Lesson 3

Objective: Create conversion tables for units of time, and use the tables to solve problems.

Suggested Lesson Structure

<table>
<thead>
<tr>
<th>Fluency Practice</th>
<th>Concept Development</th>
<th>Student Debrief</th>
<th>Total Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>(8 minutes)</td>
<td>(42 minutes)</td>
<td>(10 minutes)</td>
<td>(60 minutes)</td>
</tr>
</tbody>
</table>

Fluency Practice (8 minutes)

- Grade 4 Core Fluency Differentiated Practice Sets 4.NBT.4 (4 minutes)
- Convert Capacity 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 Topic A and for the remainder of the year, 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 materials are provided in Lesson 2.

Convert Capacity Units (4 minutes)

Materials: (S) Personal white board

Note: This fluency activity reviews Lesson 2 and metric conversions from Module 2.

T: (Write 1 L = ___ mL.) How many milliliters are in 1 liter?
S: 1,000 milliliters.

Repeat the process for 2 and 3 liters.

T: (Write 5 L = ___ mL.) Write the number sentence.
S: (Write 5 L = 5,000 mL.)

T: (Write 1 gal = ___ qt.) How many quarts are in 1 gallon?
S: 4 quarts.

Repeat the process for 2 and 3 gallons.

T: (Write 9 gal = ___ qt.) Write the number sentence.
S: (Write 9 gal = 36 qt.)
Lesson 3:
Create conversion tables for units of time, and use the tables to solve problems.

Materials: (T) Analog clock with a second hand, stopwatch
(S) Stopwatch (1 per group), personal white board, Practice Sheet

Problem 1: Convert minutes to seconds.

T: (Hold up an analog clock.) This clock has three hands. What units do the three hands count?
S: Hours, minutes, and seconds.
T: How many seconds are in 1 minute?
S: 60 seconds.
T: In your groups, one person will need to be in charge of the stopwatch. The rest of the group will close their eyes and, when they think 1 minute has passed, will write M on their personal white boards. The person with the stopwatch tells the group when 1 minute has passed. Let's see who comes closest to 1 minute.
T: (Allow students to finish the activity.) Did any of you write M on your board at exactly 1 minute?
T: (Display the two-column table.) What is the rule for converting minutes to seconds?
S: Multiply by 60.
T: Complete the conversion table for minutes to seconds.
S: (Complete the table.)
T: Solve for how many seconds are in 16 minutes.
S: 10 minutes is 600 seconds. 6 minutes is 360 seconds. 600 + 360 = 960. 960 seconds are in 16 minutes. \( \rightarrow \) 16 times 60 is 960. 16 minutes equals 960 seconds.

Repeat the process with 23 minutes.
Problem 2: Convert hours to minutes.

T: Let’s imagine, as we practiced in Grade 3, that we unwrap the clock and look at the numbers on a number line.

T: We can use the number line to help us determine the number of minutes in one hour. How many minutes are in an hour?

S: 60 minutes.

T: How many groups of 5 minutes?

S: 12 groups.

T: (Display the two-column table.) Complete the conversion table for hours to minutes.

T: How many minutes are in 18 hours?

S: 600 + 480 = 1,080. There are 1,080 minutes in 18 hours. \(18 \times 60 = 1,080\). 18 hours equals 1,080 minutes.

T: How many seconds are in 18 minutes? (Pause.)

S: It’s the same number! 1,080 seconds.

T: Why?

S: We multiplied by a factor of 60 for both. \(\text{The rule is times 60.}\)

Repeat the process with 36 hours.

Problem 3: Convert days to hours.

T: With your partner, determine the number of hours in 1 day. Use the number line if it helps you.

S: There are 24 hours in 1 day. The number line represents 12 hours, but I know that we need to double that because 12:00 a.m. to 12:00 p.m. is just half the day. A full day would be another 12 hours back to 12:00 a.m.

T: If we know that there are 24 hours in 1 day, we can complete the conversion table for days to hours. Complete the table.

T: How many hours are in 14 days?

S: 240 hours + 96 hours = 336 hours. \(14 \times 24 = 336\). 14 days equals 336 hours.

Repeat the process for 42 days.
Problem 4: Solve a word problem involving converting days to hours.

T: The Apollo 17 mission was completed in 12 days, 14 hours. How many hours did the mission last?

Solution A

12 days 14 hours
240 hours
48 hours

12 days = 10 days + 2 days

10 days 2 days
240 hours 48 hours

10 × 24 + 2 × 24
240 + 48
288

The mission lasted 302 hours.

Solution B

12 days 14 hours
10 + 2 days
240 hours + 48 hours 288

12 × 24 = 288
288 + 14 = 302

The mission took 302 hours.

Solution C

13 days
12 days 14 hours
10 hours

13 × 24 = 312

312 hr - 10 hr = 302 hr

It took 302 hours.

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.

NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Differentiate the difficulty of the word problem by offering students working above grade level these extension questions:

- Research the duration of Apollo 16’s mission in days and hours. How many hours did it last?
- Compare the duration of Apollo 16 and 17’s missions.
Lesson 3: Create conversion tables for units of time, and use the tables to solve problems.

Student Debrief (10 minutes)

Lesson Objective: Create conversion tables for units of time, and use the tables to solve problems.

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.

- Explain how you could solve Problem 1 without a number line.
- Would it make sense to solve Problem 2 in seconds? Why or why not?
- Explain two strategies for solving problems converting a number of days to hours. Which method is most efficient and why? Which strategy did you use to solve Problem 7?
- Can anyone describe how time is kept in the military or in a foreign country? Is time (seconds, minutes, hours) defined as a metric or customary system?

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.
Lesson 3: Create conversion tables for units of time, and use the tables to solve problems.

<table>
<thead>
<tr>
<th>a. Minutes</th>
<th>Seconds</th>
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The rule for converting minutes to seconds is ________________.

<table>
<thead>
<tr>
<th>b. Hours</th>
<th>Minutes</th>
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The rule for converting hours to minutes is ________________.

c. Days | Hours |
<table>
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<tbody>
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</table>

The rule for converting days to hours is ________________.
Lesson 3 Problem Set

Name ________________________________  Date ____________________

Use RDW to solve Problems 1–2.

1. Courtney needs to leave the house by 8:00 a.m. If she wakes up at 6:00 a.m., how many minutes does she have to get ready? Use the number line to show your work.

   0 1 2 3 4 5 6 7 8 9 10 11 12

2. Giuliana’s goal was to run a marathon in under 6 hours. What was her goal in minutes?

3. Complete the following conversion tables and write the rule under each table.

   a.

<table>
<thead>
<tr>
<th>Hours</th>
<th>Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
<td>3</td>
<td></td>
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<tr>
<td>6</td>
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<td>10</td>
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<tr>
<td>15</td>
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</tr>
</tbody>
</table>

   The rule for converting hours to minutes and minutes to seconds is ________________________________.

   b.

<table>
<thead>
<tr>
<th>Days</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>5</td>
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<td>7</td>
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</tbody>
</table>

   The rule for converting days to hours is ________________________________.
4. Solve.

   a. 9 hours 30 minutes = ________ minutes
   b. 7 minutes 45 seconds = ______ seconds
   c. 9 days 20 hours = ________ hours
   d. 22 minutes 27 seconds = ______ seconds
   e. 13 days 19 hours = ________ hours
   f. 23 hours 5 minutes = ______ minutes

5. Explain how you solved Problem 4(f).

6. How many seconds are in 14 minutes 43 seconds?

7. How many hours are there in 4 weeks 3 days?
The astronauts from Apollo 17 completed 3 spacewalks while on the moon for a total duration of 22 hours 4 minutes. How many minutes did the astronauts walk in space?
Use RDW to solve Problems 1–2.

1. Jeffrey practiced his drums from 4:00 p.m. until 7:00 p.m. How many minutes did he practice? Use the number line to show your work.

2. Isla used her computer for 5 hours over the weekend. How many minutes did she spend on the computer?

3. Complete the following conversion tables and write the rule under each table.

   a. Hours | Minutes
   ---------------
   1 |          
   2 |          
   5 |          
   9 |          
   12 |        

   The rule for converting hours to minutes is ________________________.

   b. Days | Hours
   --------|-------
   1 |      
   3 |      
   6 |      
   8 |      
   20 |     

   The rule for converting days to hours is _______________________.

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Lesson 3 Homework

4. Solve.
   a. 10 hours 30 minutes = _______ minutes
   b. 6 minutes 15 seconds = _______ seconds
   c. 4 days 20 hours = _______ hours
   d. 3 minutes 45 seconds = _______ seconds
   e. 23 days 21 hours = _______ hours
   f. 17 hours 5 minutes = _______ minutes

5. Explain how you solved Problem 4(f).

6. It took a space shuttle 8 minutes 36 seconds to launch and reach outer space. How many seconds did it take?

7. Apollo 16’s mission lasted just over 1 week 4 days. How many hours are there in 1 week 4 days?