Finding a Fraction of a Fraction

Teacher		**Class**	Grade 5
Subject	Math	**Topic**	Multiplying fractions
Date		**Room**	
Lesson length	60 minutes	**Country**	United States

Students learn to multiply a fraction by a fraction and a whole number by a fraction. They draw overlap squares and match models to the multiply-across rule.

Curriculum links

- Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction [1]
- Solve problems involving multiplication of a whole number and a fraction with models [2]

Learning objectives

- Students will multiply a fraction by a fraction using an area model.
- Students will multiply a whole number by a fraction and explain the product.
- Students will simplify products to simplest form when possible.

Success criteria

- I can draw and solve a fraction of a fraction.
- I can show a whole number times a fraction with a model.
- I can multiply tops and bottoms and simplify the answer.

What students already know

Show 1/2 + 1/3 and 1/2 x 1/3. Ask: which one needs the same bottom first and why? Listen for adding needs same bottom.

Key words

numerator	the top number that tells how many parts are counted [10]
denominator	the bottom number that tells how many equal parts make one whole [10]
product	the answer you get when you multiply two numbers [10]
area model	a rectangle drawing that shows overlap to find the answer [3]
simplify	make top and bottom smaller by dividing by the same number [24]

Materials

- Grid paper (1 sheet per student)
- Two colored pencils per student (for example red and yellow)
- Ruler
- Slides 1-5 and 7-11
- Video clip 5 (0:00–5:00) on Slide 8
- Worksheet Task B copies (1 per student)

Before the lesson

- Print grid paper and Worksheet Task B, one per student
- Test Slides 1-5 and 7-11 and Video clip 5 (0:00–5:00) on Slide 8
- Set out two colored pencils and a ruler for each pair
- Draw a 1-unit square divided into thirds one way and fourths the other way for demo

Created with LessonDino.com · AI lesson planner with checkable sources

- Mini whiteboards and markers

Lesson outline

0–5 min **Starter** 5 min · Whole class

Connect adding to multiplying and hook students with the paint overlap question.

YOU DO

1. Show Slide 1 Times a Fraction: Finding a part of a part and read the title together.
2. Ask the hook: What happens if you paint one fraction right on top of another fraction?
3. Show Slide 2 Did you know? You need no common bottom to multiply and stress no same bottom is needed to multiply [4].
4. Show Slide 3 Big idea: Multiplying a fraction means finding a fraction of something and have students repeat it.

STUDENTS DO

1. Listen and look at Slides 1-3.
2. Turn and talk to a partner to predict what the overlap might show.
3. Repeat the big idea in their own words.

Say: What happens if you paint one fraction right on top of another fraction? Today we will paint, overlap, and find a part of a part. Remember, multiplying a fraction means finding a fraction of something.

Ask: When we add fractions, what do we need first? (The same bottom. We add tops and keep the bottom.) · Do we need that same bottom to multiply? (No. Just multiply tops together and bottoms together to get the answer [4].)

Check understanding: Show thumbs up if you can say the big idea. If not, repeat Slide 3 together and give one example of finding a part, like half of 6.

Support: Give a half-strip and a third-strip to hold and overlap to see a small piece. **Stretch:** Ask whether the overlap of two proper fractions will be larger or smaller than each starting fraction.

Use: Slides 1-3

5–15 min **Teaching: Whole Number Times Fraction** 10 min · Whole class

Explain whole-number by fraction as groups and as a fraction of a whole.

YOU DO

1. Show Slide 5 How do you see it? Which way makes sense for 3 x 2/3 and take a vote.
2. Model 2/3 x 6 as 6 copies of two-thirds, which makes 12 thirds or 4 wholes [21].
3. Show Slide 7 Three kinds we can do and point to Whole x Fraction and Fraction x Whole cards.
4. Write 6 as 6/1 so 2/3 x 6 is the same as 2/3 x 6/1 [4], then multiply the numerator by the whole number and keep the same denominator [21].

STUDENTS DO

1. Vote for 3 groups of 2/3, 2/3 of 3 wholes, or both ways make sense.
2. Copy the 2/3 x 6 = 12/3 = 4 model on mini whiteboards.
3. Explain to a partner why only the top number changes.

Say: 3 x 2/3 can mean 3 groups of 2/3, and it can also mean 2/3 of 3 wholes. Both ways make sense. Any whole number can be written as a fraction over 1, so we multiply straight across and the bottom number stays the same.

Worked example: 2/3 x 6: Write 6 as 6/1 [4]. Multiply tops: 2 x 6 = 12. Multiply bottoms: 3 x 1 = 3. So 12/3 = 4. That is 6 copies of two-thirds makes 12 thirds, which is 4 wholes [21].

Ask: If you have 6 sheets of art paper and you use two-thirds of them, did you use more or less than 6? (Less than 6. Two-thirds of 6 is 4.) · How do you multiply a whole number by a fraction? (Multiply the numerator by the whole number to get the top of the answer, and keep the denominator the same [21].)

Check understanding: Hold up whiteboards for 1/2 x 6. Look for 6/2 = 3. Reteach with 2 boxes for halves and counters if many show 1/12 [19].

Support: Use counters and 3 boxes for thirds so students can place 6 counters evenly to see 4 in two boxes [19]. **Stretch:** Ask students to predict 7 x 2/3 and whether the answer should stay as an improper fraction or become a mixed number.

Use: Slides 5, 7

15–27 min **Teaching: Fraction Times Fraction** 12 min · Whole class

Show how an overlap square proves the multiply-across rule.

YOU DO

1. Show Slide 4 Add or multiply? and contrast adding, which needs the same bottom first, with multiplying, which needs no same bottom [4].
2. Play Video clip 5 (0:00–5:00) on Slide 8 Watch: Paint the rectangle and tell students to watch where the two shades overlap and listen for tops times tops.
3. Model 2/3 x 1/4 on the demo square: shade two-thirds one color, one-fourth the other color, and point to the 2 overlap parts out of 12 total parts [3].
4. Write the rule that to multiply fractions you multiply the top numbers for the numerator and the bottom numbers for the denominator [3].

STUDENTS DO

1. Watch the video and raise a hand when they hear tops times tops.
2. Sketch the 2/3 by 1/4 square and count 12 total parts and 2 double-shaded parts.
3. Choral read the multiply-across rule with the teacher.

Say: Watch where the two shades overlap. See how the square becomes small parts. Spot why bottoms multiply. The overlap is the answer, and it shows tops times tops and bottoms times bottoms.

Worked example: 2/3 x 1/4: Divide a square into thirds one way and fourths the other way to make 12 small parts. Shade 2 thirds and 1 fourth. The 2 overlap parts show the product as 2/12 [3]. So 2 x 1 = 2 on top and 3 x 4 = 12 on bottom [3].

Ask: Why is the bottom of 2/3 x 1/4 equal to 12? (Thirds one way and fourths the other way make 3 x 4 = 12 equal small parts [3].) · What is 1/2 x 1/3 and how do you see it in a rectangle? (1/6. Split a rectangle into halves and thirds to see 1 part out of 6 [10].)

Check understanding: Ask all to write 1/2 x 1/3 = ? on whiteboards. Look for 1/6. If wrong, redraw halves one way and thirds the other way and recount [10].

Support: Give a rectangle already split into 6 parts so students color halves one way and thirds the other way to see the overlap. **Stretch:** Ask why 1/2 x 1/3 = 1/6 is smaller than both 1/2 and 1/3.

Use: Slides 4, 8; Video clip 5 (0:00–5:00)

27–47 min **Main Activity: Paint Overlap Squares** 20 min · Pairs

Practice multiplying fraction by fraction with area models and whole number by fraction with bars.

YOU DO

1. Hand out grid paper, colored pencils, and rulers and show Slide 9 Your task.
2. Demo the steps: draw a 1-unit square, divide into thirds one way and fourths the other way, shade two-thirds, shade one-fourth, outline overlap.
3. Direct pairs to complete the square for 2/3 x 3/4, then draw bars or groups for 3 x 2/5 and write tops x tops and bottoms x bottoms and simplify.
4. Circulate, check labels like 2/3 x 1/4 = 2/12, and prompt Worksheet Task B multiply-across items.

STUDENTS DO

1. In pairs, draw, shade, and label overlap squares for 2/3 x 1/4 and 2/3 x 3/4.
2. Model 3 x 2/5 with bars or groups and write the multiply-across steps.
3. Complete Worksheet Task B items and check by multiplying numerators together and denominators together [4].

Say: Draw your 1-unit square with a ruler. Split it thirds one way and fourths the other way. Shade two-thirds in one color and one-fourth in the other color. The overlap where paint meets paint is your answer. Label it and write the tops and bottoms multiplication.

Worked example: 1/4 x 1/2 = 1/8: Shade 1/4 of a sheet, then find 1/2 of that shaded part, which is 1/8 of the whole sheet [4]. Tops: 1 x 1 = 1. Bottoms: 4 x 2 = 8. For 3 x 2/5, write 3 as 3/1 and multiply across to get 6/5 [4].

Ask: How many total parts does your square have and why? (12 for thirds by fourths, because 3 x 4 = 12 [3].) · Where do you see the 3 double-shaded parts and 8 total parts for 1/2 of 3/4? (Cut each fourth in half to make eighths and circle half of the shaded part; the answer is 3/8 [24].)

Check understanding: Walk and look for squares labeled 2/3 x 1/4 = 2/12 with 2 overlap parts out of 12 [3]. If missing, have pair recount total parts and re-outline overlap.

Support: Start with 1/2 x 1/3, where students split a rectangle into halves and thirds to see 1 part out of 6 [10].
Stretch: Students draw and solve 3/4 x 2/3 and explain how they know the total number of parts.

Use: Slide 9; Worksheet Task B

Created with LessonDino.com · AI lesson planner with checkable sources

47–60 min **Plenary: Simplify and Exit** 13 min · Whole class

Review simplifying and check both kinds of multiplication.

YOU DO

1. Show Slide 10 Finish strong: simplify and read the three cards together.
2. Model 4/5 x 3/8: multiply numerators and denominators to get 12/40, then divide top and bottom by 4 to get 3/10 [10].
3. Show Slide 11 Exit ticket and give time for Solve 1/2 x 2/3 with a quick sketch.
4. Collect exits and preview that finding a fraction of something is multiplying [10].

STUDENTS DO

1. Copy 4/5 x 3/8 = 12/40 = 3/10 and say the simplify step.
2. On their own, solve the exit ticket and draw a quick bar or square.
3. Share one thing learned and one question still left.

Say: Multiply straight across. Tops times tops, bottoms times bottoms. Write a whole as over 1, like 5 = 5/1. Simplify last. Divide top and bottom by the same number to make the answer simplest.

Worked example: 4/5 x 3/8: Tops 4 x 3 = 12. Bottoms 5 x 8 = 40. So 12/40. Divide top and bottom by 4 to get 3/10 [10]. You can also simplify before multiplying to keep numbers small.

Ask: What does finding 1/2 of 3/4 mean as a multiplication? (It means 1/2 multiplied by 3/4, which is 3/8 [10] [24].) · Why did we not find a common bottom today? (Multiplying fractions does not need a common denominator; we multiply straight across [4].)

Check understanding: Read exits for 1/2 x 2/3 = 2/6 = 1/3 with sketch. Reteach overlap count in small group tomorrow if sketches show adding.

Support: Provide a factor list for denominators up to 12 so students can spot common factors quickly and reduce to lowest terms [24]. **Stretch:** Ask students to write a match that needs simplifying, like 4/5 x 3/8, and show both unsimplified and simplified products.

Use: Slides 10-11

Common mistakes

Mistake	How to spot it	How to fix it
Finding a common denominator before multiplying	Work shows changed fractions like 1/2 x 1/3 changed to 3/6 x 2/6	Remind that multiplying fractions does not need a common denominator; multiply straight across tops and bottoms [4].
Multiplying both top and bottom by the whole number, for example 3/5 x 3 as 9/15	Bottom changes from 5 to 15 in a whole-number problem	Show 3 as 3/1 [4] and multiply only the numerator by 3, keeping the denominator the same [21].
Adding tops and bottoms or simplifying incorrectly	Answer like 1/2 x 2/5 = 3/7 or unsimplified 12/40 left without dividing	Point to area model to count double-shaded parts over total parts [23], then divide top and bottom by the common factor, like 12/40 to 3/10 [10].

Support

- Start with 1/2 x 1/3 with halves and thirds to see 1 part out of 6 [10].

Stretch

- Draw and solve 3/4 x 2/3 and explain how they know the total number of parts.

Created with LessonDino.com · AI lesson planner with checkable sources

- Use pre-split bars and counters in 3 boxes to show whole-number problems [19].
- Create matches that need simplifying and show both products, like 12/40 and 3/10 [10].

For the LSE or teaching assistant

Sit with target pairs during Paint Overlap Squares. Help count total parts and overlap parts, prompt tops-times-tops language, and check Worksheet Task B for common-bottom errors.

Check for understanding

Question	Answer
Solve 1/2 x 2/3. Show a quick sketch.	2/6 = 1/3. Rectangle split into halves and thirds shows 2 overlap parts out of 6.
Solve 3 x 2/5. Show how you wrote the whole number.	3 = 3/1 [4], so 6/5 or 1 1/5.
Why do you multiply bottoms when you multiply fractions?	Splitting one way and the other way makes new small equal parts; bottoms multiply to give the total [3][23].

Homework

Draw an overlap square for 1/4 x 2/3, write tops x tops and bottoms x bottoms, and simplify.

Sources

1. Grade 5 | Common Core State Standards Initiative · thecorestandards.org · https://www.thecorestandards.org/Math/Content/5/
2. Grade 5 Math Curriculum - Fairfax County Public Schools · fcps.edu · https://www.fcps.edu/academics/elementary/fifth-grade/year-at-a-glance/math
3. Multiplying Fractions | Learning Blocks | University of Arkansas · learningblocks.uark.edu · https://learningblocks.uark.edu/mathblocks/fractions/multiplying-fractions.php
4. Multiplying Fractions - ResourceCenter · resourcecenter.byupathway.edu · https://resourcecenter.byupathway.edu/math/m07-08
5. Multiplying Fractions – Mathematics for Elementary Teachers · open.maricopa.edu · https://open.maricopa.edu/mathforelementaryteachers/chapter/multiplying-fractions/
6. Math Foundations: Fractions - Multiplication and Division ... · studentsuccess.temple.edu · https://studentsuccess.temple.edu/sites/studentsuccess/files/media/document/Fractions%20-%20Multiplication%20and%20Division_0.pdf
7. Multiplying Fractions - University of North Georgia · ung.edu · https://ung.edu/learning-support/video-transcripts/multiplying-fractions.php
8. Multiplying Fractions - Brigham Young University–Idaho · content.byui.edu · https://content.byui.edu/file/b8b83119-9acc-4a7b-bc84-efacf9043998/1/Math-1-9-2.html
9. How to multiply fractions - BBC Bitesize · bbc.co.uk · https://www.bbc.co.uk/bitesize/articles/z8fyv4j
10. Learn how to multiply fractions – KS3 Maths – BBC Bitesize · bbc.co.uk · https://www.bbc.co.uk/bitesize/articles/zxdmxbk
11. Kids Math: Multiplying and Dividing Fractions - Ducksters · ducksters.com · https://www.ducksters.com/kidsmath/fractions_multiplying_dividing.php
12. Multiplying Fractions – Mathematics for Elementary Teachers · pressbooks-dev.oer.hawaii.edu · https://pressbooks-dev.oer.hawaii.edu/math111/chapter/multiplying-fractions/
13. Multiplying and dividing fractions - Fractions - Edexcel - GCSE … · bbc.com · https://www.bbc.com/bitesize/guides/zgqpv9q/revision/5
14. Flexi answers - How do you multiple fractions? | CK-12 Foundation · ck12.org · https://www.ck12.org/flexi/cbse-math/multiply-fractions/how-do-you-multiple-fractions/
15. Multiplying Fractions Calculator, Mixed Fractions with Examples … · edume.org · http://www.edume.org/pre-algebra/fractions/multiply
16. Multiplying Fractions Calculator · omnicalculator.com · http://www.omnicalculator.com/math/multiplying-fractions
17. The Magic of Multiplying Fractions: A Kid's Guide / Learning ... · learningcorner.co · https://learningcorner.co/explain-anything/1591
18. Multiplying Fractions - Math is Fun · mathsisfun.com · https://www.mathsisfun.com/fractions_multiplication.html
19. How to Teach Multiplying Fractions so Students Actually ... · educatewithease.com · https://educatewithease.com/multiplying-fractions/
20. Multiplying Fractions – Definition, Steps, Properties, Example · brighterly.com · https://brighterly.com/math/multiplying-fractions/

Created with LessonDino.com · AI lesson planner with checkable sources

21. Multiplying Fractions by Fractions Math Videos for Kids ... · generationgenius.com · https://www.generationgenius.com/videolessons/multiplying-fractions-by-fractions/
22. How to Multiply Fractions is Explained and Exampled · digitmath.com · https://www.digitmath.com/m.multiplying-fractions.html
23. 5.1: Multiplying fractions – Mathematics For Elementary Education I · openwa.pressbooks.pub · https://openwa.pressbooks.pub/math131/chapter/multiplying-fractions/
24. Multiplying Fractions | Mathematics for the Liberal Arts Corequisite · courses.lumenlearning.com · https://courses.lumenlearning.com/esc-mathforliberalartscorequisite/?p=4628
25. Multiplying Fractions – Math for Trades · pressbooks.bccampus.ca · https://pressbooks.bccampus.ca/mark/chapter/multiplying-fractions/

Created with LessonDino.com · AI lesson planner with checkable sources