

Participant Resource Guide

Shop Math

September 2026



Course Outline

- Module 1: Basic Operations

Module 2: Fractions

- Module 3: Decimals
- Module 4: Measurements



U.S. Department of Transportation
Federal Transit Administration

A program of the Federal Transit Administration administered by the International Transportation Learning Center

Course: Shop Math

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Shop Math – Common Fractions

Objectives

- Demonstrate the ability to solve mathematics problems involving fractions.
- Solve multiplication and division problems involving fractions.
- Solve addition and subtraction problems involving fractions.
- Use the order of operations to solve problems involving fractions accurately.

Key Terms

- | | |
|----------------------------------|-----------------|
| • Common Fraction | • Mixed Number |
| • Denominator | • Numerator |
| • Improper fraction | • Reciprocal |
| • Least Common Denominator (LCD) | • Simplest Form |



Participant Resource Guide

Common Fractions

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Common Fractions
Shop Math
Transit Core Competencies Curriculum (TC3)

U.S. Department of Transportation
Federal Transit Administration
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Objectives

- Demonstrate the ability to solve mathematics problems involving fractions.
 - Solve multiplication and division problems involving fractions.
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Agenda

- Warm Up and Introduction
- 2.1 - Multiplying and Dividing Fractions
- 2.2 - Adding and Subtracting Fractions
- 2.3 - Combining Operations with Fractions
- Quiz and Wrap Up



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Warm Up

Let's see what you recall from Module 1 – Basic Operations.

**What are the 4
basic
operations?**

**What does
PEMDAS stand
for?**

**Why does
order matter
when solving a
math problems
on the job?**

Notes:

- Let's start with a quick review to get our brains warmed up:
 1. What are the four basic math operations we've worked with before?
 2. Do you remembers what PEMDAS stands for?
 3. Why does order matter when solving a problem? What could happen if we just solved left to right without a plan?
- Keep these three important ideas in mind during our lesson today. We'll be building on our knowledge of basic operations to solve equations involving fractions.

What is a common fraction?

- A **common fraction** is number that represents a part of a whole.
- They are written with one number over another, separated by a line called a fraction bar.

$\frac{1}{6}$	$\frac{1}{6}$
$\frac{1}{6}$	$\frac{1}{6}$
$\frac{1}{6}$	$\frac{1}{6}$

- **Numerator** (Top) – the number of equal parts being counted.

- **Denominator** (Bottom) – The number of equal parts in one whole.



Notes:

- A **fraction** is a number that represents part of a whole. You'll see these all the time in the shop when measuring, cutting, or dividing materials.
- Fractions are written with one number over another, separated by a line called a fraction bar. That line just means **division**. Now let's break down the parts of a fraction.
 - The top number is called the **numerator**. This tells us how many parts are being counted.
 - The bottom number is called the **denominator**. This tells us how many equal parts are in a whole.
- How many parts are in the whole? This will be our denominator.
- How many parts are being counted in blue? This will be our numerator.
- What we're saying here is that each box within the whole is $1/6^{\text{th}}$ of the total. So, the blue boxes represent $2/6^{\text{th}}$
- Understanding these two parts is key, because everything we do with fractions builds from this idea.

How are fractions represented?

parts counted
whole

1.) 

2.) 

3.) 

4.) 

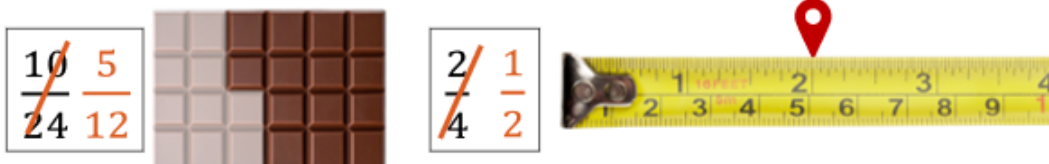
Notes:

- Fractions can be represented in a variety of ways such as piece of a whole, parts of a group, or even portions of a number line.
- Let's try writing fractions for each of these examples.
- Remember the total number of parts goes on the bottom and it called the denominator. The parts being counted go on top and are called numerators.

What does “Simplest Form” mean?

A fraction in **simplest form** cannot be reduced further. The numerator and denominator have no common factors (except 1).

How can these fractions be reduced to simplest form?



Notes:

- A fraction is in **simplest form** when it cannot be reduced any further. That means the numerator and denominator do not share any common factors other than 1.
- In our first example, the numbers 10 and 24 can both be divided by 2. So, what is our fraction in simplest form?
- What about our second example? What is the simplest form?
 - Even though these fractions look different, they represent the same amount.
- Simplifying helps us write fractions in a cleaner, easier-to-use form when solving problems.

Why do fractions matter on the job?

- Measure materials accurately
- Cut and fit parts correctly
- Follow specifications and diagrams
- Reduce waste and rework
- Support safe and efficient work



Notes:

- Fractions are something you will use regularly on the job, even if you don't always think about them that way.
- You use fractions any time you measure materials, whether that's wire, conduit, or other components. Accuracy matters, because even small measurement errors can cause parts not to fit correctly.
- Fractions also help you cut and install parts properly.
 - If a measurement is off, it can lead to wasted material or extra work to fix the mistake.
- You'll also see fractions when reading specifications, diagrams, or instructions. Being able to understand and work with them helps you follow those directions correctly.
- At the end of the day, using fractions correctly helps you work more efficiently, reduce mistakes, and maintain a safe work environment.

Key Terms

Common Fraction - A number that represents a part of a whole. The numerator is the number on top, and the denominator is the number on the bottom.

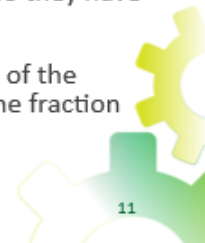
Simplest Form – The process of reducing the fraction so the numerator and denominator have no common factors except 1.

Reciprocal – A fraction created by flipping the numerator and denominator of another fraction (Ex: $\frac{2}{3}$ is $\frac{3}{2}$). Reciprocals are used when dividing fractions.

Least Common Denominator (LCD) – The smallest number that two or more denominators can all divide into evenly. It is used to rewrite fractions so they have the same denominator, which makes them easier to add or subtract.

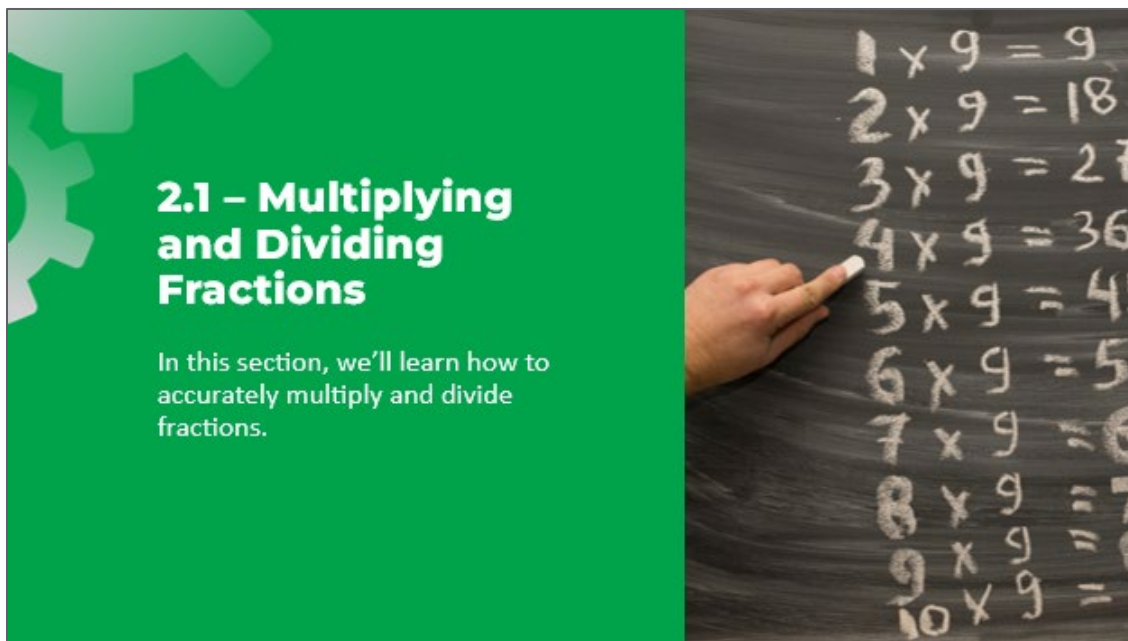
Improper fraction - A number greater than one whole. The numerator of the fraction (top number) is, therefore, greater than the denominator of the fraction (bottom number).

Mixed Number – A whole number and a fraction (Ex: $1\frac{1}{2}$)



Notes:

- There are a few key terms to keep in mind as we work through this lesson. You can find these in the glossary of the course, but I recommend bookmarking this page in your Participant Resource Guide so you can quickly and easily refer to these terms as needed.
 - In addition to common fraction, numerator, and denominator, it's also important to know reciprocal and least common denominator.
 - A **reciprocal** is a fraction created by flipping the numerator and denominator of another fraction. For example, the reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$. We'll use this term when we discuss *dividing* fractions.
 - The **least common denominator (LCD)** is the he smallest number that two or more denominators can all divide into evenly. It is used to rewrite fractions so they have the same denominator, which makes them easier to add, or subtract.
 - An **improper fraction** is a number greater than one whole. The numerator of the fraction (top number) is, therefore, greater than the denominator of the fraction (bottom number).
 - Lastly, a **mixed number** is a whole number and a fraction (Ex: $1\frac{1}{2}$).
-
-
-
-
-



Notes:

- In this section, you'll learn how to accurately multiply and divide fractions.

Multiplying Fractions

1. Multiply the **numerators**.
2. Multiply the **denominators**.
3. Reduce the fraction to **simplest form**, if possible.

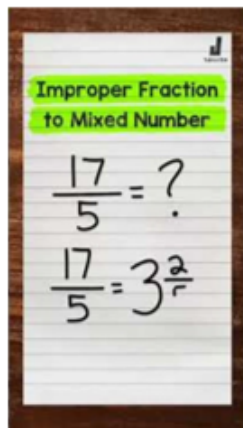
$$\frac{2}{3} \times \frac{5}{6} = \frac{\cancel{2} \times 5}{3 \times \cancel{6}} = \frac{10}{18}$$

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Notes:

- Multiplying fractions is a three-step process.
- **First**, we multiply the numerators, which are the top numbers.
 - In this example, we multiply 2 times 5 to get 10.
- **Next**, we multiply the denominators, which are the bottom numbers.
- So, we multiply 3 times 6 to get 18. At this point, we have the fraction 10/18.
- The **last** step is to reduce the fraction to simplest form, if possible. Both 10 and 18 can be divided by 2.
 - When we divide 10 by 2, we get 5.
 - When we divide 18 by 2, we get 9.
- So, our final answer is 5/9.
- Multiplying fractions is straightforward. We multiply straight across, then simplify if we can.

Converting Improper Fractions



Improper fraction: The numerator is larger than the denominator.

Mixed number: A whole number and a fraction.

Example

$$\frac{7}{3}$$



How many times
does 3 go into 7?
How much is left
over?



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

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Notes:

- Sometimes the solution to a math problem results in an improper fraction.
- Remember, an **improper fraction** has a numerator that is larger than the denominator.
- It can be helpful to convert improper fractions to a **mixed number**, which combines a whole number and a fraction.
- Take a moment to watch this short video. It will show you how to convert an improper fraction into a mixed number.

Multiplying Fractions – Group Practice 1

Method:

1. Multiply the **numerators**.
2. Multiply the **denominators**.
3. Reduce the fraction to **simplest form**, if possible.

$$\frac{7}{10} \times \frac{2}{3} = \underline{\quad}$$

Multiplying Fractions – Group Practice 2

Method:

1. Multiply the **numerators**.
2. Multiply the **denominators**.
3. Reduce the fraction to **simplest form**, if possible.

$$\frac{4}{5} \times \frac{3}{8} = \underline{\quad}$$

Multiplying Fractions – Group Practice 3

Method:

1. Multiply the **numerators**.
2. Multiply the **denominators**.
3. Reduce the fraction to **simplest form**, if possible.

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

Dividing Fractions

Method

1. Rewrite the problem with multiplication using the **reciprocal** of the second fraction.
2. Multiply the **numerators** and **denominators**.
3. Reduce the fraction to **simplest form**, if possible.

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

Flip this fraction to get the reciprocal and change the $\div$ to $\times$

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Notes:

- Dividing fractions is very similar to multiplying fractions. In fact, we are going to change the equation from division to multiplication by adding one simple step.
- Do you remember what a reciprocal is?
 - To get the reciprocal all we have to do is flip it! That's our first step.
- We only flip the fraction we are dividing by which is the second one. The first fraction stays exactly the same.
- **First**, we'll rewrite the problem with multiplication using the reciprocal of the second fraction.
 - In this example, that means we will have $\frac{3}{4}$ **multiplied** by $\frac{2}{1}$.
- Next, we'll multiply our numerators and denominators.
 - In this example, we multiply 3×2 to get 6 as our numerator, and 4×1 to get 4 as our denominator.
- Finally, we'll reduce our fraction to simplest form.
 - In this example, we can divide each number by 2.
 - Our final answer is $\frac{3}{2}$.

Converting Improper Fractions to Mixed Numbers

Improper Fraction

Mixed Number

$\frac{3}{2}$ → How many times does 2 go into 3? How much is left over? → $1\frac{1}{2}$

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Notes:

- Let's stick with the fraction $\frac{3}{2}$ for a moment.
- Since this is an improper fraction, let's convert it to a mixed number.
- How many times does 2 go into 3?
 - How much is left over?
- That makes our mixed number $1\frac{1}{2}$.

Dividing Fractions – Group Practice 1

Method

1. Rewrite the problem with multiplication using the **reciprocal** of the second fraction.
2. Multiply the **numerators** and **denominators**.
3. Reduce the fraction to **simplest form**, if possible.

$$\frac{4}{9} \div \frac{2}{3} =$$

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Dividing Fractions – Group Practice 2

Method

1. Rewrite the problem with multiplication using the **reciprocal** of the second fraction.
2. Multiply the **numerators** and **denominators**.
3. Reduce the fraction to **simplest form**, if possible.

$$\frac{5}{6} \div \frac{1}{3} =$$

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Dividing Fractions – Group Practice 3

Method

1. Rewrite the problem with multiplication using the **reciprocal** of the second fraction.
2. Multiply the **numerators** and **denominators**.
3. Reduce the fraction to **simplest form**, if possible.

$$\frac{3}{5} \div \frac{2}{7} =$$

Real-World Word Example

A technician has 6 feet of tubing and needs to cut it into pieces that are each $\frac{1}{2}$ foot long.

What operation do we need?

What is the equation?

How many pieces of tubing will the technician get from the 6 feet of tubing?

$$6 \text{ feet of tubing} = \frac{6}{1}$$

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Notes:

- Let's put things in context by reviewing a real-world scenario. For instance, "A technician has 6 feet of tubing and needs to cut it into pieces that are each $\frac{1}{2}$ foot long."
 - What operation do we need to solve this equation? Multiplication or division?
- When we say, "6 feet", we can write this as a fraction $\frac{6}{1}$.
 - What would our equation be?
- Who can solve this equation for us? Remember that we need to change the equation from division to multiplication by using the reciprocal.
- The fraction $\frac{12}{1}$ is the same as simply saying 12.
- This makes our final answer 12 pieces of tubing.

Multiplying and Dividing Fractions



Part 1 – Multiplying Fractions

Use the multiplying fractions method the solve the equations.

Part 2 – Dividing Fractions

Use the dividing fractions method the solve the equations.

Activity

Multiplying and Dividing Fractions

Part 1 – Multiplying Fractions
Use the method below to solve the equations.

Problem	Method	Answer
1. $\frac{1}{2} \times \frac{3}{4}$	1. Multiply the numerators. 2. Multiply the denominators. 3. Reduce the fractions to simplest form, if possible.	$\frac{1 \times 3}{2 \times 4} = \frac{3}{8}$
2. $\frac{2}{3} \times \frac{5}{6}$		$\frac{2 \times 5}{3 \times 6} = \frac{10}{18} = \frac{5}{9}$
3. $\frac{3}{4} \times \frac{1}{2}$		$\frac{3 \times 1}{4 \times 2} = \frac{3}{8}$
4. $\frac{4}{5} \times \frac{2}{3}$		$\frac{4 \times 2}{5 \times 3} = \frac{8}{15}$
5. $\frac{5}{6} \times \frac{3}{4}$		$\frac{5 \times 3}{6 \times 4} = \frac{15}{24} = \frac{5}{8}$

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Activity

Multiplying and Dividing Fractions

Part 1 – Multiplying Fractions

Use the method below to solve the equations.

Multiplying Fractions	
Method	Example
1. Multiply the numerators. 2. Multiply the denominators. 3. Reduce the fraction to simplest form, if possible.	$\frac{2}{3} \times \frac{5}{6} = \frac{\cancel{10}}{\cancel{18}} \xrightarrow{\text{simplify}} \frac{5}{9}$

$$1. \frac{1}{2} \times \frac{3}{5}$$

$$6. \frac{6}{7} \times \frac{2}{3}$$

$$2. \frac{2}{3} \times \frac{4}{7}$$

$$7. \frac{7}{9} \times \frac{3}{4}$$

$$3. \frac{3}{4} \times \frac{5}{6}$$

$$8. \frac{8}{11} \times \frac{5}{6}$$

$$4. \frac{4}{5} \times \frac{2}{9}$$

$$9. \frac{9}{10} \times \frac{2}{3}$$

$$5. \frac{5}{8} \times \frac{3}{10}$$

$$10. \frac{3}{8} \times \frac{4}{9}$$

Part 2 – Dividing Fractions

Use the method below to solve the equations.

Multiplying Fractions	
Method	Example
1. Rewrite the problem with multiplication using the reciprocal of the second fraction. 2. Multiply the numerators and denominators. 3. Reduce the fraction to simplest form, if possible.	$\frac{3}{4} \div \frac{1}{2}$ $\frac{3}{4} \times \frac{2}{1} = \frac{\cancel{6}}{\cancel{4}} \text{ simplify } \rightarrow \frac{3}{2}$

11. $\frac{2}{3} \div \frac{1}{5}$

16. $\frac{6}{7} \div \frac{3}{5}$

12. $\frac{3}{4} \div \frac{2}{7}$

17. $\frac{8}{9} \div \frac{4}{11}$

13. $\frac{5}{6} \div \frac{3}{8}$

18. $\frac{9}{10} \div \frac{3}{2}$

14. $\frac{7}{9} \div \frac{1}{3}$

19. $\frac{5}{12} \div \frac{5}{6}$

15. $\frac{4}{5} \div \frac{2}{3}$

20. $\frac{7}{8} \div \frac{7}{4}$

Knowledge Check



Q: Define numerator and denominator.

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Knowledge Check



Q: What does it mean to put a fraction in simplest form?

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Knowledge Check



Convert the **improper fraction** $\frac{15}{4}$ into a **mixed number**.

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Knowledge Check



A maintenance worker has 4 sheets of insulation that are 3 feet long. The worker needs strips that are $1\frac{1}{2}$ feet long for repairs. Using all the sheets how many repairs can be made?

(1.) What is the total amount of insulation?

(2.) What is the equation?

(3.) What is the solution?



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Summary and What's Next

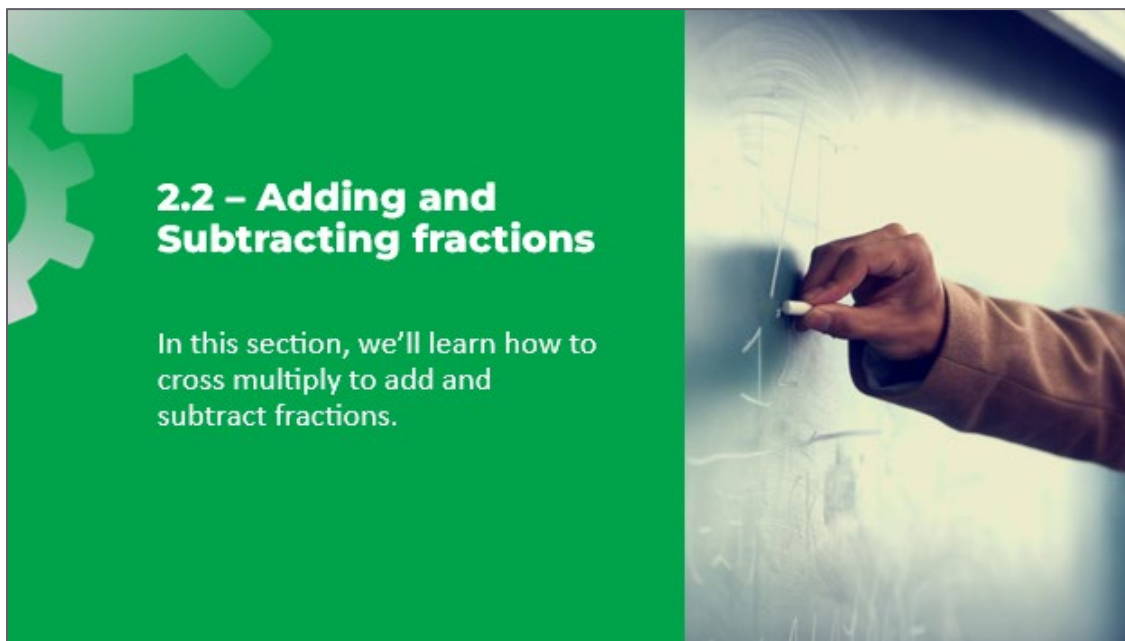
- **Multiply:** Multiply across, then simplify
- **Divide:** Flip the fraction to get the reciprocal, then multiply
- Always check if your answer can be simplified

Next, we'll learn about adding and subtracting fractions.

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Notes:

- When multiplying fractions, we multiply straight across the top numbers and bottom numbers. Then simplify if possible.
 - When dividing fractions, we keep the first fraction as it is but change division to multiplication by using the reciprocal of the second fraction. Then we multiply and simplify.
 - Remember – reciprocal means *flip it!*
 - In both cases, it's important to check your final answer and reduce it to simplest form when you can.
 - Now, you're going to build on our new learning by looking at adding and subtracting fractions.
 - Unlike multiplying and dividing, we can't just go straight across. We need to make sure the fractions have a common denominator first.
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-
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Notes:

- In this section, you'll learn how to cross multiply to add and subtract fractions.

Adding and Subtracting Fractions

Method

1. If the denominators are the same, add/subtract the **numerators**.
2. If the denominators are not the same, create a common denominator by **cross multiplying**. Then add/subtract the numerators.
3. Solve the equation and reduce the fraction to simplest form, if possible.

$$\frac{1}{2} + \frac{1}{2} =$$

$$\frac{1}{5} \times \frac{2}{6} =$$

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Notes:

- Adding and subtracting fraction can be a little trickier than multiplying and dividing fractions. However, If the denominators are the same, the process is straightforward. We keep the denominator the same and just add or subtract the numerators. Keep the denominators the same.
 - For example, one-half plus one-half equals two-halves, which simplifies to one.
- If the denominators are different, we need to create a **common denominator** before we can combine the fractions.
- A common denominator is the smallest number that two or more denominators can all divide into evenly.
- One way to do this is by **cross multiplying**. That means we multiply each numerator by the opposite denominator. Once the denominators match, we can add or subtract the numerators.
 - For example, 5 x 6 gives us a common denominator of 30.
- If we cross multiply 6 x 1 and 5 x 2 we get 6 + 10 as our numerator.
 - Adding 6 + 10 will give us our new fraction of 16/30.
- Finally, just like before, we simplify the fraction if possible.
 - In this case, 16/30 can be reduced to 8/15.
- This process is important because, unlike multiplying and dividing, we cannot combine fractions unless they represent equal-sized parts.

Adding and Subtracting Fractions –Practice 1

Method

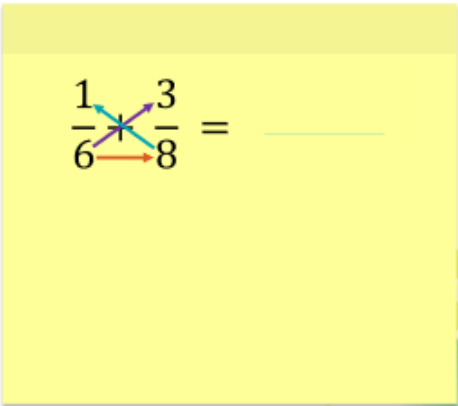
1. If the denominators are the same, add/subtract the **numerators**.
2. If the denominators are not the same, create a common denominator by **cross multiplying**. Then add/subtract the numerators.
3. Solve the equation and reduce the fraction to simplest form, if possible.

$$\frac{5}{6} + \frac{1}{3} =$$

Adding and Subtracting Fractions –Practice 2

Method

1. If the denominators are the same, add/subtract the **numerators**.
2. If the denominators are not the same, create a common denominator by **cross multiplying**. Then add/subtract the numerators.
3. Solve the equation and reduce the fraction to simplest form, if possible.


$$\frac{1}{6} + \frac{3}{8} = \underline{\hspace{2cm}}$$

Adding and Subtracting Fractions –Practice 3

Method

1. If the denominators are the same, add/subtract the **numerators**.
2. If the denominators are not the same, create a common denominator by **cross multiplying**. Then add/subtract the numerators.
3. Solve the equation and reduce the fraction to simplest form, if possible.

$$\frac{9}{16} - \frac{6}{16} =$$

Adding and Subtracting Fractions



Directions: Use the method below the solve the equations.

Method:

1. If the denominators are the same, add/subtract the numerators.
2. If the denominators are not the same, create a **common denominator** by **cross multiplying**. Then and add/subtract the numerators.
3. Solve the equation and reduce the fraction to simplest form, if possible

Adding and Subtracting Fractions

Activity

Adding and Subtracting Fractions

Directions: Use the method below to solve the equations.

Method	Example
1. If the denominators are the same, add/subtract the numerators.	$\frac{1}{2} + \frac{2}{2} = \frac{3}{2} = 1\frac{1}{2}$
2. If the denominators are not the same, create a common denominator by cross multiplying. Then add/subtract the numerators.	$\frac{1}{2} + \frac{2}{3} = \frac{3}{6} + \frac{4}{6} = \frac{7}{6} = 1\frac{1}{6}$
3. Solve the equation and reduce the fraction to simplest form, if possible.	

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

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

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

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

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

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

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

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

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Activity

Adding and Subtracting Fractions

Directions: Use the method below the solve to equations.

Multiplying Fractions	
Method	Example
4. If the denominators are the same, add/subtract the numerators.	$\frac{1}{3} + \frac{2}{3} = \frac{3}{3} = 1$
5. If the denominators are not the same, create a common denominator by cross multiplying . Then and add/subtract the numerators.	$\frac{1}{5} + \frac{2}{6} = \frac{6 + 10}{30} = \frac{16}{30} \text{ simplify } \rightarrow \frac{8}{15}$
6. Solve the equation and reduce the fraction to simplest form, if possible.	

1. $\frac{2}{3} + \frac{1}{5}$

5. $\frac{3}{4} + \frac{2}{7}$

2. $\frac{3}{8} + \frac{2}{8}$

6. $\frac{5}{6} + \frac{1}{6}$

3. $\frac{5}{6} - \frac{1}{4}$

7. $\frac{7}{8} - \frac{1}{3}$

4. $\frac{7}{10} - \frac{4}{10}$

8. $\frac{4}{5} + \frac{3}{10}$

9. $\frac{9}{12} - \frac{3}{12}$

10. $\frac{6}{7} - \frac{2}{5}$

11. $\frac{1}{2} + \frac{3}{8}$

12. $\frac{4}{5} + \frac{1}{5}$

13. $\frac{9}{10} - \frac{1}{6}$

14. $\frac{5}{9} + \frac{2}{3}$

15. $\frac{7}{12} - \frac{1}{4}$

Knowledge Check



Q: When is cross multiplication needed?

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Summary and What's Next

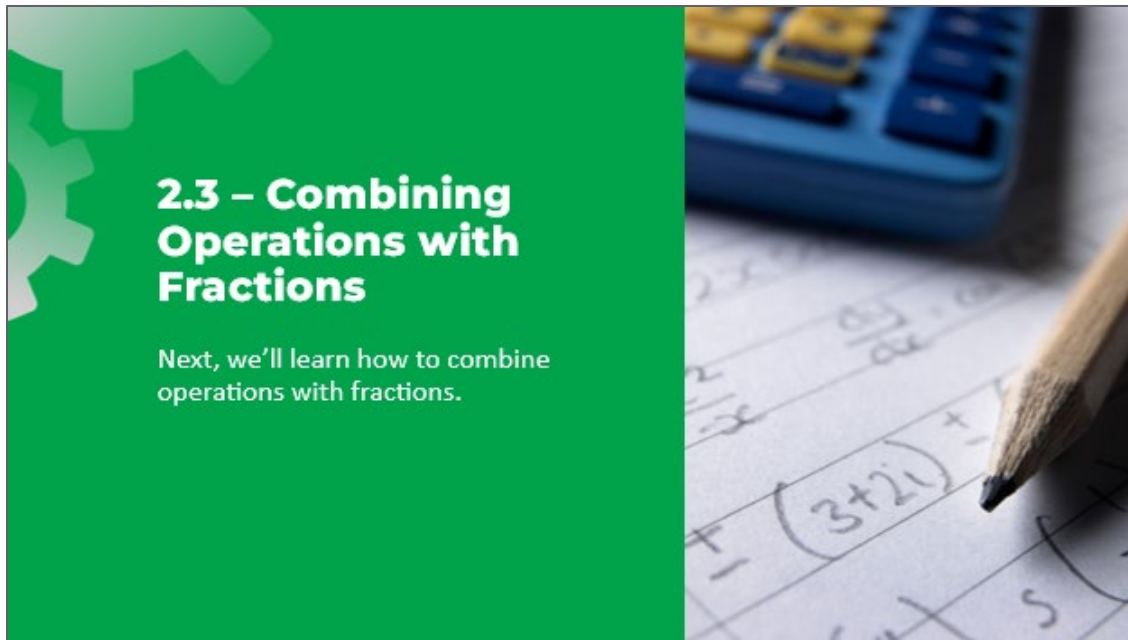
- **When the denominators are the same** - add/subtract the numerators
- **When the denominators are different** – cross multiply to find a common denominator
- Always simply your final answer

Next, we'll learn about combining operations with fractions.

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Notes:

- When the denominators are the same, we can simply add or subtract the numerators and keep the denominator the same.
 - When the denominators are different, we need to create a common denominator first. One way to do that is by cross multiplying so the fractions represent equal-sized parts.
 - You should always check our final answer and simplify it if possible.
 - Now that you can add and subtract fractions, we're ready to take the next step.
 - Next, you'll learn how to combine multiple operations with fractions, which brings together everything you've practiced so far.
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Notes:

- Next, you'll learn how to combine operations with fractions.

PEMDAS: Order of Operations

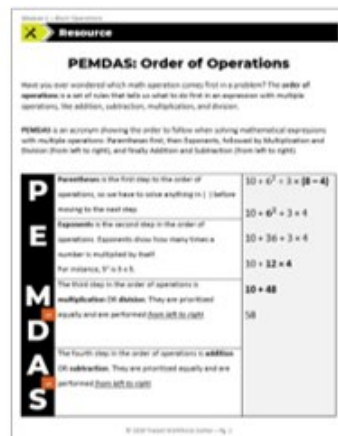
Have you ever wondered which math operation comes first in a problem? The **order of operations** is a set of rules that tells us what to do first in an expression with multiple operations, like addition, subtraction, multiplication, and division.

PEMDAS is an acronym showing the order to follow when solving mathematical expressions with multiple operations: Parentheses first, then Exponents, followed by Multiplication and Division (from left to right), and finally Addition and Subtraction (from left to right).

P E M D A S	Parentheses is the first step to the order of operations, so we have to solve anything in () before moving to the next step.	$10 + 6^2 \div 3 \times (8 - 4)$
	Exponents is the second step in the order of operations. Exponents show how many times a number is multiplied by itself. For instance, 5^2 is 5×5 .	$10 + 6^2 \div 3 \times 4$ $10 + 36 \div 3 \times 4$ $10 + 12 \times 4$
	The third step in the order of operations is multiplication OR division . They are prioritized or equally and are performed <u>from left to right</u> .	$10 + 48$ 58
	The fourth step in the order of operations is addition OR subtraction . They are prioritized or equally and are performed <u>from left to right</u> .	

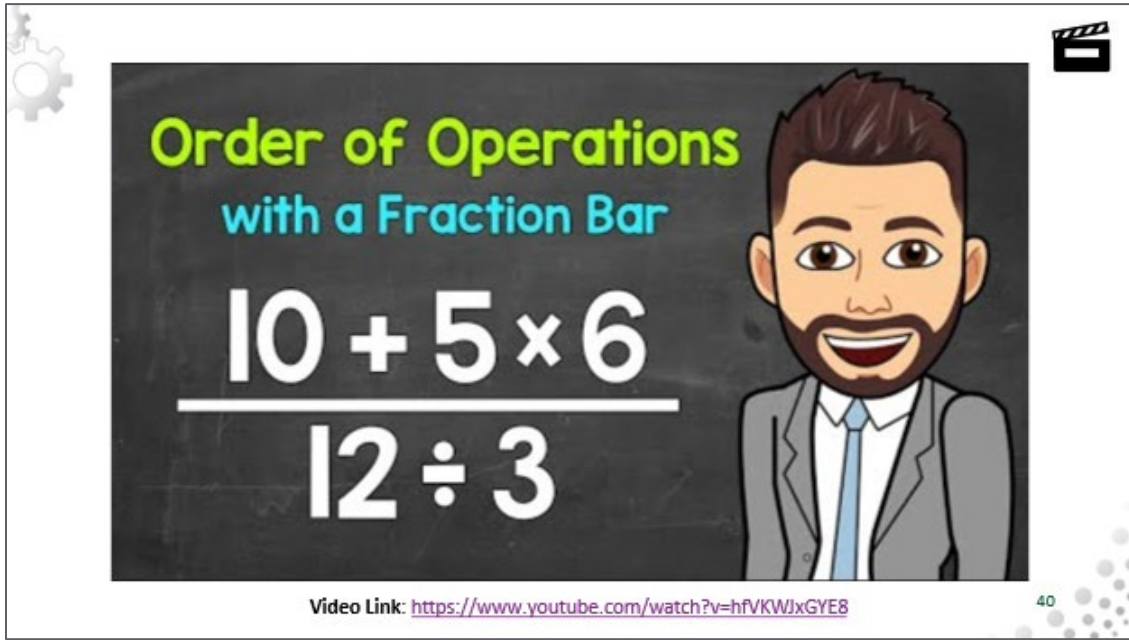
PEMDAS: Order of Operations

This resource from **Module 1 – Basic Operations** will be useful in this part of our lesson.



Notes:

- In this section of our lesson, we'll be building off what we learned about basic operations in Module 1.
- You may want to have the "PEMDAS Order of Operations" handout from Module 1 in front of you.
- It should be embedded in your Participant Resource Guide and will be a useful reference for this part of our lesson.



The video thumbnail features a man with a beard and a suit on the right side. On the left, the title "Order of Operations with a Fraction Bar" is displayed in green and blue text. Below the title, the math expression $10 + 5 \times 6$ is shown above a horizontal line, with $12 \div 3$ below it. A video link is provided at the bottom: <https://www.youtube.com/watch?v=hfVKWJxGYE8>. The number 40 is visible in the bottom right corner of the video frame.

Notes:

- Use the note taking space in your Participant Resource Guide to follow along with the video.
- Record the examples as the instructor in the video work through the equations.

Combining Operations with Fractions

Method:

1. Use PEMDAS to solve the equation on the **top** of the division bar.
2. Use PEMDAS to solve the equation on the **bottom** of the division bar.
3. Reduce the fraction to simplest form, if possible.

*Always
work
from
LEFT to
RIGHT*

$$\frac{8 + 4 \times 3}{10 \div 2}$$

Notes:

- When it comes to combining operations with fractions, we'll use the following steps to solve equations.
- First, use PEMDAS to solve the equation on the top of the division bar.
- Next, use PEMDAS to solve the equation on the bottom of the division bar.
 - Remember to always work from LEFT to RIGHT.
- Lastly, we'll reduce the fraction to simplest form, if possible.
- Let's work through a practice problem together. Start with the equation on top of the division bar.
- What operation do we need to do first?
- Staying with the top of the division bar, what operation comes next?
- We're ready to move onto the bottom bar. There is only one operation here.
- What is $10 \div 2$?
- Ok, all you need to do now is reduce this fraction to its simplest form.
- What is the simplest form of $12/5$?

Combining Operations with Fractions

Method:

1. Use PEMDAS to solve the equation on the **top** of the division bar.
2. Use PEMDAS to solve the equation on the **bottom** of the division bar.
3. Reduce the fraction to simplest form, if possible.

$$\frac{24 - 6 + 2 \times 5}{(18 - 6) \div (2 \times 3)}$$


Combining Operations with Fractions



Directions: Use the method below the solve the equations.

Method:

1. Use PEMDAS to solve the equation on the top of the division bar.

2. Use PEMDAS to solve the equation on the bottom of the division bar.

3. Reduce the fraction to simplest form, if possible.

Always work from LEFT to RIGHT

Combining Operations with Fractions

Directions: Use the method below the solve the equations.

Problem	Working	Answer
1. Use PEMDAS to solve the equation on the top of the division bar.	$\frac{4 + 3 \times 2}{20 \div 2}$	
2. Use PEMDAS to solve the equation on the bottom of the division bar.	$\frac{6 + 12}{10 \div 2}$	
3. Reduce the fraction to simplest form, if possible.	$\frac{18}{5}$	
4. Reduce the fraction to simplest form, if possible.	$\frac{18}{5}$	

1. Use PEMDAS to solve the equation on the top of the division bar.

2. Use PEMDAS to solve the equation on the bottom of the division bar.

3. Reduce the fraction to simplest form, if possible.

$$\frac{4 + 3 \times 2}{20 \div 2}$$

$$\frac{10}{10}$$

$$1$$

$$\frac{6 + 12}{10 \div 2}$$

$$\frac{18}{5}$$

$$\frac{18}{5}$$

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Activity

Combining Operations with Fractions

Directions: Use the method below to solve the equations.

Multiplying Fractions	
Method	Example
7. Use PEMDAS to solve the equation on the top of the division bar.	$\frac{8 + 4 \times 3}{10 \div 2}$
8. Use PEMDAS to solve the equation on the bottom of the division bar.	$\frac{8 + 12}{10 \div 2}$
9. Reduce the fraction to simplest form, if possible.	$\frac{20}{10 \div 2}$
Reminders	
• PEMDAS = Parenthesis, Exponents, Multiplication/Division, Addition/Subtraction • Always work from left to right when using PEMDAS.	$\frac{20}{5} = \frac{\cancel{4}}{\cancel{1}} \text{ simplify } \rightarrow = 4$

1.
$$\frac{6 + 2 \times 4}{12 \div 3}$$

2.
$$\frac{9 + 3 \times 2}{8 \div 2}$$

3.
$$\frac{14 - (6 \div 2)}{(10 - 5) \times 2}$$

4.
$$\frac{18 - (4 \times 2)}{(12 \div 3) + 2}$$

5.
$$\frac{16 - (8 \div 4) + 3}{(6 + 2) \times 2}$$

6.
$$\frac{20 - 4 + 2^3}{(15 - 9) \div (3 \times 2)}$$

7.
$$\frac{30 - 6 + 3^2}{(18 - 6) \div (2 \times 3)}$$

8.
$$\frac{24 - 6 \times 3 + 2^2}{(18 - 6) \div (3 \times 2)}$$

Knowledge Check



Q: True or False: Always solve equations using PEMDAS from right to left.

True

False

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Knowledge Check



Q: What is the solution to this equation?

$$\frac{12 + 3^2 - 1}{8^2 - 24}$$

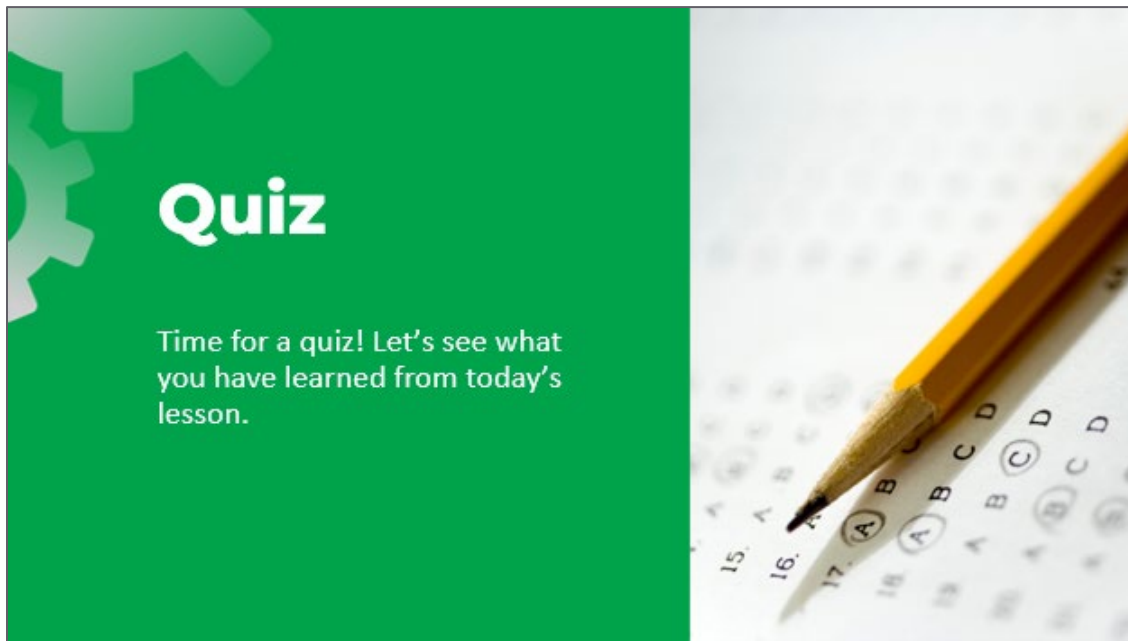
(A). 17/8

(B). 1/20

(C). 9/20

(D). 1/2

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Notes:

- Time for a quiz! Let's see what you have retained from today's lesson.

Revisiting Objectives

- Demonstrate the ability to solve mathematics problems involving fractions.
 - Solve multiplication and division problems involving fractions.
 - Solve addition and subtraction problems involving fractions.
 - Use the order of operations to solve problems involving fractions accurately.

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Notes:

- If you were explaining today's objectives to someone else, how would you summarize what they mean and why they matter?
- Which of today's objectives do you feel most confident about? Which were most challenging?
 - Explain your reasoning.
- Can you give an example of how you could apply one of today's objectives in a real-world situation?
