ square meter; $\frac{1}{13} \times \frac{1}{24}$ means the sides were added.

Need help? Cut a paper square foot into tiles and lay them on the rectangle.

Ready for more? Find two different rectangles with fraction sides whose area is $\frac{1}{4}$ square foot.

GET READY

- Grid paper with 1 inch squares (the Graph Paper maker prints it), and rulers
- Paper squares cut into thirds both ways
- Colored pencils

WORDS TO USE

area: the space a flat shape covers, in square units

square unit: a square 1 unit on each side, like 1 square foot

tile: a small square that fits exactly: $\frac{1}{3}$ foot on a side is $\frac{1}{9}$ square foot

ASK

- What size is each tile? What part of a square foot is it?
- How many tiles cover the rectangle?
- Does multiplying the sides give the same area?

WATCH FOR

Names the area by the count alone (6 square feet). Each tile is $\frac{1}{16}$ of a square foot: 6 tiles is $\frac{6}{16}$.

Adds the side lengths. That is half the perimeter. Area counts the tiles inside.

Uses tiles that are not squares. Cut both sides into parts of the same size, so the tiles are squares.

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PRINTABLE

Multiplying Fractions: sheet 2, the tiled rectangles

MAKER

Graph Paper: Paper Type Square Grid, Square Size 1 Inch

QUIZ

Multiplying and Dividing Fractions Quiz: the Multiply Fractions level

EXIT TICKET

5th Grade Multiplying Fractions Exit Tickets: Exit Ticket 8.5

Multiplying Fractions

Lesson 8.6: Multiply mixed numbers

GOAL Students multiply mixed numbers by writing them as fractions greater than 1, or by adding partial products on an area model, and find areas of rectangles with mixed-number sides, with each product in simplest form.

About 45 minutes

I can multiply mixed numbers.

THE LESSON

- 1 Warm up** (5 min) Write $2\frac{1}{2}$ and $3\frac{2}{3}$ as fractions greater than 1. ($\frac{5}{2}$ and $\frac{11}{3}$.)
- 2 Teach** (10 min) Multiply $1\frac{2}{3} \times 2\frac{1}{2}$. Write both as fractions: $\frac{5}{3} \times \frac{5}{2} = \frac{25}{6} = 4\frac{1}{6}$. Then $3\frac{1}{2} \times 1\frac{1}{4}$ on an area model: split one side into 3 and $\frac{1}{2}$, the other into 1 and $\frac{1}{4}$. The four parts are $3 \times 1 = 3$, $3 \times \frac{1}{4} = \frac{3}{4}$, $\frac{1}{2} \times 1 = \frac{1}{2}$ and $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$, which add to $4\frac{3}{8}$. Check: $\frac{7}{2} \times \frac{5}{4} = \frac{35}{8} = 4\frac{3}{8}$. A rug $3\frac{1}{2}$ feet by $1\frac{1}{4}$ feet covers $4\frac{3}{8}$ square feet.
Say: "To multiply mixed numbers, I write them as fractions greater than 1 and multiply, or I add the four partial products. Both ways give the same product."
- 3 Try it together** (10 min) Pairs multiply $2\frac{1}{5} \times 1\frac{1}{2}$ by writing fractions, and $4 \times 1\frac{3}{8}$ with partial products. Then they find the area of a rectangle $2\frac{3}{4}$ meters by $1\frac{1}{2}$ meters both ways and compare.
- 4 Practice** (15 min) Students write each mixed number as a fraction first, multiply and simplify on the bottom half of sheet 3 of Multiplying Fractions. Early finishers draw each problem as an area model and check it with partial products.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 8.6** and circle a face beside the "I can" line. Question 1: $2\frac{11}{12}$ and $1\frac{4}{5}$ (or $\frac{35}{12}$ and $\frac{9}{5}$); $2\frac{1}{12}$ means the wholes and the fractions were multiplied apart. Question 2: $\frac{9}{4} \times \frac{5}{3} = \frac{45}{12} = 3\frac{3}{4}$ square feet; $2\frac{2}{12}$ is the same mistake.

Ready for more? Find two mixed numbers whose product is a whole number.

GET READY

- Grid paper and rulers
- A chart of the two ways: fractions first, and partial products
- Whiteboards and markers

WORDS TO USE

fraction greater than 1: a numerator bigger than the denominator, like $\frac{7}{3}$

partial products: the products of the parts, added to make the whole product

ASK

- What is each mixed number as a fraction?
- What are the four partial products?
- About how big should the product be?

WATCH FOR

Multiplies the wholes and the fractions apart ($1\frac{2}{3} \times 2\frac{1}{2} = 2\frac{2}{6}$). Draw the area model: two of the four parts are missing.

Writes a mixed number as a fraction wrongly ($1\frac{2}{3} = \frac{3}{3}$). One whole is 3 thirds, and 2 more thirds: $\frac{5}{3}$.

Leaves 25/6. Divide: $25 \div 6$ is 4 with 1 left, $4\frac{1}{6}$.

Need help? Draw every product as an area model on grid paper and add the four parts.

ON ANIMAL MATH

PRINTABLE

Multiplying Fractions: sheet 3, problems 7 to 9

QUIZ

Multiplying and Dividing Fractions Quiz: the Multiply Fractions level

EXIT TICKET

5th Grade Multiplying Fractions Exit Tickets: Exit Ticket 8.6

Multiplying Fractions

Lesson 8.7: Multiplying as scaling

GOAL Students decide without multiplying whether a product is greater than, less than or equal to one factor by comparing the other factor with 1: more than 1 makes it bigger, less than 1 makes it smaller, and a factor equal to 1, such as $\frac{4}{4}$, leaves it the same.

About 45 minutes

I can tell if a product is more or less without multiplying.

THE LESSON

- 1 Warm up** (5 min) Which is more: 3×8 or 8 ? 1×8 or 8 ? Half of 8 or 8? How do you know without working it out?
- 2 Teach** (10 min) Compare $\frac{3}{4} \times 16$ with 16: $\frac{3}{4}$ is less than 1, so the product is only part of 16, less than 16. Compare $\frac{7}{4} \times 16$ with 16: $\frac{7}{4}$ is more than 1, so the product is more than 16. And $\frac{5}{5} \times 16$ is exactly 16, because $\frac{5}{5}$ is 1. Times $\frac{3}{4}$ shrinks 16 toward 0; times $\frac{7}{4}$ stretches it past 16. With two fractions, $\frac{3}{4} \times \frac{5}{9}$ is less than $\frac{5}{9}$, because $\frac{3}{4}$ is less than 1. Check one: $\frac{3}{4} \times 16 = 12$.
Say: "Multiplying by a number greater than 1 makes a product bigger. Multiplying by a number less than 1 makes it smaller. Multiplying by 1 keeps it the same."
- 3 Try it together** (10 min) Pairs sort cards into more, less and the same, comparing each product with its first factor and not multiplying: $8 \times \frac{2}{3}$, $8 \times \frac{4}{3}$, $8 \times \frac{3}{3}$, $1\frac{1}{4} \times \frac{5}{6}$ and $\frac{5}{6} \times 1\frac{1}{2}$. Each pair explains one card to the class.
- 4 Practice** (15 min) Students circle what is true and write $>$, $<$ or $=$ without multiplying on sheet 4 of Multiplying Fractions.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 8.7** and circle a face beside the "I can" line. Question 1: $<$ and $>$; a student who multiplied gets them right too, but ask how the factor $\frac{5}{6}$ tells it at once. Question 2: $12 \times 1\frac{1}{3}$ and $12 \times \frac{5}{4}$ circled; a circled $12 \times \frac{3}{4}$ or $12 \times \frac{9}{10}$ means multiplying was taken to always make bigger.

Need help? Show each factor on a number line from 0 to 2 with 1 marked, and say if it is left or right of 1.

Ready for more? Write a product of 18 and a fraction that is more than 18, one that is less and one that is equal, and put them in order without multiplying.

GET READY

- A number line from 0 to 2 with 1 marked, drawn large
- Cards with products to sort: more, less, the same
- Whiteboards and markers

WORDS TO USE

scaling: stretching or shrinking a number by multiplying

factor: a number being multiplied

compare with 1: is the factor more than 1, less than 1 or equal to 1?

ASK

- Is the other factor more than 1, less than 1 or equal to 1?
- Will the product be bigger or smaller than the first factor?
- How could you check with one multiplication?

WATCH FOR

Thinks multiplying always makes a number bigger. Try $\frac{1}{2} \times 8$: half of 8 is 4, less than 8.

Compares the product with the wrong factor. Circle the factor you compare with, and look at the other one.

Calls $\frac{5}{5}$ less than 1. Five fifths is one whole.

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PRINTABLE

Multiplying Fractions: sheet 4

QUIZ

Multiplying and Dividing Fractions Quiz: the Scaling level

EXIT TICKET

5th Grade Multiplying Fractions Exit Tickets: Exit Ticket 8.7

Multiplying Fractions

Lesson 8.8: Fraction multiplication stories

GOAL Students solve stories and recipes that multiply fractions and mixed numbers with a model and an equation, saying first whether the answer will be more or less.

About 45 minutes

I can solve story problems that multiply fractions.

THE LESSON

- 1 Warm up** (5 min) A recipe uses 2 cups of rice for 6 people. How much rice for 3 people? For 12 people? What did you multiply by each time?
- 2 Teach** (10 min) Read: A pancake recipe uses $\frac{3}{4}$ cup of milk. Mia makes $1\frac{1}{3}$ batches. How much milk? More than $\frac{3}{4}$ cup, since $1\frac{1}{3}$ is more than 1: $1\frac{1}{3} \times \frac{3}{4} = \frac{4}{3} \times \frac{3}{4} = \frac{12}{12} = 1$ cup. Read: Of a park, $\frac{3}{5}$ is grass, and a soccer field covers $\frac{1}{4}$ of the grass. What part of the park is the field? On an area model, $\frac{1}{4} \times \frac{3}{5} = \frac{3}{20}$, less than $\frac{3}{5}$.
Say: "I find the amount being multiplied and the number I multiply by, and estimate: more or less than the amount I started with? Then I write the equation and solve."
- 3 Try it together** (10 min) Pairs solve: A trail is $2\frac{1}{2}$ miles long. Leo walks $\frac{3}{4}$ of it. How far does he walk? Then: A recipe for 4 rolls uses $\frac{2}{3}$ cup of butter. How much butter for 6 rolls?
- 4 Practice** (15 min) Students solve the stories on sheet 5 of Multiplying Fractions, then sheet 3 of Fraction Word Problems for 5th Grade and problems 1 and 3 of its sheet 5 (the rest divide). Recipe groups scale the recipes on sheets 3-4 of Recipe Math.
- 5 Exit ticket** (5 min) Students do **Exit Ticket 8.8** and circle a face beside the "I can" line. Question 1: $4\frac{3}{8}$ cups (or $\frac{35}{8}$); $2\frac{3}{8}$ means the wholes and the fractions were multiplied apart, and $4\frac{1}{4}$ means the amounts were added. Question 2: $\frac{3}{24} = \frac{1}{8}$ of a pan; $\frac{11}{12}$ means the fractions were added.

Need help? Act the recipe out with measuring cups, or draw the story on a tape before writing the equation.

Ready for more? Write a recipe story that multiplies by $\frac{2}{3}$ and one that multiplies by $1\frac{1}{2}$, then solve both.

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PRINTABLE **Multiplying Fractions:** sheet 5

PRINTABLE **Fraction Word Problems for 5th Grade:** sheet 3; sheet 5, problems 1 and 3

PRINTABLE **Recipe Math:** sheets 3-4

EXIT TICKET **5th Grade Multiplying Fractions Exit Tickets:** Exit Ticket 8.8

GET READY

- Story cards and a simple recipe card
- Measuring cups
- Whiteboards and markers

WORDS TO USE

of: part of an amount: multiply

batch: one whole recipe

scale a recipe: multiply every amount by the same number

ASK

- What amount is being multiplied? By what?
- Should the answer be more or less than the amount you started with?
- Does your answer have the unit?

WATCH FOR

Adds the amounts ($\frac{3}{4}$ of $2\frac{1}{2}$ miles as $\frac{3}{4} + 2\frac{1}{2}$). Of means times: draw the trail and take $\frac{3}{4}$ of it.

Multiplies the wholes and the fractions apart. Write mixed numbers as fractions first, or use all four partial products.

Gets an answer bigger than the trail for part of it. Estimate first: part of a trail is less than the trail.