Fix the Shop: Converting Units

Teacher		**Class**	Grade 4
Subject	Math	**Topic**	Unit conversion
Date		**Room**	
Lesson length	60 minutes	**Country**	United States

Students learn how metric and customary units compare in size. They fix shop labels by converting and ordering measurements.

Curriculum links

- Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec.
- Determine the appropriate unit of measurement for length, weight/mass and liquid volume and estimate and measure using U.S. Customary and metric units [1]

Learning objectives

- Students will compare the relative sizes of length, weight, volume and time units.
- Students will convert measurements between larger and smaller units within one system.
- Students will choose sensible units and order measurements by true size.

Success criteria

- I can order units from small to big and say which is larger.
- I can multiply big to small and divide small to big correctly.
- I can pick the best unit and convert to fix word problems.

What students already know

Hold up a pencil, a water bottle and point to the clock. Ask: What do we measure with cm, with ml, with min? Listen for length, volume, time.

Key words

kilometer	a long distance unit for trips; 1 equals 1,000 meters [4]
centimeter	a small length unit for a pencil; 100 make a meter [4]
kilogram	a heavy weight unit for a backpack; 1 equals 1,000 grams [3]
ounce	a light weight unit for an apple; 16 make a pound [5]
milliliter	a tiny volume unit for a spoon; 1,000 make a liter [24]
minute	a time unit for recess; 60 make an hour [8]

Materials

- Slides 1-5, 7-10, 12
- Video clip 1 Converting units overview and Video clip 5 Hours, minutes, seconds
- Worksheet Tasks B, C, D printed for pairs

Before the lesson

- Print Worksheet Tasks B, C, D and Shopkeeper Mix-Up problem cards for each pair
- Test Video clip 1 (0:00-2:01) and Video clip 5 (0:00-4:40) with sound and captions

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- Shopkeeper Mix-Up problem cards, pencils, paper, play money in dollars and cents
- Whiteboard, markers, mini-whiteboards
- Set desks in pairs with pencils, paper, play money and whiteboard ready

Lesson outline

0–8 min **Starter** 8 min · Whole class

Hook students with the shop mix-up and recall which units measure length, weight, volume and time.

YOU DO

1. Show Slides 1-2 and read today's goals with the class.
2. Tell the shopkeeper hook and hold up a 200-milliliter cup next to a 2-liter jug.
3. Show Slide 3 and model sizes with hands for centimeter, meter and kilometer.
4. Ask partners to sort km, g, ml and min into length, weight, volume or time.

STUDENTS DO

1. Look at Slides 1-3 and listen to the shop story.
2. Show centimeter, meter and kilometer sizes with hands.
3. Tell a partner whether km, g, ml and min measure length, weight, volume or time.

Say: The shopkeeper mixed up the labels. A bottle marked 200 milliliters is really 2 liters. Can you fix the shop? Today we will learn how big each unit is so we can fix labels like this together.

Ask: Would you measure our hallway in centimeters or kilometers? (Meters are best; centimeters are too tiny and kilometers are way too big. A standard door is commonly 2 m [10].) · Is 200 milliliters or 2 liters more water? (2 liters is much more because 1,000 milliliters is 1 liter [24], so 2 liters is 2,000 milliliters.)

Check understanding: Use thumbs up if you can name length, weight, volume and time units. If many are unsure, sort two picture cards together before moving on.

Support: Give picture cards for pencil, backpack, cup and recess so students point to match the unit. **Stretch:** Ask students to explain why kilometers would be silly for a pencil using bigger and smaller language.

Use: Slides 1-3

8–20 min **Teaching** 12 min · Whole class

Teach relative sizes and the multiply down, divide up rule for all unit groups.

YOU DO

1. Play Video clip 1 (0:00-2:01) and tell students to listen for when to multiply or divide.
2. Show Slide 4 and read the size facts: 1 kilometer = 1,000 meters [4] and 1 meter = 100 centimeters [4].
3. Model 2 km to meters and 300 cm to meters on the whiteboard step by step.
4. Show Slide 7 and chant the rule that larger to smaller means multiply and smaller to larger means divide [18].

STUDENTS DO

1. Watch the video and chant multiply down, divide up with hand motions.
2. Copy the two worked conversions into notebooks.
3. Show on fingers whether the answer should be bigger or smaller.

Say: Big unit to small unit? Multiply. Small to big? Divide. We step down to a smaller unit to multiply and step up to a bigger unit to divide. Choosing the right unit is expected in grade 4 [1].

Worked example: 2 km to m: 1 kilometer = 1,000 meters [4], so 2 x 1,000 = 2,000 m. 300 cm to m: 1 meter = 100 centimeters [4], so 300 divided by 100 = 3 m.

Ask: 1 kilogram = 1,000 grams, so what is 3 kilograms in grams? (3,000 grams because 1 kg = 1,000 g [3], larger to smaller, so multiply [18].) · 1 pound = 16 ounces, so what is 2 pounds in ounces? (32 ounces because 1 pound = 16 ounces [5], so 2 x 16 = 32.)

Check understanding: Ask all to write 4 m in cm on mini-whiteboards. If many write 40, reteach that 1 m = 100 cm [4], so multiply by 100.

Support: Give a step card that shows 1 m = 100 cm [4] to hold while chanting multiply or divide. **Stretch:** Ask for kilometers straight to centimeters using both facts together.

Use: Video clip 1 (0:00–2:01), Slides 4, 7

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20–32 min **Practice Together** 12 min · Whole class

Practice time and weight conversions together using voting and short video.

YOU DO

1. Show Slide 5 vote: 3 km to meters, 2 hours to minutes, 5 pounds to ounces, 4 liters to milliliters.
2. Play Video clip 5 (0:00-4:40) and tell students to count how 1 hour becomes 60 minutes.
3. Model 2 hours = 120 minutes because 1 hour = 60 minutes [8] and 3 minutes = 180 seconds because there are 60 seconds in 1 minute [4].
4. Call on teams to solve the vote choices and write number sentences on the board.

STUDENTS DO

1. Vote with fingers for which conversion to try first on Slide 5.
2. Watch Video clip 5 and count aloud 60, 120 for minutes.
3. Solve two conversions with a partner and show number sentences.

Say: You pick first, then we solve together. Talk to your partner, vote, then show the math. Remember big to small means multiply [18]. We will check weight with pounds and time with hours.

Worked example: 2 hours to minutes: 1 hour = 60 minutes [8], so 2 x 60 = 120 minutes. 5 pounds to ounces: 1 pound = 16 ounces [5], so 5 x 16 = 80 ounces.

Ask: 4 liters is how many milliliters? (4,000 milliliters because 1,000 milliliters is 1 liter [24], so multiply by 1,000.) · 120 minutes is how many hours? (2 hours because 1 hour = 60 minutes [8], smaller to bigger, so divide [18].)

Check understanding: Do a hinge vote: Is 3 minutes 180 seconds? Show 1 for true, 2 for false. Recount in 5s on a number line if split.

Support: Let partners chant that there are 60 seconds in 1 minute [4] and use a number line in 5s to count up.
Stretch: Combine both steps to find seconds in 1 hour using 60 minutes and 60 seconds.

Use: Slides 5, 8, Video clip 5 (0:00–4:40)

32–50 min **Main Activity** 18 min · Pairs

Apply all conversions to fix shop word problems in pairs.

YOU DO

1. Show Slide 9 task and hand out problem cards, paper and play money.
2. Read the five cards aloud: Card 1: The shopkeeper measures a 2-kilometer delivery trip. How many meters is that? Card 2: The shopkeeper has 3 kilograms of apples priced at $4.50. How many grams is that? Card 3: The shopkeeper packs 2 pounds of rice. How many ounces is that? Card 4: The shopkeeper has 2 liters of water for plants. How many milliliters is that? Card 5: The shopkeeper cleans for 2 hours starting at 10:00 a.m. How many minutes is that? Also convert back 300 cm to m and 120 min to hr.
3. Remind pairs to write the conversion, circle the correct label, and check by ordering small to big.
4. Circulate, check tables with scale readings, and stop the class once to share one strong solution.

STUDENTS DO

1. In pairs, solve cards and Worksheet Tasks B-C: convert 2 km to m, 3 kg to g, 2 lb to oz, 2 l to ml and back 300 cm to m and 120 min to hr.
2. Write each conversion as a number sentence and make a small table with label and fixed amount.
3. Order each group small to big and read answers aloud to check.

Say: You are the fixers. Pick a card, convert to the right unit, and circle the correct label. Write the number sentence and use the helper table if you need it. When you finish, order your answers from small to big.

Worked example: Card 4: 2 liters to milliliters. 1 liter = 1,000 milliliters [3], so 2 x 1,000 = 2,000 milliliters. Circle 2,000 ml, not 200 ml, because the small unit needs a bigger number.

Ask: 3 kilograms of apples is how many grams? (3,000 grams because 1 kg = 1,000 g [3], so multiply.) · 2 liters of water is how many milliliters, and why is the number bigger? (2,000 milliliters because 1,000 milliliters is 1 liter [24]; smaller units need more of them.)

Check understanding: Collect one card answer from each pair on the board. If conversions are flipped, point to Slide 7 rule and redo one together.

Support: Give a helper table that shows 1 kg = 1,000 g [3] for students to look up while solving. **Stretch:** Students write their own mix-up problem for another pair using pounds and ounces.

Use: Slide 9, Worksheet Tasks B-C

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50–60 min **Plenary** 10 min · Whole class

Return to goals by checking true-false conversions and ordering by size.

YOU DO

1. Show Slide 10 best-unit cards and ask for quick picks for pencil, trip and spoon.
2. Show Slide 12 true-or-false and have all vote true or false with reasons.
3. Model ordering 200 cm, 2 m and 2 km from small to big using 1 m = 100 cm and 1 km = 1,000 m.
4. Summarize the multiply-divide rule and preview the exit ticket.

STUDENTS DO

1. Vote true or false for Slide 12 and Worksheet Task D and explain the math.
2. Order their pair's measurements small to big aloud.
3. Complete the three exit questions on mini-whiteboards.

Say: Let's prove what we know. You vote true or false, then defend with the size fact. Tell me if you multiplied or divided and why. We finish by ordering from smallest to largest.

Worked example: Order 200 cm, 2 m, 2 km: 200 cm = 2 m because 1 meter = 100 centimeters [4]. 2 km = 2,000 m because 1 kilometer = 1,000 meters [4]. So order is 200 cm = 2 m < 2 km.

Ask: True or false: 5 m = 500 cm and 2 lb = 32 oz? (Both true because 1 m = 100 cm [4] and 1 pound = 16 ounces [5].) · True or false: 2 l = 200 ml? (False, 2 l = 2,000 ml because 1,000 milliliters is 1 liter [24].)

Check understanding: Use mini-whiteboards for all three exit questions. Reteach any group below 80% correct with one more model tomorrow.

Support: Provide sentence frame: It is closest to ___ because 1 m = 100 cm [4] to explain a pick. **Stretch:** Ask students to give two acceptable units for the same object and convert between them.

Use: Slides 10-12, Worksheet Task D

Common mistakes

Mistake	How to spot it	How to fix it
Mixing up when to multiply or divide	Bigger unit gets a smaller number, like 2 m written as 20 cm	Point to rule larger to smaller multiply [18]; check that 1 meter = 100 centimeters [4] so 2 m must be 200 cm.
Using 100 or 10 for all conversions	Writes 2 lb as 200 oz or 2 kg as 200 g	Sort facts: 1 kg = 1,000 g [3] and 1,000 milliliters is 1 liter [24], but 1 pound = 16 ounces [5].
Thinking time works like metric by 100s	Writes 2 hours as 200 minutes	Chant that 1 hour = 60 minutes [8] and there are 60 seconds in 1 minute [4], so 2 x 60 = 120.

Support

- Keep a helper table for kg to g and l to ml on desks for quick look-up
- Use picture cards and sentence frames to explain best-unit choices
- Allow partner whisper time before answering time conversions

Stretch

- Students write their own mix-up problem for another pair using pounds and ounces
- Try two-step jumps like kilometers to centimeters or hours to seconds
- Order close pairs like 1,500 ml and 2 l after converting first

For the LSE or teaching assistant

Stay with the pairs doing shop cards. Point to helper table for kg to g, read cards aloud, and prompt multiply or divide before they write.

Check for understanding

Question	Answer
3 km is how many meters?	3,000 meters
2 pounds is how many ounces and 2 hours is how many minutes?	32 ounces and 120 minutes
Order small to big: 1,500 ml, 2 l, 200 cm, 3 m	200 cm, 3 m is length order and 1,500 ml, 2 l is volume order; 1,500 ml is less than 2 l

Homework

Complete Worksheet Task D and explain one true-or-false answer to family.

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