

**LESSON 5: Fractions—Addition and Subtraction**

**Weekly Focus:** Fractions  
**Weekly Skill:** Addition,  
Subtraction

**Lesson Summary:** In the warm up, students will solve an order of operations word problem. In Activity 1, they will determine if addition problems are true. In Activity 2, they will practice adding fractions. In Activity 3, they will do problems in the student book. In Activity 4, they will model how to subtract fractions with a partner activity. In Activity 5, they will subtract mixed numbers. In Activity 6, they will solve word problems in the workbook. There are an exit ticket and an extra problem at the end. Estimated time for the lesson is two hours.

**Materials Needed for Lesson 5:**

- 2 Worksheets with answers (attached)
- *Mathematical Reasoning Test Preparation for the 2014 GED Test Student Book pages 8-9.*
- Video on area models: (length 4:30)
- Video for the teacher: (4:30)
- Video on Subtracting Mixed Numbers. Required for the teacher and recommended for the students.
- Remind students they can practice fractions on their own at [www.visualfractions.com](http://www.visualfractions.com)
- Markers and tape
- *Mathematical Reasoning Test Preparation for the 2014 GED Test Workbook Pages 14-15*
- Exit ticket
- Teacher Note: You may decide to have students complete only part of the worksheets in class.

**Objectives:** Students will be able to:

- Solve word problems using order of operations and add & subtract fractions
- Calculate the missing fraction to make an equation correct
- Perform and explain computation of adding and subtracting fractions

**ACES Skills Addressed:** N, CT, LS

**CCRS Mathematical Practices Addressed:** look for and make use of structure, look for and express regularity in repeated reasoning

**Levels of Knowing Math Addressed:** Pictorial, Concrete, Abstract, Application, and Communication

**Notes:**

**You can add more examples if you feel students need them before they work. Any ideas that concretely relates to their lives make good examples.**

**For more practice as a class, feel free to choose some of the easier problems from the worksheets to do together. The “easier” problems are not necessarily at the beginning of**

**each worksheet. Also, you may decide to have students complete only part of the worksheets in class and assign the rest as homework or extra practice.**

The GED Math test is 115 minutes long and includes approximately 46 questions. The questions have a focus on quantitative problem solving (45%) and algebraic problem solving (55%).

Students must be able to understand math concepts and apply them to new situations, use logical reasoning to explain their answers, evaluate and further the reasoning of others, represent real world problems algebraically and visually, and manipulate and solve algebraic expressions.

This computer-based test includes questions that may be multiple-choice, fill-in-the-blank, choose from a drop-down menu, or drag-and-drop the response from one place to another.

The purpose of the GED test is to provide students with the skills necessary to either further their education or be ready for the demands of today's careers.

**Lesson 5 Warm-up: Solve the order of operations problem**

**Time: 5-10 Minutes**

Write on the board: You used your debit card to buy each of your 3 kids an ice cream cone at \$1.50 per cone and to fill up your car gas tank for \$44.50. Your new balance in your checking account is \$403.25.

Basic Question:

How much did you have before you made these purchases? *(\$452.25)*

Extension Question:

Write an expression to show what your balance was before you spent this money.

*$(3 \times 1.50) + 44.50 + 403.25 = 452.25$*

**Lesson 5 Activity 1: Adding Fractions: True or False?**

**Time: 10 Minutes**

Unit fractions (fractions with a numerator of 1) can be written as the sum of two other unit fractions.

Example A: Write on the board:  $1/2 = 1/3 + 1/6$ . Ask students why this is correct. They should tell you because the fractions are equivalent. With their input, show how this is true with drawings: draw half a circle and fill in one side. Draw another circle and divide into three and fill in one part. Draw a third circle, divide into six parts, and fill in one. This can also be done with rectangles. Also do the computation with equivalent fractions:  $2/6 + 1/6 = 3/6 = 1/2$ .

Example B: Do the same with  $1/4 = 1/5 + 1/20$ . You can do it or have a volunteer do it on the board and explain it.

Lesson 5: Fractions—Addition and Subtraction

Practice: Write these on the board and have students solve to figure out if they are correct or not.

$$\frac{1}{2} = \frac{1}{10} + \frac{1}{20} \text{ (Answer: not correct)}$$

$$\frac{1}{6} = \frac{1}{7} + \frac{1}{42} \text{ (correct)}$$

$$\frac{1}{3} = \frac{1}{7} + \frac{1}{21} \text{ (not correct)}$$

$$\frac{1}{8} = \frac{1}{9} + \frac{1}{72} \text{ (correct)}$$

**Lesson 5 Activity 2: Adding Mixed Numbers**

**Time: 15-20 Minutes**

Ask students what are some occasions when they might need to add fractions or mixed numbers, for example  $\frac{1}{3}$  and  $2\frac{1}{2}$ . They might say when measuring in cooking, in construction, in figuring out medicine dosages.

Solve the example:  $\frac{1}{3} + 2\frac{1}{2} = \frac{2}{6} + 2\frac{3}{6} = 2\frac{5}{6}$ . It can also be solved this way:  $\frac{1}{3} + 2\frac{1}{2} = \frac{1}{3} + \frac{5}{2} = \frac{2}{6} + \frac{15}{6} = \frac{17}{6} = 2\frac{5}{6}$ . Students should solve the problems the way they prefer but the second way takes longer. Also demonstrate with circles or rectangles as you did in the first activity.

**Do worksheet 5.1 (attached).** Do the first question together and then circulate to help.

**Lesson 5 Activity 3: Complete Word Problems with Fractions**

**Time: 15 Minutes**

Have students work independently in the **student book pages 8-9 #1, 2, 3, 4 and 6**. These questions practice all the fractions concepts reviewed so far, not just addition. Circulate to help. Review any questions that students found challenging. Choose a few problems to have students volunteer to do them on the board and explain if they want to.

Note to teacher: Drag-and-Drop is one of the ways that students answer questions on the GED test. Read the explanation in the student workbook page x. Explain to the students that they choose which numbers from the boxes to “drag” into the answer boxes.

**Worksheet 5.1 Adding Fractions**

- 1) The table below shows the weight of several bags.

Bag	Weight (in kilograms)
Bag 1	$4 \frac{2}{3}$
Bag 2	$6 \frac{1}{4}$
Bag 3	$9 \frac{1}{4}$
Bag 4	$6 \frac{2}{3}$

What is the combined weight of all the bags?

- 3) The table below shows the weight of several vehicles.

Car	Weight (in tons)
Car 1	$8 \frac{1}{2}$
Car 2	$3 \frac{1}{8}$
Car 3	$6 \frac{2}{3}$
Car 4	$5 \frac{3}{4}$

What is the combined weight of all the cars?

- 5) The table below shows the weight of several phones.

Phone	Weight (in ounces)
Phone 1	$3 \frac{5}{6}$
Phone 2	$1 \frac{3}{4}$
Phone 3	$7 \frac{4}{5}$
Phone 4	$4 \frac{1}{3}$

What is the combined weight of all the phones?

- 2) The table below shows how many milliliters of ink were in pens.

Pen	Capacity (in milliliters)
Pen 1	$1 \frac{5}{8}$
Pen 2	$2 \frac{5}{8}$
Pen 3	$9 \frac{3}{8}$
Pen 4	$3 \frac{7}{8}$

What is the combined capacity of all the pens?

- 4) The table below shows how much water several containers will hold.

Container	Capacity (in cups)
Container 1	$1 \frac{1}{2}$
Container 2	$8 \frac{1}{2}$
Container 3	$7 \frac{3}{6}$
Container 4	$8 \frac{1}{2}$

What is the combined capacity of all the containers?

- 6) The table below shows the length of several pieces of string.

String	Length (in Inches)
String 1	$7 \frac{1}{2}$
String 2	$8 \frac{2}{3}$
String 3	$6 \frac{5}{6}$
String 4	$5 \frac{1}{6}$

What is the combined length of all the strings?

Worksheet 5.1 Adding Fractions **Answers**

- 1) The table below shows the weight of several bags.

Bag	Weight (in kilograms)	
Bag 1	$4 \frac{2}{3}$	$4 \frac{8}{12}$
Bag 2	$6 \frac{1}{4}$	$6 \frac{3}{12}$
Bag 3	$9 \frac{1}{4}$	$9 \frac{3}{12}$
Bag 4	$6 \frac{2}{3}$	$6 \frac{8}{12}$

What is the combined weight of all the bags?

- 3) The table below shows the weight of several vehicles.

Car	Weight (in tons)	
Car 1	$8 \frac{1}{2}$	$8 \frac{12}{24}$
Car 2	$3 \frac{1}{8}$	$3 \frac{3}{24}$
Car 3	$6 \frac{2}{3}$	$6 \frac{16}{24}$
Car 4	$5 \frac{3}{4}$	$5 \frac{18}{24}$

What is the combined weight of all the cars?

- 5) The table below shows the weight of several phones.

Phone	Weight (in ounces)	
Phone 1	$3 \frac{5}{6}$	$3 \frac{50}{60}$
Phone 2	$1 \frac{3}{4}$	$1 \frac{45}{60}$
Phone 3	$7 \frac{4}{5}$	$7 \frac{48}{60}$
Phone 4	$4 \frac{1}{3}$	$4 \frac{20}{60}$

What is the combined weight of all the phones?

- 2) The table below shows how many milliliters of ink were in pens.

Pen	Capacity (in milliliters)	
Pen 1	$1 \frac{5}{8}$	$1 \frac{5}{8}$
Pen 2	$2 \frac{5}{8}$	$2 \frac{5}{8}$
Pen 3	$9 \frac{3}{8}$	$9 \frac{3}{8}$
Pen 4	$3 \frac{7}{8}$	$3 \frac{7}{8}$

What is the combined capacity of all the pens?

- 4) The table below shows how much water several containers will hold.

Container	Capacity (in cups)	
Container 1	$1 \frac{1}{2}$	$1 \frac{3}{6}$
Container 2	$8 \frac{1}{2}$	$8 \frac{3}{6}$
Container 3	$7 \frac{3}{6}$	$7 \frac{3}{6}$
Container 4	$8 \frac{1}{2}$	$8 \frac{3}{6}$

What is the combined capacity of all the containers?

- 6) The table below shows the length of several pieces of string.

String	Length (in Inches)	
String 1	$7 \frac{1}{2}$	$7 \frac{3}{6}$
String 2	$8 \frac{2}{3}$	$8 \frac{4}{6}$
String 3	$6 \frac{5}{6}$	$6 \frac{5}{6}$
String 4	$5 \frac{1}{6}$	$5 \frac{1}{6}$

What is the combined length of all the strings?

1.  $26 \frac{10}{12}$
2.  $17 \frac{4}{8}$
3.  $24 \frac{1}{24}$
4.  $26$
5.  $17 \frac{43}{60}$
6.  $28 \frac{1}{6}$

Note: Answer 1 can be reduce to  $26 \frac{5}{6}$ , and Answer 2 to  $17 \frac{1}{2}$

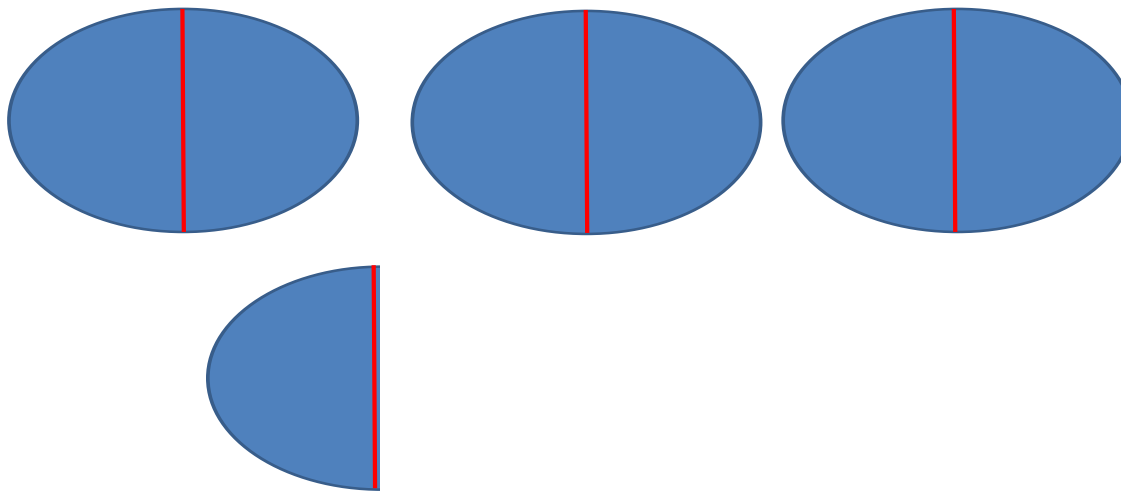
**Lesson 5 Activity 4: Make visual models to show subtraction of mixed numbers**

**Time: 20-25 Minutes**

Students will work with partners to make models to show the subtraction of mixed numbers. Start with talking about changing mixed numbers into improper fractions. There is a simple algorithm to change mixed numbers into improper fractions: multiply the denominator by the whole number, and then add the numerator. This becomes the NEW numerator. Your denominator stays the same. Example:  $3 \frac{1}{2}$  becomes  $2 \times 3 + 1 = 7/2$

BUT before you talk about the algorithm draw the example below and ask the students what fraction is represented. Do not show them the answer. Wait to see what responses you get. I hope they see  $3 \frac{1}{2}$  but you are trying to get them to see that it is also seven  $\frac{1}{2}$ s or  $7/2$ . They are going to need this skill to be able to subtract **mixed numbers**.

$$3 \frac{1}{2} = 7/2$$



To start the activity, tell the students they are to work in pairs and come up any two mixed numbers that they will subtract from each other. Do two examples together first.

Example A:  $2 \frac{1}{4} - 1 \frac{1}{2}$ . They must draw a visual representation (can be lines, rectangles, circles), and show how deleting the second mixed number results in the answer. Then they do the computation: change the mixed number to an improper fraction, and solve. Do this example with lines or rectangles so they can see a different visual. Also do the algorithm:  $2 \frac{1}{4} - 1 \frac{1}{2} = 9/4 - 3/2 = 9/4 - 6/4 = 3/4$ .

Example B: Repeat with  $5 \frac{1}{3} - 1 \frac{2}{3}$ . Draw the visual representation and do the algorithm:  $5 \frac{1}{3} - 1 \frac{2}{3} = 3 \frac{2}{3}$ .

Lesson 5: Fractions—Addition and Subtraction

Have each pair of students write out their problem and the drawing, but not the solution. They should solve it but not write the answer on the paper. Have them tape their problem to the wall for others to solve. Give everyone time to solve other student's problems. Then go over all of the answers one by one. Let the students discuss how they solved the problems.

Finished early? If all or some of the students finish quickly, ask them to do another problem.

**Lesson 5 Activity 5: Practice Subtracting Mixed Numbers**

**Time: 10-20 Minutes**

When subtracting mixed numbers, you don't always have to change the mixed number to an improper fraction. Sometimes you can just change the fraction parts to make them equivalent (Ex. A) and at other times you can borrow from the whole number (Ex. B).

Example A:  $3 \frac{1}{2} - 2 \frac{1}{3} = 3 \frac{3}{6} - 2 \frac{2}{6} = 1 \frac{1}{6}$

Example B:  $5 \frac{1}{3} - 2 \frac{1}{2} = 4 \frac{4}{3} - 2 \frac{1}{2} = 4 \frac{8}{6} - 2 \frac{3}{6} = 2 \frac{5}{6}$ .

After you've done the examples, have the students do some of **Worksheet 5.2** and assign the rest as homework.

**Lesson 5 Activity 6: Fractions Word Problems**

**Time: 15-20 Minutes**

Have students do the word problems on **pages 14 and 15 of the workbook**. Note that these are mixed fractions word problems, not necessarily subtraction. Choose a few problems to do together on the board.

Note to teacher: Drag-and-Drop is one of the ways that students answer questions on the GED test. Read the explanation in the student workbook page x. Explain to the students that they choose which numbers from the boxes to "drag" into the answer boxes. (This was done in lesson 9 also.)

**Lesson 5 Exit Ticket**

**Time: 5 Minutes**

Write on the board:

Before a big race, a runner jogs 3 times around a  $\frac{1}{4}$  mile track to warm up. Then she runs  $8 \frac{1}{2}$  miles. Write an expression and solve.

$(\frac{1}{4} \times 3) + 8 \frac{1}{2} = \frac{3}{4} + 8 \frac{1}{2} = 9 \frac{1}{4}$

**Lesson 5 Extra Problem****Time: 3-5 Minutes**

Write on the board: Steve eats  $\frac{1}{2}$  a pizza. Marcus eats half as much as Steve does. How much is left for Leo?

Basic Question: Draw a picture and solve the problem. (*Answer: Half the pizza is left for Steve who eats  $\frac{1}{4}$  of the whole pizza, so  $\frac{1}{4}$  is left for Leo.*)

Extension Question: Write the algorithm (computation). (*Answer:  $1 - \frac{1}{2} - \frac{1}{4} = \frac{4}{4} - \frac{2}{4} - \frac{1}{4} = \frac{1}{4}$* )



## Worksheet 5.2 Subtracting Fractions

1)  $7\frac{1}{2} - 3\frac{4}{5} =$

2)  $6\frac{1}{5} - 3\frac{1}{2} =$

3)  $6\frac{1}{5} - 4\frac{1}{3} =$

4)  $9\frac{5}{10} - 3\frac{2}{3} =$

5)  $9\frac{4}{5} - 1\frac{8}{10} =$

6)  $7\frac{1}{2} - 2\frac{2}{3} =$

7)  $7\frac{2}{3} - 1\frac{4}{5} =$

8)  $7\frac{2}{10} - 3\frac{1}{2} =$

9)  $7\frac{2}{4} - 3\frac{5}{10} =$

10)  $8\frac{3}{10} - 4\frac{2}{3} =$

Worksheet 5.2 Subtracting Fractions **Answers**

$$1) \quad 7\frac{1}{2} - 3\frac{4}{5} = 6\overset{15}{\cancel{7}5} - 3\frac{8}{10} = 3\frac{7}{10}$$

$$2) \quad 6\frac{1}{5} - 3\frac{1}{2} = 5\overset{12}{\cancel{6}2} - 3\frac{5}{10} = 2\frac{7}{10}$$

$$3) \quad 6\frac{1}{5} - 4\frac{1}{3} = 5\overset{18}{\cancel{6}3} - 4\frac{5}{15} = 1\frac{13}{15}$$

$$4) \quad 9\frac{5}{10} - 3\frac{2}{3} = 8\overset{45}{\cancel{9}15} - 3\frac{20}{30} = 5\frac{25}{30} = 5\frac{5}{6}$$

$$5) \quad 9\frac{4}{5} - 1\frac{8}{10} = 9\frac{8}{10} - 1\frac{8}{10} = 8$$

$$6) \quad 7\frac{1}{2} - 2\frac{2}{3} = 6\overset{9}{\cancel{7}3} - 2\frac{4}{6} = 4\frac{5}{6}$$

$$7) \quad 7\frac{2}{3} - 1\frac{4}{5} = 6\overset{25}{\cancel{7}10} - 1\frac{12}{15} = 5\frac{13}{15}$$

$$8) \quad 7\frac{2}{10} - 3\frac{1}{2} = 6\overset{12}{\cancel{7}2} - 3\frac{5}{10} = 3\frac{7}{10}$$

$$9) \quad 7\frac{2}{4} - 3\frac{5}{10} = 7\frac{10}{20} - 3\frac{10}{20} = 4$$

$$10) \quad 8\frac{3}{10} - 4\frac{2}{3} = 7\overset{39}{\cancel{8}9} - 4\frac{20}{30} = 3\frac{19}{30}$$