

## **Grade 6 Target B**

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

[Content Domain: The Number System](#)

[Target B \[m\]: 6.NS.A Apply and extend previous understanding of multiplication and division to divide fractions by fractions.](#)

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### **Content Domain: The Number System**

### **Target B [m]: 6.NS.A Apply and extend previous understanding of multiplication and division to divide fractions by fractions.**

### **Standards included in Target B: 6.NS.A, 6.NS.A.1**

**6.NS.A** Apply and extend previous understanding 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  $(\frac{2}{3}) \div (\frac{3}{4})$  and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that  $(\frac{2}{3}) \div (\frac{3}{4}) = \frac{8}{9}$  because  $\frac{3}{4}$  of  $\frac{8}{9}$  is  $\frac{2}{3}$ . (In general,  $(\frac{a}{b}) \div (\frac{c}{d}) = \frac{ac}{bd}$ .) How much chocolate will each person get if 3 people share  $\frac{1}{2}$  lb of chocolate equally? How many  $\frac{3}{4}$ -cup servings are in  $\frac{2}{3}$  of a cup of yogurt? How wide is a rectangular strip of land with length  $\frac{3}{4}$  mi and area  $\frac{1}{2}$  square mi?

### **Vertical Alignment**

#### **Related Grade 5 standards**

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

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divide fractions.

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  $(1/3) \div 4$ , and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain the  $(1/3) \div 4 = 1/12$  because  $1/12 \times 4 = 1/3$ .

b. Interpret division of a whole number by a unit fraction, and compute such quotients. For example, create a story context for  $4 \div 1/5$ , and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that  $4 \div 1/5 = 20$  because  $20 \times (1/5) = 4$ .

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?

### **Related Grade 7 Standards**

7.NS.A Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

7.NS.A.2 Apply and extend previous understandings of multiplication and division of fractions to multiply and divide rational numbers.

a. Understand that multiplication is extended from fractions to rational numbers by requiring the operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as  $(-1)(-1) = 1$  and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If  $p$  and  $q$  are integers, then  $-(p/q) = (-p)/q = p/(-q)$ . Interpret quotients of rational numbers by describing real-world contexts.

c. Apply properties of operations as strategies to multiply and divide rational numbers.

d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

### **Achievement Level Descriptors**

**Level 1** Students should be able to apply and extend previous understandings of multiplication and division to multiply a fraction by a fraction, divide a fraction by a whole number, and be able to connect to a visual model. They should understand the effect that a fraction greater than or less than 1 has on a whole number when multiplied and use or create visual models when multiplying a whole number by a fraction between 0 and 1.

**Level 2** Students should be able to apply and extend previous understandings of multiplication

and division to divide a whole number by a fraction between 0 and 1, divide a mixed number by a whole number, and be able to connect to a visual model.

**Level 3** Students should be able to apply and extend previous understandings of multiplication and division to divide a fraction by a fraction and be able to connect to a visual model.

**Level 4** Students should be able to use visual models in settings where smaller fractions are divided by larger fractions. They should also understand and apply the fact that a fraction multiplied or divided by 1 in the form of  $a/a$  is equivalent to the original fraction.

### **Evidence Required**

1. The student interprets quotients of fractions using visual fraction models, equations, and the relationship between multiplication and division.
2. The student solves real-world and mathematical one-step problems involving division of fractions by fractions.

### **Vocabulary**

fraction, quotient, product

### **Response Types**

Multiple Choice, single correct response; Drag and Drop; Equation/Numeric

### **Materials**

visual fraction models

### **Attributes**

Unit rates are limited to non-complex fractions.

### **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.

### **Claim 1 6.NS.A.1 DOK Level 2**

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.

### **Evidence Required**

The student interprets quotients of fractions using visual fraction models, equations, and the relationship between multiplication and division.

**Question Type 1:** The student is presented with a quotient equation with an unknown fraction or number.

1. The equation shown has an unknown number.

$$\square \div \frac{2}{3} = \frac{3}{4}$$

Enter a number that makes the equation true.

2. The equation shown has an unknown number.

$$\frac{2}{3} \div \square = \frac{6}{8}$$

Enter a number that makes the equation true.

Rubric: (1 point) Student enters the correct fraction (e.g.,  $\frac{1}{2}$  ;  $\frac{8}{9}$  or equivalent value).

Response Type: Equation/Numeric

### **Claim 1 6.NS.A.1 DOK Level 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.

#### **Evidence Required**

The student solves real-world and mathematical one-step problems involving division of fractions by fractions.

**Question Type 1:** The student is is asked to compute the quotient of two fractions.

1. What is the value of  $\frac{2}{3} \div \frac{3}{4}$  ?
2. What is the value of  $2 \frac{2}{3} \div \frac{3}{4}$  ?

Rubric: (1 point) Student enters a whole number, mixed number, or fraction equivalent to the correct quotient (e.g., 8 9; 3 5 9).

Response Type: Equation/Numeric

**Question Type 2:** The student is presented with a real-world one-step problem involving division of fractions by fractions.

1. A recipe requires  $\frac{3}{4}$  cup of nuts for 1 batch of muffins.

Enter the number of batches of muffins that can be made using  $7\frac{1}{2}$  cups of nuts.

2. Nina used  $3\frac{3}{4}$  liters of water to completely fill 3 water bottles.

If the water bottles are all the same size, how many liters of water does each bottle hold?

Enter your answer in the response box.

3. Joey made  $\frac{1}{2}$  of a recipe and used  $\frac{3}{4}$  cups of peas.

How many cups of peas are required for a whole recipe?

Enter your answer in the response box.

Rubric: (1 point) Student enters the correct quotient (e.g., 10;  $1\frac{1}{4}$  or  $\frac{5}{4}$ ;  $1\frac{1}{2}$  or  $\frac{6}{4}$  or equivalents).

Response Type: Equation/Numeric

### Claim 1 6.NS.A.1 DOK Level 2

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.

### Evidence Required

The student interprets quotients of fractions using visual fraction models, equations, and the relationship between multiplication and division.

### Question Type 1:

Select all the questions that can be answered by determining the value of  $1\frac{3}{4} \div \frac{1}{2}$  ?

A. Chloe has  $1\frac{3}{4}$  kilograms of rice she is using to fill  $\frac{1}{2}$  kilogram packets. How many packets can she fill?

B. Terry ran  $1\frac{3}{4}$  miles. This is  $\frac{1}{2}$  the distance that Kim ran. What is the distance, in miles, that Kim ran?

C. Danielle has a cat who is  $1\frac{3}{4}$  years old. Her dog is  $\frac{1}{2}$  that age. How old is her dog?

D. Jeri had  $1\frac{3}{4}$  pounds of gummi worms, which she shared equally with her best friend.

How many pounds of gummi worms did they each get?

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Rubric: (1 point) The student selects all of the contexts that can be represented by the given quotient (e.g., A, B).

Response Type: Multiple choice, multiple select response

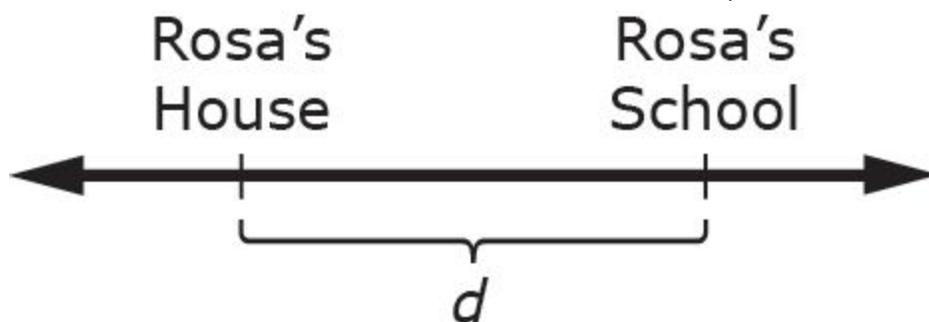
**Claim 2 Problem Solving Question Banks**

[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**

The distance between Rosa's house and her school is  $\frac{3}{4}$  mile. She ran  $\frac{1}{2}$  mile.



Rubric: (1 point). The student enters the correct fraction in the response box (e.g., 23).

Response Type: Equation/Numeric

**Example 2**

A serving of hot chocolate requires  $\frac{3}{4}$  cup of milk.

How many servings can Nina make with  $7\frac{1}{2}$  cups of milk?

Enter your answer in the response box.

Rubric: (1 point). The student enters the correct number of servings in the response box (e.g., 10).

Response Type: (Equation/Numeric)

**Example 3**

It takes  $\frac{1}{2}$  cup of water to fill  $\frac{2}{3}$  of a plastic container.

How much water, in cups, will the full container hold?

Enter your answer in the response box.

Rubric: (1 point). The student enters the correct number of cups in the response box (e.g.,  $\frac{3}{4}$  ).

Response Type: (Equation/Numeric)

Example 4

Ellie ordered  $\frac{3}{4}$  of a pound of cheese from the deli.

Drag the slices of cheese onto the scale so that together they weigh at least  $\frac{3}{4}$  of a pound.



Interaction: The student drags pieces of cheese singly or in groups of three onto the scale. The weight of the cheese, to the nearest hundredth of a pound, is shown on the scale as the slices are added. Each slice is approximately 0.05 pounds, although they are not all equal.

Rubric: (1 point) The student drags the correct number of slices onto the scale (e.g., 8).

Response Type: Drag and drop

### **Claim 4 Modeling and Data Analysis Question Banks**

#### [Claim Descriptors and Targets](#)

Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.

#### Example 1

Juan has  $7\frac{3}{4}$  cups of nuts. He wants to make either banana nut muffins or carrot muffins. The table shows how many cups of nuts are needed for each batch.

Amount of Nuts Needed Per Batch of Muffins

<b>Muffin Type</b>	<b>Amount of Nuts per Batch</b>
Banana nut	$\frac{1}{2}$ cup
Carrot	$\frac{5}{8}$ cup

Juan decided to make only carrot muffins. What is the maximum number of whole batches of carrot muffins Juan can make with  $7\frac{3}{4}$  cups of nuts?

Enter your answer in the response box.

Rubric: (1 point) Student enters the correct number (12).

Response Type: Equation/Numeric

Commentary: The task could also ask about banana nut muffins, or about both for a 2-point item. A more cognitively demanding version of the task could ask how many whole batches can be made if he wants to make half banana nut and half carrot.

