

Student Guide

Multiply Two Fractions (SG pp. 498–501)

Questions 1–9


1. **A.** The product of $\frac{3}{4} \times \frac{2}{3}$ is less than $\frac{3}{4}$ because you are finding a part of $\frac{2}{3}$.
 - B.** The product is also less than $\frac{2}{3}$ because I know $\frac{2}{3} \times \frac{3}{4} = \frac{3}{4} \times \frac{2}{3}$. Since I am finding only a part of $\frac{3}{4}$, the answer will be less than $\frac{3}{4}$.
 - C.** Yes, Nicholas's answer is reasonable. $\frac{1}{2}$ is less than both $\frac{2}{3}$ and $\frac{3}{4}$.
2. Her paper is divided into 4×3 or 12 parts so the denominator in the product is 12.
 3. **A.** She multiplied the numerators 3×2 together to get 6.
 - B.** She multiplied the denominators 4×3 together to get 12.

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Multiply Two Fractions


Mr. Moreno presented his class with this problem:

$\frac{2}{3}$ of a pizza has sausage. $\frac{3}{4}$ of that section of the pizza has mushrooms, too. What fraction of the pizza has both sausage and mushrooms?




Nicholas's Way

Here is how Nicholas used fraction circle pieces to model $\frac{3}{4} \times \frac{2}{3}$. First he showed $\frac{2}{3}$ of a whole, the part of the pizza that has sausage.




He saw that 4 aqua pieces covered the 2 orange pieces. He showed $\frac{3}{4}$ of $\frac{2}{3}$ with 3 aqua pieces. This was the part of the pizza that had both sausage and mushrooms.



Nicholas thought about the whole pizza again. He saw that $\frac{3}{4}$ of $\frac{2}{3}$ is $\frac{1}{2}$ of the whole. $\frac{1}{2}$ of the whole pizza has both sausage and mushrooms.

$$\frac{3}{4} \times \frac{2}{3} = \frac{3 \times 2}{4 \times 3} = \frac{6}{12} = \frac{1}{2}$$

Discuss



1. **A.** Is the product of $\frac{3}{4}$ and $\frac{2}{3}$ greater than or less than $\frac{3}{4}$? Why?
- B.** Is the product of $\frac{3}{4}$ and $\frac{2}{3}$ greater than or less than $\frac{2}{3}$? Why?
- C.** Does Nicholas's answer make sense? How do you know?

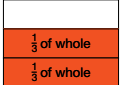
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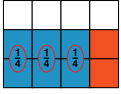
Yolanda's Way

Yolanda used paper folding to find the product. She explained her strategy:

"To multiply $\frac{3}{4} \times \frac{2}{3}$, I folded the paper into thirds the long way. I colored $\frac{2}{3}$ of it orange.




"Then I folded the paper into fourths the other way. I colored $\frac{3}{4}$ of the $\frac{2}{3}$ with blue.



"I noticed a pattern. I saw that I had divided the paper into 4×3 , or 12 parts. I colored 3×2 , or 6 of the 12 parts blue, so $\frac{6}{12}$ of the parts are colored blue. That's the same as $\frac{1}{2}$ so I wrote:

$$\frac{3}{4} \times \frac{2}{3} = \frac{3 \times 2}{4 \times 3} = \frac{6}{12} = \frac{1}{2}$$

$\frac{3}{4}$ of $\frac{2}{3}$ is $\frac{6}{12}$ or $\frac{1}{2}$ of the whole.



2. Look at Yolanda's folded paper. How did she know the denominator in the product would be 12?
3. Look at the pattern in the equation Yolanda wrote.
 - A.** How did Yolanda find the numerator 6?
 - B.** How did Yolanda find the denominator 12?

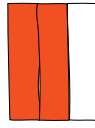
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Answer Key • Lesson 8: Multiply Two Fractions

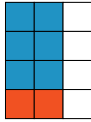
Roberto's Way

Roberto didn't have any paper to fold. Instead he drew a rectangular shaped pizza and solved $\frac{3}{4} \times \frac{2}{3}$ in a way similar to Yolanda's way. He drew vertical lines to divide the rectangle into thirds. He shaded 2 of the 3 parts orange.



To find $\frac{2}{3}$ of the $\frac{3}{4}$, he drew horizontal lines dividing the rectangle into fourths.

He shaded $\frac{3}{4}$ of the $\frac{2}{3}$ -part blue. This shows the product of $\frac{3}{4} \times \frac{2}{3}$.



$$\frac{3}{4} \times \frac{2}{3} = \frac{\text{number of parts}}{\text{kind of parts}} = \frac{3 \times 2}{3 \times 4} = \frac{6}{12}$$

4. A. How many little pieces are in the whole rectangle?
- B. What fractional part of the whole rectangle is each piece?
- C. What fractional part of the whole rectangle is shaded blue? Write a number sentence: $\frac{3}{4} \times \frac{2}{3} =$



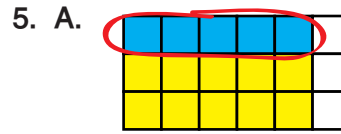
5. A. Draw a rectangle like Roberto did to solve $\frac{1}{3} \times \frac{5}{6}$.
 - Draw vertical lines to divide the rectangle into 6 parts.
 - Shade $\frac{5}{6}$ of the rectangle one color.
 - To find $\frac{1}{3}$ of the $\frac{5}{6}$, draw horizontal lines to divide the rectangle into 3 parts.
 - Shade $\frac{1}{3}$ of $\frac{5}{6}$ a different color.
- B. How many little pieces are in the whole rectangle?
- C. What fractional part of the whole rectangle is shaded with two colors? Write a number sentence: $\frac{1}{3} \times \frac{5}{6} =$

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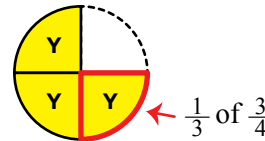
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4. A. 12
- B. $\frac{1}{12}$
- C. $\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$ or $\frac{1}{2}$

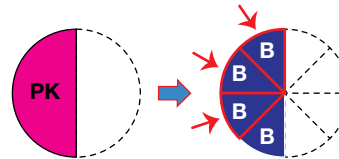


5. B. 18
- C. $\frac{1}{3} \times \frac{5}{6} = \frac{5}{18}$
6. Both Josh and Sam are correct. If Josh rewrites $\frac{4}{24}$ in simplest form, he gets Sam's answer $\frac{1}{6}$.
7. A.* The product of $\frac{1}{3}$ and $\frac{3}{4}$ is less than $\frac{1}{3}$ and less than $\frac{3}{4}$.
- B.* Solution strategies will vary. Using fraction circle pieces:



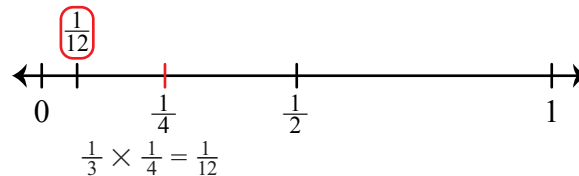
$$\frac{1}{3} \times \frac{3}{4} = \frac{1}{4}$$

- C.* $\frac{1}{3} \times \frac{3}{4} = \frac{1 \times 3}{3 \times 4} = \frac{3}{12} = \frac{1}{4}$
- D. They are the same, $\frac{1}{4}$.
8. Solution strategies for Questions 8A–H will vary. Possible solution strategies are given.
- A. estimate: less than $\frac{3}{4}$ and less than $\frac{1}{2}$



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

- B. estimate: less than $\frac{1}{3}$ and less than $\frac{1}{4}$



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6. Josh and Sam solved the problem $\frac{1}{2} \times \frac{4}{12}$ in two different ways. Josh used paper and pencil and wrote the following:

$$\frac{1}{2} \times \frac{4}{12} = \frac{1 \times 4}{2 \times 12} = \frac{4}{24}$$

Sam reasoned that since $\frac{1}{2}$ of 4 is 2, then $\frac{1}{2}$ of $\frac{4}{12}$ is $\frac{2}{12}$, or $\frac{1}{6}$ in simplest form. Who is correct? Explain.

7. A. Estimate the product of $\frac{1}{3}$ and $\frac{3}{4}$. Is it greater or less than $\frac{1}{3}$? Is it greater or less than $\frac{3}{4}$?
- B. Fold paper, sketch a rectangle, or use fraction circle pieces to solve $\frac{1}{3} \times \frac{3}{4}$. Show your work with a drawing of the model you used.
- C. Multiply $\frac{1}{3} \times \frac{3}{4}$ using paper and pencil like Josh did in Question 6.
- D. How do your solutions in Question 7B and Question 7C compare?
8. Find the products.
 - Estimate the size of the product. You can use fraction circle pieces to help you estimate.
 - Choose any strategy to solve the problem and write a number sentence.
 - Use paper folding or a rectangle model at least once.
 - Use fraction circle pieces at least once.
 - Compare your product to your estimate to see if it is reasonable.

A. $\frac{3}{4} \times \frac{1}{2} =$ B. $\frac{1}{3} \times \frac{1}{4} =$ C. $\frac{5}{6} \times \frac{1}{2} =$ D. $\frac{1}{4} \times \frac{2}{5} =$
 E. $\frac{2}{3} \times \frac{3}{5} =$ F. $\frac{1}{3} \times \frac{3}{10} =$ G. $\frac{3}{4} \times 3 =$ H. $\frac{2}{5} \times \frac{3}{6} =$

Check-In: Question 9

9. A. Estimate the product of $\frac{5}{6}$ and $\frac{2}{3}$. Will it be more or less than $\frac{5}{6}$? Will it be more or less than $\frac{2}{3}$?
- B. Show how to solve $\frac{5}{6} \times \frac{2}{3}$ using fraction circle pieces, by sketching a rectangle, or by folding paper. Write a number sentence to show your solution.
- C. Solve $\frac{5}{6} \times \frac{2}{3}$ using paper and pencil.
- D. Is your answer to Question 6C reasonable? How do you know?

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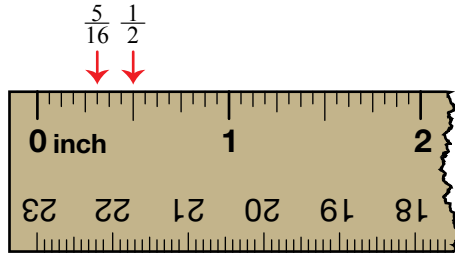
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*Answers and/or discussion are included in the lesson.

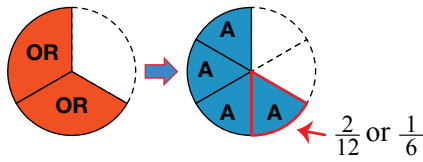
C. estimate: less than $\frac{5}{8}$ and less than $\frac{1}{2}$

I thought of a ruler:



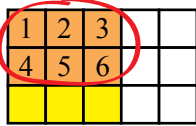
$$\frac{5}{8} \times \frac{1}{2} = \frac{5}{16}$$

D. estimate: less than $\frac{1}{4}$ and less than $\frac{2}{3}$



$$\frac{1}{4} \times \frac{2}{3} = \frac{2}{12} = \frac{1}{6}$$

E. estimate: less than $\frac{2}{3}$ and less than $\frac{3}{5}$



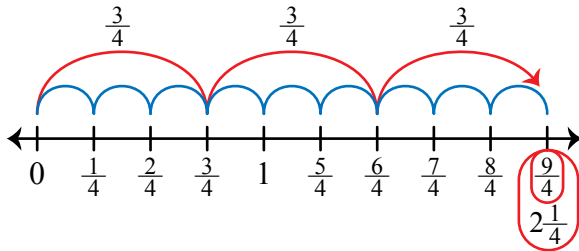
$$\frac{2}{3} \times \frac{3}{5} = \frac{6}{15}$$

F.* estimate: less than $\frac{1}{3}$ and less than $\frac{3}{10}$
Using mental math: $\frac{1}{3}$ of 3 is 1, $\frac{1}{3}$ of $\frac{3}{10}$ is $\frac{1}{10}$.

$$\frac{1}{3} \times \frac{3}{10} = \frac{3}{30} \text{ or } \frac{1}{10}$$

G. estimate: less than $\frac{3}{4}$ and less than 3

$$\frac{3}{4} \times 3 = \frac{9}{4} \text{ or } 2\frac{1}{4} \text{ see hardcopy}$$



H. estimate: less than $\frac{2}{5}$ and less than $\frac{3}{8}$

Using paper and pencil:

$$\frac{2}{5} \times \frac{3}{8} = \frac{6}{40} = \frac{3}{20}$$

6. Josh and Sam solved the problem $\frac{1}{2} \times \frac{4}{12}$ in two different ways. Josh used paper and pencil and wrote the following:

$$\frac{1}{2} \times \frac{4}{12} = \frac{1 \times 4}{2 \times 12} = \frac{4}{24}$$

Sam reasoned that since $\frac{1}{2}$ of 4 is 2, then $\frac{1}{2}$ of $\frac{4}{12}$ is $\frac{2}{12}$, or $\frac{1}{6}$ in simplest form. Who is correct? Explain.

7. A. Estimate the product of $\frac{1}{3}$ and $\frac{3}{4}$. Is it greater or less than $\frac{1}{3}$? Is it greater or less than $\frac{3}{4}$?
 B. Fold paper, sketch a rectangle, or use fraction circle pieces to solve $\frac{1}{3} \times \frac{3}{4}$. Show your work with a drawing of the model you used.
 C. Multiply $\frac{1}{3} \times \frac{3}{4}$ using paper and pencil like Josh did in Question 6.
 D. How do your solutions in Question 7B and Question 7C compare?
8. Find the products.
 • Estimate the size of the product. You can use fraction circle pieces to help you estimate.
 • Choose any strategy to solve the problem and write a number sentence.
 • Use paper folding or a rectangle model at least once.
 • Use fraction circle pieces at least once.
 • Compare your product to your estimate to see if it is reasonable.
- A. $\frac{3}{4} \times \frac{1}{2} =$ B. $\frac{1}{3} \times \frac{1}{4} =$ C. $\frac{5}{8} \times \frac{1}{2} =$ D. $\frac{1}{4} \times \frac{2}{3} =$
 E. $\frac{2}{3} \times \frac{5}{6} =$ F. $\frac{1}{3} \times \frac{3}{10} =$ G. $\frac{2}{4} \times 3 =$ H. $\frac{2}{5} \times \frac{3}{8} =$

✓ Check-In: Question 9

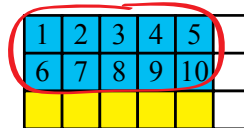
9. A. Estimate the product of $\frac{5}{6}$ and $\frac{2}{3}$. Will it be more or less than $\frac{5}{6}$? Will it be more or less than $\frac{2}{3}$?
 B. Show how to solve $\frac{5}{6} \times \frac{2}{3}$ using fraction circle pieces, by sketching a rectangle, or by folding paper. Write a number sentence to show your solution.
 C. Solve $\frac{5}{6} \times \frac{2}{3}$ using paper and pencil.
 D. Is your answer to Question 6C reasonable? How do you know?

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9. A. less than $\frac{5}{6}$ and less than $\frac{2}{3}$

B. Possible solution strategy:



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

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

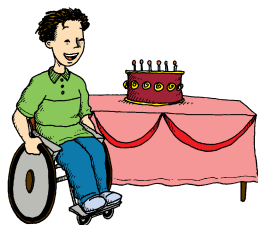
D. Possible response: I know my answer $\frac{5}{9}$ is reasonable because it is less than $\frac{5}{6}$ and $\frac{2}{3}$, and because I solved $\frac{5}{6} \times \frac{2}{3}$ two different ways and got the same product.

Homework

Find the following products. Write your answers in simplest form.

1. $\frac{5}{6} \times \frac{1}{2} =$ 2. $\frac{1}{3} \times \frac{3}{4} =$ 3. $\frac{3}{10} \times \frac{1}{2} =$
 4. $\frac{3}{4} \times \frac{3}{4} =$ 5. $\frac{3}{8} \times 4 =$ 6. $\frac{2}{3} \times \frac{2}{3} =$
 7. $3 \times \frac{5}{6} =$ 8. $\frac{7}{10} \times \frac{1}{2} =$ 9. $10 \times \frac{4}{5} =$
 10. $\frac{4}{6} \times \frac{3}{4} =$ 11. $8 \times \frac{2}{3} =$ 12. $\frac{2}{3} \times \frac{7}{8} =$

13. Darius made a cheese pizza. He put pepperoni on $\frac{1}{2}$ of the pizza. He put onions on $\frac{2}{3}$ of the half with pepperoni. Draw a picture showing the toppings on the pizza.
- A. How much of the whole pizza has pepperoni and onions?
 B. How much of the whole pizza has only cheese?
 C. How much of the whole pizza has only pepperoni but no onions?
14. A. Frank's guests ate $\frac{2}{3}$ of a cake at his party. How much cake was left over?
 B. The next day Frank ate $\frac{1}{4}$ of the leftover cake. How much of the whole cake did he eat the day after the party?



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Homework (SG p. 502)

Questions 1–14

1. $\frac{5}{12}$ 2. $\frac{1}{4}$
 3. $\frac{3}{20}$ 4. $\frac{9}{20}$
 5. $\frac{12}{8} = \frac{3}{2}$ or $1\frac{1}{2}$ 6. $\frac{4}{9}$
 7. $\frac{15}{6} = \frac{5}{2}$ or $2\frac{1}{2}$ 8. $\frac{7}{20}$
 9. 8 10. $\frac{12}{20} = \frac{3}{5}$
 11. $\frac{16}{3} = 5\frac{1}{3}$ 12. $\frac{7}{12}$

13.



- A. $\frac{3}{8}$ pizza B. $\frac{1}{2}$ pizza C. $\frac{1}{8}$ pizza
14. A. $\frac{1}{3}$
 B. $\frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$ cake