Lesson: Division of Fractions
Math Academy – Day 09
Student Notes

Goals:
- Demonstrate division of fractions with models, drawings, equations
- Solve real world problems involving division of fractions
- Create the standard algorithm for division of fractions

Prerequisite Knowledge:
- Understand meaning of division
- Understand multiplication of fractions
- Know single digit multiplication tables
- Understand equivalent fractions

Activities

1. Whole Class Discussion: Which operations with fractions require a common denominator and why? Are there any operations with fractions that do not require a common denominator and why? Are there any operations with fractions where a common denominator is optional and why?

2. Consider the following scenario:

Jimmy has made 18 cupcakes to bring to his friends birthday party.
Upon arriving at the party, he finds out that there are six people attending the party including himself.
How many cupcakes does each person receive?

   a. Write the expression that represents this scenario.

   b. Write the result.

   c. Whole Class Discussion: Which operation was used in this scenario and how do you know that operation is being used (i.e. what part of the problem makes that operation apparent for use)?

3. Consider the following scenario:

Alexa is making brownies. The recipe calls for ½-cup of cocoa powder.
Upon looking in her cupboard, she realizes that she only has a ¼-cup measuring cup.
How many ¼-cup scoops does she have to measure out in order to make the brownie recipe?

   a. Draw a picture of this scenario.

   b. Write the expression that represents this scenario.

    c.   Write the result.

    d.   Whole Class Discussion: Which operation was used in this scenario and how do you know that operation is being used (i.e. what part of the problem makes that operation apparent for use)?

4. Find your fraction strips from previous class periods. If you do not have them, then create three new strips for the following fractions: ½, ¼, and 1/3.

5. Working with partner, for each of the following problems, translate the math into English, and then use the fraction strips to determine the result. Draw your findings. Be prepared to share your drawings, results, and translations with the class.

    a. $1 \div \frac{1}{2}$ means how many _____ are in _____.

    b. $1 \div \frac{1}{4}$ means

c. $1 \div \frac{1}{3}$ means

d. $1 \div \frac{2}{3}$ means

e. $\frac{3}{4} \div \frac{1}{4}$ means

6. With your partner, list any patterns that you notice with the expressions and their results from problem 5. Be prepared to share these with the class.

7. A recipe calls for 1/4 of a cup of sugar. How many batches of the recipe can you make if you have a 1/2 of a cup of sugar available?
    a. Draw a picture of the scenario and write the result.

    b. Write an expression that represents the scenario.

    c. Find the result using the paper-and-pencil method.

8. A recipe calls for 1/2 of a cup of sugar. How many batches of the recipe can you make if you have a 1/4 of a cup of sugar available?
   a. Draw a picture of the scenario and write the result.

   b. Write an expression that represents the scenario.

   c. Find the result using the paper-and-pencil method.

9. Lily has ¾ of a cup of blueberries. She is using a muffin recipe that calls for 1/3 a cup of blueberries. How many batches of the recipe can she make?
   a. Draw a picture of the scenario and write the result.

   b. Write an expression that represents the scenario.

   c. Find the result using the paper-and-pencil method.

10. Cody has 2 and ½ cups of mini Reese's peanut butter cups. A homemade ice cream recipe calls for 1 and ½ cups of mini Reese's peanut butter cups. How many batches of the homemade ice cream recipe can he make?

    a.   (Optional) Draw a picture of the scenario and write the result.

    b.   Write an expression that represents the scenario.

    c.   Find the result using the paper-and-pencil method.

Lesson: Division of Fractions
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Instructor Notes

Goals:
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Prerequisite Knowledge:
- Understand meaning of division
- Understand multiplication of fractions
- Know single digit multiplication tables
- Understand equivalent fractions

Lesson Materials:
- Student Notes for Day 09
- Additional fraction strips that have not been folded. (color does not matter for this day)

Lesson Breakdown:

Activity	Size of Group	Time in Activity **Total Time: 115 minutes**
When common denominators necessary?	Whole class discussion	5 minutes
Jimmy Scenario II	Partners, except part c is a whole class discussion	10 minutes
Alexa Scenario	Partners, except part d is a whole class discussion	15 minutes
Getting fraction strips ready	Individual	5 minutes
Break	Whole Class	5 minutes
Dividing 1	Partners	25 minutes
Seeing Patterns	First between partners then Whole Class Discussion	10 minutes
Recipe Problem 1	Partners	10 minutes
Recipe Problem 2	Partners	10 minutes
Lily Scenario	Partners	10 minutes
Cody Scenario	Partners	10 minutes

Activities

1. Whole Class Discussion: Which operations with fractions require a common denominator and why? Are there any operations with fractions that do not require a common denominator and why? Are there any operations with fractions where a common denominator is optional and why?

   Common Denominator required: Addition and Subtraction of fractions. A common denominator is needed so that there are equal sized pieces to be combined or taken from.

   Do not require Common Denominators: Multiplication and Division do not require common denominators.

   Optional Common denominator: Multiplication and Division can be done using common denominators. The result will need to be simplified or reduced in the end.

2. Consider the following scenario:

   Jimmy has made 18 cupcakes to bring to his friends birthday party.
   Upon arriving at the party, he finds out that there are six people attending the party including himself.
   How many cupcakes does each person receive?

   a. Write the expression that represents this scenario.

   $$18 \div 6$$

   b. Write the result.

   $$18 \div 6 = 3 \text{ cupcakes each}$$

c. Whole Class Discussion: Which operation was used in this scenario and how do you know that operation is being used (i.e. what part of the problem makes that operation apparent for use)?

Division was used. Objects are being divided up between 6 people

3. Consider the following scenario:

Alexa is making brownies. The recipe calls for ½-cup of cocoa powder.
Upon looking in her cupboard, she realizes that she only has a ¼-cup measuring cup.
How many ¼-cup scoops does she have to measure out in order to make the brownie recipe?

a. Draw a picture of this scenario.

→ 2nd scoop
→ 1 scoop

$\frac{1}{2}$ cup needs   has a $\frac{1}{4}$ cup measuring cup
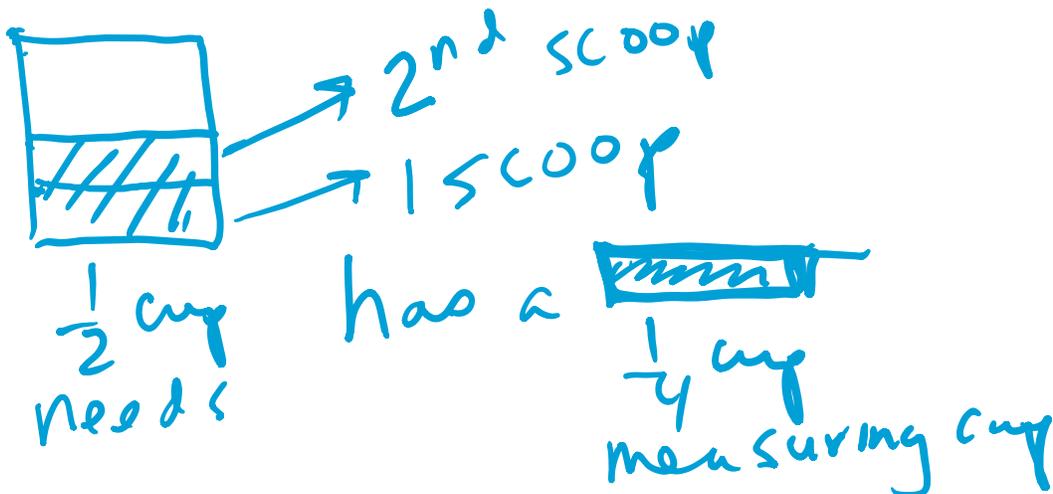
b. Write the expression that represents this scenario.

How many $\frac{1}{4}$ are in $\frac{1}{2}$ or $\frac{1}{2} \div \frac{1}{4}$

c. Write the result.

$$\frac{1}{2} \div \frac{1}{4} = \frac{1}{2} \times \frac{4}{1} = 2$$

d. Whole Class Discussion: Which operation was used in this scenario and how do you know that operation is being used (i.e. what part of the problem makes that operation apparent for use)?

Division. We are using repeated subtraction so division is a quick way to solve

4. Find your fraction strips from previous class periods. If you do not have them, then create three new strips for the following fractions: ½, ¼, and 1/3.

5. Working with partner, for each of the following problems, translate the math into English, and then use the fraction strips to determine the result. Draw your findings. Be prepared to share your drawings, results, and translations with the class.

a. $1 \div \frac{1}{2}$ means how many __2__ are in __1__.
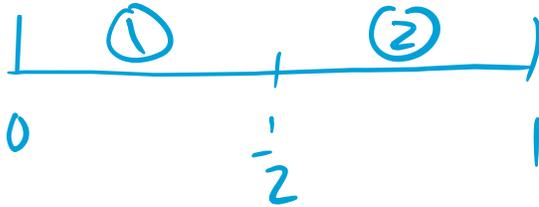
There are 2
$\frac{1}{2}$ in 1.

b. $1 \div \frac{1}{4}$ means **how many** $\frac{1}{4}$ **are in** **1**
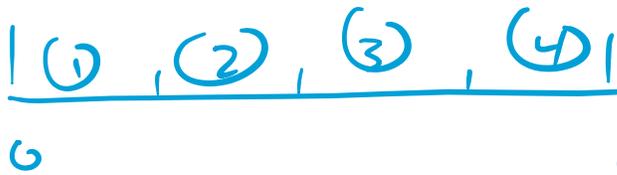
There are 4
$\frac{1}{4}$ in 1

c. $1 \div \frac{1}{3}$ means **how many** $\frac{1}{3}$ **are in 1**

There are 3
$\frac{1}{3}$ in 1

d. $1 \div \frac{2}{3}$ means how many $\frac{2}{3}$ are in 1

Official.
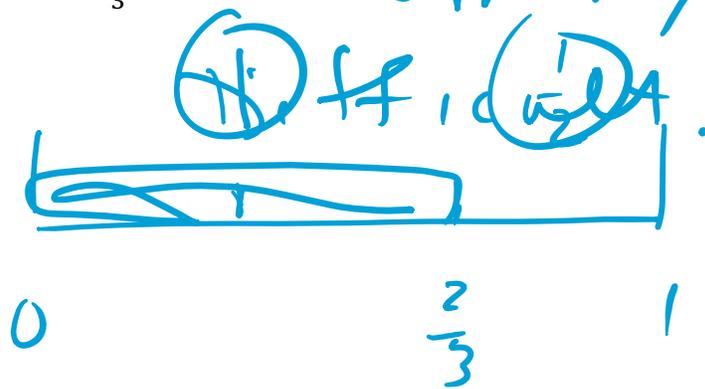
There are $1\frac{1}{2}$ $\frac{2}{3}$ in 1

0          $\frac{2}{3}$ 1

e. $\frac{3}{4} \div \frac{1}{4}$ means how many $\frac{1}{4}$ are in $\frac{3}{4}$
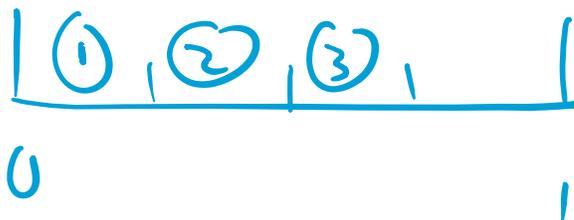
① ② ③

There are 3 $\frac{1}{4}$ in $\frac{3}{4}$.

0   1

6. With your partner, list any patterns that you notice with the expressions and their results from problem 5. Be prepared to share these with the class.

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

$1 \div \frac{1}{3} = 3$

$1 \div \frac{1}{4} = 4$ The result is the reciprical of the 2nd fraction

7. A recipe calls for 1/4 of a cup of sugar. How many batches of the recipe can you make if you have a 1/2 of a cup of sugar available?

   a. Draw a picture of the scenario and write the result.
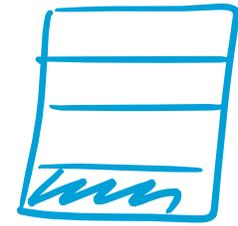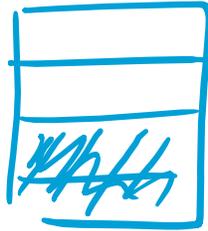
recipe $\frac{1}{4}$ cup   have $\frac{1}{2}$ cup   you can make 2 batches

   b. Write an expression that represents the scenario.

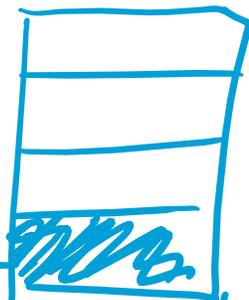$$\frac{1}{2} \div \frac{1}{4} \qquad \text{how many } \frac{1}{4} \text{ in } \frac{1}{2}$$

   c. Find the result using the paper-and-pencil method.

$$\frac{1}{2} \div \frac{1}{4} = \frac{1}{2} \times \frac{4}{1} = \frac{4}{2} = 2 \text{ batches}$$

8. A recipe calls for 1/2 of a cup of sugar. How many batches of the recipe can you make if you have a 1/4 of a cup of sugar available?

   a. Draw a picture of the scenario and write the result.

$\frac{1}{2}$ cup   have $\frac{1}{4}$ cup   not enough to make 1 whole recipe.

$\frac{1}{2}$ of a batch
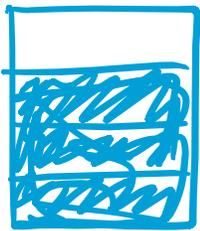
   b. Write an expression that represents the scenario.

how many $\frac{1}{2}$ in $\frac{1}{4}$

Amber Schreve and Thomas Geil

c. Find the result using the paper-and-pencil method.
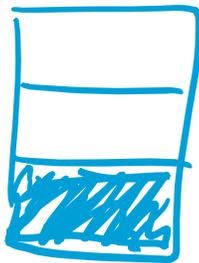
$$\frac{1}{4} \div \frac{1}{2} = \frac{1}{4} \times \frac{2}{1} = \frac{2}{4} = \frac{1}{2} \text{ of batch}$$

9. Lily has ¾ of a cup of blueberries. She is using a muffin recipe that calls for 1/3 a cup of blueberries. How many batches of the recipe can she make?

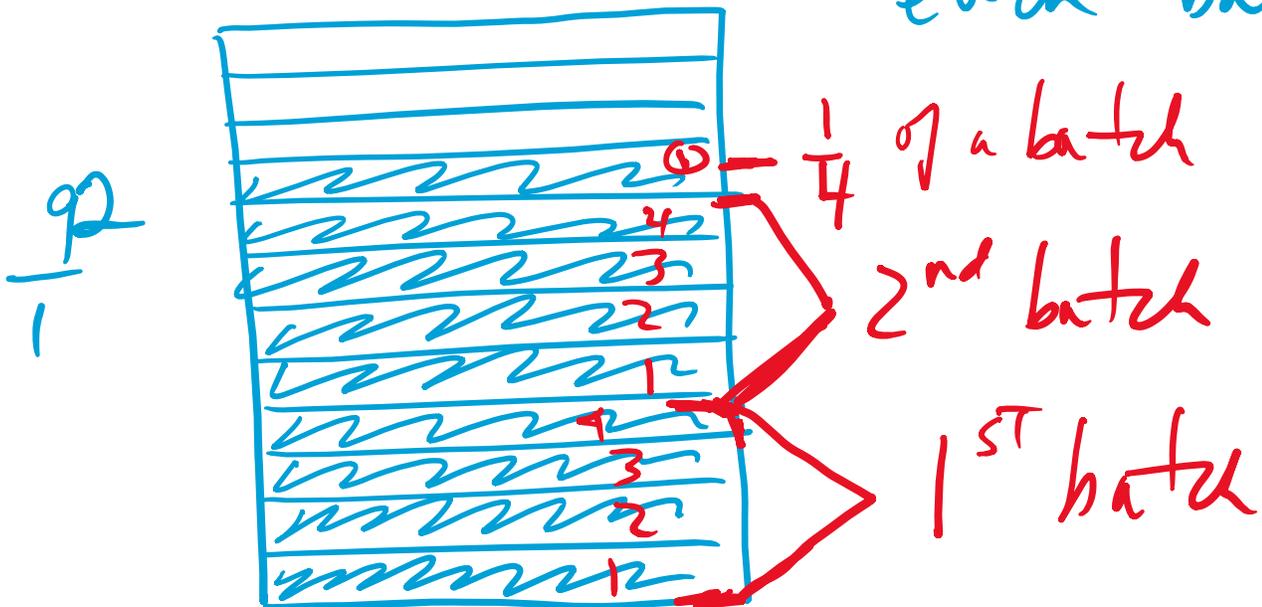a. Draw a picture of the scenario and write the result.

$\frac{3}{4}$ cup $\frac{1}{3}$ cup

$\frac{9}{12}$ cup $\frac{4}{12}$ cup

need $\frac{1}{12}$'s to see this.

Taking $\frac{4}{12}$ for each batch

$\frac{9}{1}$

$\frac{1}{4}$ of a batch

2nd batch

1ST batch

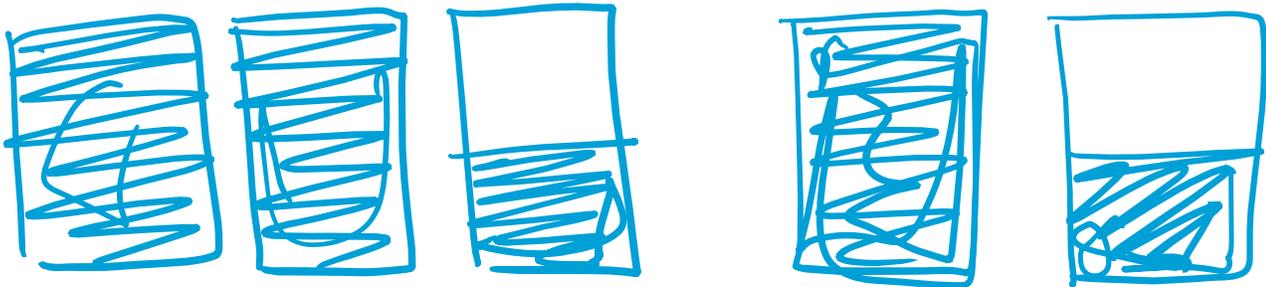b. Write an expression that represents the scenario.

how many $\frac{1}{3}$ are in $\frac{3}{4}$? $\frac{3}{4} \div \frac{1}{3}$
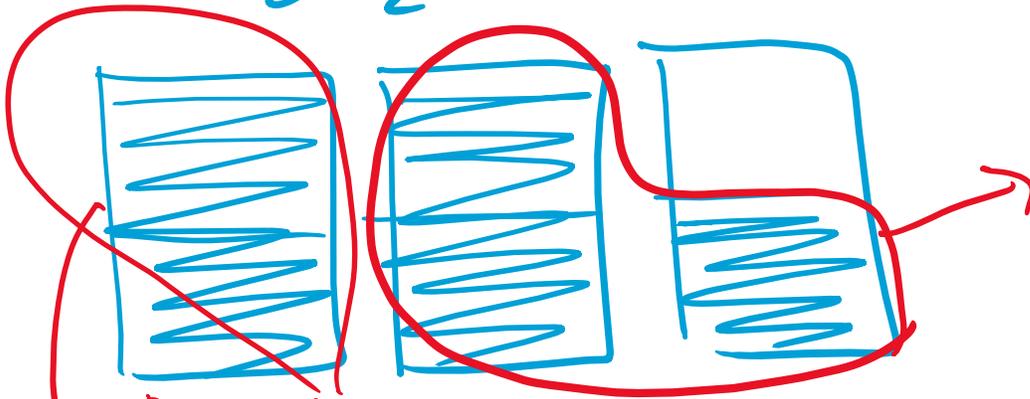
c. Find the result using the paper-and-pencil method.

$$\frac{3}{4} \div \frac{1}{3} = \frac{3}{4} \times \frac{3}{1} = \frac{9}{4} = 2\frac{1}{4} \text{ batches}$$

10. Cody has 2 and ½ cups of mini Reese's peanut butter cups. A homemade ice cream recipe calls for 1 and ½ cups of mini Reese's peanut butter cups. How many batches of the homemade ice cream recipe can he make?

    a. (Optional) Draw a picture of the scenario and write the result.

$2\frac{1}{2}$

1 batch

$1\frac{2}{3}$ batches

2 out of 3 parts needed so 2/3 of a batch

    b. Write an expression that represents the scenario.

How many $1\frac{1}{2}$ are in $2\frac{1}{2}$ or $2\frac{1}{2} \div 1\frac{1}{2}$

    c. Find the result using the paper-and-pencil method.

$$2\frac{1}{2} \div 1\frac{1}{2} = \frac{5}{2} \div \frac{3}{2} = \frac{5}{2} \times \frac{2}{3} = \frac{10}{6} = \frac{5}{3}$$

$1\frac{2}{3}$ batches

11. Lily has 2/3 of a cup of blueberries. She is using a muffin recipe that calls for 1/4 a cup of blueberries. How many batches of the recipe can she make?
   a. Draw a picture of the scenario and write the result.

   b. Write an expression that represents the scenario.

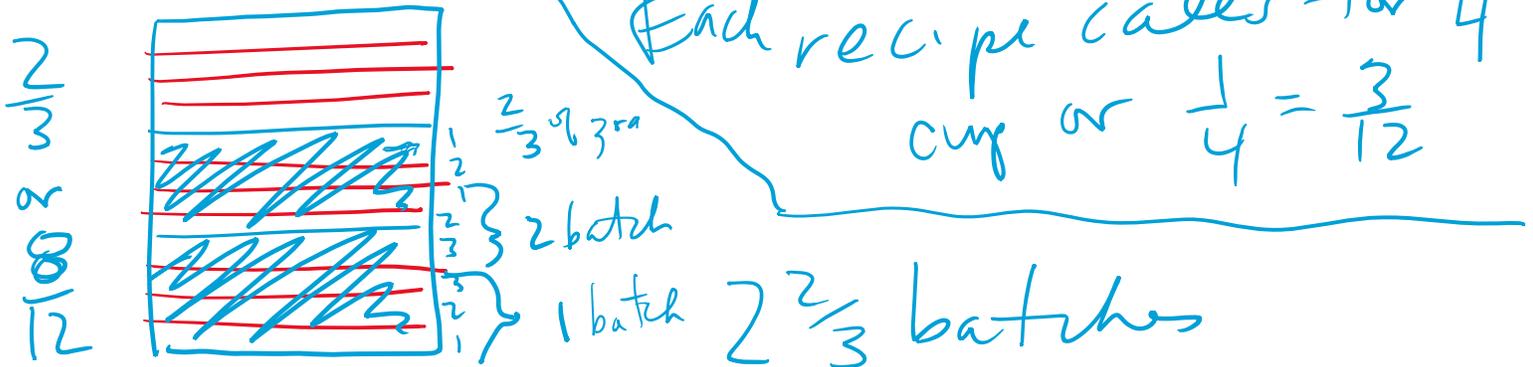   c. Find the result using the paper-and-pencil method.

12. Cody has 3 and 1/4 cups of mini Reese's peanut butter cups. A homemade ice cream recipe calls for 1 and ½ cups of mini Reese's peanut butter cups. How many batches of the homemade ice cream recipe can he make?

   a. Write an expression that represents the scenario.

   b. Find the result using the paper-and-pencil method.

1. 1. Lily has 2/3 of a cup of blueberries. She is using a muffin recipe that calls for 1/4 a cup of blueberries. How many batches of the recipe can she make?

   a. Draw a picture of the scenario and write the result.

$\frac{2}{3}$ or $\frac{8}{12}$

Each recipe calls for $\frac{1}{4}$ cup or $\frac{1}{4} = \frac{3}{12}$

$\frac{2}{3}$ of 3rd

2 batch

1 batch $2\frac{2}{3}$ batches

   b. Write an expression that represents the scenario.

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

   c. Find the result using the paper-and-pencil method.

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

2. Cody has 3 and 1/4 cups of mini Reese's peanut butter cups. A homemade ice cream recipe calls for 1 and ½ cups of mini Reese's peanut butter cups. How many batches of the homemade ice cream recipe can he make?

   a. Write an expression that represents the scenario.

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

   b. Find the result using the paper-and-pencil method.

$\frac{13}{4} \div \frac{3}{2} = \frac{13}{4} \times \frac{2}{3} = \frac{26}{12} = \frac{13}{6} = 2\frac{1}{6}$ batches