

# Instructor's Manual

## Modules 7 & 9: Subtracting Fractions and Mixed Numbers

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### What Students Should Gain from this Module

At the end of this module, students should be able to:

- Subtract fractions
- Subtract mixed numbers

**Recommended Timing for this Module**    2 hours

### Required Equipment and Materials

- An LCD projector and a Windows computer or laptop. The computer should have high speed internet access, a recent version of PowerPoint, an updated Internet browser, and speakers
- Cords for connecting the LCD projector to the computer
- A wireless presenter which allows you to move around the room while controlling the PowerPoint presentation
- A screen visible to all in the room
- Three sets of fraction strips per student. The strips should be separated from one another. For example, each set of fraction strips should consist of sixteen  $\frac{1}{16}$ ths separated from one another, not a single row of connected  $\frac{1}{16}$ ths.
- The *Subtracting Fractions* PowerPoint file
- A copy of the *Subtracting Fractions* handout for each student and instructor



## Set Up

- Set up the computer and projector.




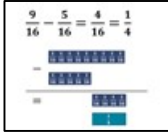
## Optional Materials

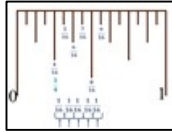
At Math-Aids.com <http://www.math-aids.com> you can create and print a wide variety of practice problem sets (and answer keys) for students who want or need additional practice. You can also create problem sets that offer a higher degree of challenge for students who want an additional challenge. Be sure to confirm that your use of the Math-Aids resources complies with its usage guidelines.

## Note to the Instructor

Some of the slides for this module require you to “Click” or press enter on the keyboard to reveal additional information on the slide. Especially where there is a lot of information on a slide, this will help you guide students’ attention to the information you are addressing. In other cases, it engages students by giving them a chance to think through their own answer or strategy for solving a problem before the answer is revealed on the slide.



Time	Activity	Materials	What to Do
35	Subtracting Fractions & Mixed Numbers with Common Denominators	<p>Handout: <i>Subtracting Fractions</i></p>  	<p><b>Pass out</b> the handout.</p> <p><b>Say</b> that they are hauling a load of scrap to a transfer station. Their total weight entering the transfer station is <math>45 \frac{3}{4}</math> tons. Leaving the transfer station the weight is <math>23 \frac{1}{4}</math> tons.</p> <p><b>Ask</b> how much scrap they dumped.</p> <p><b>Say</b> that, to answer this question, and often on the job, they will have to be able to subtract fractions.</p> <p><b>Review</b> the objective.</p>
		<p>When subtracting fractions, treat the bottom numbers the same way you do for addition.</p>  	<p><b>Say</b> that when subtracting fractions, the bottom numbers are treated the same way they are for addition.</p> <p><b>Have students</b> use their fraction strips and the number line in their handout (the image of the slide) to subtract these fractions, simplify their answer if necessary, and write their answer on their handout.</p> <p><b>Point out</b> the <math>9/16</math>, <math>5/16</math>, and <math>4/16</math>, and how <math>4/16</math> is the same as <math>1/4</math>.</p>



**Point out**, using the number line, how  $9/16 - 5/16 = 4/16$ , and how  $4/16$  is the same as  $1/4$ .

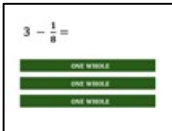
**Have students correct their answers** (if necessary) on their handout.



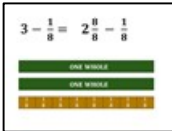
**Ask students** how they would solve this.

When subtracting a fraction from a whole number, borrow a 1 from the whole number, then rename it as a fraction.

**Say** that, when subtracting a fraction from a whole number, they should borrow a 1 from the whole number then rename it as a fraction.

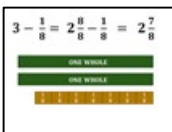


**Point out** the three wholes.



**Show** how a one was borrowed from the 3, and renamed to a fraction ( $8/8$ ).

**Point out** that the  $8/8$  is still the same amount as one whole, even after being renamed.




**Show** how the answer was determined.


**Have students correct their answers** (if necessary) on their handout.



**Have students** use their fraction strips to find the answer and write it on their handout.


$$2 - \frac{3}{4} =$$


**Point out** the two wholes.

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


**Show** how a one was borrowed from the 2, and renamed to a fraction.

**Point out** that the  $\frac{4}{4}$  is still the same amount as one whole, even after being renamed.

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


**Show** how the answer was determined.

**Have students correct their answers** (if necessary) on their handout.



$$19 - \frac{13}{16} =$$

**Have students** find the answer then write it on their handout.

$$19 - \frac{13}{16} =$$

$$19 - \frac{13}{16} = 18\frac{16}{16} - \frac{13}{16} = 18\frac{3}{16}$$

**Show** how the answer was determined.

**Have students correct their answers** (if necessary) on their handout.



Weight in =  $45\frac{3}{4}$  tons

Weight out =  $23\frac{1}{4}$  tons

**Say** that, to find the amount of scrap they dumped at the transfer station, they need to subtract the mixed numbers.

Subtract whole numbers first,  
borrow if necessary,  
subtract the fractions,  
then combine.

**Say** that, when subtracting mixed numbers, they should subtract the whole numbers first, borrow if necessary, subtract the fractions, then combine.

Weight in =  $45\frac{3}{4}$  tons

Weight out =  $23\frac{1}{4}$  tons

$$45\frac{3}{4} \text{ tons} - 23\frac{1}{4} \text{ tons} =$$

$$45 \text{ tons} - 23 \text{ tons} = 22 \text{ tons}$$

**Say** to subtract the whole numbers first.

Weight in =  $45 \frac{3}{4}$  tons  
 Weight out =  $23 \frac{1}{4}$  tons  
 $45 \frac{3}{4}$  tons -  $23 \frac{1}{4}$  tons =  
 $\frac{3}{4}$  tons -  $\frac{1}{4}$  tons =  $\frac{2}{4}$  tons =  $\frac{1}{2}$  tons

**Say** to subtract the fractions next since it isn't necessary to borrow.

**Show** how the  $\frac{1}{2}$  was determined.

Weight in =  $45 \frac{3}{4}$  tons  
 Weight out =  $23 \frac{1}{4}$  tons  
 Weight of scrap left at the dump =  $22 \frac{1}{2}$  tons


**Show** where the  $22 \frac{1}{2}$  came from.

$2 \frac{1}{8} - \frac{7}{8} =$




**Have students** use their fraction strips to find the answer, then write it on their handout.

$2 \frac{1}{8} - \frac{7}{8} =$



**Show** how the fraction strips represent the equation.

$2 \frac{1}{8} - \frac{7}{8} = 1 \frac{1}{8} - \frac{7}{8} =$



**Point out** that it is necessary to borrow a one because it is impossible to subtract  $\frac{7}{8}$  from  $\frac{1}{8}$ .

**Show** how one was borrowed and renamed eighths, how the answer was determined, **CLICK**

and how  $\frac{2}{8}$  is simplified to  $\frac{1}{4}$ .

$15 \frac{1}{16} - 4 \frac{5}{16} =$



**Have students** find the answer and write it on their handout.

$15 \frac{1}{16} - 4 \frac{5}{16} =$   
 $14 \frac{17}{16} - 4 \frac{5}{16} =$

**Point out** that it was necessary to borrow one from the 15 and rename it because it isn't possible to subtract  $\frac{5}{16}$  from  $\frac{1}{16}$ .

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**Subtracting  
Fractions &  
Mixed  
Numbers with  
Different  
Denominators**

$$14\frac{17}{16} - 4\frac{5}{16} =$$
$$14 - 4 = 10$$
$$\frac{17}{16} - \frac{5}{16} = \frac{12}{16} = \frac{3}{4}$$
$$15\frac{1}{16} - 4\frac{5}{16} = 10\frac{3}{4}$$


$$26\frac{15}{16} - 11\frac{11}{16} =$$

$$26\frac{15}{16} - 11\frac{11}{16} =$$
$$26 - 11 = 15$$
$$\frac{15}{16} - \frac{11}{16} = \frac{4}{16} = \frac{1}{4}$$
$$26\frac{15}{16} - 11\frac{11}{16} = 15\frac{1}{4}$$

Like with addition, fractions must have the same bottom number to subtract them.

$$\frac{1}{2} - \frac{1}{4} =$$


If the bottom number of one (or more) of the fractions divides evenly into the bottom number of another fraction, rename the fraction(s) so they have the larger bottom number.

**Show** where the 10 and 3/4 came from.

**Have students correct their answers** (if necessary) on their handout.

**Have students** find the answer and write it on their handout.

**Show** how the answer was determined.

**Have students correct their answers** (if necessary) on their handout.

**Say** that, like with addition, fractions have to have the same bottom number in order to subtract them.

**Ask** students how they would solve this.

**Say** to remember that, if the bottom number of one (or more) of the fractions divides evenly into the bottom number of another fraction, they should rename the fractions so they all have the larger bottom number.

$$\frac{2}{2} - \frac{1}{4} = \frac{1}{4}$$

**Ask** students how they would solve this. **CLICK**

**Say** that you are not changing the amount, you are only renaming  $1/2$  as  $2/4$  so you now have all of the same thing (fourths)

**Say** that now you have all fourths so you can subtract them.

**Show** that, when  $1/2$  is renamed  $2/4$ , both the top and bottom number changed.

**Say that** whenever renaming a fraction in this way, both the top and bottom number have to change.

**Point out** that  $1/2$  and  $2/4$  are the same amount but because  $2/4$  has the same bottom number as  $1/4$ , the fractions can be subtracted.

$$\frac{3}{16} - \frac{1}{8} =$$

**Have students** use their fraction strips to find the answer, then write it on their handout.



$$\frac{3}{16} - \frac{1}{8} = \frac{3}{16} - \frac{2}{16} = \frac{1}{16}$$

$\frac{1}{8}$  is the same as  $\frac{2}{16}$

**Say that** to subtract  $1/8$  from  $3/16$  they need to have the same bottom number.

**Show** that  $1/8$  is the same amount as  $2/16$  and, now that both fractions have the same bottom number, **CLICK**

you can subtract the fractions.

**Point out** that, when  $1/8$  is renamed  $2/16$ , both the top and bottom number changed.

**Say that** whenever renaming a fraction in this way, both the top and bottom number have to change.

$$\frac{7}{8} - \frac{3}{4} =$$


**Have students** use their fraction strips to find the answer, then write it on their handout.

$$\frac{7}{8} - \frac{3}{4} = \frac{7}{8} - \frac{6}{8} = \frac{1}{8}$$


**Show** how the answer was determined.

**Have students correct their answers** (if necessary) on their handout.

$$\frac{11}{16} - \frac{1}{2} =$$


**Have students** use their fraction strips to find the answer, then write it on their handout.

$$\frac{11}{16} - \frac{1}{2} = \frac{11}{16} - \frac{8}{16} = \frac{3}{16}$$


**Show** how the answer was determined.

**Have students correct their answers** (if necessary) on their handout.

$$7\frac{3}{8} - 3\frac{1}{4} =$$



**Have students** find the answer, then write it on their handout.

$$7\frac{3}{8} - 3\frac{1}{4} =$$

$$7\frac{3}{8} - 3\frac{2}{8} = 4\frac{1}{8}$$

**Show** how the answer was determined.

**Have students correct their answers** (if necessary) on their handout.

$$19\frac{15}{16} - 9\frac{1}{2} =$$


**Have students** find the answer, then write it on their handout.

$$19\frac{15}{16} - 9\frac{1}{2} =$$

$$19\frac{15}{16} - 9\frac{8}{16} = 10\frac{7}{16}$$

**Show** how the answer was determined.

**Have students correct their answers** (if necessary) on their handout.

$$31\frac{1}{4} - 8\frac{15}{16} =$$


**Have students** find the answer, then write it on their handout.

$$31\frac{1}{4} - 8\frac{15}{16} =$$

$$31\frac{4}{16} - 8\frac{15}{16} =$$

$$30\frac{20}{16} - 8\frac{15}{16} = 22\frac{5}{16}$$

**Show** how the answer was determined.

**Have students correct their answers** (if necessary) on their handout.

$$13\frac{1}{2} - 6\frac{5}{8} =$$


**Have students** find the answer, then write it on their handout.

$$13\frac{1}{2} - 6\frac{5}{8} =$$

$$13\frac{4}{8} - 6\frac{5}{8} =$$

$$12\frac{12}{8} - 6\frac{5}{8} = 6\frac{7}{8}$$

**Show** how the answer was determined.

**Have students correct their answers** (if necessary) on their handout.

You are working on a plumbing job and need a piece of pipe that is  $6\frac{5}{8}$ . The pipe you have is  $13\frac{1}{2}$ . How much pipe will be left after you cut the piece you need?

**Have students** find the answer, then write it on their handout.

		$10\frac{1}{4} - 5\frac{7}{8} =$ $10\frac{2}{8} - 5\frac{7}{8} =$ $9\frac{10}{8} - 5\frac{7}{8} = 4\frac{3}{8}$	<p><b>Show</b> how the answer was determined.</p> <p><b>Have students correct their answers</b> (if necessary) on their handout.</p>
45	Practice Subtracting Fractions and Mixed Numbers	<p><b>Handout:</b> <i>Subtracting Fractions</i></p>	<p><b>Have students form groups</b> of 3 or 4.</p> <p><b>Say</b> to remember that, in class or on the job, they will need to work as a team, which means supporting and encouraging one another. It is not enough for the group to get the right answers. Instead, they should take responsibility for helping one another until each member of the group has mastered the process and feels confident in her ability to solve the problems on her own.</p> <p><b>Say</b> that they should remember the goal(s) they set for themselves, what they pledged to do to “Commit to Grit” in the <i>Being Gritty</i> handout at the beginning of the course, and the importance of maintaining a growth mindset if they have difficulty or get frustrated.</p> <p><b>Say</b> that you can provide additional problem sets for students who want additional practice or additional challenge. See the information about Math-Aids under Optional Materials above.</p> <p><b>Have students</b> work through the problems in the Subtracting Fractions Practice pages which follow the slides in the <i>Subtracting Fractions</i> handout. As they do, check in with groups to answer questions and ensure that no individual(s) in the group is being left behind.</p> <p><b>Review the answers</b>, answer questions, and review content students are struggling with.</p>

10	Planning to Apply their Learning		<b>Have students reflect</b> on the learning from this module and note in their journal what they have learned that will be useful to them on the job, what they want to remember, tips, etc., and when they have demonstrated grit or a growth mindset.
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