Grade 5 Target F

Domain, Target, Standards, DOK, Vertical Alignments, Achievement Levels, Evidence Required, Vocabulary, Response Types, Materials, Attributes, Question Types, and Question Banks (Examples)

Content Domain: Number and Operations—Fractions
Target F [m]: 5.NF.B Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
Standards included in Target 5.NF.B, 5.NF.B.3, 5.NF.B.4, 5.NF.B.4a, 5.NF.B.4b, 5.NF.B.5, 5.NF.B.5a, 5.NF.B.5b, 5.NF.B.6, 5.NF.B.7, 5.NF.B.7a, 5.NF.B.7b, 5.NF.B.7c
Vertical Alignment
Achievement Level Descriptors
Evidence Required
Vocabulary
Response Types
Materials
Attributes
Claim 1: Concepts and Procedures (DOK 1, 2) Question Banks
Claim 2 Problem Solving Questions Banks
Claim 3 Communicating Reasoning Question Banks

Content Domain: Number and Operations—Fractions

Target F [m]: 5.NF.B Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

Standards included in Target 5.NF.B, 5.NF.B.3, 5.NF.B.4, 5.NF.B.4a, 5.NF.B.4b, 5.NF.B.5, 5.NF.B.5a, 5.NF.B.5b, 5.NF.B.6, 5.NF.B.7, 5.NF.B.7a, 5.NF.B.7b, 5.NF.B.7c

5.NF.B Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

5.NF.B.3 Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?

5.NF.B.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

a. Interpret the product (a/b) × q as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations a × q ÷ b. For example, use a

visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)
b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

5.NF.B.5 Interpret multiplication as scaling (resizing), by:
a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.
b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence a/b = (n×a)/(n×b) to the effect of multiplying a/b by 1.

5.NF.B.6 Solve real-world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

5.NF.B.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.
a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.
b. Interpret division of a whole number by a unit fraction, and compute such quotients. For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.
c. Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?

Vertical Alignment

Related Grade 4 standards

4.NF.B Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

4.NF.B.4 Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.
a. Understand a fraction a/b as a multiple of 1/b. For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4). b. Understand a multiple of a/b as a multiple of 1/b, and use this

understanding to multiply a fraction by a whole number. For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.) c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?

Related Grade 6 Standards

6.NS.A Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

6.NS.A.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?

Achievement Level Descriptors

Level 1 Students should be able to apply their previous understandings of multiplication to multiply a fraction by a fraction; know the effect that whole number multiplication has on fractions; use or create visual models when multiplying a whole number by a fraction between 0 and 1; and interpret and perform division of a whole number by 1/2 or 1/3.

Level 2 Students should be able to multiply a whole number by a mixed number; know the effect that a fraction greater than or less than 1 has on a whole number when multiplied; use or create visual models when multiplying two fractions between 0 and 1; extend their previous understandings of division to divide a unit fraction by a whole number; and understand that division of whole numbers can result in fractions.

Level 3 Students should be able to multiply a mixed number by a mixed number; know the effect that a fraction has on another fraction when multiplied (proper and improper fractions); use or create visual models when multiplying two fractions, including when one fraction is larger than 1; and interpret and perform division of any unit fraction by a whole number.

Level 4 Students should be able to understand and use the fact that a fraction multiplied by 1 in the form of a/a is equivalent to the original fraction.

Evidence Required

1. The student interprets a fraction as division of the numerator by the denominator.

2. The student solves problems involving division of whole numbers leading to quotients in the form of fractions or mixed numbers, with or without fraction models.

3. The student multiplies a fraction or whole number by a fraction.

4. The student multiplies fractional side lengths to find areas of rectangles.

5. The student compares the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.

6. The student solves real-world problems involving multiplication of fractions and mixed numbers, with or without visual fraction models.

7. The student solves real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, with or without visual fraction models.

Vocabulary
fraction, equivalent, denominator, numerator, sum, difference, product, mixed number

Response Types
Multiple Choice, single correct response; Equation/Numeri

Materials
visual fraction models (circles, rectangles, tape diagrams, number lines)

Attributes
Division tasks should be limited to those dividing a unit fraction (written 1/a, such that a is any non-zero whole number) by a whole number or a whole number by a unit fraction.

Claim 1: Concepts and Procedures (DOK 1, 2) Question Banks
Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.

5.NF.B.3 DOK Level 1

Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?

Evidence Required:

The student interprets a fraction as division of the numerator by the denominator.

Question Type 1: The stem will present a fraction and ask for an equivalent expression for the fraction.

Which expression is equal to $\frac{3}{4}$?

A. 3 × 4
B. 4 × 3
C. 4 ÷ 3
D. 3 ÷ 4

Question Type 2: The student is presented with a contextual division problem that will result in a fractional quotient.

An art teacher divided 22 ounces of beads equally among 6 groups of students.
How many ounces of beads did each group receive?

A. $\frac{1}{16}$ ounce
B. $\frac{1}{28}$ ounce
C. $\frac{6}{22}$ ounce
D. $\frac{22}{6}$ ounces

Rubric: (1 point) The student identifies the correct fractional quotient (e.g., D; D).

Response Type: Multiple Choice, single correct response

5.NF.B.3 DOK Level 1

Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?

Evidence Required:

The student solves problems involving division of whole numbers leading to quotients in the form of fractions or mixed numbers, with or without fraction models.

Question Type 1: The student is presented with a real-world division problem.

John has 25 ounces of juice. He pours an equal amount of juice into 7 cups.

Enter the number of ounces of juice in each cup.

Rubric: (1 point) The student correctly enters a fraction which represents a solution involving quotients (e.g., $\frac{25}{7}$ or 3 $\frac{4}{7}$).

Response Type: Equation/Numeric

5.NF.B.4 DOK Level 1

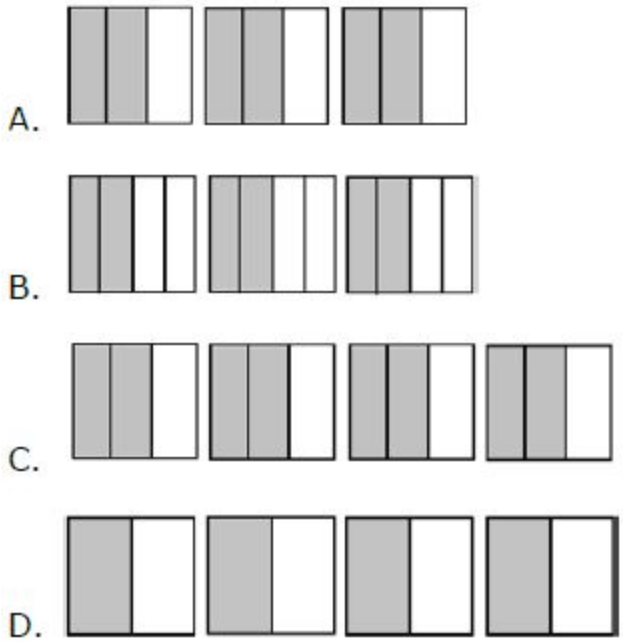
Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. Interpret the product (a/b) × q as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations a × q ÷ b. For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)

Evidence Required:

The student multiplies a fraction or whole number by a fraction.

Question Type 1: The student is presented with a multiplication problem involving a whole number and a fraction that includes fraction models.

Which fraction model best represents 4×2 3?



Rubric: (1 point) The student identifies the correct fraction model for the given multiplication problem (e.g., C).

Response Type: Multiple Choice, single correct response

5.NF.B.4 DOK Level 2

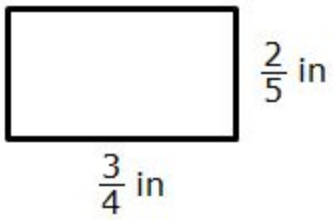
Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

Evidence Required:

The student multiplies fractional side lengths to find areas of rectangles.

Question Type 1: The student is presented with a rectangle with fractional side lengths.

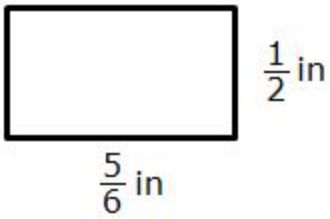
Use this diagram to solve the problem.



Enter the area, in square inches, of the rectangle.
Question Type 2: The student is presented with a contextual problem involving a rectangle with fractional side lengths.

Cherrytown Park is in the shape of a rectangle.

- The width of the park is $\frac{1}{2}$ mile.
- The length of the park is $\frac{5}{6}$ mile.



Enter the area, in square miles, of Cherrytown Park.

Rubric: (1 point) The student correctly finds the area of a given rectangle with fractional side length (e.g., $\frac{6}{20}$; $\frac{5}{12}$).

Response Type: Equation/Numeric

5.NF.B.5 DOK Level 2

Interpret multiplication as scaling (resizing), by: a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.

Evidence Required:

The student compares the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.

Question Type 1: The student is presented with a multiplication expression and the range from 0 to the whole number.

Enter a value for b that makes this statement true: 5 × b is less than 5 but greater than 0.

Question Type 2: The student is presented with a multiplication expression and the range from the whole number to twice the whole number.

Enter a value for b that makes this statement true: 5 × b is greater than 5 but less than 10.

Rubric: (1 point) The student enters a correct value in the given range (e.g., $\frac{1}{2}$; 1 $\frac{1}{2}$).

Response Type: Equation/Numeric

5.NF.B.6 DOK Level 2

Solve real-world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

Evidence Required:

The student solves real-world problems involving multiplication of fractions and mixed numbers, with or without visual fraction models.

Question Type 1: The student is presented with a real-world context multiplication problem involving a fraction and a mixed number.

Julie bikes 62 3 miles along the river trail on Saturday. Greg swims 3 4 of that distance. Enter the distance, in miles, that Greg swims.

Question Type 2: The student is presented with a real-world context multiplication problem involving a fraction and a whole number, including a visual model.

Lisa is painting her kitchen and bathroom.

- She uses 4 gallons of paint in the kitchen.
- She uses $\frac{2}{3}$ of that amount in the bathroom.
- The shaded portions in this model represent the amount of paint she uses in the bathroom.

Enter the amount of paint, in gallons, Lisa uses in the bathroom.

Rubric: (1 point) The student correctly enters the solution (e.g., 5 or $\frac{60}{12}$; $\frac{8}{3}$ or 2 $\frac{2}{3}$).

Response Type: Equation/Numeric

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5.NF.B.7 DOK Level 1

Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. c. Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?

Evidence Required:

The student solves real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, with or without visual fraction models.

Question Type 1: The student is presented with a real-world context division problem involving a unit fraction and a whole number.

Ryan has 1 2 pound of chocolate. He divides it into 4 equal portions. Enter the amount of chocolate, in pounds, in each portion.

Rubric: (1 point) The student correctly enters the solution to the division problem (e.g., 1 8).

Response Type: Equation/Numeric

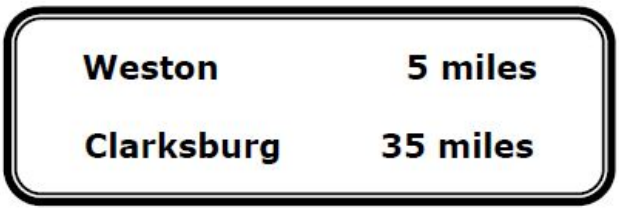
Claim 2 Problem Solving Questions Banks

Claim Descriptors and Targets

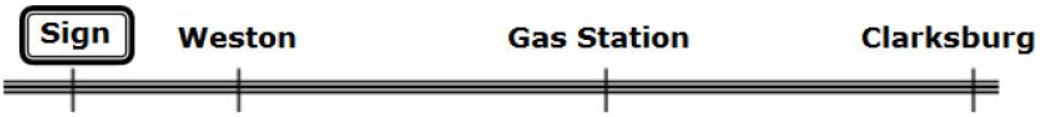
Students can solve a range of complex well-posed problems in pure and applied mathematics, making productive use of knowledge and problem-solving strategies.

Example 1

Mia is traveling along a road toward Clarksburg and sees the following sign.



Mia knows there is a gas station located halfway between Weston and Clarksburg, as shown on this diagram.



How many miles is it from Weston to Clarksburg?

Enter your answer in the first response box.

How many miles is it from the sign to the gas station?

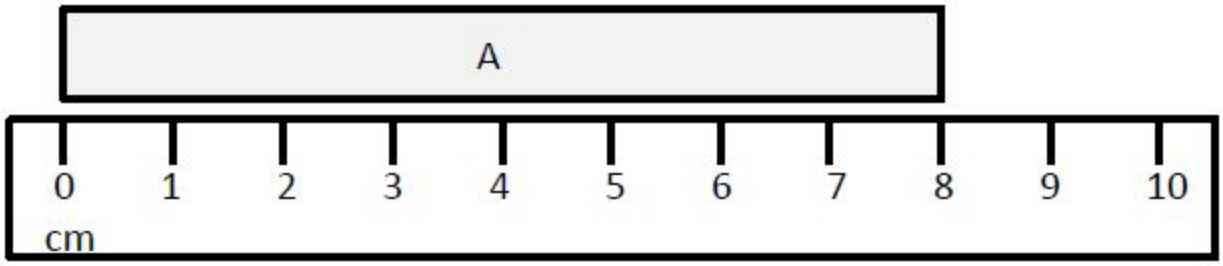
Enter your answer in the second response box.

Rubric: (2 points) The student enters the correct distances for each question (30 or 30 mi; 20 or 20 mi).
(1 point) The student enters only one correct distance (e.g., 30 or 20).

Response Type: Equation/Numeric (2 response boxes)
Commentary: This item requires the student to identify the distances between the sign and the different cities as well as the distances between cities and understand the relationships between these quantities, and so draws on the skill set identified in Target 2D.

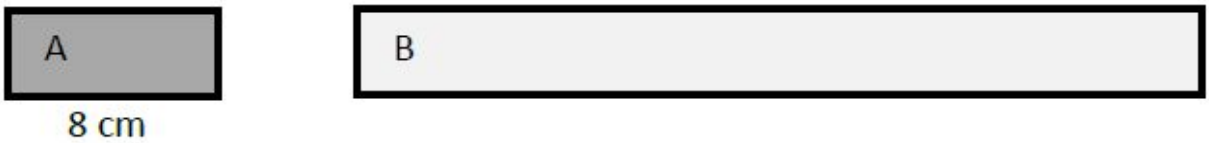
Example: 2

Rectangle A (shown) is $\frac{1}{4}$ as long as rectangle B (not shown). How long is rectangle B?



OR

Rectangle A is $\frac{1}{4}$ as long as rectangle B. How long is rectangle B?



A. 2 cm
B. 6 cm

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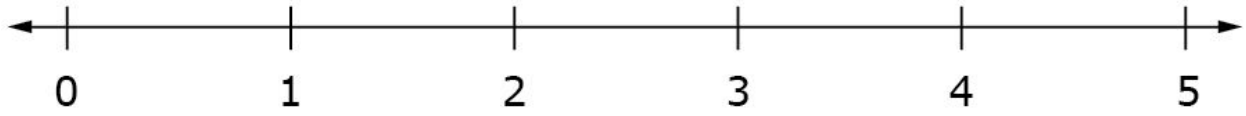
C. 8 cm
D. 32 cm

Rubric: (1 point) The student selects the correct option (D).

Response Type: Multiple Choice, single correct response

Example 3

Plot the value of $\frac{1}{3}$ x $\frac{5}{2}$ on the number line below. Add more tick marks and make sure the point is on a tick mark.



Rubric: (1 point) The student chooses a refinement of the number line that includes sixths and correctly plots a point at 56 (with a graphing tolerance of +/- 1 $\frac{1}{6}$ or there is a snap-to feature and points snap to tick marks).

Response Type: Graphing

Example 4

Scott is buying water bottles and apples for his soccer team. The cost of buying packs of water bottles and bags of apples is shown in the table.

Item	Cost
One pack of 6 water bottles	$4.80
One bag of 5 apples	$3.20

What is the least amount of money that he can spend on whole packs of water bottles and bags of apple so that all 18 players on his team can have both a bottle of water and an apple?

Enter your answer, in dollars, in the response box.

Rubric: (1 point) The student enters the correct minimum cost (27.20).

Response Type: Equation/Numeric

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Example 5

Graciela walked her dog every day for the last 5 days. The time for each walk was between $\frac{1}{2}$ and $\frac{3}{4}$ of an hour. Make an estimate for the total number of minutes she walked her dog in the last 5 days.

Enter your estimate, in minutes, in the response box.

Rubric: (1 point) The student enters a value in the correct range (any number from 150 to 225, inclusive).

Response Type: Equation/numeric

Claim 3 Communicating Reasoning Question Banks

Claim Descriptors and Targets

Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.

Example 1

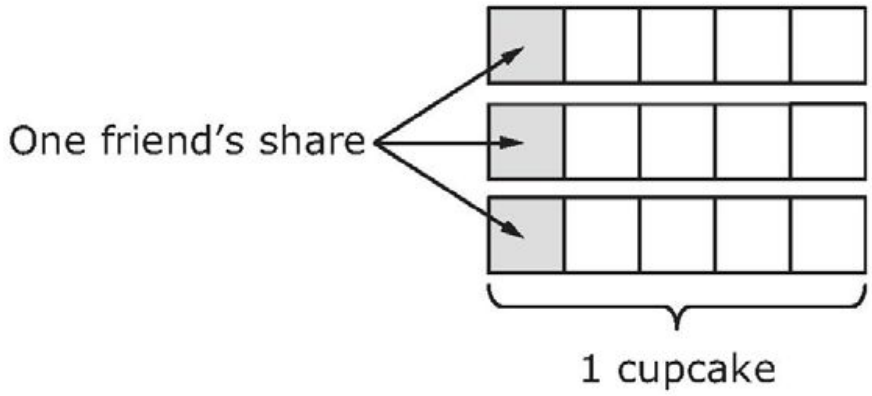
32 × 45 is greater than both 32 and 45. When is a × b between a and b?
Select all that apply.
A. When a > 1 and b > 1
B. When a < 1 and b > 1
C. When b < 1 and a > 1
D. When a < 1 and b < 1

Rubric: (1 point) The student selects B and C.
Response Type: Multiple Choice, multiple correct response

Example 2

Complete the story about friends sharing cupcakes to show that 3÷5=35.

- 5 friends were sharing 3 cupcakes. They divided each cupcake into 5 equal pieces.
- Each piece is [drop-down menu choices: $\frac{1}{3}$, $\frac{1}{5}$, $\frac{3}{5}$] of a cupcake.
- Each friend got 1 piece of each cupcake.
- Each friend got [drop-down menu choices: $\frac{1}{3}$, $\frac{1}{5}$, $\frac{3}{5}$] of a cupcake in total.



Rubric: (1 point) The student selects the correct unit fraction ($\frac{1}{5}$) and the correct total amount each friend receives ($\frac{3}{5}$).

Response Type: Drop-down Menu