Cutting Grass Extended Constructed Response

Overview

This instructional task requires students to use division of fractions by fractions to solve word problems.

Standards

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?*

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade Level Standards	The following standards will prepare them:	Items to Check for Task Readiness:	Sample Remediation Items :
6.NS.A.1	• 3.OA.B.6 • 5.NF.B.7	1. $\frac{3}{4} \div \frac{2}{3} = \frac{9}{8}$ 2. What is the area of a rectangle with length $\frac{7}{8}\ foot$ and width $\frac{2}{3}\ foot$? $\frac{7}{12}\ square\ feet$ 3. http://www.illustrativemathematics.org/illustrations/692 4. http://www.illustrativemathematics.org/illustrations/50 5. http://www.illustrativemathematics.org/illustrations/267	1. http://www.illustrativemathematics.org/illustrations/12 2. http://www.illustrativemathematics.org/illustrations/829 3. http://www.illustrativemathematics.org/illustrations/1196 4. http://learnzillion.com/lessonsets/701-interpret-and-compute-quotients-of-fractions 5. http://learnzillion.com/lessonsets/13-divide-fractions-by-fractions

Real world preparation: The following questions will prepare students for some of the real world components of this task:

1. What is a lawnmower?
   a. A lawnmower is a machine used to cut grass.
2. What is a gas can?
   a. A gas can is a container used to hold gas until you are ready to pour it into a machine.
3. If I am cutting grass, do I need to know the area or perimeter of the lot?
   a. This question is designed to ensure that students do not confuse area and perimeter. As you are explaining that students need to know the area of the lot, you can clarify any questions about what it means to cut grass.

After the Task:

This task shows students the how fractions appear in the real-world. Remind students that most of the time real-world problems will involve fractions- not always simple numbers or integers. Have students write a word problem using division of fractions.

Student Extended Constructed Response

The lot next to your house is empty. You want to use it to play soccer with your friends, so you are going to cut the grass. Answer the following questions.

1. Your lawnmower requires $\frac{1}{3}$ of a gallon of gas to cut grass for one hour. You have $\frac{5}{6}$ of a gallon of gas in a gas can. How long can you cut the grass with this amount of gas? Show how you found your answer.

2. How wide is the rectangular lot if it has length $100\frac{1}{2}$ feet and an area of $5100\frac{3}{8}$ square feet? Show your work.

3. How long will it take you to cut the lot if you can cut $2550\frac{3}{16}$ square feet an hour? Show your work.

4. Do you have enough gas in your can to cut the lot? Justify your response.

5. You find a second gas can in your garage. You use $\frac{1}{4}$ of a gallon of the gas in the second gas can to cut your lot. If this is $\frac{2}{3}$ of the amount of gas that was originally in the second gas can, how much gas did you have in the second gas can when you started? Show your work.

Student Extended Constructed Response Exemplar Response

The lot next to your house is empty. You want to use it to play soccer with your friends, so you are going to cut the grass. Answer the following questions.

1. Your lawnmower requires $\frac{1}{3}$ of a gallon of gas to cut grass for one hour. You have $\frac{5}{6}$ of a gallon of gas in a gas can. How long can you cut the grass with this amount of gas? Show how you found your answer.

$$\frac{5}{6} \div \frac{1}{3} = \frac{5}{6} \times \frac{3}{1} = \frac{5}{2}\ hours\ or\ 2\frac{1}{2}\ hours$$

2. How wide is the rectangular lot if it has length $100\frac{1}{2}$ feet and an area of $5100\ \frac{3}{8}$ square feet? Show your work.

$$Area = length \times width$$

$$5100\frac{3}{8} = 100\frac{1}{2} \times width$$

$$width = 5100\frac{3}{8} \div 100\frac{1}{2}$$

$$width = 50\frac{3}{4}\ feet$$

3. How long will it take you to cut the lot if you can cut $2550\frac{3}{16}$ square feet an hour? Show your work.

$$5100\frac{3}{8} \div 2550\frac{3}{16}$$

$$\frac{40803}{8} \div \frac{40803}{16}$$

$$\frac{40803}{8} \times \frac{16}{40803}$$

$$\frac{40803 \times 16}{8 \times 40803}$$

It would take 2 hours.

4. Do you have enough gas in your can to cut the lot? Justify your response.

Yes, you do have enough gas to cut your lot.

You have enough gas to cut grass for $2\frac{1}{2}\ hours$. *It will take* $2\ hours$ *to cut your lot.*

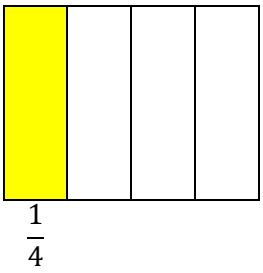
$$2\frac{1}{2}\ hours > 2\ hours$$

5. You find a second gas can in your garage. You use $\frac{1}{4}$ of a gallon of this gas to cut your lot. If this is $\frac{2}{3}$ of the amount of gas that was originally in the can, how much gas did you have when you started? Show your work.

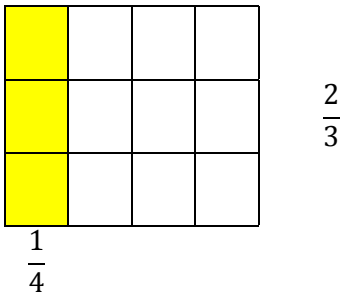
$$\frac{1}{4} \div \frac{2}{3} = \frac{1}{4} \times \frac{3}{2} = \frac{3}{8} \; gallon$$

Alternate solution method (students would likely only draw the diagram—the explanation is provided for understanding):

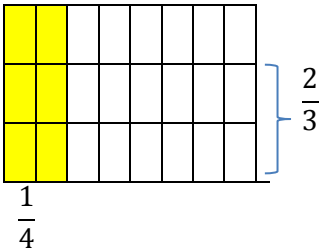
- *This model represents* $\frac{1}{4}$.



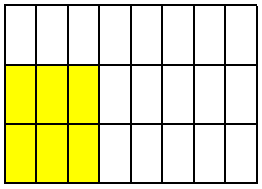
- *This model superimposes a square portioned into thirds horizontally onto the original model.*



- *Now we know the yellow* $\frac{1}{4}$ *area and the size of one of the factors that made that area.*

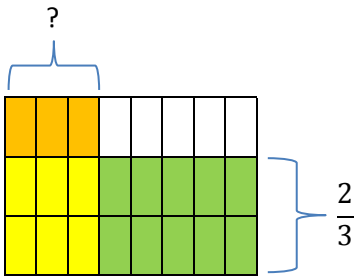


- *Now we move the top two yellow pieces into the $\frac{2}{3}$ area.*



$$\frac{1}{4} \div \frac{2}{3}$$

- *Now shade the squares to the right and above the shaded area.*



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

We know that $\frac{1}{4} \div \frac{2}{3}$ can be thought of as $\frac{2}{3} \times ? = \frac{1}{4}$. There are 6 yellow parts out of 24 parts in all. The yellow area is $\frac{1}{4}$ of the rectangle. We know that one of the factors is $\frac{2}{3}$. From the orange and white areas of the rectangle, we can see that the other factor is $\frac{3}{8}$. Therefore $\frac{1}{4} \div \frac{2}{3} = \frac{3}{8}$.