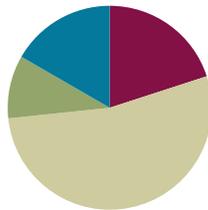


## Lesson 8

Objective: Solve problems involving mixed units of weight.

### Suggested Lesson Structure

■ Application Problem	(6 minutes)
■ Fluency Practice	(12 minutes)
■ Concept Development	(32 minutes)
■ Student Debrief	(10 minutes)
<b>Total Time</b>	<b>(60 minutes)</b>



### Application Problem (6 minutes)

A sign next to the roller coaster says a person must be 54 inches tall to ride. At his last doctor’s appointment, Hever was 4 feet 4 inches tall. He has grown 3 inches since then.

- a. Is Hever tall enough to ride the roller coaster? By how many inches does he make or miss the minimum height?

Solution A

$$4 \text{ ft } 4 \text{ in} = 4 \text{ ft} + 4 \text{ in} = (4 \times 12 \text{ in}) + 4 \text{ in} = 48 \text{ in} + 4 \text{ in} = 52 \text{ in}$$

$$52 \text{ inches} + 3 \text{ inches} = 55 \text{ inches}$$

Hever is tall enough to ride the roller coaster. He is tall enough by 1 inch.

Solution B

$$4 \text{ ft } 4 \text{ in} + 3 \text{ in} = 4 \text{ ft } 7 \text{ in} = (4 \times 12 \text{ in}) + 7 \text{ in} = 55 \text{ in}$$

Hever is tall enough by 1 inch.

- b. Hever’s father is 6 feet 3 inches tall. How much taller than the minimum height is his father?

$$6 \text{ ft } 3 \text{ in} = 6 \text{ ft} + 3 \text{ in} = (6 \times 12 \text{ in}) + 3 \text{ in} = 72 \text{ in} + 3 \text{ in} = 75 \text{ in}$$

$$\begin{array}{r} 75 \\ - 54 \\ \hline 21 \end{array}$$

Hever's father is 21 inches taller than the minimum height.

Note: This Application Problem links students’ prior work with mixed units to today’s work. Students review the skills of working with mixed units of length to reinforce today’s Concept Development, where they work with mixed units of weight.

**Fluency Practice (12 minutes)**

- Grade 4 Core Fluency Differentiated Practice Sets **4.NBT.4** (4 minutes)
- Add Mixed Numbers **4.MD.1** (4 minutes)
- Convert Weight Units **4.MD.1** (4 minutes)

**Grade 4 Core Fluency Differentiated Practice Sets (4 minutes)**

Materials: (S) Core Fluency Practice Sets (Lesson 2 Core Fluency Practice Sets)

Note: During Module 7, each day's Fluency Practice may include an opportunity for mastery of the addition and subtraction algorithm by means of the Core Fluency Practice Sets. The process is detailed and Practice Sets are provided in Lesson 2.

**Add Mixed Numbers (4 minutes)**

Materials: (S) Personal white board

Note: This fluency activity reviews Module 5's fraction work and anticipates today's lesson by adding mixed measurement units since sixteenths relate to pounds and ounces. Complete as a choral or white board activity.

T: 8 sixteenths + 11 sixteenths is how many sixteenths?

S: 19 sixteenths.

T: Express 19 sixteenths as ones and sixteenths.

S: 1 one and 3 sixteenths.

T: 13 sixteenths + 8 sixteenths is how many sixteenths?

S: 21 sixteenths.

T: Express 21 sixteenths as ones and sixteenths.

S: 1 one and 5 sixteenths.

Continue with the following possible sequence:  $\frac{14}{16} + \frac{9}{16}$ ,  $\frac{15}{16} + \frac{15}{16}$ ,  $\frac{12}{16} + \frac{12}{16}$ ,  $\frac{13}{16} + \frac{27}{16}$ .

**Convert Weight Units (4 minutes)**

Materials: (S) Personal white board

Note: This fluency activity reviews Lesson 1 and anticipates today's work with weight units.

T: Respond on your personal white board. Express each number of pounds and ounces as ounces.

T: 1 pound?

S: (Write 16 ounces.)

T: 1 pound 3 ounces?

S: (Write 19 ounces.)

- T: 1 pound 1 ounce?  
 S: (Write 17 ounces.)  
 T: 2 pounds?  
 S: (Write 32 ounces.)  
 T: Express each number of ounces as pounds and ounces if possible.  
 T: 16 ounces is ...?  
 S: (Write 1 pound.)  
 T: 32 ounces is ...?  
 S: (Write 2 pounds.)

Repeat the process with 2 pounds 1 ounce, 2 pounds 11 ounces, 3 pound 15 ounces, and 3 pounds 6 ounces.

**Concept Development (32 minutes)**

Materials: (S) Personal white board

Note: The same lesson format may be followed from Lessons 6–7 if students need more guidance. This lesson invites students to share solution strategies on the assumption that they are ready to apply what they have learned in the previous two lessons to weight units.

**Problem 1: Add mixed units of weight measure, and share alternate strategies.**

- T: (Write 4 lb 11 oz + 15 oz.) Solve the problem. Be prepared to share your solution strategy with a partner.  
 S: I completed a pound by adding 5 ounces and then added 10 more ounces. 5 pounds 10 ounces. (Solution A.)

Solution A  
 $4\text{ lb } 11\text{ oz} \xrightarrow{+5\text{ oz}} 5\text{ lb} \xrightarrow{+10\text{ oz}} 5\text{ lb } 10\text{ oz}$

- S: I added a pound and then subtracted an ounce. (Solution B.)

Solution B  
 $4\text{ lb } 11\text{ oz} \xrightarrow{+1\text{ lb}} 5\text{ lb } 11\text{ oz} \xrightarrow{-1\text{ oz}} 5\text{ lb } 10\text{ oz}$

- S: We can add up or add like units. That gave me 4 pounds 26 ounces, so I took out a pound from 26 ounces to find 5 pounds 10 ounces. (Solution C.)

Solution C  
 $4\text{ lb } 11\text{ oz} + 15\text{ oz} = 4\text{ lb } 26\text{ oz} = 5\text{ lb } 10\text{ oz}$   
 (Note: 26 oz is decomposed into 16 oz and 10 oz)



**NOTES ON  
 MULTIPLE MEANS  
 OF ENGAGEMENT:**

If students working below grade level struggle with presenting strategies to solve, adjust the format of the lesson, offering guidance and practice until students become confident. Adding like units and decomposing the sum may be an approachable first strategy. Challenge students working above grade level and others who may be ready to utilize, analyze, and discuss multiple strategies independently, within partnerships, or small groups.

Invite students to direct questions to their peers to understand their solution strategies.

- T: (Display  $24\text{ lb } 8\text{ oz} + 9\text{ lb } 13\text{ oz}$ .) Find this sum. Use the strategy you feel is most efficient.  
 S: I just added like units. (Solution A.)

Solution A

$$24\text{ lb } 8\text{ oz} + 9\text{ lb } 13\text{ oz} = 33\text{ lb } 21\text{ oz} = 34\text{ lb } 5\text{ oz}$$

$\swarrow \searrow$   
 $16\text{ oz } 5\text{ oz}$

- S: I added the pounds first and then the ounces. (Solution B.)

Solution B

$$24\text{ lb } 8\text{ oz} \xrightarrow{+9\text{ lb}} 33\text{ lb } 8\text{ oz} \xrightarrow{+13\text{ oz}} 33\text{ lb } 21\text{ oz} = 34\text{ lb } 5\text{ oz}$$

$\swarrow \searrow$   
 $1\text{ lb } 5\text{ oz}$

- S: I added 10 pounds and then subtracted 3 ounces since 9 lb 13 oz is 3 oz away from 10 lb. (Solution C.)

Solution C

$$24\text{ lb } 8\text{ oz} \xrightarrow{+10\text{ lb}} 34\text{ lb } 8\text{ oz} \xrightarrow{-3\text{ oz}} 34\text{ lb } 5\text{ oz}$$



**NOTES ON  
MULTIPLE MEANS  
OF ENGAGEMENT:**

Empower English language learners to collaborate and communicate effectively to understand and explain solution strategies with sentence frames, sentence and question starters, and other scaffolds. Some possible question starters are given below:

- How did you solve?
- Why did you rename/compensate/count up/take from ...?
- Can you explain why ...?

MP.3

Invite students to direct questions to their peers to understand their solution strategies.

**Problem 2: Subtract units of weight measure when there are not enough smaller units.**

- T: (Display  $6\text{ lb } 7\text{ oz} - 12\text{ oz}$ .) Solve the problem, and then you will have the opportunity to share your solution strategies with your peers.

Solution A

$$6\text{ lb } 7\text{ oz} - 12\text{ oz} = 5\text{ lb } 11\text{ oz}$$

$\swarrow \searrow$   
 $5\text{ lb } 23\text{ oz}$

Solution B

$$6\text{ lb } 7\text{ oz} - 12\text{ oz} = 6\text{ lb } 11\text{ oz} - 1\text{ lb} = 5\text{ lb } 11\text{ oz}$$

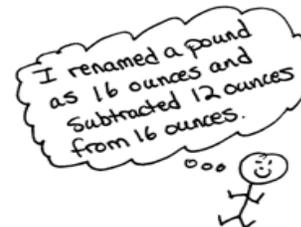
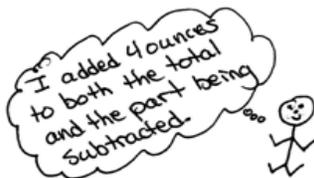
Solution C

$$6\text{ lb } 7\text{ oz} \xrightarrow{-7\text{ oz}} 6\text{ lb} \xrightarrow{-5\text{ oz}} 5\text{ lb } 11\text{ oz}$$

Solution D

$$6\text{ lb } 7\text{ oz} - 12\text{ oz} = 5\text{ lb } 7\text{ oz} + 4\text{ oz} = 5\text{ lb } 11\text{ oz}$$

$\swarrow \searrow$   
 $5\text{ lb } 7\text{ oz } 16\text{ oz}$



The ability demonstrated on the previous page, to subtract a number of small units from a mixed number, is an essential skill. When students are ready, have them practice next with subtraction of a mixed number, such as 5 pounds 9 ounces – 2 pounds 14 ounces. This problem invites a variety of strategies, such as the following:

- Compensation: Students add 2 ounces to both minuend and subtrahend (since 14 ounces is 2 ounces away from 1 pound) to make the problem easier, as in 5 pounds 11 ounces – 3 pounds.
- Take from a pound: Students subtract the 2 pounds first and then subtract 14 ounces from 16 ounces.
- Rename a pound, and combine it with the ounces: Students rename 5 pounds 9 ounces as 4 pounds 25 ounces and subtract like units.
- Count up: Students count up 2 ounces to 3 pounds, add 2 pounds to get 5 pounds, and then add the remaining 9 ounces.

**Problem Set (10 minutes)**

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.

**Student Debrief (10 minutes)**

**Lesson Objective:** Solve problems involving mixed units of weight.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

Any combination of the questions below may be used to lead the discussion.

- What pattern did you notice between Problem 1(e) and Problem 1(f)?
- Explain to your partner how to solve Problem 1(g).
- For Problem 4(b), did you include the weight of the backpack as you calculated the answer? Does the weight of the backpack change the answer? Explain.

**Lesson 8 Problem Set**

Name: Jack Date: \_\_\_\_\_

1. Determine the following sums and differences. Show your work.

a.  $7\text{ oz} + 9\text{ oz} = 1\text{ lb}$   
 $1\text{ lb } 0\text{ oz}$

b.  $1\text{ lb } 5\text{ oz} + 11\text{ oz} = 2\text{ lb}$   
 $1\text{ lb } 0\text{ oz}$

c.  $1\text{ lb} - 13\text{ oz} = 3\text{ oz}$   
 $1\text{ lb } 0\text{ oz} - 13\text{ oz}$

d.  $12\text{ lb} - 4\text{ oz} = 11\text{ lb } 12\text{ oz}$   
 $11\text{ lb } 16\text{ oz}$

e.  $3\text{ lb } 9\text{ oz} + 9\text{ oz} = 4\text{ lb } 2\text{ oz}$   
 $= 3\text{ lb } 18\text{ oz}$   
 $1\text{ lb } 0\text{ oz} + 2\text{ oz}$

f.  $30\text{ lb } 9\text{ oz} + 9\text{ lb } 9\text{ oz} = 40\text{ lb } 2\text{ oz}$   
 $= 39\text{ lb } 18\text{ oz}$   
 $1\text{ lb } 0\text{ oz} + 2\text{ oz}$

g.  $25\text{ lb } 2\text{ oz} - 14\text{ oz} = 24\text{ lb } 4\text{ oz}$   
 $24\text{ lb } 18\text{ oz}$

h.  $125\text{ lb } 2\text{ oz} - 12\text{ lb } 3\text{ oz} = 112\text{ lb } 15\text{ oz}$   
 $124\text{ lb } 18\text{ oz}$

2. The total weight of Sarah and Amanda's full backpacks is 27 pounds. Sarah's backpack weighs 15 pounds 9 ounces. How much does Amanda's backpack weigh?

$15\text{ lb } 9\text{ oz} + 7\text{ oz} + 11\text{ lb} \rightarrow 27\text{ lb}$   
 $A = 11\text{ lb } 7\text{ oz}$   
 Amanda's backpack weighs  
 11 pounds 7 ounces.

**EUREKA MATH** Lesson 8: Solve problems involving mixed units of weight. Date: 8/20/15 engageNY 33

- Explain how the work from Lessons 6, 7, and 8 are related.
- What makes one strategy for adding or subtracting mixed units more efficient than another?
- How is adding and subtracting weight measurement units like adding and subtracting mixed numbers? Length units? Capacity units?
- Notice that in the fluency activities we added sixteenths. Why do you think sixteenths were chosen as the unit in the fluency activities for this lesson?

**Exit Ticket (3 minutes)**

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students’ understanding of the concepts that were presented in today’s lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

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3. In Emma’s supply box, a pencil weighs 3 ounces. Her scissors weigh 3 ounces more than the pencil, and a bottle of glue weighs three times as much as the scissors. How much does the bottle of glue weigh in pounds and ounces?

$P = 3 \text{ oz}$   
 $S = 3 \text{ oz} + 3 \text{ oz} = 6 \text{ oz}$   
 $G = 6 \text{ oz} \times 3 = 18 \text{ oz}$   
 $G = 1 \text{ lb } 2 \text{ oz}$

The bottle of glue weighs 1 pound 2 ounces.

4. Use the information in the chart about Jodi’s school supplies to answer the following questions:

Textbook 3 lb 8 oz	Supply Case 1 lb	Binder 2 lb 5 oz
Laptop 5 lb 12 oz	Notebook 11 oz	Backpack (empty) 2 lb 14 oz

a. On Mondays, Jodi packs only her laptop and supply case into her backpack. How much does her full backpack weigh?

$5 \text{ lb } 12 \text{ oz} + 2 \text{ lb } 14 \text{ oz} = 8 \text{ lb } 26 \text{ oz}$   
 $16 \text{ oz} = 1 \text{ lb } 0 \text{ oz}$   
 $8 \text{ lb } 26 \text{ oz} = 9 \text{ lb } 10 \text{ oz}$

Jodi’s full backpack weighs 9 pounds 10 ounces on Mondays.

b. On Tuesdays, Jodi brings her laptop, supply case, two notebooks, and two textbooks in her backpack. On Fridays, Jodi only packs her binder and supply case. How much less does Jodi’s full backpack weigh on Friday than it does on Tuesday?

T:  $5 \text{ lb } 12 \text{ oz} + 7 \text{ lb} + 22 \text{ oz} = 12 \text{ lb } 34 \text{ oz}$   
 $16 \text{ oz} + 18 \text{ oz} = 34 \text{ oz} = 2 \text{ lb}$   
 $12 \text{ lb } 34 \text{ oz} = 14 \text{ lb } 2 \text{ oz}$

F:  $2 \text{ lb } 5 \text{ oz} + 1 \text{ lb} = 3 \text{ lb } 5 \text{ oz}$   
 $14 \text{ lb } 2 \text{ oz} - 3 \text{ lb } 5 \text{ oz} = 11 \text{ lb } 13 \text{ oz}$   
 $13 \text{ lb} - 2 \text{ lb} = 11 \text{ lb}$   
 $16 \text{ oz} - 5 \text{ oz} = 11 \text{ oz}$   
 $11 \text{ lb } 13 \text{ oz}$

Jodi’s full backpack weighs 11 pounds 13 ounces less on Fridays than on Tuesdays.

**EUREKA MATH** Lesson 8: Solve problems involving mixed units of weight. ©2015  
 engage<sup>ny</sup> 34

Name \_\_\_\_\_

Date \_\_\_\_\_

1. Determine the following sums and differences. Show your work.

a.  $7 \text{ oz} + 9 \text{ oz} = \underline{\hspace{2cm}} \text{ lb}$

b.  $1 \text{ lb } 5 \text{ oz} + 11 \text{ oz} = \underline{\hspace{2cm}} \text{ lb}$

c.  $1 \text{ lb} - 13 \text{ oz} = \underline{\hspace{2cm}} \text{ oz}$

d.  $12 \text{ lb} - 4 \text{ oz} = \underline{\hspace{2cm}} \text{ lb } \underline{\hspace{2cm}} \text{ oz}$

e.  $3 \text{ lb } 9 \text{ oz} + 9 \text{ oz} = \underline{\hspace{2cm}} \text{ lb } \underline{\hspace{2cm}} \text{ oz}$

f.  $30 \text{ lb } 9 \text{ oz} + 9 \text{ lb } 9 \text{ oz} = \underline{\hspace{2cm}} \text{ lb } \underline{\hspace{2cm}} \text{ oz}$

g.  $25 \text{ lb } 2 \text{ oz} - 14 \text{ oz} = \underline{\hspace{2cm}} \text{ lb } \underline{\hspace{2cm}} \text{ oz}$

h.  $125 \text{ lb } 2 \text{ oz} - 12 \text{ lb } 3 \text{ oz} = \underline{\hspace{2cm}} \text{ lb } \underline{\hspace{2cm}} \text{ oz}$

2. The total weight of Sarah and Amanda's full backpacks is 27 pounds. Sarah's backpack weighs 15 pounds 9 ounces. How much does Amanda's backpack weigh?

3. In Emma’s supply box, a pencil weighs 3 ounces. Her scissors weigh 3 ounces more than the pencil, and a bottle of glue weighs three times as much as the scissors. How much does the bottle of glue weigh in pounds and ounces?

4. Use the information in the chart about Jodi’s school supplies to answer the following questions:

- a. On Mondays, Jodi packs only her laptop and supply case into her backpack. How much does her full backpack weigh?

 Textbook 3 lb 8 oz	 Supply Case 1 lb	 Binder 2 lb 5 oz
 Laptop 5 lb 12 oz	 Notebook 11 oz	 Backpack (empty) 2 lb 14 oz

- b. On Tuesdays, Jodi brings her laptop, supply case, two notebooks, and two textbooks in her backpack. On Fridays, Jodi only packs her binder and supply case. How much less does Jodi’s full backpack weigh on Friday than it does on Tuesday?

Name \_\_\_\_\_

Date \_\_\_\_\_

Determine the following sums and differences. Show your work.

1.  $4 \text{ lb } 6 \text{ oz} + 10 \text{ oz} = \underline{\hspace{1cm}} \text{ lb } \underline{\hspace{1cm}} \text{ oz}$

2.  $12 \text{ lb } 4 \text{ oz} + 3 \text{ lb } 14 \text{ oz} = \underline{\hspace{1cm}} \text{ lb } \underline{\hspace{1cm}} \text{ oz}$

3.  $5 \text{ lb } 4 \text{ oz} - 12 \text{ oz} = \underline{\hspace{1cm}} \text{ lb } \underline{\hspace{1cm}} \text{ oz}$

4.  $20 \text{ lb } 5 \text{ oz} - 13 \text{ lb } 7 \text{ oz} = \underline{\hspace{1cm}} \text{ lb } \underline{\hspace{1cm}} \text{ oz}$

Name \_\_\_\_\_

Date \_\_\_\_\_

1. Determine the following sums and differences. Show your work.

a.  $11 \text{ oz} + 5 \text{ oz} = \underline{\hspace{1cm}} \text{ lb}$

b.  $1 \text{ lb } 7 \text{ oz} + 9 \text{ oz} = \underline{\hspace{1cm}} \text{ lb}$

c.  $1 \text{ lb} - 11 \text{ oz} = \underline{\hspace{1cm}} \text{ oz}$

d.  $12 \text{ lb} - 8 \text{ oz} = \underline{\hspace{1cm}} \text{ lb } \underline{\hspace{1cm}} \text{ oz}$

e.  $5 \text{ lb } 8 \text{ oz} + 9 \text{ oz} = \underline{\hspace{1cm}} \text{ lb } \underline{\hspace{1cm}} \text{ oz}$

f.  $21 \text{ lb } 8 \text{ oz} + 6 \text{ lb } 9 \text{ oz} = \underline{\hspace{1cm}} \text{ lb } \underline{\hspace{1cm}} \text{ oz}$

g.  $23 \text{ lb } 1 \text{ oz} - 15 \text{ oz} = \underline{\hspace{1cm}} \text{ lb } \underline{\hspace{1cm}} \text{ oz}$

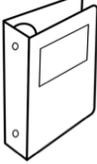
h.  $89 \text{ lb } 2 \text{ oz} - 16 \text{ lb } 4 \text{ oz} = \underline{\hspace{1cm}} \text{ lb } \underline{\hspace{1cm}} \text{ oz}$

2. When David took his dog, Rocky, to the vet in December, Rocky weighed 29 pounds 9 ounces. When he took Rocky back to the vet in March, Rocky weighed 34 pounds 4 ounces. How much weight did Rocky gain?

3. Bianca had 6 identical jars of bubble bath. She put them all in a bag that weighed 2 ounces. The total weight of the bag filled with the six jars was 1 pound 4 ounces. How much did each jar weigh?

4. Use the information in the chart about Melissa’s school supplies to answer the following questions:

a. On Wednesdays, Melissa packs only two notebooks and a binder into her backpack. How much does her full backpack weigh on Wednesdays?

 Textbook 3 lb 8 oz	 Supply Case 1 lb	 Binder 2 lb 5 oz
 Laptop 5 lb 12 oz	 Notebook 11 oz	 Backpack (empty) 2 lb 14 oz

b. On Thursdays, Melissa puts her laptop, supply case, two textbooks, and a notebook in her backpack. How much does her full backpack weigh on Thursdays?

c. How much more does the backpack weigh with 3 textbooks and a notebook than it does with just 1 textbook and the supply case?