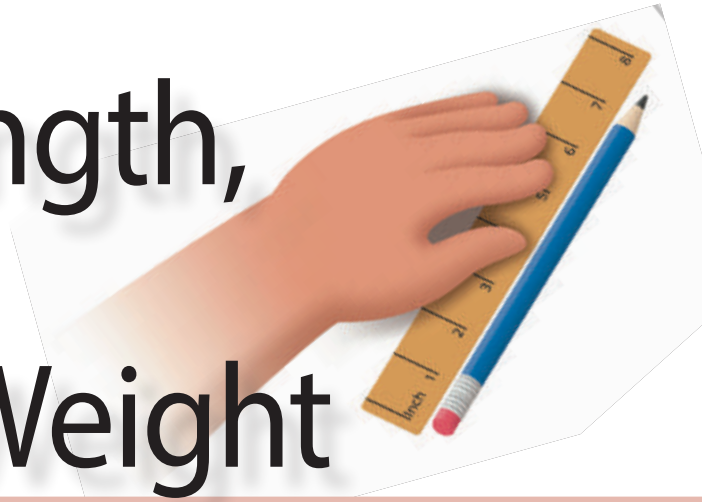




Core Knowledge<sup>®</sup> MATHEMATICS

# Measuring Length, Time, Liquid Volume, and Weight



Teacher Guide



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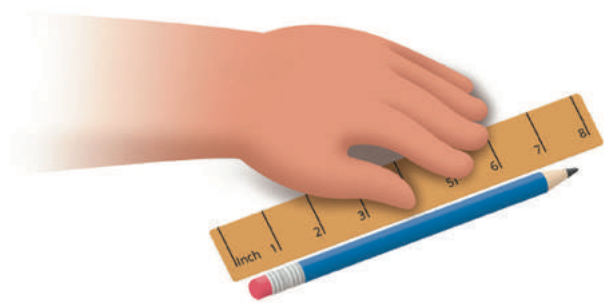
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# Measuring Length, Time, Liquid Volume, and Weight

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# **Measuring Length, Time, Liquid Volume, and Weight Teacher Guide**

Core Knowledge Mathematics™



# **Unit 6: Measuring Length, Time, Liquid Volume, and Weight**

## **At a Glance**

Unit 6 is estimated to be completed in 17-18 days including 2 days for assessment.

This unit is divided into four sections including 15 lessons and 1 optional lesson.

- Section A—Measurement Data on Line Plots (Lessons 1-5)
- Section B—Weight and Liquid Volume (Lessons 6-8)
- Section C—Problems Involving Time (Lessons 9-11)
- Section D—Measurement Problems in Context (Lessons 12-16)

On pages 9-10 of this Teacher Guide is a chart that identifies the section each lesson belongs in and the materials needed for each lesson.

This unit uses seven student centers.

- Estimate and Measure
- Target Measurements
- Creating Line Plots
- Number Puzzles: Addition and Subtraction
- Target Numbers
- Compare
- How Close?





# Unit 6: Measuring Length, Time, Liquid Volume, and Weight

## Unit Learning Goals

- Students generate and represent length measurement data in halves and fourths of an inch on line plots. They learn about and estimate relative units of measure including weight, liquid volume, and time, and use the four operations to solve problems involving measurement.

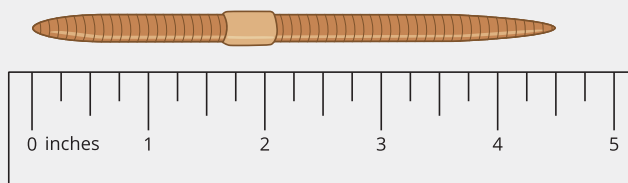
In this unit, students measure length, weight, liquid volume, and time. They begin with a study of length measurement, building on their recent work with fractions.

In grade 2, students measured lengths using informal and formal units to the nearest whole number. They plotted length data on line plots. Here, students explore length measurements in halves and fourths of an inch. They use a ruler to collect measurements and then display the data on line plots, learning about mixed numbers and revisiting equivalent fractions along the way.

*Kiran says that the worm is  $4\frac{2}{4}$  inches long.*

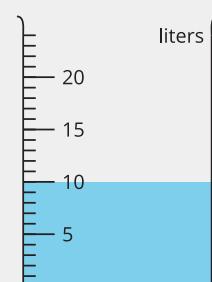
*Jada says that the worm is  $4\frac{1}{2}$  inches long.*

*Use the ruler to explain how both of their measurements are correct.*



Next, students learn about standard units for measuring weight (kilograms and grams) and liquid volume (liters). To build a sense of weights such as 1 gram or 1 kilogram, students hold common objects such as paper clips and bottles of water.

To gain familiarity with liters, they fill a container with water by the liter and estimate the volume of everyday containers such as pots, tubs, and buckets. They then use the scale on measurement tools to measure and represent liquid volume.



From there, students move on to measure time. In grade 2, they told and wrote time to the nearest 5 minutes. Now, they tell time to the minute, using the relationship between the hour hand and the minute hand to make sense of times such as 3:57 p.m.

In the final section of the unit, students make sense of and solve problems related to all three measurements. The work here allows students to continue to develop their fluency with addition and subtraction within 1,000 and understanding of properties of operations. It also prompts them to use the relationship between multiplication and division to solve problems.

## Section A: Measurement Data on Line Plots

### Standards Alignments

Building On	2.MD.D.9
Addressing	3.MD.B.4, 3.NF.A.3.c, 3.OA.C.7
Building Towards	3.MD.B.4

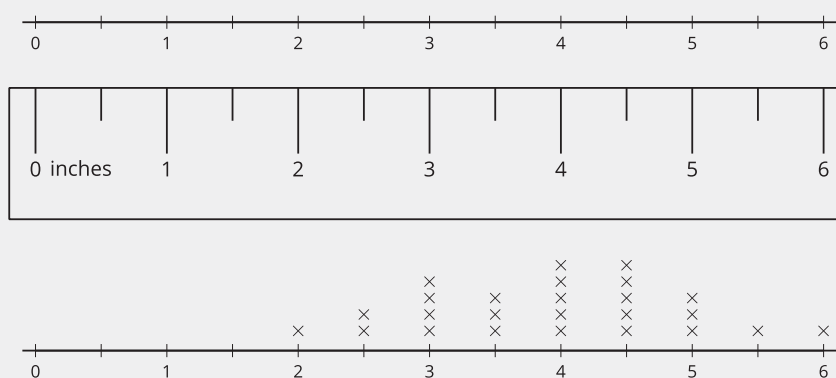
### Section Learning Goals

- Measure lengths using rulers marked with halves and fourths of an inch to generate data for making a line plot.


In this section, students learn to measure lengths in fractions of an inch—first in halves of an inch, and then fourths of an inch. They partition rulers with whole-number inch marks into equal intervals and then use them to measure lengths of objects in the classroom.

Students learn that measurements that are greater than 1 can be expressed with mixed numbers, which combine a whole number and a fraction less than 1.

As they measure with greater levels of precision, students revisit the idea of equivalent fractions. They see that the half-inch marks are also two-fourths of an inch, and that each whole number of inches can also be expressed as some number of halves or fourths.



Students then use their understanding of the number line and rulers to interpret and create line plots that represent lengths measured in half inches and quarter inches. They see that all three representations—number lines, rulers, and line plots—have the same structure, which shows whole-number intervals being partitioned into equal parts.

 PLC: Lesson 3, Activity 1, Halves and Quarters

**Suggested Centers**

- Estimate and Measure (1–4), Stage 2: Centimeters and Inches (Supporting)
- Target Measurements (2–5), Stage 1: Inches and Centimeters (Supporting)
- Estimate and Measure (1–4), Stage 3: Quarter Inches (Addressing)
- Target Measurements (2–5), Stage 2: Quarter Inches (Addressing)
- Creating Line Plots (2–5), Stage 1: Inches and Centimeters (Supporting)

## Section B: Weight and Liquid Volume

### Standards Alignments

Addressing 3.MD.A.2, 3.NF.A, 3.OA.C.7

Building Towards 3.MD.A.2

### Section Learning Goals

- Measure and estimate weights and liquid volumes of objects.

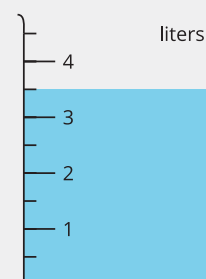
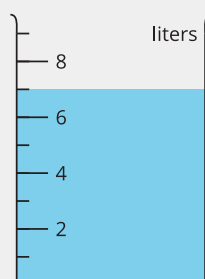
In earlier grades, students learned that weight is a measurable attribute and directly compared the weights of two objects. In this section, they learn that weight is a measure of how heavy something is and that grams and kilograms are units for measuring weight.

To establish some benchmarks for weights, they hold objects of different numbers of grams and kilograms. Then, they estimate the weight of other objects relative to those benchmarks.

Next, students learn that liquid volume is the amount of space that a liquid takes up. They first use informal units (such as plastic cups, spoons, and so on) to compare the liquid volume that two containers can hold before learning about liters as a unit for measurement.

Students gain concrete experience with the new unit by filling a large container in 1-liter increments. They also estimate the liquid volume of everyday objects such as a sink, a bucket, and a bathtub.

Later, students make sense of fractional units of liquid volume, learn to read the scale on liquid measurement tools (such as beakers), and compare the scales to the marks on rulers.



 PLC: Lesson 7, Activity 2, Liquid Volume in Liters

### Suggested Centers

- Creating Line Plots (2–5), Stage 2: Quarter Inches (Addressing)
- Target Measurements (2–5), Stage 2: Quarter Inches (Addressing)

## Section C: Problems Involving Time

### Standards Alignments

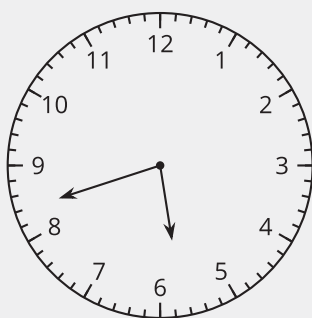
Addressing 3.MD.A.1

### Section Learning Goals

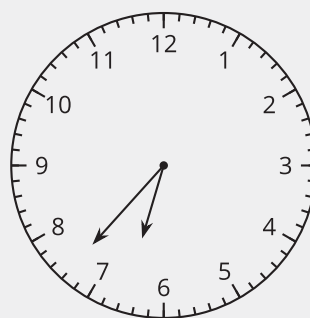
- Solve problems involving addition and subtraction of time intervals in minutes.
- Tell time to the minute.

In this section, students learn to tell and write time to the nearest minute and to show given time on an analog clock. They also solve elapsed time problems with an unknown start time, unknown duration, or unknown end time.

*Han got on the bus:*



*Han got off the bus:*



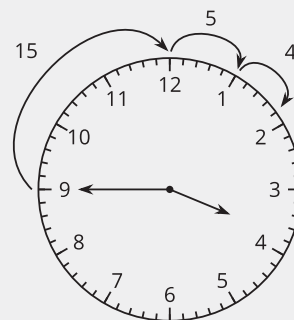
*For how many minutes was Han on the bus?*

To reason about the problems, students can use any representation that makes sense to them, such as tables, words, equations, or marks on a clock. They also examine a variety of reasoning strategies and adjust their approach depending on the problem at hand.

*Elena arrived at the bus stop at 3:45 p.m.  
She waited 24 minutes for her bus to arrive.  
What time did the bus arrive?*

*Show your thinking. Organize it so it can be followed by others.*

As they solve problems, students continue to build their fluency with multiplication (especially multiples of 5, 10, and 15), addition, and subtraction.



**Suggested Centers**

- Creating Line Plots (2–5), Stage 2: Quarter Inches (Addressing)
- Target Measurements (2–5), Stage 2: Quarter Inches (Addressing)
- Number Puzzles: Addition and Subtraction (1–4), Stage 5: Within 1,000 (Supporting)
- Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting)

## Section D: Measurement Problems in Context

### Standards Alignments

Building On	3.MD.A, 3.NBT.A.2, 3.OA.A
Addressing	3.MD.A.1, 3.MD.A.2, 3.NBT.A.2, 3.OA.A.3, 3.OA.C.7
Building Towards	3.MD.A.2

### Section Learning Goals

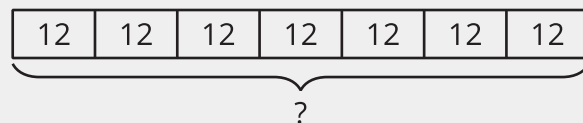
- Solve problems involving the four operations and measurement contexts.

In this section, students solve problems that involve measurements of weight, liquid volume, and time in the context of a state or county fair. The problems prompt students to use all four operations: addition and subtraction within 1,000, and multiplication and division within 100.

The problems prompt students to make sense of the situations and the questions being asked, consider information that might be needed to answer questions. They explain why they need that information and may need to ask different questions if their partner does not have the information requested (MP1). In each situation, students make sense of quantities and their relationships (MP2).



*At one point during the growing season, a giant pumpkin gained 12 kilograms per day for 7 days. How much weight did the pumpkin gain during that week?*



An optional lesson at the end of the section gives students a chance to examine carnival games and design a game that incorporates concepts of measurement and operations.

PLC: Lesson 12, Activity 1, Giant Pumpkin Event

### Suggested Centers

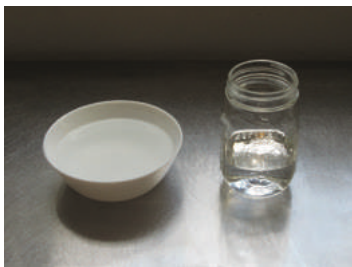

- Number Puzzles: Addition and Subtraction (1–4), Stage 5: Within 1,000 (Supporting)
- Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting)
- Compare (1–5), Stage 3: Multiply within 100 (Supporting)
- How Close? (1–5), Stage 5: Multiply to 100 (Supporting)

## Throughout the Unit

The progression of warm-ups in the first three sections of the unit reflect the progression of ideas in those sections of the unit. In these sections students begin with opportunities to build conceptual understanding of an attribute and notice structures in the tools used to measure the attribute. The notice and wonder routine is used for these purposes. Warm-ups in the last section of the unit are directly connected to supporting students to apply what they've learned about a variety of measurement contexts to the last section themed around exploring the fair.

Throughout the unit, students participate in Number Talks to continue the development of multiplication and division strategies as they work toward fluent division within 100.

Here is a sampling of the warm-ups in the unit.

lesson 7	lesson 8	lesson 13
Notice and Wonder 	Number Talk $30 \div 3$ $60 \div 3$ $63 \div 3$ $54 \div 3$	Estimation Exploration 



## Materials Needed

LESSON	GATHER	COPY
A.1	<ul style="list-style-type: none"> <li>Materials from a previous activity</li> </ul>	<ul style="list-style-type: none"> <li>Measure Around the Room (groups of 5)</li> </ul>
A.2	<ul style="list-style-type: none"> <li>Materials from a previous activity</li> <li>Materials from a previous lesson</li> </ul>	<ul style="list-style-type: none"> <li>none</li> </ul>
A.3	<ul style="list-style-type: none"> <li>Materials from a previous activity</li> <li>Materials from a previous lesson</li> <li>Rulers (inches)</li> </ul>	<ul style="list-style-type: none"> <li>Notice and Wonder Rulers (groups of 4)</li> </ul>
A.4	<ul style="list-style-type: none"> <li>none</li> </ul>	<ul style="list-style-type: none"> <li>none</li> </ul>
A.5	<ul style="list-style-type: none"> <li>Glue or tape</li> <li>Materials from a previous lesson</li> <li>Scissors</li> <li>Tools for creating a visual display</li> </ul>	<ul style="list-style-type: none"> <li>Let's Make a Line Plot (groups of 2)</li> </ul>
B.6	<ul style="list-style-type: none"> <li>Chart paper</li> <li>Markers</li> </ul>	<ul style="list-style-type: none"> <li>none</li> </ul>
B.7	<ul style="list-style-type: none"> <li>Markers (dry-erase)</li> </ul>	<ul style="list-style-type: none"> <li>none</li> </ul>
B.8	<ul style="list-style-type: none"> <li>none</li> </ul>	<ul style="list-style-type: none"> <li>none</li> </ul>
C.9	<ul style="list-style-type: none"> <li>none</li> </ul>	<ul style="list-style-type: none"> <li>none</li> </ul>
C.10	<ul style="list-style-type: none"> <li>none</li> </ul>	<ul style="list-style-type: none"> <li>none</li> </ul>
C.11	<ul style="list-style-type: none"> <li>Materials from a previous activity</li> </ul>	<ul style="list-style-type: none"> <li>none</li> </ul>
D.12	<ul style="list-style-type: none"> <li>Tools for creating a visual display</li> </ul>	<ul style="list-style-type: none"> <li>Card Sort: Giant Pumpkins (groups of 2)</li> </ul>

D.13	<ul style="list-style-type: none"><li>• none</li></ul>	<ul style="list-style-type: none"><li>• Info Gap: Pumpkin Weigh-Off (groups of 2)</li><li>• Info Gap: Pig Weigh-Off (groups of 2)</li></ul>
D.14	<ul style="list-style-type: none"><li>• none</li></ul>	<ul style="list-style-type: none"><li>• none</li></ul>
D.15	<ul style="list-style-type: none"><li>• Materials from a previous activity</li><li>• Tools for creating a visual display</li></ul>	<ul style="list-style-type: none"><li>• none</li></ul>
D.16	<ul style="list-style-type: none"><li>• Paper clips</li><li>• Pipe cleaners</li><li>• Rulers</li><li>• Tape (painter's or masking)</li><li>• Yardsticks</li></ul>	<ul style="list-style-type: none"><li>• none</li></ul>

## Center: Estimate and Measure (1–4)

### Stage 2: Centimeters and Inches

#### Lessons

- Grade3.6.A1 (supporting)
- Grade3.6.A2 (supporting)

#### Stage Narrative

Students choose an object and a unit (inches, feet, centimeters) to measure it with. They estimate the length of the object and then measure to see the actual length to the nearest whole unit.

#### Standards Alignments

Addressing 2.MD.A.1, 2.MD.A.3

#### Materials to Gather

Rulers (centimeters), Rulers (inches)

#### Materials to Copy

Estimate and Measure Stage 2 Recording Sheet  
(groups of 1)

#### Additional Information

Gather or identify objects of various lengths (pencils, markers, books, glue, scissors, shoes, tape dispensers, sides of desk, length of bulletin board).

### Stage 3: Quarter Inches

#### Lessons

- Grade3.6.A3 (addressing)
- Grade3.6.A4 (addressing)
- Grade3.6.A5 (addressing)

#### Stage Narrative

Students choose and estimate the length of the object and then measure to see the actual length to the nearest  $\frac{1}{4}$  inch.

#### Standards Alignments

Addressing 3.MD.B.4

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**Materials to Gather**

Rulers (inches)

**Materials to Copy**

Estimate and Measure Stage 3 Recording Sheet  
(groups of 1)

**Additional Information**

Gather or identify objects of various lengths (pencils, markers, books, glue, scissors, shoe, tape dispenser, side of desk, length of bulletin board).

**Stages used in Grade 2****Stage 1****Addressing**

- Grade2.3.A

**Stage 2****Addressing**

- Grade2.3.A
- Grade2.3.B
- Grade2.3.C

## Center: Target Measurements (2–5)

### Stage 1: Inches and Centimeters

#### Lessons

- Grade3.6.A1 (supporting)
- Grade3.6.A2 (supporting)

#### Stage Narrative

Students try to draw a line segment as close as possible to the length of the target measurement (in whole inches or centimeters).

#### Standards Alignments

Addressing 2.MD.A.1, 2.MD.A.3

#### Materials to Gather

Paper, Rulers (centimeters), Rulers (inches)

#### Materials to Copy

Target Measurement Stage 1 Recording Sheet  
(groups of 2)

### Stage 2: Quarter Inches

#### Lessons

- Grade3.6.A3 (addressing)
- Grade3.6.A4 (addressing)
- Grade3.6.A5 (addressing)
- Grade3.6.B6 (addressing)
- Grade3.6.B7 (addressing)
- Grade3.6.B8 (addressing)
- Grade3.6.C9 (addressing)

#### Stage Narrative

Students try to draw a line segment as close as possible to the length of the target measurement (in quarter inches).

#### Standards Alignments

Addressing 3.MD.B.4

### **Materials to Gather**

Paper, Rulers (inches)

### **Materials to Copy**

Target Measurement Stage 2 Recording Sheet  
(groups of 2)

## **Stages used in Grade 2**

### **Stage 1**

#### **Addressing**

- Grade2.3.B
- Grade2.3.C

## Center: Creating Line Plots (2–5)

### Stage 1: Inches and Centimeters

#### Lessons

- Grade3.6.A3 (supporting)
- Grade3.6.A4 (supporting)
- Grade3.6.A5 (supporting)

#### Stage Narrative

Students measure up to eight objects to the nearest centimeter or inch. They work with a partner to create a line plot to represent their measurement data. Then they ask their partner two questions that can be answered based on their line plot.

#### Variation:

If students completed the Estimate and Measure Center, they may choose to use their length measurements to represent on the line plot.

#### Standards Alignments

Addressing 2.MD.D.9

#### Materials to Gather

Objects of various lengths, Rulers (centimeters),  
Rulers (inches)

#### Materials to Copy

Creating Line Plots Stage 1 Recording Sheet  
(groups of 1)

#### Additional Information

Gather or identify objects of various lengths (pencils, markers, books, glue, scissors, shoe, tape dispenser, side of desk, length of bulletin board).

### Stage 2: Quarter Inches

#### Lessons

- Grade3.6.B6 (addressing)
- Grade3.6.B7 (addressing)
- Grade3.6.B8 (addressing)
- Grade3.6.C9 (addressing)

## Stage Narrative

Students measure up to eight objects to the nearest quarter inch. They work with a partner to create a line plot to represent their measurement data. Then, they ask their partner two questions that can be answered based on the data in their line plot.

### Variation:

If students completed the Estimate and Measure Center, they may choose to use their length measurements to represent on the line plot.

## Standards Alignments

Addressing 3.MD.B.4

### Materials to Gather

Objects of various lengths, Rulers (inches)

### Materials to Copy

Creating Line Plots Stage 2 Recording Sheet  
(groups of 1)

### Additional Information

Gather or identify objects of various lengths (pencils, markers, books, glue, scissors, shoe, tape dispenser, side of desk, length of bulletin board).

## Stages used in Grade 2

### Stage 1

#### Addressing

- Grade2.3.C



## Center: Number Puzzles: Addition and Subtraction (1–4)

### Stage 5: Within 1,000

#### Lessons

- Grade3.6.C10 (supporting)
- Grade3.6.C11 (supporting)
- Grade3.6.D12 (supporting)
- Grade3.6.D13 (supporting)

#### Stage Narrative

Students use the digits 0–9 to make addition equations true. They work with sums and differences within 1,000.

#### Standards Alignments

Addressing 3.NBT.A.2

#### Materials to Copy

Number Puzzles Addition and Subtraction Stage 5  
Recording Sheet (groups of 2)

### Stages used in Grade 2

#### Stage 1

##### Addressing

- Grade2.1.A
- Grade2.1.B
- Grade2.1.C

##### Supporting

- Grade2.1.A

## Stage 2

### Addressing

- Grade2.1.A
- Grade2.1.B
- Grade2.1.C
- Grade2.3.C

### Supporting

- Grade2.5.A
- Grade2.6.C

## Stage 3

### Addressing

- Grade2.3.C

### Supporting

- Grade2.5.A
- Grade2.6.C

## Stage 4

### Addressing

- Grade2.3.B
- Grade2.3.C
- Grade2.4.B

### Supporting

- Grade2.4.A
- Grade2.5.A
- Grade2.6.C
- Grade2.7.B
- Grade2.7.C

## Center: Target Numbers (1–5)

### Stage 7: Subtract Hundreds, Tens, or Ones

#### Lessons

- Grade3.6.C10 (supporting)
- Grade3.6.C11 (supporting)
- Grade3.6.D12 (supporting)
- Grade3.6.D13 (supporting)

#### Stage Narrative

Students subtract hundreds, tens, and ones to get as close to 0 as possible. Students start their first equation with 1,000 and take turns rolling three cubes to get a number to subtract. For each number they roll, they choose whether they want it to represent hundreds, tens, or ones. Students subtract their hundreds, tens, and ones from the starting number. The difference becomes the first number in the next equation. The player who gets closest to 0 in 6 rounds, without going below 0, is the winner.

#### Standards Alignments

Addressing 2.NBT.B.7, 2.NBT.B.8, 3.NBT.A.2

#### Materials to Gather

Number cubes

#### Materials to Copy

Target Numbers Stage 7 Recording Sheet (groups of 1)

#### Additional Information

Each group of 2 needs three number cubes.

### Stages used in Grade 2

#### Stage 3

##### Addressing

- Grade2.9.B

#### Stage 4

##### Addressing

- Grade2.2.B
- Grade2.2.C
- Grade2.9.B

## Stage 5

### Addressing

- Grade2.2.B
- Grade2.2.C
- Grade2.3.A
- Grade2.9.B

### Supporting

- Grade2.7.C

## Stage 6

### Addressing

- Grade2.7.C

### Supporting

- Grade2.8.A
- Grade2.8.B

## Stage 7

### Addressing

- Grade2.7.C

### Supporting

- Grade2.8.A
- Grade2.8.B

## Center: Compare (1–5)

### Stage 3: Multiply within 100

#### Lessons

- Grade3.6.D14 (supporting)
- Grade3.6.D15 (supporting)
- Grade3.6.D16 (supporting)

#### Stage Narrative

Students use cards with multiplication expressions within 100.

#### Standards Alignments

Addressing 3.OA.C.7

#### Materials to Copy

Compare Stage 3-8 Directions (groups of 2), Compare Stage 3 Multiplication Cards (groups of 2)

## Center: How Close? (1–5)

### Stage 5: Multiply to 100

#### Lessons

- Grade3.6.D14 (supporting)
- Grade3.6.D15 (supporting)
- Grade3.6.D16 (supporting)

#### Stage Narrative

Before playing, students remove the cards that show 10 and set them aside.

Each student picks 4 cards and chooses 2–3 of them to use to create a multiplication expression. Each student multiplies the numbers. The score for the round is the difference between each student's product and 100. Students pick new cards so that they have 4 cards in their hand and then start the next round. The player with the lowest score wins.

#### Variation:

Students can write the related division equation for each multiplication equation they record.

#### Standards Alignments

Addressing 3.OA.B.5

#### Materials to Gather

Number cards 0–10

#### Materials to Copy

How Close? Stage 5 Recording Sheet (groups of 1)

## Stages used in Grade 2

### Stage 1

#### Addressing

- Grade2.1.A
- Grade2.1.B
- Grade2.1.C

### Stage 2

#### Addressing

- Grade2.1.A
- Grade2.1.B
- Grade2.1.C

### **Stage 3**

#### **Addressing**

- Grade2.1.A
- Grade2.1.B
- Grade2.1.C

#### **Supporting**

- Grade2.4.A
- Grade2.4.B
- Grade2.7.A
- Grade2.7.B

### **Stage 4**

#### **Addressing**

- Grade2.7.B
- Grade2.7.C

#### **Supporting**

- Grade2.8.A
- Grade2.8.B

## Section A: Measurement Data on Line Plots

### Lesson 1: Measure in Halves of an Inch

#### Standards Alignments

Addressing 3.MD.B.4

Building Towards 3.MD.B.4

#### Teacher-facing Learning Goals

- Measure lengths using a ruler marked with halves of an inch.

#### Student-facing Learning Goals

- Let's measure the length of objects around the room.

#### Lesson Purpose

The purpose of this lesson is for students to measure lengths that are fractions of an inch and relate these measurements to fractions on a number line.

In grade 2, students learned how to measure lengths to the nearest inch. They also learned how to represent fractions on the number line in the previous unit.

In this lesson, students start by measuring the length of objects using an inch ruler. As students find objects whose length is not a whole number of inches, they consider how to partition the inches to get a more precise measurement. Students then partition a ruler to show halves of an inch and use the ruler to measure lengths to the nearest half of an inch. The lesson synthesis introduces students to **mixed numbers** as numbers that combine whole numbers and fractions less than 1.

Students use the rulers they make in this lesson again in future lessons.

#### Access for:

##### Students with Disabilities

- Engagement (Activity 1)

##### English Learners

- MLR2 (Activity 2)

#### Instructional Routines

What Do You Know About \_\_\_\_? (Warm-up)



**Materials to Gather**

- Materials from a previous activity: Activity 2

**Materials to Copy**

- Measure Around the Room (groups of 5): Activity 1

**Lesson Timeline**

Warm-up	10 min
Activity 1	15 min
Activity 2	20 min
Lesson Synthesis	10 min
Cool-down	5 min

**Teacher Reflection Question**

In the last unit, students learned how to represent fractions on diagrams and number lines. In what ways did you see students applying that experience here?

**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

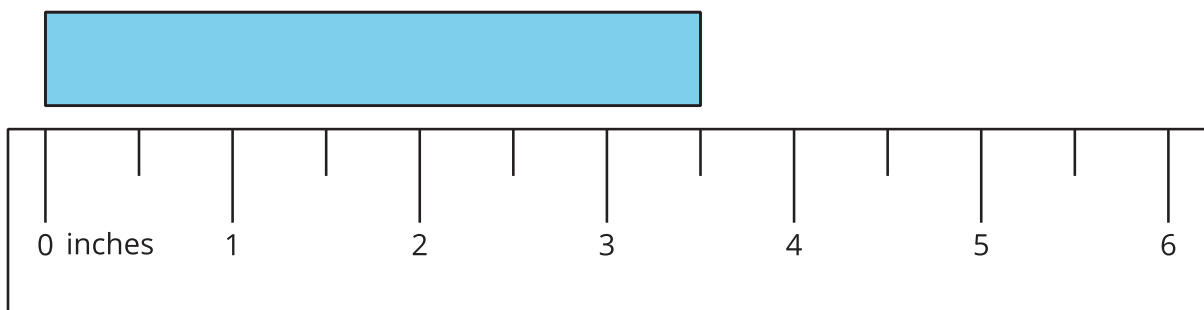
Length in Half Inches

**Standards Alignments**

Addressing 3.MD.B.4

**Student-facing Task Statement**

What is the length of the rectangle?

**Student Responses**

$\frac{7}{2}$  inches or  $3\frac{1}{2}$  inches

---

**Begin Lesson**


---

**Warm-up**

🕒 10 min

What Do You Know About Inches?

**Standards Alignments**

Building Towards 3.MD.B.4

The purpose of this warm-up is to invite students to share what they know about inches. Later in the lesson, students will explore lengths that are not a whole-number of inches.

**Instructional Routines**

What Do You Know About \_\_\_\_?

**Student-facing Task Statement**

What do you know about inches?

**Student Responses**

Sample responses:

- They are used to measure length.
- There are inch marks on rulers, yardsticks, and tape measures.
- They are shorter than feet.
- They are longer than centimeters.

**Launch**

- Display the question.
- “What do you know about inches?”
- 1 minute: quiet think time

**Activity**

- Record responses.

**Synthesis**

- “Inches are a unit we use to measure length. What are some lengths that we could use inches to measure?” (The length of a shoe. The length of material for an art project. The height of a desk.)

**Activity 1**

🕒 15 min

Measure Around the Room

## Standards Alignments

Addressing 3.MD.B.4

In grade 2, students only measured the length of objects that were whole units and sometimes described lengths as “about 4 inches.” The purpose of this activity is for students to learn that fractions of an inch can be useful for measuring the length of an object that is not exactly a whole number of inches.

Given a ruler marked with inches, students measure objects around the room. They may record measurements in whole inches even for objects whose length is not exactly a whole number inches. In the synthesis, discuss the need for fractions of an inch to describe lengths more precisely (MP6).

The rulers from this activity are used in the next activity.

### Access for Students with Disabilities

*Engagement: Develop Effort and Persistence.* Chunk this task into more manageable parts. Check in with students to provide feedback and encouragement after each chunk.

*Supports accessibility for: Attention, Organization*

## Materials to Copy

Measure Around the Room (groups of 5)

## Required Preparation

- Make copies and cut out the rulers from the Instructional master (5 rulers per page).

### Student-facing Task Statement

Use the ruler from your teacher to measure the length of objects in the room. Be prepared to discuss your reasoning.

object	length (inches)

### Launch

- Groups of 2
- Give each student a ruler.

### Activity

- “Use your ruler to measure the length of objects in the room. Work with your partner. You should each choose 3 objects.”
- 5–7 minutes: partner work time
- Monitor for students who find objects that



## Student Responses

Sample responses:

object	length (inches)
paper clip	1 inch
book	8 inches
pencil	6 inches
eraser	$1\frac{1}{2}$ inches

are not exactly whole numbers of inches. Highlight the objects and their measurement in the synthesis.

## Synthesis

- Display the inch ruler and an object that wasn't exactly a whole number of inches.
- "What is the length of this object?" (Between 3 and 4 inches. More than 3 but less than 4. Three-and-a-half inches.)
- If needed, "Could we say that the length of this object is (a whole number of) inches." (No, It's between 3 inches and 4 inches.)
- "We need a way to make our measurements more precise. We'll think about this more in the next activity."

## Activity 2

🕒 20 min

Partition Inches into Halves

### Standards Alignments

Addressing 3.MD.B.4

The purpose of this activity is for students to partition the inches on a ruler to show half inches and then use their ruler to measure lengths to the nearest half of an inch.

The unpartitioned rulers from this activity are used in the next lesson.

### 🌐 Access for English Learners

*MLR2 Collect and Display.* Circulate, listen for and collect the language and numbers students use as they measure objects. On a visible display, record numbers, words and phrases such as: seven half inches, seven halves of an inch,  $\frac{7}{2}$ , between 2 and 3 inches, six and a half inches,  $6\frac{1}{2}$ , and less than 5 inches. Invite students to borrow language from the display as needed, and update it throughout the lesson.

*Advances: Conversing, Reading*

## Materials to Gather

Materials from a previous activity

## Required Preparation

- Each student needs a ruler from the previous activity.

## Student-facing Task Statement

You will need one ruler from an earlier activity.

- Work with your partner to partition every inch on the ruler into halves of an inch.
- Use the ruler marked with halves of an inch to measure some lengths around the room.

object	length (inches)

## Student Responses

Sample responses:

object	length (inches)
paper clip	$\frac{3}{2}$ inches
book	$5\frac{1}{2}$ inches
pencil	$\frac{13}{2}$ inches
eraser	$\frac{1}{2}$ inches

## Launch

- Groups of 2
- "How could we adjust our rulers to measure lengths that are in between whole numbers?" (We could fold each inch into smaller equal parts. We could partition each inch into halves.)

## Activity

- "Work with your partner to partition every inch on one ruler into halves of an inch. Decide whose ruler you'll partition. Leave the other ruler in whole inches."
- 2–3 minutes: partner work time
- "Just like in the last activity, you may have objects that don't line up with one of the marks on the ruler. How might you record those lengths? Talk to your partner about it." (Estimate how long the object is. Record the mark that is closest.)
- 1 minute: partner discussion
- Share responses.
- "Work with your partner to choose objects to measure to the nearest half inch. You should each measure 3 objects."
- 5–7 minutes: partner work time

## Synthesis

- "How did you measure the length of objects when the length was in between the marks on your ruler?" (We recorded the mark that was closest. The length was right

between 1 inch and  $1\frac{1}{2}$  inches, so we estimated the length to be about  $1\frac{1}{4}$  inches.)

- “Save both rulers—the one you partitioned to show halves of an inch and the one that is not partitioned—for the next lesson.”

## Advancing Student Thinking

If the parts students partitioned aren’t the same size, consider asking:

- “Tell me about how you partitioned the inches into halves.”
- “How could you make sure the halves are the same size?”

## Lesson Synthesis

🕒 10 min

“Today we used a ruler to measure length in inches.”

“How is a ruler like a number line?” (The numbers go up as we move to the right. On both a number line and a ruler, each number has a location. On both, we can partition the wholes into halves.)

Display the length of one of the objects as a fraction greater than 1 and as a mixed number (for example,  $\frac{9}{2}$  and  $4\frac{1}{2}$ ).

“How could these two numbers show the same length?” (One tells us the number of whole inches and then how many half inches. The other tells us how many halves. They would be at the same location on the ruler, so they are the same length.)

“When we record the length in fractions that are greater than 1, we can record a fraction like  $\frac{9}{2}$ , or we can use a number that combines a whole number with a fraction less than 1 like  $4\frac{1}{2}$ . Numbers like this that combine whole numbers and fractions less than 1 are called **mixed numbers**.”

## Suggested Centers

- Estimate and Measure (1–4), Stage 2: Centimeters and Inches (Supporting)
- Target Measurements (2–5), Stage 1: Inches and Centimeters (Supporting)

---

**Complete Cool-Down**

---

**Response to Student Thinking**

Students record 2 inches or 3 inches for the length of the rectangle.

**Next Day Support**

- During the launch of the next day's activity, have students discuss the meaning of the marks in between the whole-inch marks.

## Lesson 2: Measure in Fourths of an Inch

### Standards Alignments

Addressing 3.MD.B.4

### Teacher-facing Learning Goals

- Measure lengths using rulers marked with fourths of an inch.

### Student-facing Learning Goals

- Let's measure lengths in quarters of an inch.

### Lesson Purpose

The purpose of this lesson is for students to measure length using a ruler marked with fourths of an inch.

In the previous lesson, students applied what they knew about fractions to partition inches into halves and measure lengths to the nearest half inch. In this lesson, students partition inches into fourths and measure lengths to both the nearest fourth and half of an inch.

Students are likely to see that they can use the ruler partitioned into fourths to measure lengths in whole numbers of inches, halves of an inch, and fourths of an inch, rather than to use separate rulers for different fractions. Some students may use fraction equivalence to describe the same length in half of an inch and fourth of an inch, which is helpful but not essential at this point. Focus the conversation on choosing the nearest quarter inch to describe the length of the object being measured. Students will consider the equivalence of  $\frac{1}{2}$  inch and  $\frac{2}{4}$  inch in the next lesson.

### Access for:

#### Students with Disabilities

- Representation (Activity 2)

#### English Learners

- MLR2 (Activity 1)

### Instructional Routines

Estimation Exploration (Warm-up)

### Materials to Gather

- Materials from a previous activity: Activity 2
- Materials from a previous lesson: Activity 1, Activity 2



**Lesson Timeline**

Warm-up	10 min
Activity 1	20 min
Activity 2	20 min
Lesson Synthesis	5 min
Cool-down	5 min

**Teacher Reflection Question**

How effective were your questions in supporting students' thinking today? What did students say or do that showed they were effective?

**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

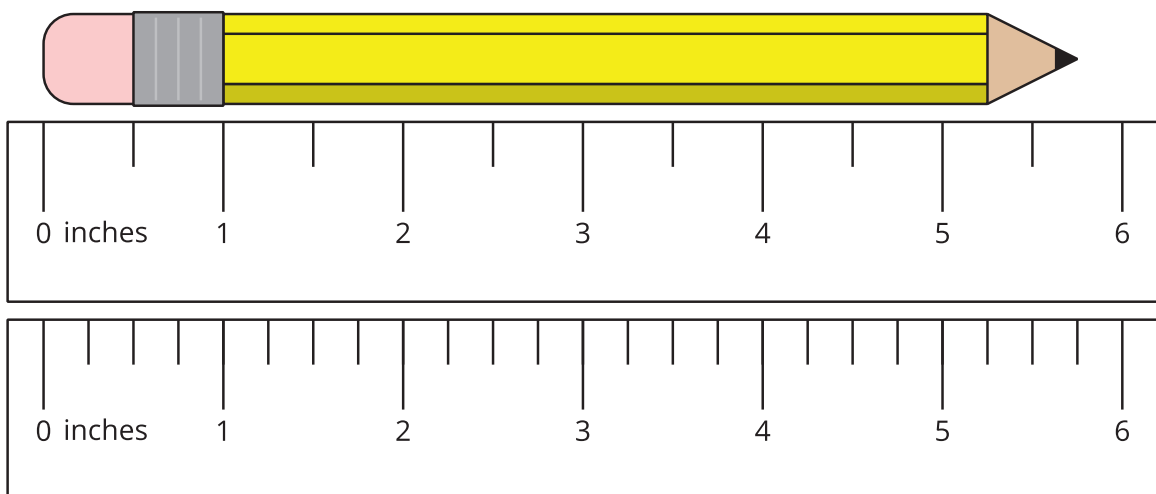
Which Ruler?

**Standards Alignments**

Addressing 3.MD.B.4

**Student-facing Task Statement**

1. Which ruler would you use to measure the length of the pencil? Explain your reasoning.



2. What is the length of the pencil?

**Student Responses**

1. I would use the ruler with quarter inches because the tip of the pencil falls in between the

half-inch marks.

2.  $5\frac{3}{4}$  inches or  $\frac{23}{4}$  inches

## Begin Lesson

### Warm-up

🕒 10 min

Estimation Exploration: Measure in Inches

#### Standards Alignments

Addressing 3.MD.B.4

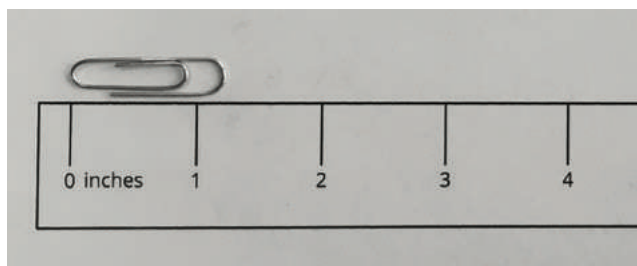
The purpose of this Estimation Exploration is to practice the skill of estimating a reasonable answer based on experience and known information. The warm-up also draws students' attention to a length between a full inch and one-half of an inch, preparing students to work with such lengths later.

#### Instructional Routines

Estimation Exploration

#### Student-facing Task Statement

What is the length of the paper clip?



Record an estimate that is:

too low	just right	too high

#### Launch

- Groups of 2
- Display the image.
- "What is an estimate that's too high? Too low? About right?"
- 1 minute: quiet think time

#### Activity

- "Discuss your thinking with your partner."
- 1 minute: partner discussion
- Record responses.

## Student Responses

Sample responses:

- Too low:  $1\frac{1}{8}$  inches or less
- About right: Between  $1\frac{1}{6}$  and  $1\frac{1}{3}$  inches
- Too high:  $1\frac{1}{2}$  inches or greater

## Synthesis

- Consider asking:
  - "Is anyone's estimate less than \_\_\_\_? Is anyone's estimate greater than \_\_\_\_?"
  - "Based on this discussion does anyone want to revise their estimate?"

## Activity 1

🕒 20 min

### Partition Inches into Fourths

### Standards Alignments

Addressing 3.MD.B.4

The purpose of this activity is for students to partition the inches on a ruler into fourth or quarter inches, using what they know about fractions on a number line. Students then use the ruler to measure objects in the classroom to the nearest quarter inch. In the synthesis, students practice reading the measurements as fractions greater than 1 and mixed numbers. They also discuss how measuring in fourths of an inch is different than measuring in half inches.

Students will use the rulers they partition in the next activity.

### 🌐 Access for English Learners

*MLR2 Collect and Display.* Direct attention to words collected and displayed from the previous lesson. Invite students to borrow language from the display as needed, and update it throughout the lesson with numbers, words, and phrases such as: eight fourths,  $\frac{8}{4}$ , five-and-one-fourth inches, less than five-and-one-half inch.

*Advances: Conversing, Reading*

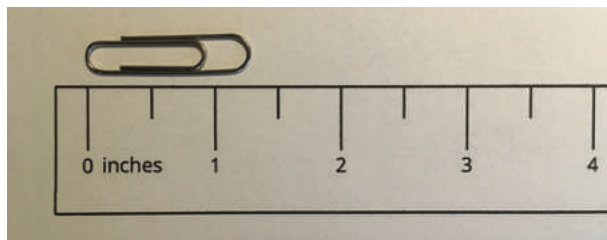
### Materials to Gather

Materials from a previous lesson

### Required Preparation

- Each group of 2 will need a ruler that didn't get partitioned in the previous lesson.

## Student-facing Task Statement



You will need the ruler that was not partitioned in an earlier activity.

1. With your partner, partition the ruler to show fourths of an inch.
2. Take turns using this ruler to measure the length of 4 objects around the room.

object	length

## Student Responses

Sample responses:

object	length
pencil	$5\frac{3}{4}$ inches
eraser	$\frac{3}{4}$ inches
book	$4\frac{1}{4}$ inches
shoe	$8\frac{2}{4}$ inches

## Launch

- Groups of 2
- Display the image.
- “Could we say that the paper clip is  $1\frac{1}{2}$  inches? Explain your reasoning.” (No, because it’s right in between the 1 inch mark and the  $1\frac{1}{2}$  inch mark. No, because it looks like it’s  $1\frac{1}{4}$  inches, because if we partition a half into 2 equal parts, it’s a quarter inch.)
- 1 minute: partner discussion
- Share responses.
- “How can we get a measurement closer to the length of the paper clip?” (We can partition the half inches into smaller parts. We can measure in fourths.)
- Make sure each group has a ruler that didn’t get partitioned from the previous lesson.

## Activity

- “You have a ruler that was not partitioned in an earlier lesson.”
- “Work with your partner to partition that ruler to show fourths of an inch. Then, you will each choose two objects to measure to the nearest quarter inch.”
- “When we partition an inch into fourths, we can call the parts ‘fourths of an inch’ or ‘quarters of an inch’ or ‘quarter inches.’ They mean the same thing.”
- 5–7 minutes: partner work time

## Synthesis

- Invite students to share an object and the length in quarter inches.
- For each measurement, ask the class to repeat the measurement as a fraction greater than 1 and a mixed number.

- “What’s different about measuring lengths in quarter inches and measuring in half inches?” (With quarter inches, it was more likely for the length of the object to match or be close to a mark on the ruler than to fall between two marks. There were also more marks to use to measure.)

## Advancing Student Thinking

If the parts students partitioned aren’t equal, consider asking:

- “How did you partition the inches into fourths?”
- “How could partitioning into half inches first help partition into quarter inches?”

## Activity 2

🕒 20 min

Find Some Lengths

### Standards Alignments

Addressing 3.MD.B.4

The purpose of this activity is for students to practice measuring objects in the classroom using their partitioned rulers and find objects of certain fractional lengths. Because the specified lengths are in halves and fourths of an inch, students may use both rulers. As they realize that all lengths could be measured with the rulers showing fourths of an inch, they may opt to use only one ruler.

When students decide to measure in halves or fourths of an inch based on the length of an object, they attend to precision (MP6).

### 🕒 Access for Students with Disabilities

*Representation: Internalize Comprehension.* Synthesis: Invite students to identify which details were most useful to measure accurately. Display the sentence frame, “The next time I measure objects with a ruler, I will look for . . .”

*Supports accessibility for: Memory, Conceptual Processing*

## Materials to Gather

Materials from a previous activity, Materials from a previous lesson

## Required Preparation

- Each group of 2 will need the rulers from previous activities: one that was partitioned into half inches and another partitioned into quarter inches.

## Student-facing Task Statement

You will need the rulers you partitioned for this activity.

With your partner:

- Find at least 4 objects in the classroom that have the lengths shown in the table.
- Practice saying each measurement.
- Record the object in the table. If you find an object that is a whole number plus a fraction of an inch, write the exact measurement.



object	length
	$2\frac{1}{2}$ inches
	$1\frac{1}{4}$ inches
	$3\frac{3}{4}$ inches
	$8\frac{1}{2}$ inches
	a whole number of inches
	a whole number and $\frac{1}{4}$ inches
	a whole number and $\frac{2}{4}$ inches
	a whole number

## Launch

- Groups of 2
- "You'll now use the rulers you partitioned to find objects that have certain lengths in inches."
- "Take a minute to read the instructions and look at the lengths in the table."
- 1 minute: quiet think time
- Invite 1–2 students to explain the activity in their own words. Answer any questions students might have.

## Activity

- "Work with your partner to complete the activity. Be sure to practice saying each measurement with your partner."
- "If you find an object with the length described in the last four rows of the table, be sure to write down the measurement."
- 10–12 minutes: partner work time

## Synthesis

- Invite 3–4 students to share an object and the length of the object. Record each measurement and ask the class to say it together.
- "How did you decide which ruler to use—the one partitioned in half inches or the one partitioned into fourth or

	and $\frac{3}{4}$ inches
--	--------------------------

## Student Responses

Sample responses:

object	length
box of paper clips	$2\frac{1}{2}$ inches
sticker	$1\frac{1}{4}$ inches
computer mouse	$3\frac{3}{4}$ inches
width of copy paper	$8\frac{1}{2}$ inches
postcard on the wall (4 inches)	a whole number of inches
length of envelope ( $8\frac{3}{4}$ inches)	a whole number and $\frac{3}{4}$ inches

quarter inches?" (For lengths that are whole numbers or show  $\frac{1}{2}$  inch, we used the ruler partitioned into halves. For lengths that show  $\frac{1}{4}$ ,  $\frac{2}{4}$ , or  $\frac{3}{4}$ , we used the ruler partitioned into fourths. We used only the ruler partitioned into fourths because we can see whole numbers, halves, and fourths in it.)

- Consider asking: "Was there a particular measurement that was easy to find because a lot of objects have that length? Were there any that were hard to find?"

## Lesson Synthesis

🕒 5 min

Display a ruler with whole-inch marks, a ruler with half-inch marks, and a ruler with quarter-inch marks.

"Which ruler would you use if we want to measure and get a length that is as close as possible to the actual length of the object?" (I would use the ruler with quarter inches because they would allow you to get really close to the length of the object.)

## Suggested Centers

- Estimate and Measure (1–4), Stage 2: Centimeters and Inches (Supporting)
- Target Measurements (2–5), Stage 1: Inches and Centimeters (Supporting)

----- Complete Cool-Down -----

**Response to Student Thinking**

Students choose the ruler with the half-inch marks to measure the pencil.

**Next Day Support**

- Before the next day's warm-up, pass back the cool-down and discuss how the ruler marked with quarter inches would give a measurement closer to the length of the pencil.



## Lesson 3: Measure in Halves and Fourths of an Inch

### Standards Alignments

Addressing 3.MD.B.4, 3.NF.A.3.c

### Teacher-facing Learning Goals

- Measure lengths using a ruler marked with both halves and fourths of an inch.
- Use equivalent fractions to describe length measurements.

### Student-facing Learning Goals

- Let's measure lengths in halves of an inch and quarters of an inch.

### Lesson Purpose

The purpose of this lesson is for students to use what they know about fraction equivalence to measure with a ruler that is marked with halves and fourths of an inch.

Previously, students learned to measure lengths using separate rulers that were marked with halves or fourths of an inch. Here, they use what they know about fraction equivalence to read measurements from a ruler marked with both halves and fourths of an inch. Then, students consider lengths that could be named in more than one way.

In future lessons, this ruler will be used to measure objects and represent measurements in a line plot.

### Access for:

#### Students with Disabilities

- Engagement (Activity 2)

#### English Learners

- MLR8 (Activity 1)

### Instructional Routines

Notice and Wonder (Warm-up)

#### Materials to Gather

- Materials from a previous activity: Activity 1, Activity 2
- Materials from a previous lesson: Warm-up
- Rulers (inches): Warm-up, Activity 1, Activity 2

#### Materials to Copy

- Notice and Wonder Rulers (groups of 4): Warm-up

**Lesson Timeline**

Warm-up	10 min
Activity 1	15 min
Activity 2	25 min
Lesson Synthesis	5 min
Cool-down	5 min

**Teacher Reflection Question**

Think about who volunteered to share their thinking with the class today. Are the same students always volunteering, while some students never offer to share? What can you do to help the class understand the value of hearing the ideas of every mathematician?

**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

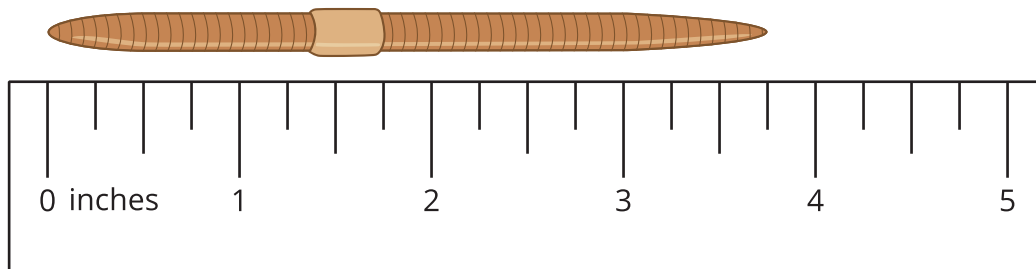
How Long?

**Standards Alignments**

Addressing 3.MD.B.4

**Student-facing Task Statement**

What is the length of the worm in inches?

**Student Responses** $3\frac{3}{4}$  or  $\frac{15}{4}$  inches

----- Begin Lesson -----

## Warm-up

🕒 10 min

Notice and Wonder: Rulers

### Standards Alignments

Addressing 3.MD.B.4

The purpose of this warm-up is to elicit the idea that a ruler can be marked with halves and fourths of an inch, which will be useful when students use a ruler like this in a later activity. While students may notice and wonder many things about these rulers, focus the conversation on how the quarter-inch marks are distinguished from the half-inch and whole-inch marks.

### Instructional Routines

Notice and Wonder

### Materials to Gather

Materials from a previous lesson, Rulers (inches)

### Materials to Copy

Notice and Wonder Rulers (groups of 4)

### Required Preparation

- Each group of 2 needs the rulers from the previous lesson.
- Cut out a ruler from the Instructional master for each student.

### Student-facing Task Statement

Look at the rulers you have been using to measure and the ruler your teacher gave you.

What do you notice? What do you wonder?

### Student Responses

Students may notice:

- On both rulers, the whole-inch marks are the longest.
- On the rulers we partitioned, the marks we added were not always the same length and not always precise.
- On this ruler, the marks for halves are all the same length and the marks for fourths are all the same length.

### Launch

- Groups of 2
- Make sure each group has rulers from the previous lesson.
- Give each student a ruler from the Instructional master.
- “What do you notice? What do you wonder?”
- 1 minute: quiet think time

### Activity

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Share and record responses.

- The half-inch marks are a little longer than the one-fourth and three-fourth marks.
- The spacing on the new ruler is very precise.

Students may wonder:

- Why are some of the marks shorter and some are longer?
- Are all of the marks in between the whole numbers fourths?
- How would I use this ruler to measure?
- What would be the length of something that was in between marks?

## Synthesis

- “How is this ruler like the rulers you used in earlier lessons?” (They all have marks showing whole inches and are partitioned into smaller parts.)
- “How is it different than those rulers?” (We had one ruler showing fourth inches and one showing half inches. On this ruler, both halves and fourths are shown. The marks for whole inches and half inches are different from those for fourth inches.)
- “On these rulers, the location of 0 is shown with a label. On some other rulers, there’s no gap between the edge of the ruler and the 0, so the edge itself is the 0. Before you use a ruler to measure, it’s good to look at the ruler and check where the 0 is located.”
- Consider showing students a ruler where one edge of the ruler marks the location of 0, if available.

## Activity 1

🕒 15 min

Halves and Quarters

👤 ↔ 👤 PLC Activity

### Standards Alignments

Addressing 3.MD.B.4, 3.NF.A.3.c

The purpose of this activity is for students to measure lengths using a ruler that is marked with half inches and quarter inches. Building on their understanding of equivalent fractions, students recognize that lengths that line up with a half-inch mark can be read as one-half of an inch or two-fourths of an inch. They also recognize that lengths that are whole numbers of inches can be expressed as fractions.

### 🌐 Access for English Learners

*MLR8 Discussion Supports.* Synthesis: Provide students with the opportunity to rehearse what they will say with a partner before they share with the whole class.

*Advances: Speaking*

## Materials to Gather

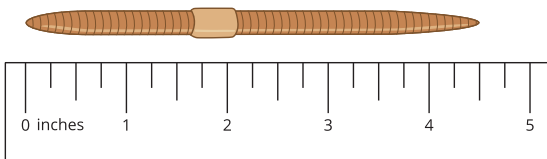
Materials from a previous activity, Rulers (inches)

## Required Preparation

- Each student needs a ruler marked with half inches and quarter inches from the warm-up.

## Student-facing Task Statement

- Kiran and Jada are discussing the length of a worm.



- Kiran says that the worm is  $4\frac{2}{4}$  inches long.
- Jada says that the worm is  $4\frac{1}{2}$  inches long.

Use the ruler to explain how both of their measurements are correct.

- Measure the length of the following worms.

A



B



C



D



## Launch

- Groups of 2
- Display the problem.
- "Think about how Kiran and Jada record the length of the worm. Use the ruler to explain how both of their measurements make sense."
- 1 minute: quiet think time
- 2–3 minutes: partner discussion
- Monitor for students that say they both make sense because  $4\frac{1}{2}$  is equivalent to  $4\frac{2}{4}$  and select them to share their responses.
- Make sure each student has a ruler marked with half inches and quarter inches from the previous activity.

## Activity

- "Now, work with your partner to measure the length of some worms. Some lengths can be recorded in more than one way. Be ready to explain how you recorded each length."
- 3–5 minutes: partner work time

## Synthesis

- Invite students to share how they recorded their measurements and why they chose to record them in the way they did.
- "Let's think more about the first worm you

## Student Responses

### 1. Sample responses:

- Kiran's measurement makes sense because the end of the worm is at the second fourth-inch mark between 4 and 5.
- Jada's measurement makes sense because the worm goes to the half between 4 and 5.
- They both make sense because  $4\frac{1}{2}$  is equivalent to  $4\frac{2}{4}$ .

- 2.
- a. 4 inches
  - b.  $5\frac{3}{4}$  inches
  - c.  $2\frac{1}{4}$  inches
  - d.  $3\frac{1}{2}$  inches or  $3\frac{2}{4}$  inches

measured. What are all the ways that we could record its length?" (4 inches.  $\frac{8}{2}$  inches.  $\frac{16}{4}$  inches.)

- "What are all the ways that we could record the length of the last worm?" ( $3\frac{1}{2}$  inches.  $3\frac{2}{4}$  inches.  $\frac{7}{2}$  inches.  $\frac{14}{4}$  inches.)
- "We can use different numbers to describe the same length because the numbers are equivalent."

## Advancing Student Thinking

If students start measuring from the edge of their ruler instead of from 0, consider asking:

- "In the image for the first problem, how is the ruler lined up to the worm?"
- "Why does it make sense to not line up the left end of the ruler with the left end of the worm?"

## Activity 2

🕒 25 min

Measure and Describe

### Standards Alignments

Addressing 3.MD.B.4

The purpose of this activity is for students to practice measuring with a ruler that is marked with

halves and fourths of an inch, as well as to identify lengths that can be described in different ways because they are equivalent. This activity gives students an opportunity to attend to the details of each measurement and to use language precisely (MP6). Students are prompted to find objects with whole-number lengths and those with fractional lengths. The work here allows students to reinforce earlier work on expressing whole numbers as fractions and naming equivalent fractions.

### Access for Students with Disabilities

*Engagement: Develop Effort and Persistence.* Invite students to generate a list of shared expectations for group work. Record responses on a display and keep visible during the activity.

*Supports accessibility for: Social-Emotional Functioning*

## Materials to Gather

Materials from a previous activity, Rulers (inches)

## Required Preparation

- Each student needs a ruler marked with half inches and quarter inches from the previous activity.

## Student-facing Task Statement

- Use the ruler you received today to measure some objects around the room.

Find at least 1 object whose length is a whole number of inches and at least 3 objects whose lengths are not whole numbers.

object	length

- Trade lists with another group. Find a length that could be written a different way.

## Launch

- Groups of 2
- Make sure each student has a ruler marked with half inches and quarter inches from the previous activity.
- "We are going to practice measuring some objects around the room with the same ruler you used earlier."
- "Take a minute and think about some things you could measure. Write down the objects as you think of them."
- 1 minute: independent work time
- Share student responses. Encourage students to add objects to their list that they didn't have.

## Activity

- "Work with your partner to measure these

object	length	equivalent length

## Student Responses

Sample responses:

1.

object	length
pinky finger	$2\frac{1}{4}$ inches
pencil case	$8\frac{1}{2}$ inches
stapler	6 inches
marker	$4\frac{3}{4}$ inches

2.

object	length	equivalent length
paper clip	$1\frac{1}{2}$ inches	$1\frac{2}{4}$ inches
pencil	$5\frac{2}{4}$ inches	$5\frac{1}{2}$ inches
notebook	7 inches	$\frac{14}{2}$ inches

objects and record the length of each object."

- 5–7 minutes: partner work time
- "Now, trade lists with another group. Find an object whose length could be recorded a different way. Record the object, its length, and an equivalent length."
- 2 minutes: group work time
- Repeat as many rounds of trading lists and recording equivalent lengths as time allows.
- Monitor for students who write fractions that are equivalent to whole-number measurements.

## Synthesis

- "Discuss with your partner how you used equivalent fractions as you measured lengths today." (The ruler is marked with half inches and quarter inches. I knew that the mark for  $\frac{2}{4}$  was also the mark for  $\frac{1}{2}$ .)
- "Since some of the marks on the ruler can be described with halves or fourths, how did you decide which way to describe the lengths you measured?" (If the end of the object landed right on one of the half marks, we described it as a half. If it landed in between the half marks, we used fourths to describe the length.)
- Select previously identified students to share the equivalent lengths they wrote.
- If no students express whole numbers as fractions, ask: "Could 7 inches be expressed in another way? How many half inches is that? How many quarter inches?"

## Lesson Synthesis

🕒 5 min



Display a ruler marked with halves and fourths of an inch.

"Today we measured lengths using a ruler marked with halves of an inch and quarters of an inch."

"What are some things you learned about using a ruler marked with half inches and quarter inches?"  
(We can use it to measure lengths that are whole numbers of inches or fractions of an inch. Some measurements can be described in more than one way using equivalent fractions. For example,  $5\frac{1}{2}$  is equivalent to  $5\frac{2}{4}$ .)

"Can a length like  $1\frac{1}{4}$  inches be described using half of an inch? Why or why not?" (No, because it is between 2 halves and 3 halves of an inch.) "Can it be described in another way?" (Yes,  $\frac{5}{4}$  inches.)

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### Suggested Centers

- Estimate and Measure (1–4), Stage 3: Quarter Inches (Addressing)
- Target Measurements (2–5), Stage 2: Quarter Inches (Addressing)
- Creating Line Plots (2–5), Stage 1: Inches and Centimeters (Supporting)

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### Complete Cool-Down

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### Response to Student Thinking

Students record a length of the worm that isn't to the nearest quarter inch, such as  $3\frac{1}{2}$  inches or 4 inches.

### Next Day Support

- Before the next day's warm-up, pass back the cool-down and have students discuss whether they would describe the length of the worm as  $3\frac{3}{4}$  inches or 4 inches and the reasoning behind their choice.

## Lesson 4: Interpret Measurement Data on Line Plots

### Standards Alignments

Building On	2.MD.D.9
Addressing	3.MD.B.4
Building Towards	3.MD.B.4

### Teacher-facing Learning Goals

- Interpret line plots that display measurement data in fractions of an inch.

### Student-facing Learning Goals

- Let's make sense of line plots with lengths in half inches and quarter inches.

### Lesson Purpose

The purpose of this lesson is for students to make sense of line plots that represent measurements to the nearest half or fourth of an inch.

In grade 2, students made line plots to show measurements to the nearest whole unit. In previous lessons, they measured objects with rulers marked with halves and fourths of an inch. In this lesson, students interpret line plots that show lengths in half inches and quarter inches and ask and answer questions about the data.

### Access for:



#### Students with Disabilities

- Engagement (Activity 2)



#### English Learners

- MLR6 (Activity 2)

### Instructional Routines

Notice and Wonder (Warm-up)

### Lesson Timeline

Warm-up	10 min
Activity 1	20 min
Activity 2	15 min
Lesson Synthesis	10 min

### Teacher Reflection Question

What part of the lesson went really well today in terms of students' learning? What did you do that made that part go well?

Cool-down

5 min

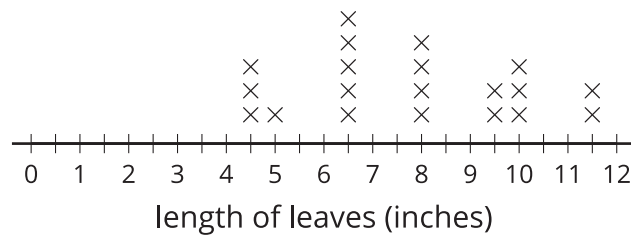
**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

Interpret and Choose

**Standards Alignments**

Addressing 3.MD.B.4

**Student-facing Task Statement**Select **all** the statements that are true about the measurements in the line plot.

- A. Five leaves had a length of  $6\frac{1}{2}$  inches.
- B. Six leaves had a length of  $9\frac{1}{2}$  inches.
- C. There were 12 leaves measured.
- D. There were 20 leaves measured.
- E. The shortest leaf was 5 inches.
- F. The shortest leaf was  $4\frac{1}{2}$  inches.

**Student Responses**

A, D, F

----- Begin Lesson -----

**Warm-up**

⌚ 10 min

Notice and Wonder: A List and a Line Plot

## Standards Alignments

Building On 2.MD.D.9

Building Towards 3.MD.B.4

The purpose of this warm-up is to remind students that measurement data can be shown on a line plot, preparing them to interpret a line plot that includes fractional measurements in a later activity. While students may notice and wonder many things about the given data, the general structure of the line plot and how it shows the measurement data in the table are the important discussion points.

## Instructional Routines

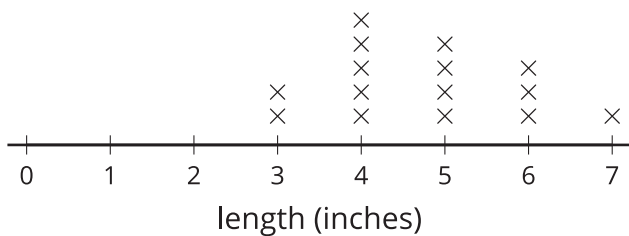
Notice and Wonder

### Student-facing Task Statement

What do you notice? What do you wonder?

Lengths in Inches

3	5	4	4
5	6	7	5
3	4	4	5
6	6	4	



### Student Responses

Students may notice:

- The lengths are in inches.
- All the lengths are whole numbers.
- The shortest length is 3 inches.
- The longest length is 7 inches.
- There are three items that are 6 inches long.

### Launch

- Groups of 2
- Display the data and line plot.
- “What do you notice? What do you wonder?”
- 1 minute: quiet think time

### Activity

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Share and record responses.

### Synthesis

- “How would we adjust the line plot to include a length that is  $6\frac{1}{2}$  inches?” (Add half inch marks to the scale. Partition the inches into two equal parts.)

- Objects that are 4 inches long make up the largest group.

Students may wonder:

- What objects were being measured?
- Why were all the lengths whole numbers?
- Why weren't there any lengths between whole numbers?
- Could these be lengths of pencils or something in the classroom?

## Activity 1

🕒 20 min

### A Set of Seedlings

#### Standards Alignments

Addressing 3.MD.B.4

The purpose of this activity is for students to analyze a line plot that represents lengths that are measured to the nearest half inch. They make observations and write statements about the data represented in the line plot, and then generate questions that could be answered with the line plot. When students recognize how organizing data helps to read the information and to answer questions, they learn that line plots are a powerful tool to present data (MP5).

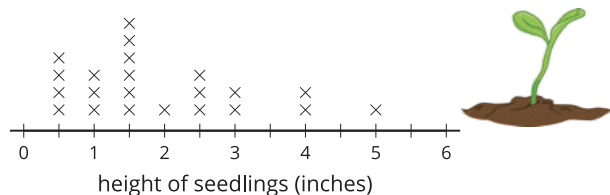
#### Student-facing Task Statement

heights of seedlings (in inches)

#### Launch

- Groups of 2
- Display the list and line plot.
- "The list and the line plot both show the heights of seedlings. A seedling is a young plant. Where have you seen seedlings before?" (At the park. In a garden.)
- "Looking at the list, can we tell the height of the shortest seedling?" (Yes,  $\frac{1}{2}$  inch). "What about the tallest seedling?" (Yes, 5 inches)
- "Draw a quick sketch of the shortest

$\frac{1}{2}$	1	1	$\frac{1}{2}$
$1\frac{1}{2}$	$2\frac{1}{2}$	4	$\frac{1}{2}$
3	$1\frac{1}{2}$	5	$1\frac{1}{2}$
$1\frac{1}{2}$	$2\frac{1}{2}$	3	$\frac{1}{2}$
$2\frac{1}{2}$	$1\frac{1}{2}$	1	$1\frac{1}{2}$
4	2		



- Write 3 statements about the measurements represented in the line plot.
- What questions could be answered more easily with the line plot than the list? Write at least 2 questions.

## Student Responses

- Sample responses:
  - These measurements are the height of seedlings.
  - Some lengths are given in half inches.
  - There are 22 x's, so 22 seedlings were measured.
  - Three seedlings were  $2\frac{1}{2}$  inches tall.
  - The shortest seedlings were  $\frac{1}{2}$  inch tall.
- Sample responses:
  - How tall is the tallest seedling that was measured?
  - How many seedlings were  $1\frac{1}{2}$  inches

seedling and the tallest seedling at their actual heights. Use what you know about the length of an inch."

- 1 minute: independent work time
- "Share your sketches with your partner."
- "What else can we tell about the seedlings from looking at the list?" (Twenty-two seedlings were measured. There are two seedlings that are 3 inches tall.)
- 1 minute: partner discussion
- Share responses.

## Activity

- "Now, take a close look at the line plot. Think about what information we can gather from the line plot and what questions it can help to answer."
- "Work with your partner to complete these problems."
- 7–10 minutes: partner work time

## Synthesis

- Display the list and the line plot.
- "How is the information displayed in the line plot different from that in the list?" (In the line plot, all the measurements that are the same length are together. The measurements go from smallest to largest along the bottom. In the line plot, we don't keep writing the numbers over and over, we would just use an x for each measurement.)
- "What were some questions that could be more easily answered with the line plot than the list?" ("How many seedlings were 3 inches tall?" because we could just count the x's at 3 instead of searching through the list. "What's the shortest seedling?" because we can find the x on the left end of the scale. "Which seedling height was the most common?" because we can see which

tall?

- How many seedlings were taller than 2 inches?
- Which seedling height was the most common?

number has the most x's.)

## Activity 2

🕒 15 min

All About Twigs

### Standards Alignments

Addressing 3.MD.B.4

The purpose of this activity is for students to use a line plot to answer questions about a set of length data. The data show measurements to the nearest quarter inch. Students may apply their understanding of fraction equivalence to interpret the data and answer the questions.

### 🌐 Access for English Learners

*Reading: MLR6 Three Reads.* Keep books or devices closed. Display only the graph, without revealing the questions. “We are going to read this graph 3 times.” 1st Read: Give students 2–3 minutes to interpret and read the information displayed by the graph. Ask, “What is this situation about?” Listen for and clarify any questions about the context. 2nd Read: “Read and interpret the graph a second time. What quantities are represented? What can be counted or measured in this situation?” 3rd Read: Reveal and read the questions aloud. Invite students to take turns explaining their observations about the graph related to each question as they work together.

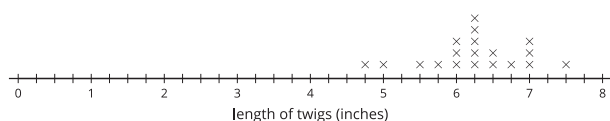
*Advances: Reading, Representing*

### ♿ Access for Students with Disabilities

*Engagement: Provide Access by Recruiting Interest.* Leverage choice around perceived challenge. Invite students to select complete 6 out of the 8 line plot questions.

*Supports accessibility for: Organization, Attention, Social-emotional skills*

## Student-facing Task Statement



1. How many twig lengths are represented in the line plot?
2. How many of the twigs are  $6\frac{1}{2}$  inches long?
3. How many of the twigs are less than 6 inches long?
4. How many of the twigs are more than 6 inches long?
5. What is the length of the shortest twig?
6. What is the length of the longest twig?
7. What is the most common twig length?
8. Add an "x" to the line plot that would represent a twig with a length between 3 and 4 inches.



What is the length of the twig you added to the line plot?

## Student Responses

1. 19 twigs
2. 2 twigs
3. 4 twigs
4. 12 twigs
5.  $4\frac{3}{4}$  inches
6.  $7\frac{1}{2}$  inches or  $7\frac{2}{4}$  inches
7.  $6\frac{1}{4}$  inches
8. Students add an x at  $3\frac{1}{4}$ ,  $3\frac{1}{2}$ , or  $3\frac{3}{4}$  and name the corresponding length.

## Launch

- Groups of 2
- "This line plot has data about the lengths of some twigs. What do you notice? What do you wonder?" (Students may notice: The twigs were measured to the nearest quarter inch. The longest twig is  $7\frac{2}{4}$  inches. Students may wonder: Where were the twigs found? How many twigs are shown on the line plot?)

## Activity

- "Work independently to answer the questions about the data shown in the line plot."
- 5 minutes: independent work time
- "Work with your partner to finish answering all the questions about the data shown in the line plot."
- 5–7 minutes: partner work time

## Synthesis

- "Discuss with your partner how you answered the last two questions." (Since the inches are partitioned into 4 equal parts, I knew the scale shows quarters of an inch. I used the quarter inch marks to add an x for a twig that is  $3\frac{1}{4}$  inches long because that is between 3 and 4 inches.)
- "How did you use fraction equivalence to answer the questions?" (When the question asked how many of the twigs were  $6\frac{1}{2}$  inches long, I used the mark that was at  $6\frac{2}{4}$ , because the lengths are equivalent. When I added a twig to the line plot, it was at the  $3\frac{2}{4}$  inch mark, but I wrote  $3\frac{1}{2}$  because the fractions are equivalent.)



## Lesson Synthesis

🕒 10 min

"Today we asked and answered questions about measurements shown in a line plot."

"What does each x in a line plot represent?" (A measurement)

"How do we know what measurement an x represents?" (The line plot has a number line with labels and tick marks. Where an x falls on the number line tells us the measurement.)

"What else can the line plot tell us about the data it displays?" (The number of x's tells us how many measurements are in the data. The x on the far left tells us the smallest measurement. The x on the far right tells us the greatest measurement. We can see which measurements are common based on how many x's there are at certain locations.)

### Suggested Centers

- Estimate and Measure (1–4), Stage 3: Quarter Inches (Addressing)
- Target Measurements (2–5), Stage 2: Quarter Inches (Addressing)
- Creating Line Plots (2–5), Stage 1: Inches and Centimeters (Supporting)

### Complete Cool-Down

### Response to Student Thinking

Students select choices that indicate they are mixing up the parts of the graph that represent the lengths of the objects and the number of objects (as in options C or E).

### Next Day Support

- Before the next day's warm-up have students discuss what the x's on a line plot represent and what the numbers along the bottom of the line plot represent.

## Lesson 5: Represent Measurement Data on Line Plots

### Standards Alignments

Addressing 3.MD.B.4, 3.OA.C.7

### Teacher-facing Learning Goals

- Create a line plot where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters—to represent measurement data.
- Generate measurement data by measuring lengths using a ruler marked with halves and fourths of an inch.

### Student-facing Learning Goals

- Let's collect measurement data and show them on a line plot.

### Lesson Purpose

The purpose of this lesson is for students to generate measurement data and represent them on a line plot.

In a previous lesson, students analyzed line plots that included measurements in halves and fourths of an inch. In this lesson, students collect measurement data, represent them on a line plot, and analyze line plots that represent different data sets (MP2).

This lesson may take more than one day if students need more time to collect data around the school and to create their line plots. If time permits and preferable, consider carrying out the activities across two days.

This lesson has a Student Section Summary.

### Access for:



#### Students with Disabilities

- Representation (Activity 2)



#### English Learners

- MLR8 (Activity 1)

### Instructional Routines

MLR7 Compare and Connect (Activity 2), Number Talk (Warm-up)

### Materials to Gather

- Glue or tape: Activity 2
- Materials from a previous lesson: Activity 1
- Scissors: Activity 2
- Tools for creating a visual display: Activity 2

### Materials to Copy

- Let's Make a Line Plot (groups of 2): Activity 2

### Lesson Timeline

Warm-up	10 min
Activity 1	20 min
Activity 2	20 min
Lesson Synthesis	5 min
Cool-down	5 min

### Teacher Reflection Question

If you were to teach this lesson over again, what activity would you redo? How would your proposed changes support student learning?

### Cool-down (to be completed at the end of the lesson)

⌚ 5 min

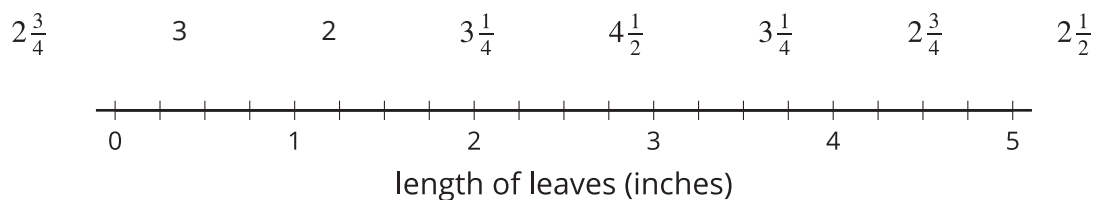
Complete the Line Plot

#### Standards Alignments

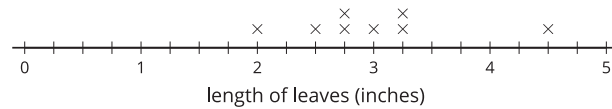
Addressing 3.MD.B.4

#### Student-facing Task Statement

The list shows lengths of leaves in inches. Use the measurements to complete the line plot.



#### Student Responses



## ----- Begin Lesson -----

### Warm-up

🕒 10 min

Number Talk: Multiply Teen Numbers

#### Standards Alignments

Addressing 3.OA.C.7

The purpose of this Number Talk is to elicit strategies and understandings students have for multiplying within 100 and to help students develop fluency.

When students use known multiplication facts to multiply larger numbers, they look for and make use of structure (MP7).

#### Instructional Routines

Number Talk

#### Student-facing Task Statement

Find the value of each expression mentally.

- $3 \times 10$
- $3 \times 13$
- $6 \times 13$
- $3 \times 26$

#### Student Responses

- 30: I counted by 10. I just knew it.

#### Launch

- Display one expression.
- “Give me a signal when you have an answer and can explain how you got it.”
- 1 minute: quiet think time

#### Activity

- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.

- 39:  $3 \times 10 = 30$ . I just added 3 more groups of 3 which is 9 to make 39.
- 78: Once I knew  $3 \times 13 = 39$ , then I doubled 39 to get  $6 \times 13$ , which is 78.
- 78:  $3 \times 20 = 60$ ,  $3 \times 6 = 18$ ,  $60 + 18 = 78$ .

## Synthesis

- “How did you use multiplication facts that you already know to find some of the other products?” (I knew that  $3 \times 10$  is 30, so  $3 \times 13$  would be 3 groups of 10 and 3 groups of 3 which is 39. Once I knew  $3 \times 13$ , I was able to find  $6 \times 13$  by doubling 39 which is 78.)

## Activity 1

🕒 20 min

Go for a Measurement Walk

### Standards Alignments

Addressing 3.MD.B.4

The purpose of this activity is for students to generate measurement data using rulers marked with half inches and quarter inches. Students go on a walk in nature, around the school, or on the playground to measure the length of items they chose. If time is limited, this activity could also be done in the classroom.

Students may record and organize their data in the provided tables or on lined paper.

### 🌐 Access for English Learners

*MLR8 Discussion Supports.* Synthesis: Revoice student ideas to demonstrate and amplify mathematical language use. For example, revoice the student statement “It lined up with one of the half thingies” as “It lined up with one of the half inch marks,” or “We recorded it in halves” as “We recorded it in half inches.”

*Advances: Speaking*

### Materials to Gather

Materials from a previous lesson

### Required Preparation

- Each group of 4 needs a ruler marked with half inches and quarter inches from a previous lesson.

### Student-facing Task Statement

1. What objects will you measure?
2. Record the lengths of the objects in the table (or on another sheet of paper).

object	length (inches)	object	length (inches)

### Student Responses

Answers vary.

### Launch

- Groups of 4
- "Today we are going to take a walk around the school (or the playground, or the classroom) to measure the length of some objects."
- "Talk to your group about some objects whose length we could measure on our walk." (sticks, leaves, pine needles, plants)
- 1 minute: group discussion
- Share responses.
- Make sure each group has a ruler that shows halves and fourths of an inch (from an earlier lesson).
- If not using the table in the workbook, give students blank lined paper for recording measurements.

### Activity

- "Discuss with your group what to measure on our walk. You'll need to gather at least 10 length measurements."
- "Later, each group will create a line plot with these measurements and display it on a poster."
- 2 minutes: group work time
- Share responses.
- "Record and organize your measurements in the table (or on lined paper)."
- 20 minutes: whole-class walk around the school

### Synthesis

- "Now that we have our measurements data, let's make a line plot."

## Activity 2

🕒 20 min

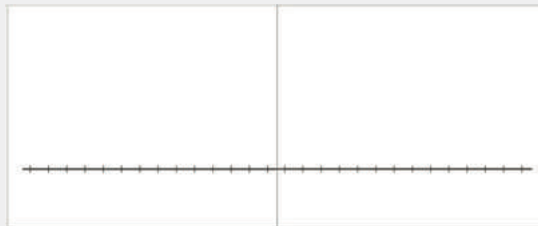
Let's Make a Line Plot

### Standards Alignments

Addressing 3.MD.B.4

In this activity, students create a line plot using the measurement data that they generated earlier and display their group's line plot for all to see.

Encourage students to plan their line plot using the blank line in the activity statement before creating a poster version for display in a gallery walk. A template for a larger line plot is provided in the Instructional master. Students can join the number lines on two copies of the Instructional master to create a longer number line.



As students visit others' data displays, they consider how the line plots are alike and how they are different, as well as why different scales might have been chosen for different objects measured.

### 🕒 Access for Students with Disabilities

*Representation: Access for Perception.* Synthesis: Use gestures during the explanation of the line plot to emphasize important aspects of the line plot.

*Supports accessibility for: Conceptual Processing, Attention*

### Instructional Routines

MLR7 Compare and Connect

### Materials to Gather

Glue or tape, Scissors, Tools for creating a visual display

### Materials to Copy

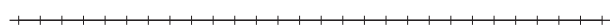
Let's Make a Line Plot (groups of 2)

## Student-facing Task Statement

Create a line plot to represent the measurement data you collected. You will display and share your line plot with your class later.

You can use the blank number line here for your draft. Think about:

- how to label the tick marks so that all the measurements are included
- details to help others understand the data you collected



## Student Responses

Answers vary.

## Launch

- Groups of 4
- “Look at the data your group collected. What do you need to know to make a line plot that represents the data?” (The longest and shortest measurements. Whether the lengths are whole numbers or include halves and fourths of an inch.)
- 1 minute: group discussion
- Share responses.
- Give each group 2 copies of the Instructional master, scissors, glue or tape, and tools for creating a visual display.

## Activity

- “Work with your group to create a line plot that represents your data. You will share your line plot with the class later.”
- “You can use the blank number line on your page to plan your line plot before creating a final one to display.”
- Consider asking:
  - “How do you plan to make the scale for the line plot so that it can show all your measurements?”
  - “What information or labels could be included to help others understand your line plot?”
- Demonstrate how to join and tape (or glue) the 2 copies of the Instructional master to make a large line plot.
- “After you complete your final line plot, tape (or glue) your line plot on a poster.”
- 12–15 minutes: group work time

## Synthesis

- Ask students to display their posters.

## MLR7 Compare and Connect



- “As you visit the posters with your group, think about how the line plots are alike and how they are different. Be prepared to share your observations.”
- 5 minute: gallery walk
- See lesson synthesis.

## Lesson Synthesis

 5 min

Discuss students' observations from the gallery walk.

“How are the line plots alike?” (They all show lengths in inches and at least 10 x's. They all show at least one stack of x's that is taller.)

“How are they different?” (They represent lengths of different objects. Some line plots show more or fewer x's than others. The numbers on the ends of the lines are different. The locations of x's and how they are spread out are different. On some line plots, each space represents  $\frac{1}{2}$  inch. On others, it represents  $\frac{1}{4}$  inch.)

“Why did the line plots have different scales?” (Some types of objects are usually longer than others. For example, twigs are usually longer than leaves. Some data include only lengths in half inches. Others include quarters of an inch.)

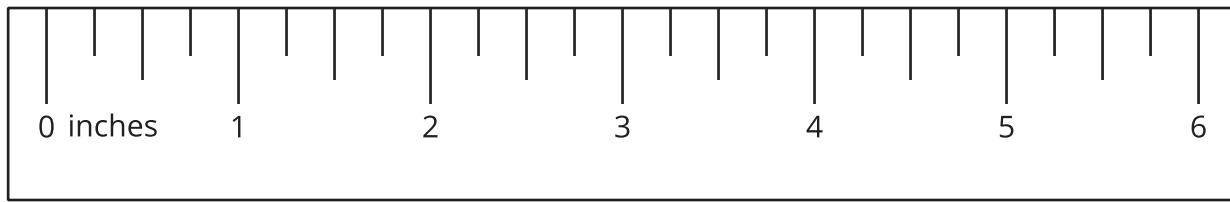
Consider asking: “What did you learn about line plots in the past few lessons?” (They are used to show measurements, including fractions an inch. We can choose the scale of the line plot based on the measurements. We can get some information about the data more easily from a line plot than from a list.)

## Suggested Centers

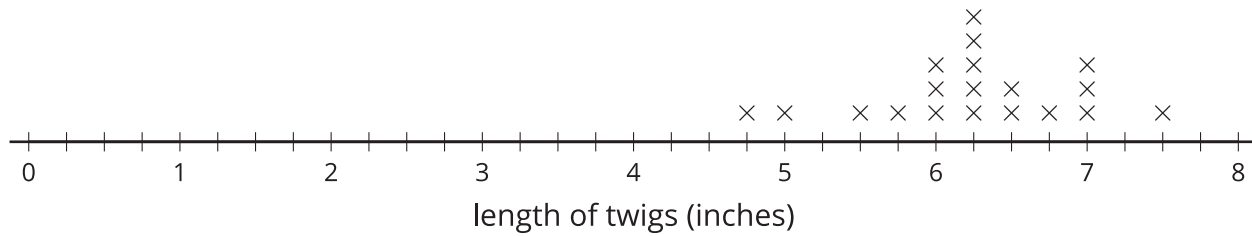
- Estimate and Measure (1–4), Stage 3: Quarter Inches (Addressing)
- Target Measurements (2–5), Stage 2: Quarter Inches (Addressing)
- Creating Line Plots (2–5), Stage 1: Inches and Centimeters (Supporting)

## Student Section Summary

In this section, we learned how to measure lengths using rulers marked with halves and quarters of an inch.



We also learned to make line plots to show measurements in half inches or quarter inches.



### ----- Complete Cool-Down -----

#### Response to Student Thinking

Students don't place x's at the locations on the line plot that correspond to the given lengths.

#### Next Day Support

- Before the warm-up, invite students to work in small groups to discuss a correct response to this cool-down.

## Section B: Weight and Liquid Volume

### Lesson 6: Estimate and Measure Weight

#### Standards Alignments

Addressing 3.MD.A.2

Building Towards 3.MD.A.2

#### Teacher-facing Learning Goals

- Measure and estimate weights of objects using standard units of grams (g) and kilograms (kg).

#### Student-facing Learning Goals

- Let's measure and estimate weight.

#### Lesson Purpose

The purpose of this lesson is for students to learn to measure and estimate the weight of objects in grams or kilograms.

In previous grades, students learned that weight is a measurable attribute and directly compared the weights of two objects. In this lesson, students learn that **weight** is a measure of how heavy something is. They are introduced to **grams** and **kilograms** as metric units for measuring weight. Students hold objects of different numbers of grams and kilograms to familiarize themselves with the units before estimating the weight of objects in those units. Since the distinction between mass and weight is beyond what students need to learn, the term “weight” is used throughout the unit.

To build a sense of weight measurements and an intuition for comparison, it is extremely helpful for students to have firsthand experience of holding different weights. To make that possible, some new materials and preparation are required for this lesson.

#### Access for:



#### Students with Disabilities

- Action and Expression (Activity 2)



#### English Learners

- MLR8 (Activity 2)

#### Instructional Routines

Notice and Wonder (Warm-up)

## Materials to Gather

- Chart paper: Activity 1
- Markers: Activity 1

## Lesson Timeline

Warm-up	10 min
Activity 1	30 min
Activity 2	10 min
Lesson Synthesis	5 min
Cool-down	5 min

## Teacher Reflection Question

What ideas about liquid volume do students have from their everyday lives? How did these ideas influence their work in this lesson?

## Cool-down (to be completed at the end of the lesson)

🕒 5 min

About a Kilogram

### Standards Alignments

Addressing 3.MD.A.2

### Student-facing Task Statement

Select **all** the objects that could have a weight of about a kilogram.

- A. a bicycle
- B. a book
- C. a marble
- D. a pencil
- E. a bunch of bananas

### Student Responses

B and E

----- Begin Lesson -----

## Warm-up

🕒 10 min

### Notice and Wonder: Produce Stand

#### Standards Alignments

Building Towards 3.MD.A.2

The purpose of this warm-up is to elicit the idea that weight can be measured. While students may notice and wonder many things about this image, how weight can be measured is the important discussion point.

#### Instructional Routines

Notice and Wonder

#### Student-facing Task Statement

What do you notice? What do you wonder?



#### Student Responses

Students may notice:

- There are fruits and vegetables that are different sizes.
- There are more of the smaller fruits or vegetables than the large yellow vegetables.
- There's a scale to weigh the fruits and vegetables.

Students may wonder:

- Is the large yellow thing a fruit or vegetable?
- What is in the large coolers?
- How many does she have altogether?
- Are the larger vegetables more expensive?
- How much do the little fruits weigh?

#### Launch

- Groups of 2
- Display the image.
- "What do you notice? What do you wonder?"
- 1 minute: quiet think time

#### Activity

- "Discuss your thinking with your partner."
- 1 minute: partner discussion
- Share and record responses.

#### Synthesis

- "Today we'll begin learning about weight. **Weight** is how heavy an object is. When are some times that we think about weight?" (When buying fruit or vegetables at the store. When getting a check-up at the doctor's office.)
- "How could weight be used to decide how much a piece of fruit should cost?" (The more the fruit weighs, the more it's going to cost because we're getting more.)

- How much do one of the large yellow vegetables weigh?

## Activity 1

🕒 30 min

### Estimate Weight

#### Standards Alignments

Addressing 3.MD.A.2

The purpose of this activity is for students to learn that grams and kilograms are standard units for measuring weight. Students are introduced to the units using common objects as benchmarks. For each benchmark, students hold an object of some number of grams or kilograms and think of an example of an object that has about the same weight. Then, students look for items in the room that are in specific weight ranges.

If time permits and if a scale or a balance is available, give students an opportunity during the synthesis to confirm the weights of the objects they estimated. Depending on the number of weight measurement tools available, arrange for a whole-class weighing demonstration with the objects students chose, or arrange for students to weigh their chosen objects in groups, taking turns with each type of available tool.

#### Materials to Gather

Chart paper, Markers

#### Required Preparation

- Create a set of metric weights (1 kilogram, 2 kilograms, 1 gram, 10 grams, 100 grams). Weights can be made by filling bags with the following quantities of objects:
  - for 1 kilogram: 1,000 jumbo paper clips or a 1 liter bottle filled with water
  - for 1 gram: 1 large paper clip
- Create a poster with the labels “less than 1 gram,” “between 1 gram and 100 grams,” “between 100 grams and 1 kilogram,” and “over 1 kilogram” for the synthesis.
- If possible, gather scales (analog and digital), primary balances, and any other available weight measurement tools for the synthesis of Estimate Weight activity. Prepare enough tools for each group of students to have one, or prepare one for a whole-class weighing demonstration.

## Student-facing Task Statement

This paper clip weighs *about* 1 gram.



This basket of apples weighs *about* 1 kilogram.



- For each weight measurement, find an example of something you think has about the same weight.
  - 1 gram
  - 10 grams
  - 100 grams
  - 1 kilogram
  - 2 kilograms
- Find some objects in the room that belong in each column based on their weight.

less than 1 gram	between 1 gram and 100 grams	between 100 grams and 1 kilogram	more than 1 kilogram

## Student Responses

Sample responses:

- pen cap
  - a marble
  - an apple

## Launch

- 5 groups
- "Grams and kilograms are some units we use to measure weight. A **gram** is a small metric unit of weight and is about the same weight as a paper clip. A **kilogram** is a larger metric unit of weight and is about the same weight as a basket of apples."

## Activity

- "We are going to hold some weights and get a sense of how heavy 1 gram, 10 grams, 100 grams, 1 kilogram, and 2 kilograms are."
- "Your group will have 2 minutes with each weight. In that time, everyone in your group should hold the weight and list some things you think weigh about the same. You can share ideas with your group as you write."
- Distribute objects with the following weights, one object for each group:
  - 1 gram
  - 10 grams
  - 100 grams
  - 1 kilogram
  - 2 kilograms
- 2 minutes: small-group work time
- Rotate materials.
- 8–10 minutes: Repeat rounds of 2 minutes with each weight until each group has had every weight.
- Monitor for examples of each weight that students generate.
- Pause for a discussion.
- Invite students to share 1–2 examples for each measurement. Have students add the examples that are shared to their list.
- "Now, look at the table in the second

d. a textbook

e. a backpack

2. Sample responses:

less than 1 gram	between 1 gram and 100 grams	between 100 grams and 1 kilogram	more than 1 kilogram
sticky note	pen cap	ball	chair
foam inch tile	pencil	shoe	table
	ruler	book	computer
	computer mouse		backpack

problem. Work with your group to find objects around the room that belong in each column based on their weight."

- 5–7 minutes: small-group work time

## Synthesis

- Select students to share 1–2 examples from each column.
- Record responses on the poster labeled with the different categories.
- If possible, allow students to use a scale or a balance to confirm the weight of some of their objects.
- To familiarize students with the available weight measurement tools, display them for all to see, and consider asking:
  - "What do you notice? What do you wonder?"
  - "How do we read the scale? What if the scale is in between two numbers?"
  - "How do we know when a balance shows that objects have the same weight?"
- If multiple scales are available, allow students to weigh their objects in groups. If only one scale is available, demonstrate it for the class.

## Advancing Student Thinking

If students say they aren't sure in which column an object belongs, consider asking:

- "How would you describe the weight of the object compared to a gram or kilogram?"
- "How many grams or kilograms do you think it weighs?"



## Activity 2

🕒 10 min

### The Weight of Pets

#### Standards Alignments

Addressing 3.MD.A.2

The purpose of this activity is for students to use what they've learned about grams and kilograms to estimate the weights of some common pets. Students should rely on the experiences they have had in previous activities to explain why the estimates they choose are reasonable. In the synthesis, students consider when it might be helpful to estimate a weight rather than measure the exact weight.

#### 🌐 Access for English Learners

*MLR8 Discussion Supports.* Synthesis: Before students share, remind students to use words such as weight, grams, and kilograms.

*Advances: Speaking*


#### ♿ Access for Students with Disabilities

*Action and Expression: Develop Expression and Communication.* Provide access to the weights used in the previous activity to determine a reasonable weight for each pet.

*Supports accessibility for: Conceptual Processing*

#### Student-facing Task Statement

Match each pet to the amount that could be its weight. Explain your reasoning.

- | pet   | weight          |
|---|-----------------|
| 1. guinea pig   | A. 20 kilograms |
|  | B. 1 kilogram   |
|   | C. 3 kilograms  |
| 2. dog  | D. 3 grams      |

#### Launch

- Groups of 2

#### Activity

- “Work with your partner to match each pet with an amount that could be its weight.”
- 3–5 minutes: partner work time
- Monitor for students who refer back to the activities where they felt different weights to determine a reasonable estimate of each pet’s weight.



3. small fish



4. cat



### Student Responses

1. B, 2. A, 3. D, 4. C

### Synthesis

- Invite 3-4 students to share their response for one of the pets, including how they determined the amount would be a reasonable estimate.

### Advancing Student Thinking

If students choose estimates for the weight of the pets that aren't reasonable, consider asking:

- "Tell me how you estimated the weight of the pet."
- "Would the pet weigh more or less than a gram (or kilogram)?"

## Lesson Synthesis

🕒 5 min

"When are some times that estimating is helpful instead of knowing the exact weight?" (To know if something is too heavy to pick up. When we're just curious about how much something weighs. When we're buying something like fruit by the gram or kilogram and want to get an idea of how much it would cost.)

### Suggested Centers

- Creating Line Plots (2-5), Stage 2: Quarter Inches (Addressing)
- Target Measurements (2-5), Stage 2: Quarter Inches (Addressing)

---

**Complete Cool-Down**

---

**Response to Student Thinking**

Students select objects whose weight is not about a kilogram.

**Next Day Support**

- Before the warm-up, invite students to work in small groups to discuss a correct response to this cool-down.

## Lesson 7: Introduction to Liquid Volume

### Standards Alignments

Addressing 3.MD.A.2

### Teacher-facing Learning Goals

- Estimate and compare liquid volumes of containers using informal units and liters.
- Understand liquid volume as the amount of space that a liquid takes up.

### Student-facing Learning Goals

- Let's learn about liquid volume.

### Lesson Purpose

The purpose of this lesson is to introduce students to the measurement of **liquid volume**.

In previous lessons, students measured and estimated the weight of objects in grams and kilograms. In this lesson, students learn that **liquid volume** is the amount of space that a liquid takes up and consider the challenges of directly comparing liquid volumes by just looking at them. Students use informal units (such as plastic cups, spoons, and so on) to compare the liquid volume that two containers will hold. Finally, students are introduced to the **liter** as a metric unit of liquid volume. They create a tool for measuring liquid volume in liters by filling a container and making a mark for each liter as it's added to the container. A clear container is used so students can see the level of the liquid and a dry erase marker is used so the marks can be erased after the lesson.

To build a conceptual understanding of liquid volume, it is extremely helpful for students to have firsthand experience of comparing liquids in different containers. To make that possible, some new materials and preparation are required for this lesson.

### Access for:



#### Students with Disabilities

- Engagement (Activity 2)



#### English Learners

- MLR5 (Activity 2)

### Instructional Routines

Notice and Wonder (Warm-up)

## Materials to Gather

- Markers (dry-erase): Activity 2

## Lesson Timeline

Warm-up	10 min
Activity 1	20 min
Activity 2	15 min
Lesson Synthesis	10 min
Cool-down	5 min

## Teacher Reflection Question

What surprised you about student thinking about measurements of liquid volume in the first activity? What strategies did you anticipate? Which did you not anticipate?

## Cool-down (to be completed at the end of the lesson)

🕒 5 min

### Liquid Volume Reflection

### Standards Alignments

Addressing 3.MD.A.2

### Student-facing Task Statement

What did you learn about liquid volume and how to measure it?

### Student Responses

Sample response: Liquid volume is the amount of space that a liquid takes up. It can be hard to compare the liquid volume that containers hold if we don't use the same unit. Liters are units of liquid volume.

## ----- Begin Lesson -----

## Warm-up

🕒 10 min

Notice and Wonder: The Bowl and the Jar

## Standards Alignments

Addressing 3.MD.A.2

The purpose of this warm-up is to elicit the idea that liquid volume is a measurable attribute, which will be useful when students use informal units and liters to measure liquid volume in later activities. While students may notice and wonder many things about these containers, ideas around how much each container holds and which container holds more are the important discussion points.

## Instructional Routines

Notice and Wonder

### Student-facing Task Statement

What do you notice? What do you wonder?



### Student Responses

Students may notice:

- There is a bowl and a jar on a table.
- The bowl is short and wide.
- The jar is tall and skinny.
- Both containers have some water in them.

Students may wonder:

- How much does each container hold?
- Why are the containers partially filled with water?
- Which container holds more?

### Launch

- Groups of 2
- Display the image.
- “What do you notice? What do you wonder?”
- 1 minute: quiet think time

### Activity

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Share and record responses.

### Synthesis

- “Which container do you think can hold the most water? Why?” (I think the bowl would hold more because it’s so wide. I think the cup would hold the most since it’s so tall. I’m not sure because they are such different shapes.)
- “When we think about how much a container can hold, we are thinking about the **liquid volume**. Liquid volume is the amount of space that a liquid takes up.”
- “How might we find out for sure which container holds the largest liquid volume?”

Sample responses:

- Fill up the bowl and the jar, and pour the liquid into a third container one at

- How could we measure the amount that each container would hold?
  - time and compare how high the liquid goes.
  - Fill up the bowl and pour into an empty jar. If it doesn't fill up the jar, that means the bowl holds less than the jar. If it spills over, that means the bowl holds more than the jar.
  - Use a smaller container, like a spoon or a small cup, to fill both and see how many spoonfuls or cupfuls are needed for each.

## Activity 1

🕒 20 min

### Liquid Volume Estimation Exploration

#### Standards Alignments

Addressing 3.MD.A.2

In this activity, students explore liquid volumes by estimating and comparing them. They use a unit container to fill two containers, A and B, to determine which container holds a greater liquid volume.

To make the comparison interesting, containers A and B should be different in size and shape but could hold similar liquid volumes. Consider, for example, a bowl and a cup. The unit container should be small enough so that multiple iterations are needed to fill and compare containers A and B. Consider a large spoon or a small measuring cup.

To involve every student in the measuring process, consider assigning roles of “filler” and “recorder” for container A, then switch roles for container B.

The purpose of an Estimation Exploration is to practice the skill of estimating a reasonable answer based on experience and known information. It gives students a low-stakes opportunity to share a mathematical claim and the thinking behind it (MP3). Asking oneself “Does this make sense?” is a component of making sense of problems (MP1). Making an estimate or a range of reasonable answers with incomplete information is a part of modeling with mathematics (MP4).

## Required Preparation

Each group of 4 needs:

- a supply of water (1 liter bottles would work and could be reused for the next activity)
- two containers that are different in shape, but close in size, each labeled with “A” and “B”
- a small container labeled with “unit,” such as a large spoon, film canister, or a small measuring cup
- a tray or towel to work on (optional)



## Student-facing Task Statement

Your teacher will give you two containers labeled “A” and “B,” and another container labeled “unit.”

1. How many units do you think container A will hold?

Record an estimate that is:

too low	about right	too high

2. How many units do you think container B will hold?

Record an estimate that is:

too low	about right	too high

3. Use the unit container to compare the liquid

## Launch

- Groups of 4
- Give each group of 4 students a tray with water and containers labeled with “A,” “B,” and “unit”.
- Display three containers labeled “A,” “B,” and “unit” for all to see.
- “How could we use the small container labeled ‘unit’ to compare containers A and B?” (We could see how many of the small containers full of water fit in containers A and B. The one that holds the most holds the most liquid volume.)

## Activity

- “Take a minute to estimate how many unit containers of water will fit in containers A and B. What is an estimate that’s too high? Too low? About right?”
- 1–2 minutes: independent work time
- “Share your responses and reasoning with



volume that containers A and B hold. Which container holds the greater volume? How do you know?

### Student Responses

1. Sample response:

too low	about right	too high
10	20	30

2. Sample response:

too low	about right	too high
15	24	40

3. Sample response: Container A holds the greater volume because it took 18 unit containers to fill it, but it only took 15 unit containers to fill container B.

your group.”

- 1–2 minutes: group discussion
- “Now work with your group to compare the liquid volumes that containers A and B hold.”
- 5–7 minutes: group work time

### Synthesis

- “How did the unit container help us compare the liquid volume the containers can hold?” (We can count how many units fit in each container so we could compare them.)

## Activity 2

Liquid Volume in Liters

🕒 15 min

👤 ↔ 👤 PLC Activity

### Standards Alignments

Addressing 3.MD.A.2

The purpose of this activity is to introduce students to liters as a formal unit to measure liquid volume. Students learn how much liquid is contained in a liter, then the whole class fills a large clear container with water one liter at a time. As the container is filled students mark the container with a dry erase marker to show the amount of liters in the container.

While it is highly recommended that the class has the experience of filling and marking the container, a video has been provided to show the process and could be used for a class demonstration. Having more than one 1-liter container or some prefilled 1-liter containers will make the process of filling and marking the container go faster.

### Access for English Learners

*MLR5 Co-Craft Questions.* Keep books or devices closed. Display only the large clear container and 1 liter of water, or the image if using the video for this activity, without revealing the questions. Ask students to write down possible mathematical questions that could be asked about the situation. Invite students to compare their questions before revealing the task. Ask, “What do these questions have in common? How are they different?” Reveal the intended questions for this task and invite additional connections.

*Advances: Reading, Writing*

### Access for Students with Disabilities

*Engagement: Provide Access by Recruiting Interest.* Synthesis: Invite students to generate a list of additional examples of items that would be measured in liters that connect to their personal backgrounds and interests.

*Supports accessibility for: Visual-Spatial Processing, Memory*

## Materials to Gather

Markers (dry-erase)

## Required Preparation

Gather the following materials:

- a large clear container that can be written on, such as a gallon water jug with top removed or clear storage bin
- 1-liter container (1-liter water bottle, measuring cup, etc.)
- a supply of water (enough to fill the larger container)
- OR the Liquid Volume in Liters video: <https://vimeo.com/451620298>

## Student-facing Task Statement

How many liters of water will fit in the large container?

Record an estimate that is:

too low	about right	too high

## Launch

- Display the large clear container and 1 liter of water, or the image of the container and 1 liter of water at the beginning of the video if using the video for this activity.
- “This is a metric unit that we can use to measure how much space a liquid takes up. It’s called a **liter**. We can use a liter to measure liquid volume, just like we can use an inch to measure length.”

## Student Responses

Sample responses:

- Too low: 1–5
- About right: 5–20
- Too high: 20 or higher

- “How many liters will fit in the large container? What is an estimate that’s too high? Too low? About right?”
- 1 minute: quiet think time
- 1 minute: partner discussion
- Share and record responses.

## Activity

- “Let’s see how many liters of water will fit in this container by filling it one liter at a time and marking it to keep track of how many liters we use.”
- Invite groups of 2 students to pour water and mark the container, one liter at a time. One partner pours, then the other marks the container with a line at the new level of the liquid.
- Continue pouring and marking until the container can no longer fit a liter.
- “How many liters fit in the container?” (It fit 9 liters, but there was space for a little more. It was almost 10 liters. It was about  $9\frac{1}{2}$  liters.)

## Synthesis

- “How would we label the marks to show the number of liters each mark shows?” (We would label the bottom mark with 1, then the one above it with 2, and keep labeling up to the top mark. The bottom of the container would be 0 liters.)
- Label the marks with numbers.
- “How is the bottom of the container like the edge of a ruler?” (They both show zero. The bottom of the container is like the zero mark on a ruler.)
- “Liters can be abbreviated with an upper case L. We could show that each number represents a number of liters by writing an uppercase L next to each number.”

- Write “L” next to each number on the container that was marked and labeled.
- “This container can hold \_\_ liters. What are some other containers that you’ve seen that can hold about the same liquid volume?” (A large sink. A storage bin. A large jug of water. A bucket. A small trash can.)

## Lesson Synthesis

🕒 10 min

“Today, we learned what liquid volume is.”

“How would you describe liquid volume to someone who didn’t know what it is?” (The amount of space that a liquid takes up.)

“Have you seen containers that were labeled with the amount of liquid volume they contained? Can you give some examples?” (Bottles of drinks or oil. Jugs of detergent or liquid soap.)

## Suggested Centers

- Creating Line Plots (2–5), Stage 2: Quarter Inches (Addressing)
- Target Measurements (2–5), Stage 2: Quarter Inches (Addressing)

## ----- Complete Cool-Down -----

## Response to Student Thinking

Students have ideas they could share with a partner.

## Next Day Support

- After the warm-up in the next lesson, pair students up to discuss their responses.

## Lesson 8: Estimate and Measure Liquid Volume

### Standards Alignments

Addressing 3.MD.A.2, 3.NF.A, 3.OA.C.7

### Teacher-facing Learning Goals

- Measure and estimate liquid volumes of objects using standard units of liters (L).

### Student-facing Learning Goals

- Let's measure and estimate liquid volume.

### Lesson Purpose

The purpose of this lesson is for students to use liters to measure and estimate liquid volumes.

In previous lessons, students learned that liquid volume is a measurable attribute and that liters can be used to measure liquid volume. Students use this experience to match containers with estimated liquid volumes they can hold. They compare the marks on a ruler to the marks on a container and learn to use a container with liter marks to measure liquid volume.

This lesson has a Student Section Summary.

### Access for:



#### Students with Disabilities

- Engagement (Activity 2)



#### English Learners

- MLR8 (Activity 1)

### Instructional Routines

Number Talk (Warm-up)

### Lesson Timeline

Warm-up	10 min
Activity 1	15 min
Activity 2	20 min
Lesson Synthesis	10 min
Cool-down	5 min

### Teacher Reflection Question

What ideas do students have about liquid volume from their everyday lives? How did it influence their ideas in this lesson?

**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

Measure in Liters

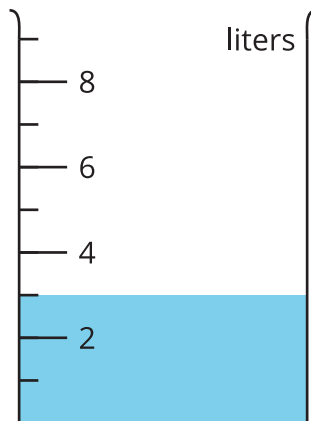
**Standards Alignments**

Addressing 3.MD.A.2, 3.NF.A

**Student-facing Task Statement**

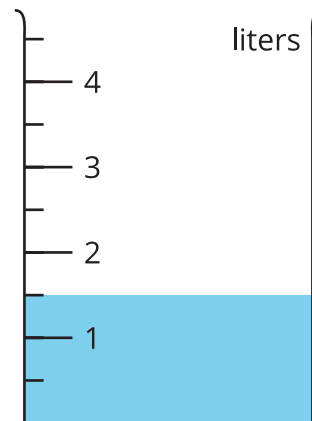
What is the volume of the liquid shown in each image?

1



---

2



---

**Student Responses**

1. 3 liters
2.  $1\frac{1}{2}$  liters

----- Begin Lesson -----

**Warm-up**

⌚ 10 min

Number Talk: Divide by 3

## Standards Alignments

Addressing 3.OA.C.7

The purpose of this Number Talk is to elicit strategies and understandings students have for dividing within 100 and to help students develop fluency.

When students use known multiplication and division facts to divide larger numbers, they look for and make use of structure (MP7).

## Instructional Routines

Number Talk

### Student-facing Task Statement

Find the value of each expression mentally.

- $30 \div 3$
- $60 \div 3$
- $63 \div 3$
- $54 \div 3$

### Student Responses

- 10: I counted by 10. I knew that  $3 \times 10$  is 30.
- 20: I knew that 10 groups of 3 makes 30 so you would need 10 more groups of 3 to make 60, so the quotient is 20.
- 21: I knew that 20 groups of 3 is 60. One more group of 3 would make 63, so it would be 21 groups.
- 18: I knew that 20 groups of 3 is 60. So, 19 groups of 3 would be 57 and 18 groups of 3 would be 54.

### Launch

- Display one expression.
- "Give me a signal when you have an answer and can explain how you got it."
- 1 minute: quiet think time

### Activity

- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.

### Synthesis

- "How did you use division facts that you already know to find some of the other quotients?" (I knew that  $60 \div 3$  would be double the answer of  $30 \div 3$ . Once I knew  $60 \div 3$ , I was able to find  $63 \div 3$  by adding another group of 3 and  $54 \div 3$  by taking groups of 3 away.)

## Activity 1

 15 min

Estimate Liquid Volume

## Standards Alignments

Addressing 3.MD.A.2

The purpose of this activity is for students to estimate liquid volumes in liters. First, students consider the number of liters it could take to fill a bathtub. Then, students match a variety of containers to the number of liters they could hold, using their experience from the previous lesson to support their reasoning.

In order to solve these problems, students rely on their experience as well as information provided by the photos of different objects. They also rely on their ability to make reasoned estimates (MP4). The activity provides students an opportunity to share their thinking and critique the reasoning of others (MP3).

### Access for English Learners

*MLR8 Discussion Supports.* Synthesis: Provide students with the opportunity to rehearse what they will say with a partner before they share with the whole class.

*Advances: Speaking*

## Student-facing Task Statement

1. Clare says the bathtub holds about 2 liters.

Jada says the bathtub holds about 20 liters.

Kiran says the bathtub holds about 200 liters.

Whom do you agree with? Explain or show your reasoning.

2. Would the bucket and the bottle hold 2 liters, 20 liters, or 200 liters? Explain how you know.



## Launch

- Groups of 2
- “Today we’re going to think about some containers that hold liquids. What are some containers that you’ve seen that hold liquid?” (cups, bowls, buckets, sinks, milk cartons, a pool)
- 30 seconds: quiet think time
- Share responses.
- Display the image and Clare, Jada, and Kiran’s ideas about how much water the bathtub holds.
- “Take a moment to think about how many liters of water the bathtub holds and whose reasoning you agree with.” (I agree with Kiran because 2 liters is less than the amount we put in the jug yesterday and I don’t think 20 liters would fill the bathtub. I think it would take 200 liters.)





3. Match the containers to the number of liters they could hold. Be ready to explain your reasoning.

item	number of liters
------	------------------

a. sink



- 4 liters
- 6 liters
- 500 liters
- 10 liters

b. kiddie pool



c. pot



d. toilet tank



- 30 seconds: quiet think time
- 1 minute: partner discussion
- Share responses.
- “What other containers could hold about 200 liters?” (a larger trash can, a kiddie pool)
- Share responses.

### Activity

- “Now, work with your partner to estimate how many liters some other items hold.”
- 5–7 minutes: partner work time
- Monitor for students who refer back to the experiences in the previous lesson as they reason about the liquid volume each container can hold.

### Synthesis

- Select previously identified students to share their responses and reasoning.
- “What strategies were useful as you estimated the liquid volume that different containers can hold?” (I thought about how much 1 liter was and how many times it could be poured into the container before it was full. I thought about the marks on the container we filled and whether the container would be more or less.)

### Student Responses

1. Sample response: I agree with Kiran that it would take 200 liters. Two liters is less than the amount we put in the jug yesterday and I don’t think 20 liters would fill the bathtub.

2. Sample response: I think the bottle would take 2 liters because it's just a little bit larger than a liter. The bucket would take 20 liters because it is even larger than the container we filled yesterday.
3.     a. 6 liters  
        b. 500 liters  
        c. 4 liters  
        d. 10 liters

## Activity 2

🕒 20 min

### Measure Liquid Volume

#### Standards Alignments

Addressing     3.MD.A.2

The purpose of this activity is for students to measure liquid volume using liters. Students compare the liter marks on a container for measuring liquid volume to the marks on a ruler before they use images of containers marked in liters to determine or show the volume of liquid in each container.

#### 🕒 Access for Students with Disabilities

*Engagement: Provide Access by Recruiting Interest.* Leverage choice around perceived challenge. Invite students to select 6 out of the 8 parts of problem 1 and 3 out of the 5 parts of problem 2 to complete.

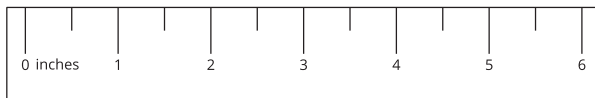
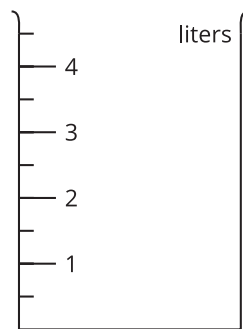
*Supports accessibility for: Organization, Attention, Social-emotional skills*

#### Student-facing Task Statement

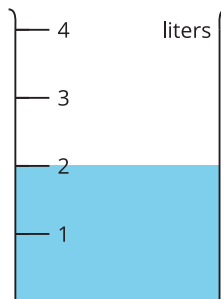
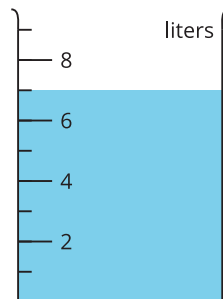
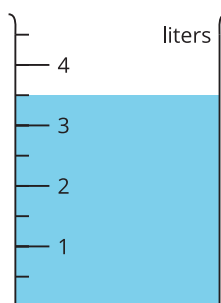
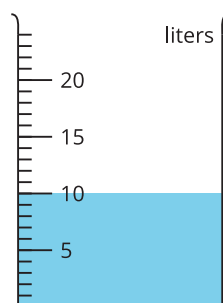
What do you notice? What do you wonder?

#### Launch

- Groups of 2
- Display the images.
- "What do you notice? What do you wonder?" (Students may notice: The ruler



1. The container in each image is marked in liters. Find the volume of the liquid.

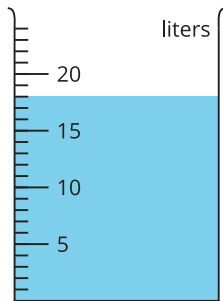
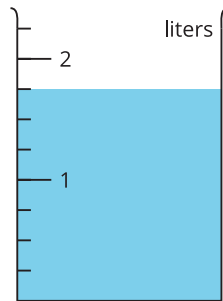
**A****B****C****D****E****F**

and the containers have marks for measuring. The marks on the ruler go side to side, but the marks on the container go up and down. They both show zero, but on the ruler there is a zero mark and for the container it's just the bottom. Students may wonder: What is the diagram supposed to be? Could we use a ruler to measure liquid volume?)

- 1 minute: quiet think time
- 1 minute: partner discussion
- Share and record responses.
- "How are the marks on the container and the marks on the ruler alike? How are they different?" (They are all used to measure. The ruler measures length, but the containers measure volume. The scale on the containers is vertical, but the ruler is horizontal.)
- 1 minute: partner discussion
- Share responses.
- If no students mention the zero mark, ask "Where is zero on the containers?"

### Activity

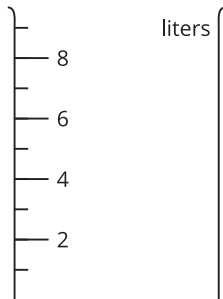
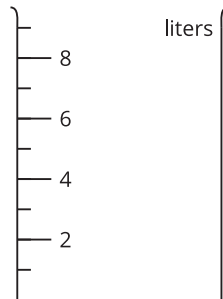
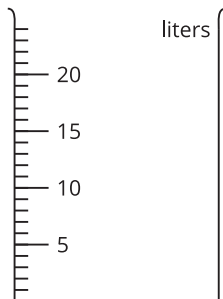
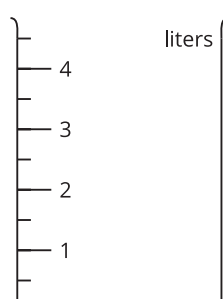
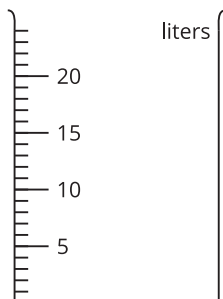
- "The container in each image is marked in liters. Work with your partner to find the volume when the liquid is shown, and to show the liquid when the volume is given."
- 7–10 minutes: partner work time
- If students finish early, have them answer the following questions:
  - "How many liters would you have if you combined the two containers with the most liquid? Show or explain your reasoning."
  - "Find a combination of liquid volumes that would fill the largest container to the top mark?"

**G****H**

## Synthesis

- “If the level of the liquid was between two numbers, how did you figure out what the marks represented?” (I thought about what was between the numbers. I knew that 7 was between 6 and 8, but  $3\frac{1}{2}$  is between 3 and 4. For the last one, I saw that the numbers went up by 5, so I thought each mark would be a liter.)

2. Shade the images of the empty containers to show the liquid volume.

**P: 1 liter****Q: 8 liters****R: 7 liters****S:  $2\frac{1}{2}$  liters****T: 23 liters**

3. If you have time: Of all the containers in this activity, which two containers have the most liquid? How many liters would you have if you combined the liquid in them? Explain or show your reasoning.

### Student Responses

1.
  - A. 3 liters
  - B. 5 liters
  - C. 2 liters
  - D. 7 liters
  - E.  $3\frac{1}{2}$  liters
  - F. 10 liters
  - G. 18 liters
  - H.  $1\frac{3}{4}$  liters
2. Each container is shaded up to the specified mark (1 liter for P, 8 liters for Q, 7 liters for R,  $2\frac{1}{2}$  liters for S, and 23 liters for T).
3. If you have time: G and T have the most liquids: 18 liters and 23 liters. Combining them would give 41 liters, because  $18 + 23 = 41$ .

### Advancing Student Thinking

If students interpret the shorter tick marks on the container as fractional amounts, consider asking:

- “Look at the marks on container D. What number is halfway between 2 and 4, or between 4 and 6?”
- “Look at the marks on container F. There are 4 tick marks that are equally spaced between 10 and 15. What numbers could they represent?”

## Lesson Synthesis

 10 min

“Today we measured and estimated liquid volume in liters.”

“What are some tips you would give someone as they use containers marked in liters to measure liquid volume?” (You have to know that the zero mark is the bottom of the container. The amount of liters goes up as you fill the container. Each mark represents a liter. If the level of the liquid is in between numbers, you need to figure out what the marks in between the numbers represent.)

## Suggested Centers

- Creating Line Plots (2–5), Stage 2: Quarter Inches (Addressing)
- Target Measurements (2–5), Stage 2: Quarter Inches (Addressing)

## Student Section Summary

In this section, we learned how to measure and estimate weight in grams and kilograms.

This paper clip weighs *about* 1 gram.



This basket of apples weighs *about* 1 kilogram.



We also learned how to measure and estimate liquid volume in liters.



## ----- Complete Cool-Down -----

### Response to Student Thinking

Students say the volume is 2 liters or 4 liters in the first container and 1 liter or 2 liters in the second container.

### Next Day Support

- Before the warm-up, invite students to work in small groups to discuss a correct response to this cool-down.

## Section C: Problems Involving Time

### Lesson 9: Time to the Nearest Minute

#### Standards Alignments

Addressing 3.MD.A.1

#### Teacher-facing Learning Goals

- Tell and write time to the nearest minute.

#### Student-facing Learning Goals

- Let's tell and write time to the nearest minute.

#### Lesson Purpose

The purpose of this lesson is for students to tell and write time to the nearest minute.

In previous grades, students learned to tell and write time from analog and digital clocks to the nearest five minutes, and to use a.m. and p.m. In this lesson, students build on this work to understand that they can tell time to the nearest minute, using the marks between the numbers that show the 5-minute increments. They also draw hands on a clock to show a given time. As students represent time on the clock and tell time to the minute, they may be off by 1 or 2 minutes. This level of precision is sufficient for the work of this lesson.

#### Access for:

##### Students with Disabilities

- Engagement (Activity 1)

##### English Learners

- MLR8 (Activity 1)

#### Instructional Routines

Estimation Exploration (Warm-up)

#### Lesson Timeline

Warm-up	10 min
Activity 1	20 min

#### Teacher Reflection Question

How did students leverage their knowledge of telling time to the nearest 5 minutes from grade 2 while learning to tell time to the nearest minute today?

Activity 2	15 min
Lesson Synthesis	10 min
Cool-down	5 min

## Cool-down (to be completed at the end of the lesson)

⌚ 5 min

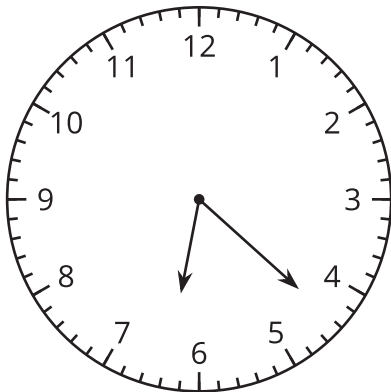
Times Like These

### Standards Alignments

Addressing 3.MD.A.1

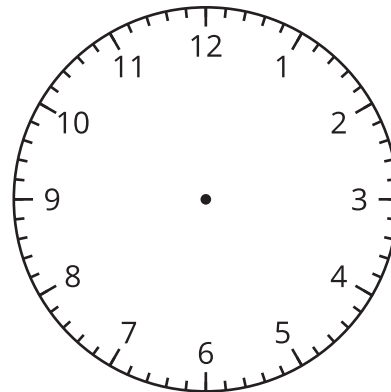
### Student-facing Task Statement

1



What time is shown? \_\_\_\_\_

2

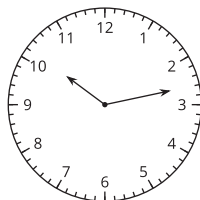


Show 10:13 a.m. on the clock.

### Student Responses

1. 6:22

2.





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**Begin Lesson**


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**Warm-up**

🕒 10 min

Estimation Exploration: On the One Hand . . .

**Standards Alignments**

Addressing 3.MD.A.1

The purpose of this Estimation Exploration is for students to make sense of times that would be reasonable with only the hour hand as a reference on a clock.

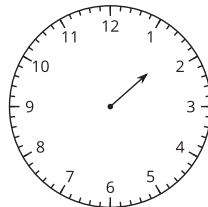
**Instructional Routines**

Estimation Exploration

**Student-facing Task Statement**

This clock only has an hour hand.

What time could it be?



Record an estimate that is:

too early	about right	too late

**Student Responses**

Sample responses:

- Too early: 1:00-1:20
- About right: 1:30-1:45
- Too late: 1:50-2:00

**Launch**

- Groups of 2
- Display image.
- “What is an estimate that’s too late?” “Too early?” “About right?”
- 1 minute: quiet think time

**Activity**

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Record responses.

**Synthesis**

- “How did you know that the hour was 1?” (The hour hand passes between 1 and 2 as the time goes from 1:00 to 2:00.)
- Consider asking:
  - “How did you decide how far past 1:00 it was?” (It has to be a little past 1:30 since the hour hand is a little more than halfway between the 1 and the 2.)

## Activity 1

🕒 20 min

### Just a Clock on the Wall

#### Standards Alignments

Addressing 3.MD.A.1

The purpose of this activity is for students to tell and write time to the nearest minute. They learn that there are 60 small tick marks around the clock to show each of the 60 minutes in 1 hour. The work here gives students a reason to attend to the features of the clock and use them to tell time more precisely (MP6). The synthesis provides an opportunity to discuss how the clock does not indicate whether the time is a.m. or p.m.

#### 🌐 Access for English Learners

*MLR8 Discussion Supports.* Synthesis: Create a visual display of a clock. As students share their strategies, annotate the display to illustrate connections. For example, next to each number or tick mark, write the minutes the student indicates.

*Advances: Speaking, Representing*

#### ♿ Access for Students with Disabilities

*Engagement: Provide Access by Recruiting Interest.* Provide choice and autonomy. Provide access to colored pencils for students to color the minute hand one color and the hour hand a different color so they can determine the time on each clock.

*Supports accessibility for: Attention*

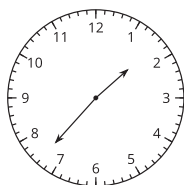
### Student-facing Task Statement

1. Lin says the time shown on the clock is 1:37 p.m.

Diego says the time is 1:35 p.m.

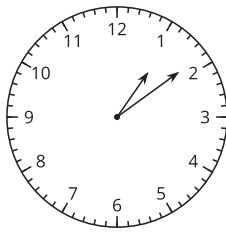
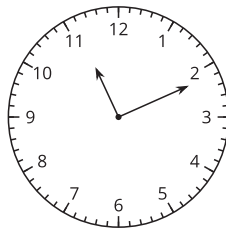
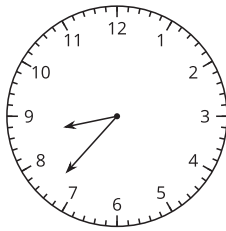
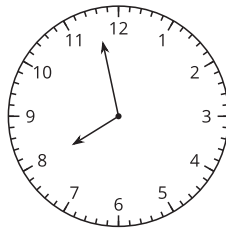
Who do you agree with?  
Explain or show your reasoning.

2. What time is shown on each clock?



### Launch

- Groups of 2
- “Take some time to think about the time Lin and Diego think this clock is showing.”
- 1-2 minutes: quiet think time
- “Talk to your partner about who you agree with and why.”
- 2 minutes: partner discussion
- Monitor for students who notice that the minute hand is not pointing to the 7 or the

**A****B****C****D**

## Student Responses

1. Sample response: I agree with Lin. The hour hand is between 1 and 2, so the hour is 1. The minute hand is not at the 7. It is 2 of the little tick marks past the 7. The minute hand would be at the 7 if it were 1:35, so it's 2 more minutes to where the minute hand is.
2.
  - a. 1:09
  - b. 11:11
  - c. 8:37
  - d. 7:58

8 but is in between the two numbers.

- Invite students to share their responses and reasoning.
- "There are 60 small tick marks around the clock to show each of the 60 minutes in 1 hour. We know it is 1:37 since the minute hand is at the thirty-seventh tick mark."

## Activity

- "Work with your partner to determine what time is shown on each of these clocks."
- 2-3 minutes: partner work time
- Monitor for different ways that students determine the minutes, such as:
  - Counting by 5 and then by 1
  - Starting at a time they know and counting on or back

## Synthesis

- Invite students to share how they knew the time on each clock. Emphasize strategies for telling time to the nearest minute.
- Consider asking:
  - "Were there any times that confused you at first or were harder to tell?" (On the fourth clock, I thought the hour might be 8.)
  - "Does anyone have suggestions for how to handle some of the times that could create confusion?"
- If not mentioned by students, ask: "Were you able to tell whether the time on the clock was a.m. or p.m.?" (No, the clock doesn't tell us whether it is a.m. or p.m., we'd need more information to know that.)

## Advancing Student Thinking

If students tell the time to the nearest 5 minutes, consider asking:

- “Tell me how you found the time.”
- “How could you use a time that you know to find the time to the nearest minute?”

## Activity 2

🕒 15 min

### Show Time

#### Standards Alignments

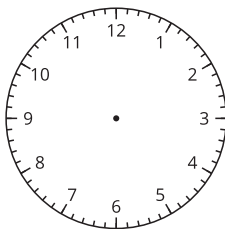
Addressing 3.MD.A.1

The purpose of this activity is for students to tell and write time to the nearest minute as they draw times on blank clocks.

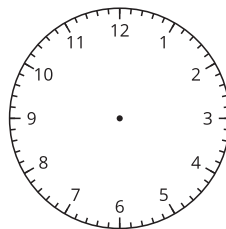
#### Student-facing Task Statement

1. Show the time given on each clock.

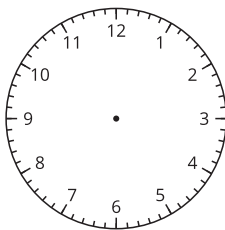
**A 2:36 PM**



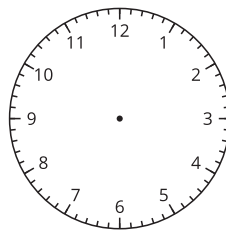
**B 3:18 PM**



**C 12:17 PM**



**D 9:02 PM**



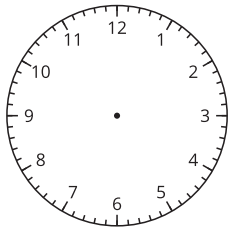
2. Draw a time on this clock. Trade with a partner and tell the time on their clock.

#### Launch

- Groups of 2
- “Let’s use what you know about telling time to the nearest minute to practice writing times on clocks.”
- “What are some important things to remember when you are drawing the time on a blank clock?” (Show the difference between the minute and hour hand clearly. Be careful in drawing the location of each hand.)
- 30 seconds: partner discussion
- Share responses.

#### Activity

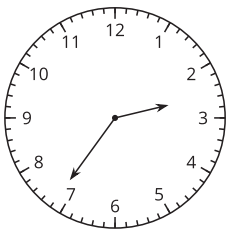
- “As you work, discuss your work and any questions you have with your partner.”
- 5-7 minutes: partner work time



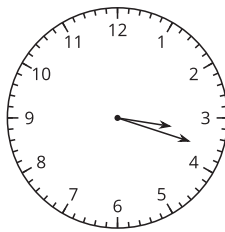
## Student Responses

1.

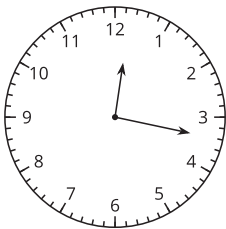
a.



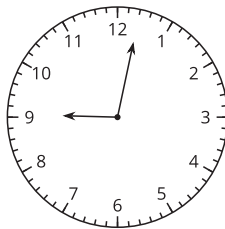
b.



c.



d.



2. Answers vary.

## Synthesis

- Invite students to share the times they drew on the clocks. Emphasize how they distinguish between the hour and minute hands for someone else to be clear on the time they are showing.
- Consider asking:
  - “Were there any times that confused you at first or were harder to show?” (For 3:18 I had to draw the hands really close together.)
  - “Does anyone have suggestions for how to handle some of the times that might be hard to show?”
- “When you were drawing a time for your partner, what did you have to keep in mind?” (To make sure to show the difference between the minute and hour hands clearly, to be precise in what minute the hand was pointing to.)

## Advancing Student Thinking

If students do not draw hands that are clearly different lengths for the hour hand and minute hand, consider asking:

- “Tell me about how you decided where to draw each hand.”
- “How could you make it easier to tell the hour hand from the minute hand?”

## Lesson Synthesis

🕒 10 min

Display a clock from the lesson.

“How was telling time different today than how you have told time in the past?” (In the past, we told time to the nearest 5 minutes. Today we told time to the nearest minute.)

“If you were going to explain to a friend how to tell time to the nearest minute, what would be the most important ideas you would want to share with them?” (Pay attention to which hand is the hour hand and which hand is the minute hand. Then, see what numbers the hour hand is between since it moves between two numbers during the hour. For the minute hand, we start at the nearest 5 minutes, like 35 minutes, and then count the minutes one-by-one, like 36, 37.)

### Suggested Centers

- Creating Line Plots (2–5), Stage 2: Quarter Inches (Addressing)
- Target Measurements (2–5), Stage 2: Quarter Inches (Addressing)

### ----- Complete Cool-Down -----

#### Response to Student Thinking

Students do not tell or write time to the nearest minute, only the nearest 5 minutes.

The work in this unit builds from time concepts developed in a prior unit.

#### Next Day Support

- Before the warm-up, invite students to work in small groups to discuss a correct response to this cool-down.

#### Prior Unit Support

Grade 2, Unit 6, Section C: Time on the Clock

# Lesson 10: Solve Problems Involving Time (Part 1)

## Standards Alignments

Addressing 3.MD.A.1

### Teacher-facing Learning Goals

- Solve problems involving addition and subtraction of time intervals in minutes in a way that makes sense to them.

### Student-facing Learning Goals

- Let's solve problems involving time.

## Lesson Purpose

The purpose of this lesson is for students to solve problems involving addition and subtraction of time intervals in minutes in a way that makes sense to them.

In a previous lesson, students learned to tell and write time to the nearest minute. In this lesson, students reason about elapsed time using any representation that makes sense to them, such as the number line, tables, equations, and words. Students consider a variety of representations so that they can make connections and possibly use them in the next lesson (MP2).

### Access for:



#### Students with Disabilities

- Action and Expression (Activity 1)



#### English Learners

- MLR7 (Activity 1)

## Instructional Routines

5 Practices (Activity 1), Choral Count (Warm-up)

### Lesson Timeline

Warm-up	10 min
Activity 1	25 min
Activity 2	10 min
Lesson Synthesis	10 min
Cool-down	5 min

### Teacher Reflection Question

How did you see students applying familiar representations to new situations in this lesson? How will you make use of their ideas as they solve problems involving time intervals in a future lesson?

**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

Soccer Time

**Standards Alignments**

Addressing 3.MD.A.1

**Student-facing Task Statement**

Clare leaves school at 3:25 p.m. Her soccer practice begins at 4:15 p.m. How much time does she have to get to the soccer field? Explain or show your reasoning.

**Student Responses**

50 minutes. Sample response: 3:25 to 3:30 is 5 minutes. Then it's 45 minutes to 4:15.

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**Begin Lesson**

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**Warm-up**

⌚ 10 min

Choral Count: Fifteens

**Standards Alignments**

Addressing 3.MD.A.1

The purpose of this Choral Count is to invite students to practice counting times by 15 minutes and notice patterns in the count. This will be helpful later in this section when students will solve problems involving addition and subtraction of time intervals.

Students have an opportunity to notice regularity through repeated reasoning (MP8) as they count by 15 minutes over a span of 3 hours.

**Instructional Routines**

Choral Count



## Student Responses

Sample responses:

- Every 4 counts you get to a new hour.
- Three hours pass during the count because you go from 12:00 to 3:00.
- The minutes have a pattern of 00, 15, 30, 45, then back to 00, which is the next hour.

## Launch

- "Count by 15 minutes, starting at 12:00."
- Record as students count. Record times in the count in a single column.
- Stop counting and recording at 3:00.

## Activity

- "What patterns do you see?"
- 1–2 minutes: quiet think time
- Record responses.

## Synthesis

- "How much time passed between 1:15 and 1:45?" (30 minutes) "1:15 and 2:30?" (75 minutes)
- Consider asking:
  - "Who can restate the pattern in different words?"
  - "Does anyone want to add an observation on why that pattern is happening here?"
  - "Do you agree or disagree? Why?"

## Activity 1

Time at the Bus Stop

 25 min

   PLC Activity

### Standards Alignments

Addressing 3.MD.A.1

In this activity, students solve problems involving elapsed time in a way that makes sense to them. Although the problem type may be new, students can reason about them using their understanding of time and of addition and subtraction. They can also support their reasoning by drawing on a clock.

In each problem, students are given a start time and an elapsed time of 24 minutes. To find each end time, students may:

- use words to describe their thinking
- write a series of numbers and symbols to show how 24 minutes is added to the start time
- create a table to track changes in time from the start time to 24 minutes later
- show incremental “jumps” that add up to 24 minutes on the clock
- use a linear representation to show incremental changes from the start time to 24 minutes later

To elicit and discuss as many possible strategies and representations for reasoning about the problems, significant time is allocated for this activity. Students may choose to use any of the strategies or representations they see here to solve elapsed time problems in future lessons.

When they determine what time different events occurred based on the initial time and the 24 minutes of elapsed time students reason abstractly and quantitatively(MP2).

### **Access for English Learners**

*MLR7 Compare and Connect. Synthesis:* Lead a discussion comparing, contrasting, and connecting the different representations. Ask, “How are the representations alike?”, “How are they different?”, “How do 24 minutes show up in each representation?”

*Advances: Representing, Conversing*

### **Access for Students with Disabilities**

*Action and Expression: Internalize Executive Functions.* Invite students to plan a strategy, including the tools they will use, for solving the elapsed time story problem. If time allows, invite students to share their plan with a partner before they begin.

*Supports accessibility for: Organization*

## **Instructional Routines**

5 Practices

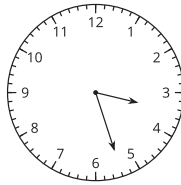
### **Student-facing Task Statement**

1. Kiran arrived at the bus stop at 3:27 p.m., as shown on this clock. He waited 24 minutes for his bus to arrive.

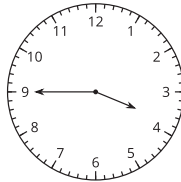
### **Launch**

- Groups of 2
- “Have you ever ridden a bus? When or where?” (I ride a school bus to school. I ride the city bus with my parents. I rode a bus at the airport to get to our car in the

What time did his bus arrive?  
Show your thinking. Organize  
it so it can be followed by  
others.



2. Elena arrived at the bus stop  
at 3:45 p.m. She also waited  
24 minutes for her bus to  
arrive.



What time did the bus arrive?  
Show your thinking. Organize  
it so it can be followed by  
others.



## Student Responses

1. 3:51 p.m. Sample responses:
  - It's 3 minutes to 3:30, 20 minutes to 3:50, and then 1 more minute to 3:51.
  - $27 + 24 = 51$ , so 24 minutes after 3:27 is 3:51.
  - If he waited 30 minutes, then it would be 3:57. Twenty-four is 6 less than 30, and 6 minutes before 3:57 is 3:51.
2. 4:09 p.m. Sample responses:
  - It's 10 minutes to 3:55, 5 minutes to 4:00, and then 9 minutes to 4:09. That's a total of 24 minutes.
  - $45 + 10 = 55$  and  $55 + 5 = 60$ . That's 4:00 and then it's 9 more minutes, so the bus arrived at 4:09.

parking lot.)

- "What are some things you need to know about when you ride the bus?" (What time will the bus come? How often does the bus come? Where does the bus pick you up? Where are you getting off? How long will your bus ride take? How much does the bus cost?)
- 1–2 minutes: partner discussion
- Share and record responses.

## Activity

- "Now solve the problems about Kiran and Elena riding the bus. Show your thinking in any way that makes sense to you."
- 8–10 minutes: independent work time
- As students work, consider asking:
  - "How does your work show the 24 minutes Kiran or Elena waited?"
  - "How does your work show the time the bus arrived?"
  - "How did you know it would be before or after 4:00 when the bus arrived?"
- Monitor for and identify students who use the strategies listed in the activity narrative.

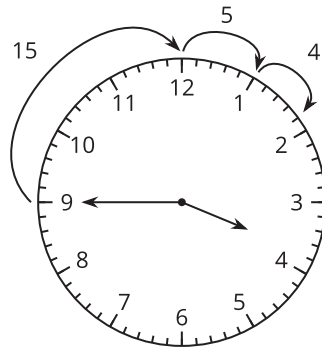
## Synthesis

- Select previously identified students to share their responses in any order. Display or record their representations for all to see.
- "In Elena's problem, how does each of the strategies help us see that the bus would come after 4:00?" (If we add the minutes and get a sum that is more than 60, we know that it's a new hour. On the clock, we can see that there are only 15 minutes until 4:00, so 24 minutes would be past 4:00.)

○

time	minutes
3:45	0
4:00	15
4:05	20
4:09	24

○



○

3:45  $\xrightarrow{+15}$  4:00  $\xrightarrow{+5}$  4:05  $\xrightarrow{+4}$  4:09

## Advancing Student Thinking

If students say they aren't sure how to show their thinking, consider asking:

- "What is the problem about?"
- "What representations have we used with addition and subtraction that could be used here to show your thinking?"

## Activity 2

🕒 10 min

Time on the Bus

### Standards Alignments

Addressing 3.MD.A.1

In this activity, students encounter another type of elapsed-time problem in which the start and end times are given but the elapsed time is not. Students consider possible strategies they saw earlier that could be used to find elapsed time. Although they are not required to solve the problem, students may choose to do so as they think about ways to reason abstractly and quantitatively about the solution (MP2).

## Student-facing Task Statement

Here's another problem about time:

At 6:32 p.m., Elena got on a bus to go home. She got off the bus at 7:10 p.m.  
How long was her bus ride?

Which strategy or representation would you use when solving a problem like this? Explain your reasoning.

## Student Responses

Sample responses:

- I would add up from 6:32 until I reach 7:10. It's 8 minutes from 6:32 to get to 6:40 and 3 groups of 10 minutes to 7:10, or  $8 + 10 + 10 + 10$ .
- I would show 6:32 on a clock, draw jumps to reach 7:10, and add the minutes for all the jumps. For example, it's a jump of 3 minutes from 6:32 to 6:35, then 7 jumps of 5 minutes to 7:10. That's  $3 + (7 \times 5)$  or  $3 + 35$ , which is 38.
- I would find the difference between 32 and 60 (which is 28) and between 0 and 10 (which is 10), and add the differences.
- I would start at 7:10 and go back 10 minutes to 7:00, then 20 minutes to 6:40, and then 8 minutes to 6:32. Adding 10, 20, and 8 gives the answer.

## Launch

- Groups of 2
- Read the problem as a class.
- "How is this problem like the ones we saw earlier?" (They are all about the passing of time and are related to riding the bus. The start time is given in all of them.) "How is this one different?" (The arrival time is given here, and the amount of time that has passed is missing.)
- 1 minute: quiet think time
- Share responses.

## Activity

- "How would you solve this problem? Explain which strategies or representations you saw earlier that would be useful for solving a problem like this."
- 5–7 minutes: independent work time

## Synthesis

- Invite students to share their reasoning and strategies. Display or record different representations for all to see.

## Lesson Synthesis

🕒 10 min

"Today we solved problems about time. We saw that we could use many ways to reason about the solutions and different representations to show our thinking."

"Which strategies would you want to keep in mind when you solve future problems about time?"  
(Making a table to keep track of the minutes that have passed. Drawing jumps on a clock and writing down the minutes of each jump before adding them up or seeing where the last jump lands. Using the clock to help me see if the time that passes means going into a new hour. Writing addition or subtraction expressions.)

Record students' ideas and display them in the next lesson.

### Suggested Centers

- Number Puzzles: Addition and Subtraction (1–4), Stage 5: Within 1,000 (Supporting)
- Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting)

### Complete Cool-Down

### Response to Student Thinking

Students do not determine the elapsed time between the time Clare leaves school and the time her soccer practice begins.

### Next Day Support

- During the launch of the next day's activity, brainstorm ways to show your reasoning when solving time problems.

# Lesson 11: Solve Problems Involving Time (Part 2)

## Standards Alignments

Addressing 3.MD.A.1

### Teacher-facing Learning Goals

- Solve problems involving addition and subtraction of time intervals in minutes.

### Student-facing Learning Goals

- Let's solve more problems involving time.

## Lesson Purpose

The purpose of this lesson is for students to solve problems involving addition and subtraction of time intervals in minutes.

In this lesson, students use any strategy and representation to solve problems involving elapsed time. The problems involve unknowns in all positions: start time, end time, and duration. When students recognize the mathematical features of familiar real-world objects and use those features to solve problems, they model with mathematics (MP4).

This lesson has a Student Section Summary.

### Access for:



#### Students with Disabilities

- Representation (Activity 1)



#### English Learners

- MLR8 (Activity 1)

## Instructional Routines

Notice and Wonder (Warm-up)

### Materials to Gather

- Materials from a previous activity: Activity 1

## Lesson Timeline

Warm-up	10 min
Activity 1	15 min

## Teacher Reflection Question

Who got to do math today in class and how do you know? Identify the norms or routines that allowed those students to engage in mathematics. How can you adjust these norms

Activity 2	20 min
Lesson Synthesis	10 min
Cool-down	5 min

and routines so all students do math tomorrow?

## Cool-down (to be completed at the end of the lesson)

 5 min

Time and Time Again

### Standards Alignments

Addressing 3.MD.A.1

### Student-facing Task Statement

Solve each problem. Explain or show your reasoning.

1. Jada had a dance class on Saturday. It started at 10:30 a.m. and ended at 11:48 a.m. How long was her dance class?
2. Another day, Jada finished her dance class at 11:55 a.m. The class was 40 minutes long. What time did her class start?

### Student Responses

1. 78 minutes or 1 hour and 18 minutes. Sample response: I started at 10:30 and jumped 30 minutes to 11:00, 30 more minutes to 11:30, 15 minutes to 11:45, and then 3 minutes to 11:48. I jumped a total of 78 minutes.
2. 11:15 a.m. Sample response:  $55 - 40 = 15$

## ----- Begin Lesson -----

## Warm-up

 10 min

Notice and Wonder: Band Practice



## Standards Alignments

Addressing 3.MD.A.1

The purpose of this warm-up is to elicit the idea that many different questions could be asked about this situation involving time, which will be useful when students solve problems in a later activity.

## Instructional Routines

Notice and Wonder

### Student-facing Task Statement

What do you notice? What do you wonder?

Han ate his dinner before he caught a bus.  
When he got off the bus, he had to hurry to get to  
band practice on time.



### Student Responses

Students may notice:

- Han was on the bus for some amount of time.
- Han had band practice after dinner.
- Han was almost late to band practice.

Students may wonder:

- How long was Han on the bus?
- What time did Han eat dinner?
- What time does band practice start?

### Launch

- Groups of 2
- Display the situation.
- "What do you notice? What do you wonder?"
- 1 minute: quiet think time

### Activity

- "Discuss your thinking with your partner."
- 1 minute: partner discussion
- Share and record responses.

### Synthesis

- "Let's add times to Han's situation. What times could we add?" (The time he started or finished dinner. The amount of time he was on the bus. How long he waited for the bus. The time his band practice started.)
- "What kinds of questions could we ask about this situation?"

## Activity 1

🕒 15 min

On the Bus Again

## Standards Alignments

Addressing 3.MD.A.1

The purpose of this activity is for students to solve problems involving addition and subtraction of time intervals when given times on a clock. Students may choose to show or explain their reasoning in any way, but the clocks are given to encourage use of that representation. Monitor for different ways that students represent their thinking, particularly differences in strategies when the problem involves time crossing the hour mark and when it doesn't.

### Access for English Learners

*MLR8 Discussion Supports.* Synthesis. Display sentence frames to support whole-class discussion: "Can you say more about . . . ?" "Why did you . . . ?"

*Advances: Speaking, Representing*

### Access for Students with Disabilities

*Representation: Develop Language and Symbols.* Synthesis: Make connections between representations visible. *Supports accessibility for: Conceptual Processing, Memory*

## Materials to Gather

Materials from a previous activity

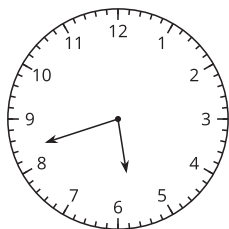
## Required Preparation

- Display students' ideas from the lesson synthesis in the previous lesson.

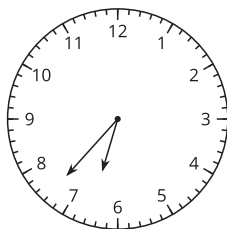
## Student-facing Task Statement

1. For how many minutes was Han on the bus?  
Explain or show your reasoning.

the time Han got  
on the bus:



the time Han got  
off the bus:

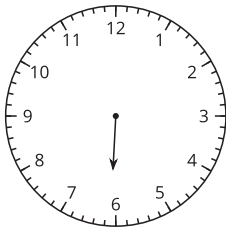


## Launch

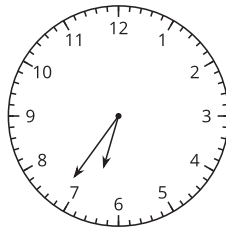
- Groups of 2
- Display the clocks showing when Han got on and off the bus.
- "Now we have more information about Han's bus ride to band practice."
- "What time could Han have been eating dinner? What time do you think band practice might start?" (Han could have eaten dinner at 5:00. Band practice might start at 6:45 since we know he had to hurry to get there.)

2. Draw the minute hand to show that Elena waited for the bus for 32 minutes.

the time Elena  
started waiting:



the time Elena got  
on the bus:



## Student Responses

- 55 minutes. Sample responses:
  - I counted up 3 minutes from 5:42 to 5:45 and then I did 15 minutes to 6:00, 30 minutes to 6:30, and then 7 minutes to 6:37.  $15 + 30 = 45$  and then  $3 + 7$  is 10 more.
  - I knew that going to 6:42 would be 60 minutes, and then I counted back 5 minutes to 6:37.
- Draw a minute hand on the clock to show 6:04.

- 1 minute: partner discussion
- Share responses.

## Activity

- "Now take some time to solve these two problems."
- 5 minutes: partner work time
- Consider asking:
  - "What time did \_\_\_\_ get on [or off] the bus?"
  - "How could you show your ideas on the clock?"
- Monitor for students who used different strategies to solve the two problems, or those who noticed that the time crossed the hour mark in the first problem but not in the second.

## Synthesis

- Select previously identified students to share their responses and reasoning.
- "We noticed that when the time does not cross the hour, we can just add or subtract the number of minutes, such as  $36 - 32 = 4$  here. When the time does cross the hour in a problem, we need to make sure to keep track of what hour we are in."

## Activity 2

🕒 20 min

Math Libs Time

### Standards Alignments

Addressing 3.MD.A.1

The purpose of this activity is for students to solve problems involving addition and subtraction of time intervals in minutes. Students fill a name and activity into each problem before they solve it using any representation that makes sense to them. The synthesis draws attention to the different types of problems that have been solved. Students need to read and think carefully about the given information and the unknown, which differ in most of the situations, in order to decide which calculations to perform (MP2).

### Student-facing Task Statement

For each problem, fill in a name and an activity, and then solve the problem. Show your thinking. Organize it so it can be followed by others.

1. \_\_\_\_\_ started  
\_\_\_\_\_  
at 8:25 a.m. and finished at 8:50 a.m. How much time was spent doing that activity?
2. \_\_\_\_\_ finished  
\_\_\_\_\_  
at 5:38 p.m. after spending 20 minutes. What was the start time?
3. \_\_\_\_\_ started  
\_\_\_\_\_  
at 10:45 a.m. and finished at 11:18 a.m. How much time was spent on it?
4. \_\_\_\_\_ started  
\_\_\_\_\_  
at 3:30 p.m. and took 45 minutes to complete it. What was the finish time?

### Student Responses

1. 25 minutes
2. 5:18 p.m.
3. 33 minutes
4. 4:15 p.m.

### Launch

- Groups of 2
- “We have been solving problems about riding the bus. What are some other activities where you would keep track of the time to the nearest minute?” (recess, TV time, baking or cooking time, class time)
- 1 minute: partner discussion
- Share and record responses. Keep displayed for ideas to use in the activity.

### Activity

- “Work with your partner to fill in a name and activity for each problem. Then, solve the problem.”
- 10 minutes: partner work time

### Synthesis

- For each problem, invite groups to share what they filled in and how they solved the problem.
- Keep the problems displayed.
- “How are these problems alike?” (They are all about doing an activity for a certain amount of time.)
- “How are they different?” (They are about different activities and give different kinds of information. Sometimes we know the start time and end time. Other times we know either the start time or end time, and

how much time passed. We are solving for different things.)

- Highlight ideas about how the problems had different unknowns (start, end, and time that passed).

## Lesson Synthesis

🕒 10 min

"Today we solved a variety of problems involving time, including finding how much time has passed and when something started or ended."

"What are some strategies that you found helpful for solving these problems?" (I can use the same counting strategies that I used for adding and subtracting numbers. I can count by 5, 10, 15, or other numbers. I can use a clock, a number line, or a table to help keep track of the counting. I can also write equations or use words.)

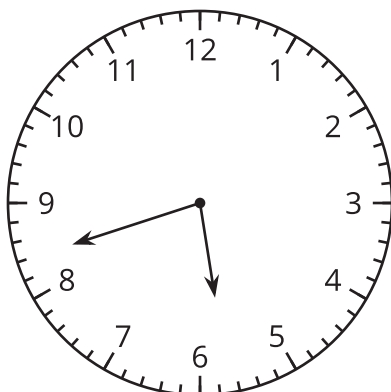
## Suggested Centers

- Number Puzzles: Addition and Subtraction (1–4), Stage 5: Within 1,000 (Supporting)
- Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting)

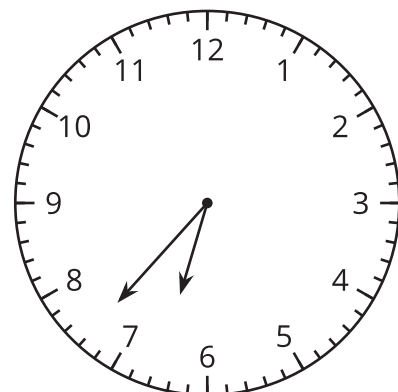
## Student Section Summary

In this section, we learned to tell and write time to the nearest minute. We solved addition and subtraction problems about time.

the time Han got on the bus:



the time Han got off the bus:



Here is one way to find out how much time Han spent on the bus:

- Count up 3 minutes from 5:42 to 5:45, and then 15 minutes from 5:45 to 6:00.
- Count up 30 minutes from 6:00 to 6:30, and then 7 more minutes to 6:37.
- Add the minutes,  $3 + 15 + 30 + 7$ , to get 55.

---

### Complete Cool-Down

#### Response to Student Thinking

Students do not find a solution to problems in which the time crosses the hour.

#### Next Day Support

- Before the next day's warm-up, pass back the cool-down and have students discuss ways to keep track of the time when it crosses the hour.

## Section D: Measurement Problems in Context

### Lesson 12: Ways to Represent Measurement Situations

#### Standards Alignments

Addressing 3.MD.A.2

Building Towards 3.MD.A.2

#### Teacher-facing Learning Goals

- Ask and answer questions about situations involving measurements.
- Interpret representations of situations involving measurements.

#### Student-facing Learning Goals

- Let's make sense of and represent measurement situations at the fair.

#### Lesson Purpose

The purpose of this lesson is for students to make sense of situations involving measurements, interpret representations of the situations, and ask and answer questions about them.

In previous lessons, students estimated and measured weights and liquid volumes. They learned a variety of methods and representations to solve problems involving all four operations, and used representations that made sense to them.

In this lesson, students make sense of tape diagrams (MP2), which better represent the continuous nature of measurement contexts. The context of a fair is used in this lesson and subsequent ones.

#### Access for:

##### Students with Disabilities

- Engagement (Activity 2)

##### English Learners

- MLR8 (Activity 2)

#### Instructional Routines

Card Sort (Activity 2), MLR5 Co-craft Questions (Activity 1), Notice and Wonder (Warm-up)

**Materials to Gather**

- Tools for creating a visual display: Activity 1

**Materials to Copy**

- Card Sort: Giant Pumpkins (groups of 2): Activity 2

**Lesson Timeline**

Warm-up	10 min
Activity 1	20 min
Activity 2	15 min
Lesson Synthesis	10 min
Cool-down	5 min

**Teacher Reflection Question**

How did you see students using their prior mathematical knowledge to solve problems involving the four operations in these new measurement contexts?

**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

Which Diagram Matches?

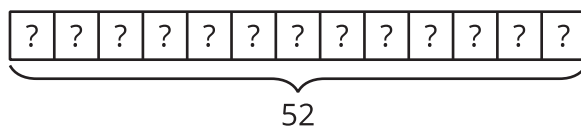
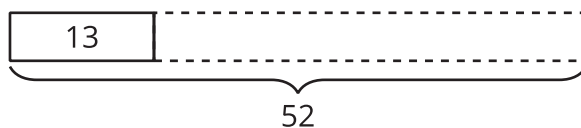
**Standards Alignments**

Addressing 3.MD.A.2

**Student-facing Task Statement**

Which diagram matches this situation? Explain your reasoning.

A pumpkin farmer used 52 liters to water 13 seedlings equally. How much water was used on each seedling?

**A****B**



## Student Responses

A. The diagram has 13 parts and each part represents a seedling, but we don't know how much water each seedling got.

---

## Begin Lesson

## Warm-up

🕒 10 min

Notice and Wonder: The Fair

### Standards Alignments

Building Towards 3.MD.A.2

The purpose of this warm-up is to elicit the idea that there are many mathematical contexts at a state or county fair, and to familiarize students with some possible situations before they solve problems in upcoming activities.

### Instructional Routines

Notice and Wonder

### Student-facing Task Statement

What do you notice? What do you wonder?



### Launch

- Groups of 2
- Display the images.
- "What do you notice? What do you wonder?"
- 1 minute: quiet think time

### Activity

- "Discuss your thinking with your partner."
- 1 minute: partner discussion
- Share and record responses.



## Student Responses

Students may notice:

- There are rides.
- There are really big pumpkins.
- There are cows.
- It looks like a fair or a carnival.
- There are a lot of people walking around.

Students may wonder:

- Why are we looking at these pictures?
- Why are those pumpkins so big?
- How much do those pumpkins weigh?
- How many different rides are there?

## Synthesis

- "In the next few lessons, we are going to solve problems that might come up at a fair. What are some activities that could be at a fair?" (carnival rides and games, food, animals in barns, concerts with music, shows)
- "Where might you see math at the fair?" (We needed money to buy things or buy tickets for rides. They weighed things like vegetables and animals.)

## Activity 1

🕒 20 min

Giant Pumpkin Event

👤 ↔ 👤 PLC Activity

### Standards Alignments

Addressing 3.MD.A.2

The purpose of this activity is for students to solve problems involving weights that are given in the same units. Students begin by generating mathematical questions about an image of two giant pumpkins. Then, weights are given for each pumpkin and students narrow down the questions that could be answered with this information. Students then solve one of the problems generated by the class. Students can all solve the same problem or each group could solve a different problem. As students are generating questions that can be answered, decide which

option makes the most sense for your class.

This activity uses *MLR5 Co-craft Questions*. Advances: Writing, Reading, Representing.

## Instructional Routines

MLR5 Co-craft Questions

## Materials to Gather

Tools for creating a visual display

## Student-facing Task Statement



1. Write a list of mathematical questions that could be asked about this image.
2. Work with your partner to solve the problem you were given by your teacher and show your thinking on a poster. Be sure to write down on your poster the problem you are solving.

## Student Responses

Sample responses:

- How tall is each pumpkin?
- How much does each pumpkin weigh?
- How much wider is the pumpkin on right than the pumpkin on the left?
- How many seeds are in each pumpkin?

## Launch

- Groups of 2

## MLR5 Co-Craft Questions

- Display the image.
- “Write a list of mathematical questions that could be asked about this image.”
- 1 minute: independent work time
- 1–2 minutes: partner discussion
- If students don’t generate questions that involve weight or liquid volume, consider asking: “What are some mathematical questions we could ask that involve weight (or liquid volume)?”
- Invite several students to share one question with the class. Record responses.

## Activity

- “At the giant pumpkin event at the fair, they weigh the pumpkins to see which is the heaviest. The heaviest pumpkin wins. The smaller pumpkin weighs 276 kg. The larger pumpkin weighs 347 kg.”
- Record weights for all to see.
- “Now that we know the weight of each pumpkin, what mathematical questions could we answer?” (How much more does

the heavier pumpkin weigh? How much less does the lighter pumpkin weigh? How much do the pumpkins weigh together?)

- 2 minutes: partner discussion
- Share and record responses.
- Give each group tools for creating a visual display.
- Have each group create a poster for one of the problems the class came up with. Decide whether the class will solve the same problem or if there is enough variety to have groups solve different problems.
- 5 minutes: partner work time

### Synthesis

- Display student posters around the room. If students solved different problems, group them by problem solved.
- 5 minutes: gallery walk
- If students solved the same problem, ask:
  - “What is the same and what is different about how this problem was represented on the posters?”
- If students solve different problems, ask:
  - “What connections do you notice about how these problems are represented?”

---

## Activity 2

🕒 15 min

Card Sort: Giant Pumpkins

### Standards Alignments

Addressing 3.MD.A.2

The purpose of this activity is for students to make sense of representations of situations involving weights and liquid volumes. Students are reminded that tape diagrams can be used to represent relationships between quantities in different types of problems.

As students analyze descriptions of situations and make connections across representations, they practice looking for and making use of structure (MP7). As they relate the numbers and relationships in situations to those in diagrams, they reason quantitatively and abstractly (MP2).

### **Access for English Learners**

*MLR8 Discussion Supports.* Activity: Students should take turns finding a match and explaining their reasoning to their partner. Display the following sentence frames for all to see: “I noticed \_\_\_\_\_, so I matched . . . .” Encourage students to challenge each other when they disagree.

*Advances: Speaking, Representing*

### **Access for Students with Disabilities**

*Engagement: Develop Effort and Persistence.* Chunk this task into more manageable parts. Give students a subset of the cards to start with and introduce the remaining cards once students have completed their initial set of matches.

*Supports accessibility for: Organization, Social-Emotional Functioning*

## **Instructional Routines**

Card Sort

## **Materials to Copy**

Card Sort: Giant Pumpkins (groups of 2)

## **Required Preparation**

- Create a set of cards from the Instructional master for each group of 2.

### **Student-facing Task Statement**

Your teacher will give you a set of cards with descriptions and diagrams.



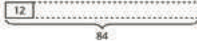
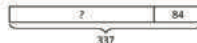

Match each description with a diagram that represents the same situation.

### **Launch**

- Groups of 2
- Give one set of pre-cut cards to each group of students.

### **Activity**

- “This set of cards includes situations and diagrams. Work with your partner to match

<p>Giant Pumpkins</p> <p>A. Giant pumpkins grow from seedlings. A farmer used 84 liters to water their seedlings with 12 liters each. How many seedlings were there?</p>	<p>Giant Pumpkins</p> <p>B.</p> 
<p>Giant Pumpkins</p> <p>C.</p> 	<p>Giant Pumpkins</p> <p>D. One farmer says he used 337 liters per day to water his giant pumpkin. Another farmer used 84 liters less per day. How much water did she use a day?</p>
<p>Giant Pumpkins</p> <p>E. A father and a daughter use 337 liters per day to water their pumpkin and 84 liters a day to water their watermelon. How much water do they use all together per day?</p>	<p>Giant Pumpkins</p> <p>F.</p> 
<p>Giant Pumpkins</p> <p>G.</p> 	<p>Giant Pumpkins</p> <p>H. A giant pumpkin gained 12 kilograms per day for 7 days. How much weight did the pumpkin gain during that week?</p>
<p>Giant Pumpkins</p> <p>I. A pack of giant pumpkin seeds weighs 7 grams. A farmer has 84 grams of seeds. How many packs does she have?</p>	<p>Giant Pumpkins</p> <p>J.</p> 

## Student Responses

A and F  
D and G  
E and B  
H and J  
I and C

Sample response: A and F match because both show a total of 84 with 12 in each group (or for each seedling). We don't know how many groups (or seedlings) there are.

each situation to a diagram that represents it. Be prepared to explain your matches."

- 8 minutes: partner work time

## Synthesis

- Display diagram C and situation I.
- "How do you know this diagram matches this situation?" (The 7 in the diagram represents each pack of seeds weighing 7 grams. The 84 shows that all the seed packs weigh 84 grams. The dotted lines in the diagram shows that we don't know how many seed packs there are.)
- "What equations could we write to match this diagram?" ( $? \times 7 = 84$  or  $84 \div 7 = ?$ )
- Discuss how students know that diagram B and situation E are a match and how the situation could be represented with equations.
- Attend to the language that students use in their explanations, giving them opportunities to describe the situations and diagrams more precisely.

## Lesson Synthesis

🕒 10 min

"Today we solved problems about weight and liquid volume related to giant pumpkins. What helps you make sense of such problems?" (It helps to think about what is happening in the situation and relate the weights or liquid volumes to what I know, like how heavy 1 kilogram is or how much 1 liter is.)

"What representations do you like to use when solving problems involving weight or liquid volume?" (When I am adding and subtracting, I like to use a number line, tape diagram, or just equations. When I am multiplying or dividing, I draw equal groups or base-ten block drawings.)

**Suggested Centers**

- Number Puzzles: Addition and Subtraction (1–4), Stage 5: Within 1,000 (Supporting)
- Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting)

---

**Complete Cool-Down**

---

**Response to Student Thinking**

Students say that diagram B matches the given situation.

**Next Day Support**

- Before the warm-up, invite students to work in small groups to discuss a correct response to this cool-down.

# Lesson 13: Problems with Missing Information

## Standards Alignments

Addressing 3.MD.A.2

### Teacher-facing Learning Goals

- Determine information that is needed to solve measurement problems.
- Solve one-step word problems involving weight.

### Student-facing Learning Goals

- Let's find out what information is needed to solve problems about measurements at the fair.

## Lesson Purpose

The purpose of this lesson is for students to determine the information needed to solve problems involving weight.

In this lesson, students solve problems involving weight in two Information Gap activities. They interpret descriptions of situations involving all four operations and in which one or more quantities are missing. Students determine the information that they need to answer the questions and then reason about the solutions.

### Access for:

#### Students with Disabilities

- Representation (Activity 2)

## Instructional Routines

Estimation Exploration (Warm-up), MLR4 Information Gap (Activity 1, Activity 2)

### Materials to Copy

- Info Gap: Pumpkin Weigh-Off (groups of 2): Activity 1
- Info Gap: Pig Weigh-Off (groups of 2): Activity 2



**Lesson Timeline**

Warm-up	10 min
Activity 1	20 min
Activity 2	20 min
Lesson Synthesis	5 min
Cool-down	5 min

**Teacher Reflection Question**

In this lesson, students had a chance to revisit subtraction that required decomposing hundreds into tens and tens into ones. What strategies are most students choosing for this work?

**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

Winner, Winner

**Standards Alignments**

Addressing 3.MD.A.2

**Student-facing Task Statement**

The winning pig weighed 48 kilograms when his owner decided to raise him to show at the fair. At the fair weigh-off, the pig weighed 124 kilograms. How much weight did the pig gain? Explain or show your reasoning.

**Student Responses**

76 kg. Sample response:

$$48 + 2 = 50$$

$$50 + 50 = 100$$

$$100 + 24 = 124$$

$$2 + 50 + 24 = 76$$
----- **Begin Lesson** -----**Warm-up**

⌚ 10 min

Estimation Exploration: Giant Cantaloupe

## Standards Alignments

Addressing 3.MD.A.2

The purpose of an Estimation Exploration is to practice the skill of estimating a reasonable answer based on experience and known information.

## Instructional Routines

Estimation Exploration

### Student-facing Task Statement

A regular cantaloupe weighs between 1 and 5 kilograms.



This cantaloupe melon was a winner at the 2010 Alaska State Fair. How many kilograms do you think it weighs?



Record an estimate that is:

too low	about right	too high

### Student Responses

Sample responses:

- Too low: less than 100 kilograms
- About right: 300–400 kilograms

### Launch

- Groups of 2
- Display the image.
- “What is an estimate that’s too high? Too low? About right?”
- 1 minute: quiet think time

### Activity

- “Discuss your thinking with your partner.”
- 1 minute: partner discussion
- Record responses.

### Synthesis

- “How did you use the image or what you know about cantaloupe or other melons to help you make estimates?”
- Consider asking:
  - “Is anyone’s estimate less than 100 kilograms? Is anyone’s estimate greater than 500 kilograms?”
  - “Based on this discussion, does anyone want to revise their estimate?”
- Consider revealing that the actual weight of the giant cantaloupe is 344 kilograms.

- Too high: more than 500 kilograms

## Activity 1

🕒 20 min

Info Gap: Pumpkin Weigh-Off

### Standards Alignments

Addressing 3.MD.A.2

This activity uses MLR4 Information Gap.

The Info Gap structure requires students to make sense of problems by determining what information is necessary, and then to ask for information they need to solve it. This may take several rounds of discussion if their first requests do not yield the information they need (MP1). It also allows them to refine the language they use and ask increasingly more precise questions until they get the information they need (MP6). This Info Gap activity provides students an opportunity to solve multiplication and division problems involving weight.

Here is an image of the cards for reference:

<p>Pumpkin Weigh-Off <b>Problem Card 1</b></p> <p>A fair is holding a pumpkin weigh-off. The farmer who grew the winning pumpkin says during some days in August, his pumpkin gained a lot of weight each day.</p> <p>How much did the weight of the pumpkin increase during this time?</p>	<p>Pumpkin Weigh-Off <b>Data Card 1</b></p> <ul style="list-style-type: none"> <li>• The pumpkin's weight increased 13 kilograms each day during these days in August.</li> <li>• There were 5 days in August when the pumpkin gained this much weight each day.</li> </ul>
<p>Pumpkin Weigh-Off <b>Problem Card 2</b></p> <p>Another farmer said, "There were some days in August when my pumpkin's weight increased by a lot each day too!"</p> <p>How much did the weight of the pumpkin increase each day during this time?</p>	<p>Pumpkin Weigh-Off <b>Data Card 2</b></p> <ul style="list-style-type: none"> <li>• The pumpkin's weight increased 72 kilograms during this time.</li> <li>• There were 6 days in August that the pumpkin's weight increased a lot each day.</li> </ul>

### 🕒 Access for Students with Disabilities

*Representation: Access for Perception.* Begin by demonstrating one round of the info gap routine, to support understanding of the context.

*Supports accessibility for: Conceptual Processing*

## Instructional Routines

### MLR4 Information Gap

## Materials to Copy

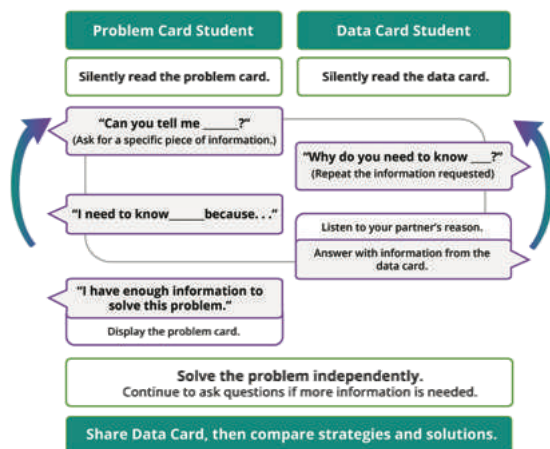
Info Gap: Pumpkin Weigh-Off (groups of 2)

## Required Preparation

- Create a set of cards from the Instructional master for each group
- of 2. Keep set 1 separate from set 2.

## Student-facing Task Statement

Your teacher will give you either a problem card or a data card. Do not show or read your card to your partner.



Pause here so your teacher can review your work.

Ask your teacher for a new set of cards and repeat the activity, trading roles with your partner.

## Student Responses

Problem Card 1: 65 kg. Sample response: Since the pumpkin's weight increased 13 kilograms each day for 5 days, I multiplied  $5 \times 13 = 65$ .

Problem Card 2: 12 kilograms each day. Sample

## Launch

- Groups of 2

## MLR4 Information Gap

- Display the task statement, which shows a diagram of the info gap structure.
- 1–2 minutes: quiet think time
- Read the steps of the routine aloud.
- "I will give you either a problem card or a data card. Silently read your card. Do not read or show your card to your partner."
- Distribute cards.
- 1–2 minutes: quiet think time
- Remind students that after the person with the problem card asks for a piece of information the person with the data card should respond with "Why do you need to know (restate the information requested)?"

## Activity

- 3–5 minutes: partner work time
- After students solve the first problem, distribute the next set of cards. Students switch roles and repeat the process with Problem Card 2 and Data Card 2.

response: I knew the pumpkin's weight increased 72 kilograms over 6 days and had gained the same amount each day, so I divided  $72 \div 6 = 12$ .

## Synthesis

- "What parts of the problem helped you make sense of the situation?"
- "Which quantities were important?"
- "Did anyone solve the problem in a different way than their partner?"

## Activity 2

🕒 20 min

Info Gap: Pig Weigh-Off

### Standards Alignments

Addressing 3.MD.A.2

This activity uses MLR4 Information Gap.

In this activity, students solve addition and subtraction problems involving weight. Here is an image of the cards for reference:

<p>Info Gap: Pig Weigh-Off <b>Problem Card 1</b></p> <p>Lin stopped at the pig weigh-off. The winning pig's owner said, "This pig gained a lot of weight between the time I decided to show him at the fair and today's weigh-off."</p> <p>How much weight did the pig gain?</p>	<p>Info Gap: Pig Weigh-Off <b>Data Card 1</b></p> <ul style="list-style-type: none"> <li>• The pig weighed 36 kilograms when his owner decided to raise him to show at the fair.</li> <li>• At the fair weigh-off the pig weighed 120 kilograms.</li> </ul>
<p>Info Gap: Pig Weigh-Off <b>Problem Card 2</b></p> <p>Lin met another pig's owner at the weigh-off. That pig's owner said, "This pig weighed a lot less when I decided to show him at the fair."</p> <p>How much did the pig weigh before gaining weight for the fair?</p>	<p>Info Gap: Pig Weigh-Off <b>Data Card 2</b></p> <ul style="list-style-type: none"> <li>• The pig gained 67 kilograms while being raised to show at the fair.</li> <li>• At the fair weigh-off the pig weighed 116 kilograms.</li> </ul>

## Instructional Routines

### MLR4 Information Gap

## Materials to Copy

Info Gap: Pig Weigh-Off (groups of 2)

## Required Preparation

- Create a set of cards from the Instructional master for each group
- of 2. Keep set 1 separate from set 2.

## Student-facing Task Statement

Your teacher will give you a new problem card or data card. Do not show or read your card to your partner.

Use the same information gap routine to solve the problem. Then, pause so your teacher can review your work.

Ask your teacher for a new set of cards and repeat the activity, trading roles with your partner.

## Student Responses

Problem Card 1: 84 kg. Sample response: I used an algorithm to subtract 36 from 120.

Problem Card 2: 49 kg. Sample response: I drew a diagram and realized I needed to subtract 67 from 116.

## Launch

- Groups of 2

### MLR4 Information Gap

- "Let's use the same information gap routine to solve new problems about another weigh-off."
- "I will give you either a problem card or a data card. Silently read your card. Do not read or show your card to your partner."
- Distribute cards.
- 1–2 minutes: quiet think time
- Remind students that after the person with the problem card asks for a piece of information the person with the data card should respond with "Why do you need to know (restate the information requested)?"

## Activity

- 3–5 minutes: partner work time
- After students solve the first problem, distribute the next set of cards. Students switch roles and repeat the process with Problem Card 2 and Data Card 2.

## Synthesis

- "What kinds of questions were the most useful to ask?"

- “Were there any questions you weren't sure how to answer?”
- “How did you represent your reasoning once you realized you needed to add (or subtract)?”

## Lesson Synthesis

🕒 5 min

“We’ve been focusing on problem solving for the last two lessons. How would you describe your general approach to solving math problems to a friend? What are some important ideas you’d want to make sure to share with them?” (I start by thinking about the situation to see if I can imagine it to understand what is happening. I like to try to draw a representation like a number line or a diagram to make sense of the problem. I think about what the numbers mean and how they are related. I think about an equation I could write for the situation. I think about strategies I have for adding, subtracting, multiplying, or dividing depending on what is happening in the problem.)

## Suggested Centers

- Number Puzzles: Addition and Subtraction (1–4), Stage 5: Within 1,000 (Supporting)
- Target Numbers (1–5), Stage 7: Subtract Hundreds, Tens, or Ones (Supporting)

## ----- Complete Cool-Down -----

### Response to Student Thinking

Students choose the wrong operation to solve the problem.

### Next Day Support

- Before the next day’s warm-up, pass back the cool-down and brainstorm strategies for solving the problem.

## Lesson 14: What Makes Sense in the Problem?

### Standards Alignments

Addressing 3.MD.A.1, 3.MD.A.2, 3.NBT.A.2

### Teacher-facing Learning Goals

- Reason about quantities, questions, and solutions that make sense in measurement problems.
- Solve one-step word problems involving time and liquid volume.

### Student-facing Learning Goals

- Let's think about what numbers and questions make sense in problems.

### Lesson Purpose

The purpose of this lesson is for students to consider quantities and questions that make sense in situations and solve problems accordingly.

In earlier lessons, students encountered and solved problems about time and liquid volume. In this lesson, students model with mathematics (MP4) as they determine quantities, questions, and solutions that make sense in given situations and adhere to mathematical and real-world constraints when solving problems.

### Access for:

#### Students with Disabilities

- Representation (Activity 1)

#### English Learners

- MLR8 (Activity 2)

### Instructional Routines

Number Talk (Warm-up)

### Lesson Timeline

Warm-up	10 min
Activity 1	20 min
Activity 2	15 min
Lesson Synthesis	10 min

### Teacher Reflection Question

This lesson pushed students to make sense of problems in new ways, by filling in numbers that make sense and generating questions that could match. How did you see students persevering in these tasks?



Cool-down

5 min

**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

A Show at the Carnival

**Standards Alignments**

Addressing 3.MD.A.2

**Student-facing Task Statement**

1. A show at the carnival starts at 2:45 p.m. and lasts 47 minutes. What time does the show end? Explain or show your reasoning.
2. Another show that is 24 minutes long ends at 5:10 p.m. Kiran says that the show starts before 4:40 p.m. Do you agree? Explain or show your reasoning.

**Student Responses**

1. 3:32 p.m. Sample responses:
  - From 2:45, it is 15 minutes from 2:45 to 3:00 and another 30 minutes to 3:30. That's 45 minutes, so 47 minutes from 2:45 would be 3:32.
  - I know that 60 minutes from 2:45 is 3:45, and 47 minutes is 13 minutes before 3:45, which is 3:32 p.m.
2. No. Sample response:
  - I know that 4:40 is 30 minutes from 5:10 p.m. If the show is shorter than 30 minutes, it must have started after 4:40.
  - I know that 20 minutes before 5:10 is 4:50, so 24 minutes before 5:10 is 4:46, which is after 4:40.

----- Begin Lesson -----

**Warm-up**

⌚ 10 min

Number Talk: Give and Take

## Standards Alignments

Addressing 3.NBT.A.2

The purpose of this Number Talk is to elicit strategies and understandings students have for adding within 1,000 and help students develop fluency. When students consider the addends carefully and adjust them to facilitate addition (such as by subtracting from one and adding to the other), they practice looking for and making use of structure (MP7).

## Instructional Routines

Number Talk

### Student-facing Task Statement

Find the value of each expression mentally.

- $306 + 199$
- $318 + 297$
- $275 + 325$
- $275 + 329$

### Student Responses

Sample responses:

- 505: I took 1 away from 506 and added it to 199 to make 200.  $305 + 200 = 505$
- 615: I took 3 from 318 to make 315 and added the 3 to 297 to make 300.  $315 + 300 = 615$
- 600: 200 plus 300 is 500 and 75 plus 25 is another 100.
- 604: It's 4 more than the previous expression.

### Launch

- Display one expression.
- "Give me a signal when you have an answer and can explain how you got it."
- 1 minute: quiet think time

### Activity

- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.

### Synthesis

- "How do you decide how much to add to one addend and take away from the other addend?"

## Activity 1

🕒 20 min

Carnival Time Number Choice

## Standards Alignments

Addressing 3.MD.A.1

The purpose of this activity is for students to consider numbers that make sense in situations involving elapsed time. Then students solve the problems. While a variety of times and answers make sense for each situation, students focus on justifying why their choices make sense to them (MP3).

Consider preparing and displaying images of roller coasters and Ferris wheels for students who may be unfamiliar with carnival attractions.

### Access for Students with Disabilities

*Representation: Internalize Comprehension.* Synthesis: Invite students to identify which details were most useful to solve the problem. Display the sentence frame, “The next time I solve problems involving time, I will look for . . .”

*Supports accessibility for: Memory, Conceptual Processing*

## Student-facing Task Statement

Here are three problems about time at the carnival. They are missing some information.

1. In the blanks, write numbers or times that make sense for the situation in the problem assigned to you.
  - a. Clare waited for Tyler to ride the Ferris wheel. Tyler left at \_\_\_\_\_ and got back at \_\_\_\_\_. How long did Clare wait for Tyler?
  - b. When Tyler got back, he and Clare got in line to ride the roller coaster. They waited \_\_\_\_\_ minutes. At \_\_\_\_\_, they got on the ride. What time did they get in line?
  - c. Clare and Tyler got to the carnival at \_\_\_\_\_. After \_\_\_\_\_ minutes, they took a break to buy lemonade. What time did they take

## Launch

- Groups of 3
- “What are some rides that you might see at a fair or a carnival?”
- “What are some situations at a carnival that could involve time?” (Time spent waiting in line for a ride or waiting for someone. Time spent on a ride. Opening or closing times.)
- 30 seconds: quiet think time
- Share responses.
- “Here are some problems about time at the carnival. They are missing some information.”
- “Each person in your group is going to think of numbers or times that make sense in one of the situations. Explain your choices to your group and work together to solve all three problems.”
- “Decide which problem each member of your group will work on.”

their lemonade break?

2. Share the numbers and times you chose with your group and explain why they make sense.
3. Work with your group to solve each problem. Be prepared to explain your reasoning.



## Student Responses

Answers vary.

## Activity

- 1 minute: independent work time
- 8–10 minutes: group work time
- Monitor for different number choices and justifications.

## Synthesis

- Select 2–3 students to share the numbers they chose for each problem.
- As students share, ask:
  - “How did you decide what numbers (or times) to choose for each problem?”
- Ask the class:
  - “Why do these numbers (or times) make sense for this situation?”
  - “What numbers (or times) would not make sense in this situation?”

## Advancing Student Thinking

If students say they aren't sure what numbers or times to choose, consider asking:

- “What is the problem about?”
- “How long do you think it would make sense to wait in line (or wait for a friend, or go on rides without breaks)? What time do you think would make sense to arrive at the fair (or to be in line for a ride)?”

## Activity 2

🕒 15 min

Lemonade Break

## Standards Alignments

Addressing 3.MD.A.2

The purpose of this activity is for students to write a question that could be answered by given mathematical work and that would make sense in the given situation. When students interpret given student work in terms of the supplied information and decide what question the work might answer, they identify important quantities and their relationships in context (MP4).

### Access for English Learners

*MLR8 Discussion Supports.* Prior to solving the problem, invite students to make sense of the situation and take turns sharing their understanding with their partner. Listen for and clarify any questions about the context.

*Advances: Reading, Representing*

### Student-facing Task Statement

A lemonade stand at the fair makes 132 liters of lemonade a day. When Clare and Tyler stopped by the stand, there were 90 liters left.



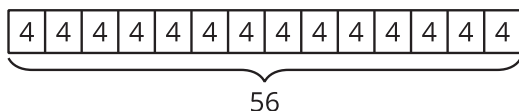
At the end of the day, there were 56 liters of lemonade left, which the vendor put on sale in 4-liter jugs.

Use the information about the lemonade stand to write a question that could be answered with the mathematical work shown.

1.  $132 - 90 = 42$

Question:

2.



Question:

### Student Responses

Sample responses:

- How many liters of lemonade had been sold

### Launch

- Groups of 2
- “Clare and Tyler took a break at the lemonade stand. Here’s what it might look like.”
- Display the image.
- “What do you notice? What do you wonder?” (Students may notice: The stand is close to the carnival. There are lemons hanging in baskets. Students may wonder: How much lemonade do they make each day? What size can you buy? How much does the lemonade cost?)
- 1 minute: quiet think time
- Share and record responses.

### Activity

- Read the information about the lemonade stand as a class.
- “What mathematical questions could we ask about this situation?”
- 1–2 minutes: partner discussion
- Share and record responses.
- “Now, look at the mathematical work in each problem. Work with your partner to write a question that could be answered by

when Clare and Tyler stopped by the stand?

2. How many 4-liter jugs can be filled with the 56 liters of lemonade?

that work.”

- 5–7 minutes: partner work time
- Monitor for groups that accurately write questions that the work could represent.

## Synthesis

- For each problem, invite a group to read the question they wrote.
- Ask the class:
  - “How does their question make sense with this mathematical work and what we know about the situation?”
- Consider asking:
  - “What did you like about writing the questions to match the mathematical work?”
  - “What was challenging about writing the questions to match the mathematical work?”

## Advancing Student Thinking

If students don’t write a question that could be solved with the given work, consider asking:

- “What numbers from the work do you see in the information about the lemonade stand?”
- “What would the work represent in the lemonade stand situation? What question would lead up to this work?”

## Lesson Synthesis

🕒 10 min

Display the image of the Ferris wheel from the activity about time at the carnival.

“Today we solved a variety of problems that came up at the carnival or lemonade stand at the fair. Work with your partner to write a situation that represents this image and involves multiplication or division.” (The ride lasts 4 minutes. Diego rode the Ferris wheel 5 times. How long was he on the Ferris wheel? There are 12 cars on the Ferris wheel. Each car holds 2 people. How many people can ride the Ferris wheel at one time? Six tickets are needed to ride the Ferris wheel. If 42 tickets were collected

from a group of riders, how many people were in the group?)

If time allows, invite students to share and solve some of the problems they wrote.

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### Suggested Centers

- Compare (1–5), Stage 3: Multiply within 100 (Supporting)
- How Close? (1–5), Stage 5: Multiply to 100 (Supporting)

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### Complete Cool-Down

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#### Response to Student Thinking

For the first problem, students add the minutes but do not account for the change in the hour.  
For the second problem, students move forward in time by 24 minutes instead of moving back.

#### Next Day Support

- Before the warm-up, select a student's cool-down from the previous lesson (name anonymous). Ask students to identify what the student did well and what the student needs to do to improve the cool-down.

## Lesson 15: Ways to Solve Problems and Show Solutions

### Standards Alignments

Addressing 3.MD.A.1, 3.MD.A.2, 3.OA.A.3, 3.OA.C.7

### Teacher-facing Learning Goals

- Analyze strategies for solving problems and for presenting solutions.
- Use the four operations to solve one-step word problems involving measurements.

### Student-facing Learning Goals

- Let's solve problems about spending a day at the fair and think about how to best show our solutions.

### Lesson Purpose

The purpose of this lesson is for students to solve problems using the four operations as they imagine spending a day at the fair.

In previous lessons, students became familiar with and solved problems involving equal groups, time, weight, and liquid volume. In this lesson, students put together the ideas they have learned to consider a variety of mathematical situations that might arise during a day at the fair. Students solve problems as they imagine the course of a day at the fair and create a poster to highlight their mathematical reasoning.

This lesson has a Student Section Summary.

### Access for:

#### Students with Disabilities

- Action and Expression (Activity 2)

#### English Learners

- MLR7 (Activity 2)

### Instructional Routines

Number Talk (Warm-up)

### Materials to Gather

- Materials from a previous activity: Activity 2
- Tools for creating a visual display: Activity 1



**Lesson Timeline**

Warm-up	10 min
Activity 1	25 min
Activity 2	10 min
Lesson Synthesis	10 min
Cool-down	5 min

**Teacher Reflection Question**

As you finish up this unit, reflect on the norms and activities that have supported each student in learning math. How have you seen each student grow as a young mathematician throughout this work? How have you seen yourself grow as a teacher? What will you continue to do and what will you improve upon in the next unit?

**Cool-down** (to be completed at the end of the lesson)

⌚ 5 min

## Problem Solving Reflection

**Standards Alignments**

Addressing 3.MD.A.1, 3.MD.A.2, 3.OA.A.3

**Student-facing Task Statement**

Choose a prompt to respond to. Write a few sentences to reflect on problem solving.

- The most important part of problem solving is to remember . . .
- The most important thing to remember when solving problems like we did in this unit is . . .
- The math in this unit reminded me of \_\_\_\_ from outside of school because . . .

**Student Responses**

Answers vary.

----- **Begin Lesson** -----**Warm-up**

⌚ 10 min

Number Talk: Divide by 8

## Standards Alignments

Addressing 3.OA.C.7

The purpose of this Number Talk is to elicit strategies and understandings students have for dividing by 8. These understandings help students develop fluency and will be helpful later in this lesson when students will need to be able to divide when solving problems.

When students use multiplication facts they know to divide and then add or remove groups of 8 for facts they are less familiar with, they look for and make use of structure (MP7).

## Instructional Routines

Number Talk

### Student-facing Task Statement

Find the value of each expression mentally.

- $80 \div 8$
- $72 \div 8$
- $96 \div 8$
- $96 \div 4$

### Student Responses

- 10: I just know it.
- 9: 72 is 8 less than 80, so it's one less group of 8.
- 12: 96 is 16 more than 80, which is two more groups of 8.
- 24: Since there are 12 groups of 8 in 96, I know there are twice as many groups of 4 in 96.

### Launch

- Display one expression.
- "Give me a signal when you have an answer and can explain how you got it."
- 1 minute: quiet think time

### Activity

- Record answers and strategy.
- Keep expressions and work displayed.
- Repeat with each expression.

### Synthesis

- "How did knowing  $80 \div 8$  help you find the other values?"
- Consider asking:
  - "Who can restate \_\_\_\_'s reasoning in a different way?"
  - "Did anyone have the same strategy but would explain it differently?"
  - "Did anyone approach the problem in a different way?"
  - "Does anyone want to add on to \_\_\_\_'s strategy?"

## Activity 1

🕒 25 min

### A Day at the Fair

#### Standards Alignments

Addressing 3.MD.A.1, 3.MD.A.2, 3.OA.A.3

The purpose of this activity is for students to put together their knowledge of problem solving, measurement topics (time, weight, and liquid volume), and equal groups to solve a variety of problems about a day at the fair. After solving problems, students create a poster about the day.

Students should feel free to display their work in creative ways while making sure that the mathematical thinking on each problem is made clear. If they want, students could create individual posters rather than working with a partner.

Throughout the activity, students reason abstractly and quantitatively as they interpret the different problems and situations, represent them, and find solutions (MP2).

#### Materials to Gather

Tools for creating a visual display

#### Student-facing Task Statement

You spent a day at the fair. Solve four problems about your day and create a poster to show your reasoning and solutions.

1. You arrived at the fair!

Entry to the fair is \$9 a person.  
You went there with 6 other people. How much did it cost your group to enter the fair?

2. How did you start your day? (Choose one.)



You arrived at the giant pumpkin weigh-off at 11:12 a.m. and left at 12:25 p.m. How long were you there?

#### Launch

- Groups of 2
- “We’re going to solve some problems about a day at the fair. What are some things you could do during a day at the fair?” (go on rides, walk around, eat fair food, look at some of the animals)
- 30 seconds: quiet think time
- Share responses.
- Give each group tools for creating a visual display.

#### Activity

- “Work with your partner to solve four problems about a day at the fair. You’ll get

You spent 48 minutes at the carnival and left at 12:10 p.m. What time did you get to the carnival?



3. What was next? (Choose one.)



You visited a barn with 7 sheep. The sheep drink 91 liters of water a day, each sheep drinking about the same amount. How much does each sheep drink a day?

You visited a life-size sculpture of a cow made of butter. The butter cow weighs 273 kilograms, which is 277 kilograms less than the actual cow. How much does the actual cow weigh?



4. Before you went home . . .



You stopped for some grilled corn on the cob. On the grill, there were 54 ears of corn arranged in 9 equal rows. How many ears of corn were in each row?

to choose some of the activities at the fair.”

- “Then, create a poster that shows your mathematical reasoning and solutions for each problem.”
- “Feel free to be creative in how you put your ideas on your poster, but make sure to organize them so that they are easy for others to understand.”
- 25 minutes: partner work time

## Synthesis

- Display the student posters around the room.

## Student Responses

Students might use a variety of representations depending on the context, problem, or numbers.

1. \$63
2.
  - 73 minutes
  - 11:22 p.m.
3.
  - 13 liters
  - 550 kilograms
4. 6 ears of corn

## Activity 2

🕒 10 min

### A Day at the Fair Gallery Walk

#### Standards Alignments

Addressing 3.MD.A.1, 3.MD.A.2, 3.OA.A.3

The purpose of this activity is for students to consider strategies different from their own (MP3) and aspects of student work that make mathematical ideas clear as they visit the posters created in the previous activity.

#### 🌐 Access for English Learners

*MLR7 Compare and Connect.* Synthesis: After the Gallery Walk, lead a discussion comparing, contrasting, and connecting the different approaches. Ask, “What did the approaches have in common?”, “How were they different?”, “Why did the different approaches lead to the same outcome?” To amplify student language and illustrate connections follow along and point to the relevant parts of the displays as students speak.

*Advances: Representing, Conversing*

#### ♿ Access for Students with Disabilities

*Action and Expression: Develop Expression and Communication.* Synthesis: Identify connections between strategies that result in the same outcomes but use differing approaches.

*Supports accessibility for: Conceptual Processing*

#### Materials to Gather

Materials from a previous activity

#### Required Preparation

- Display posters from the previous activity.

#### Student-facing Task Statement

As you visit the posters with your partner:

1. Look for a problem that was solved using a strategy that is different from yours. What made it different? Describe the strategy.

#### Launch

- Groups of 2

#### Activity

- Have half the students stand at their poster

2. Look for ways that your classmates made their thinking and the math work clear to you. Describe at least three things they did or showed on the posters.

### Student Responses

Answers vary.

with their partner to share their ideas or answer questions as the other students visit their posters.

- Have the other half of the class visit their classmates' posters with their partner.
- 5 minutes: partner work time
- Switch student roles and repeat.

### Synthesis

- "Today we created posters that put together a lot of the problem solving skills we have been learning all year."

## Lesson Synthesis

🕒 10 min

"What are some strategies or representations you saw that you might use in your own problem solving in the future?"

"What were some aspects of the posters you saw that helped make the math your classmates used clear for you?" (clear labels on diagrams that help me understand their thinking, organization of the algorithms they used, units on their answers)

### Suggested Centers

- Compare (1–5), Stage 3: Multiply within 100 (Supporting)
- How Close? (1–5), Stage 5: Multiply to 100 (Supporting)

### Student Section Summary

In this section, we solved all kinds of problems about time, weight, and liquid volume. We did so using addition, subtraction, multiplication, and division, as well as different reasoning strategies.

Clare spent 48 minutes at the carnival. She left the carnival at 12:10 p.m. What time did she get to the carnival?

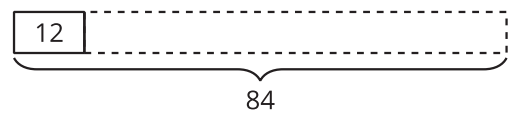
11:22  $\xleftarrow{-8}$  11:30  $\xleftarrow{-30}$  12:00  $\xleftarrow{-10}$  12:10

A cow made of butter weighs 273 kilograms. That is 277 kilograms less than the actual cow. How much does the

actual cow weigh?

$$\begin{array}{r} 11 \\ 273 \\ + 277 \\ \hline 550 \end{array}$$

A grower used 84 liters to water their pumpkin seedlings. Each seedling gets 12 liters. How many seedlings were there?



### Complete Cool-Down

#### Response to Student Thinking

Students have responses they'd like to share with a partner.

#### Next Day Support

- After the warm-up in the next lesson, pair students up to discuss their responses.

## Lesson 16: Design a Carnival Game (Optional)

### Standards Alignments

Building On 3.MD.A, 3.NBT.A.2, 3.OA.A

Building Towards 3.MD.A.2

### Teacher-facing Learning Goals

- Apply knowledge of measurement and operations to design a game.

### Student-facing Learning Goals

- Let's design a carnival game.

### Lesson Purpose

The purpose of this lesson is for students to apply their understanding of length measurement, time measurement, and fluency with four operations to design a carnival game.

This lesson is optional because it does not address any new mathematical content standards. This lesson does provide students with an opportunity to apply precursor skills of mathematical modeling.

In this lesson, students continue to work with the context of a fair. Students analyze games they might see at a carnival such as a penny toss or marble run and consider what makes a good game. They then create their own games with given materials and integrate mathematical ideas from this unit.

Students play the game and consider ways to improve it.

When students make choices about quantities and rules, analyze constraints in situations, and adjust their work to meet constraints, they model with mathematics (MP4).

This lesson may take more than 60 minutes, as students may need additional time to design, set up, and play their games. Consider modifying the activities or expanding the lesson across 2 days to meet students' needs or to give more time for revision.

### Access for:

#### Students with Disabilities

- Engagement (Activity 1)

#### English Learners

- MLR8 (Activity 1)

### Instructional Routines

Notice and Wonder (Warm-up)



## Materials to Gather

- Paper clips: Activity 1
- Pipe cleaners: Activity 1
- Rulers: Activity 1
- Tape (painter's or masking): Activity 1
- Yardsticks: Activity 1

## Lesson Timeline

Warm-up	10 min
Activity 1	45 min
Lesson Synthesis	5 min

## Teacher Reflection Question

Think about times when students were able to make connections to and build on the ideas of their peers during discussions today. What norms or routines allowed students to engage with other students' ideas?

## Begin Lesson

## Warm-up

🕒 10 min

Notice and Wonder: Carnival Games

## Standards Alignments

Building Towards 3.MD.A.2

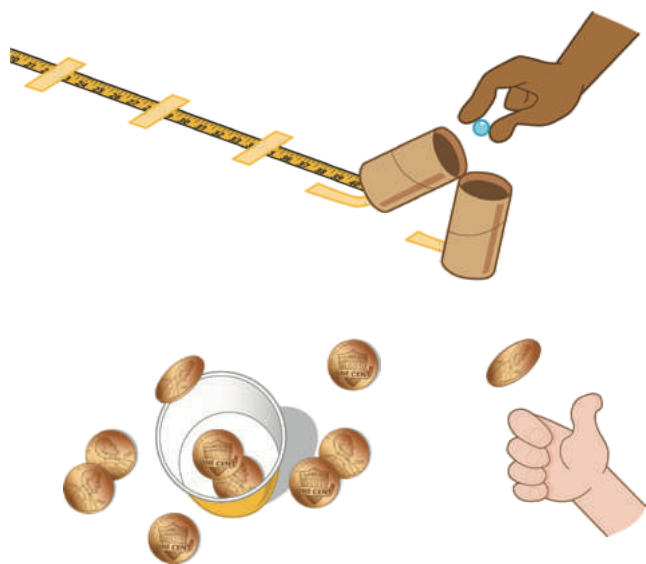
The purpose of this warm-up is to introduce the context of carnival games and have students consider the elements that make a good game. While students may notice and wonder many things about these images, constraints that make a game challenging, rules that make the game fair, and the way someone can win the game are the important discussion points.

## Instructional Routines

Notice and Wonder

## Student-facing Task Statement

What do you notice? What do you wonder?



## Student Responses

Students may notice:

- Someone is dropping a marble into a tube.
- There's a measuring tape at the end of the tube.
- There are 2 pennies in a cup.
- There are 10 pennies altogether.
- Someone is flipping a coin towards the cup.

Students may wonder:

- Are these games?
- Do you have to roll the marble the furthest?
- Why does the tape measure start at 40?
- Do you have to get the pennies in the cup?
- Do you get points for getting pennies close to the cup?

## Launch

- Groups of 2
- Display the image.
- "What do you notice? What do you wonder?"
- 1 minute: quiet think time

## Activity

- "Discuss your thinking with your partner."
- 1 minute: partner discussion
- Share and record responses.

## Synthesis

- "What makes a good game?" (It's challenging, but not too hard. The rules are clear. You improve at the game the more you play.)
- "How do you think you might win each of these games?" (Get the most pennies in the cup. Roll the marble the furthest.)
- "What are some ways you could design each of these games to make them challenging and fair?" (You have to stand far enough from the cup to make it challenging to get the penny into the cup. Everyone gets the same number of pennies to toss into the cup, so they get the same number of turns. Everyone has to use the same type of tubes to design their marble run. Everyone gets three tries to try to make their marble go the furthest.)

## Activity 1

🕒 45 min

Create Your Own Carnival Game

## Standards Alignments

Building On 3.MD.A, 3.NBT.A.2, 3.OA.A

The purpose of this activity is for students to use the provided materials to design their own game. If available, students can be provided with additional materials not included in the materials list. Students decide the rules and objective of the game. After playing the game at least once, students revise their design to include 2 of the following elements: measuring elapsed time, measuring distance, multiplication or division within 100, addition or subtraction within 1,000.

If there is time, a pair of students from each group can swap with another group at different points of this activity so they have an opportunity to play a different game.

### Access for English Learners

*MLR8 Discussion Supports.* Before they begin, give students 2–3 minutes to make sense of the task and take turns sharing their understanding with their group. Listen for and clarify any questions about the directions.

*Advances: Reading, Representing*

### Access for Students with Disabilities

*Engagement: Provide Access by Recruiting Interest.* Use visible timers or audible alerts to help learners anticipate and prepare to transition between activities.

*Supports accessibility for: Social-Emotional Functioning, Organization*

## Materials to Gather

Paper clips, Pipe cleaners, Rulers, Tape (painter's or masking), Yardsticks

## Required Preparation

- Gather tape measures, toilet paper tubes, marbles, pennies, paper cups, and a collection of balls that bounce for students to use as they create their games.
- Other material not included in this list can be made available to students to use to create their games.

### Student-facing Task Statement

1. Use the materials to design your own carnival game.

### Launch

- Groups of 4
- Display materials students will use to create their game.

- a. What are the rules of your game?
  - b. How does someone win the game?
2. Test out your game at least one time.
3. Redesign your game to include at least 2 of the following:
  - length or distance measurement in inches
  - time that has passed
  - multiplication and division within 100
  - addition and subtraction within 1,000

If you have time, play the new and improved game.

## Student Responses

1. Sample responses for a ring toss:
  - a. Ring toss. Stand behind a line and toss 4 rings at 10 different upside down cups.
  - b. The person who gets a ring around the most number of cups wins.
2. No response required.
3. Sample response: Each upside down cup is now worth different points from 2 to 100. There are 3 marks that are different lengths from the cups. The mark 36 inches from the cup gets you regular points. The mark 72 inches from the cups doubles your points. The mark 108 inches from the cup triples your points.

- “We are going to use these materials to create a game. With your group, discuss how you could use the materials to make a game. Think about the rules of your game and how someone can win.”
- 2 minutes: small group discussion
- Share responses.
- Give students access to materials they need to make their game.

## Activity

- “Use the materials to make your game. As you work, think about our discussion of what makes a good game. Once your game is done, take some time to play your game with your group.”
- 20–25 minutes: group work time
- “Now, revise your game to include 2 of the following: distance, elapsed time, multiplication or division, or addition and subtraction. If you have time after you make your revision, play the new game.”
- Monitor for groups who revise their game to include:
  - distance
  - elapsed time
  - multiplication or division
  - addition or subtraction
- 10–15 minutes: group work time
- As students work, consider asking:
  - “What elements did you add to your game when you revised it?”
  - “How did this change the rules of the game?”
  - “Did it change the way you win the game? If so, how?”

## Synthesis

- “Find another person in the room who you

did not work with and describe the rules of your game and how someone wins.”

- “How did your group redesign the game?” (We added points for each ball. We recorded when the game started and ended.)

## Lesson Synthesis

 5 min

Invite at least one group to describe the rules of their original and then the redesigned game.

“What changes do you notice?”

“What questions do you have for the designers of the game?”

“If you were a member of this design team, what other ideas do you have to redesign the original game?”

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### Suggested Centers

- Compare (1–5), Stage 3: Multiply within 100 (Supporting)
- How Close? (1–5), Stage 5: Multiply to 100 (Supporting)



# Family Support Materials

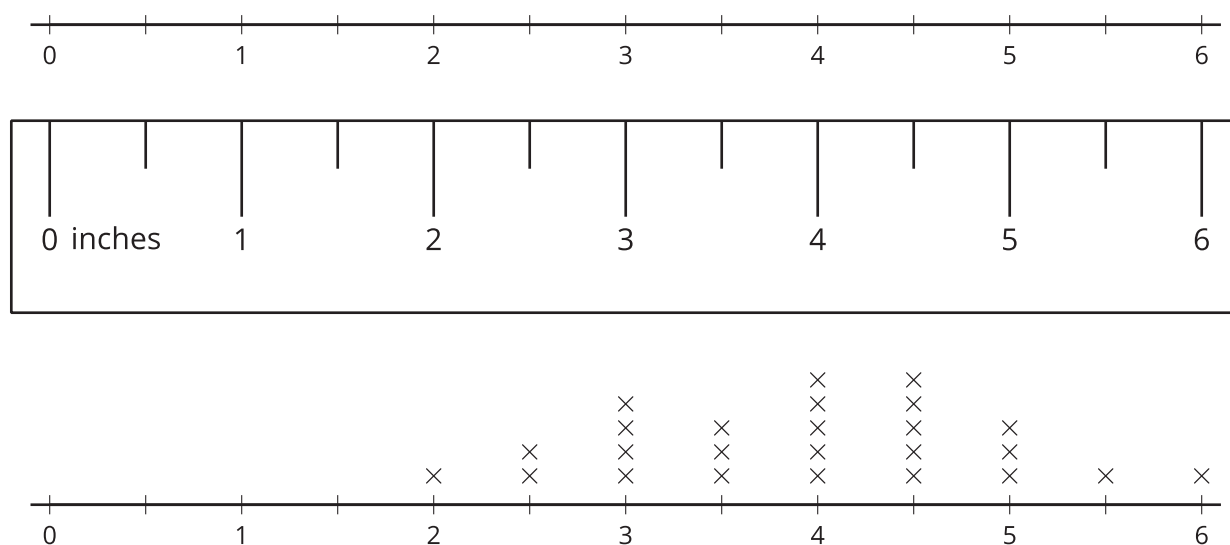
# Family Support Materials

## Measuring Length, Time, Liquid Volume, and Weight

In this unit, students measure lengths in halves and fourths of an inch and represent measurement data on line plots. They learn about units for measuring weight, liquid volume, and time. They then use the four operations to solve problems involving measurement.

### Section A: Measurement Data on Line Plots

In this section, students measure in halves and fourths of an inch, learn to use mixed numbers to represent lengths greater than 1, and interpret and create line plots that represent lengths.



Students relate the fractions on a ruler to those on a number line. The work here reinforces the idea that whole numbers can be expressed as fractions.

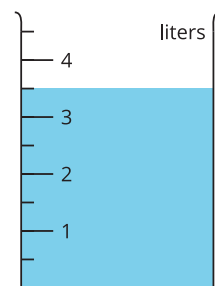
### Section B: Weight and Liquid Volume

In this section, students learn to estimate and measure weight (in grams and kilograms) and liquid volume (in liters).

Students make sense of grams and kilograms by holding objects that are about 1 gram and about 1 kilogram. They see, for example, that a paper clip weighs about 1 gram and a regular cantaloupe weighs about 1 kilogram.

To make sense of liters, students engage in activities that require pouring water into containers. They also estimate the volume of liquid in everyday objects such as a bottle, a bucket, a sink, and so on.

Students also analyze the scale on liquid measuring tools, as shown here, and make sense of fractional units of liquid volume.

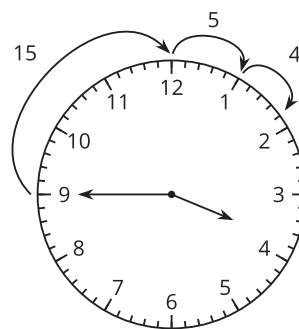


## Section C: Problems Involving Time

In this section, students learn to tell and write time to the nearest minute. They solve elapsed-time problems where the start time, the end time, or the duration is unknown.

To reason about time, students use representations that make sense to them, including drawings, tables, equations, or words.

For example, the clock shows how students could think about 24 minutes after 3:45.



## Section D: Explore the Fair

In this section, students apply what they learned in this unit to solve problems that involve measurements. All the activities use the context of a state or county fair. The work here gives students many opportunity to make sense of problems, use all four operations, and think carefully about their strategies and solutions.

## Try it at home!

Near the end of the unit, ask your student to find the following measurements of objects around your home:

- length measured to the nearest quarter inch
- weight measured in kilograms or grams
- liquid volume in liters

Questions that may be helpful as they work:

- Before you measure, estimate the object's length, weight or volume. Why do you think it will be that measurement?
- Can you create a line plot of your data?

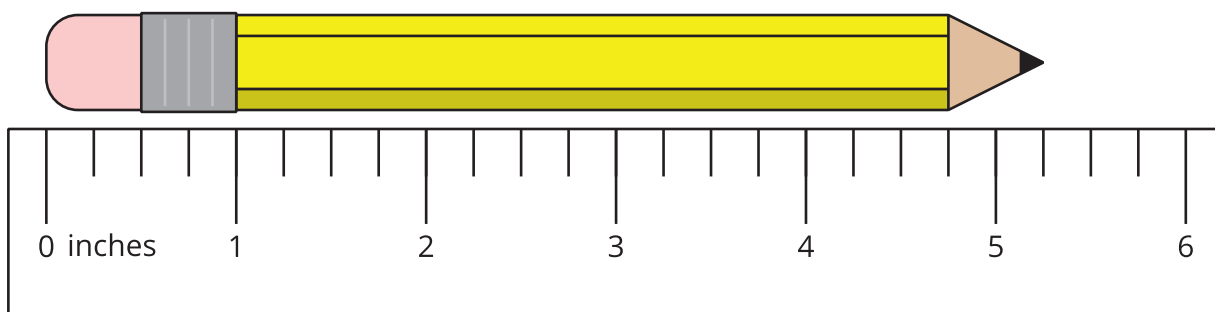


# Unit Assessments

Check Your Readiness A, B, C and D  
End-of-Unit Assessment

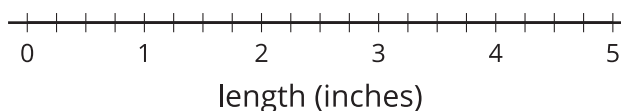
# Measuring Length, Time, Liquid Volume, and Weight: Section A Checkpoint

1. How long is the pencil?



2. Here are some pencil lengths in inches. Use the measurements to complete the line plot.

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



# Measuring Length, Time, Liquid Volume, and Weight: Section B Checkpoint

1. Which fruit weighs about 1 kilogram?

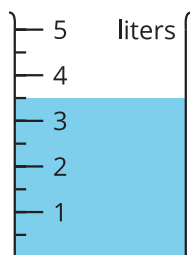
- A. one blueberry
- B. one pineapple
- C. one grape
- D. one raspberry

2. Select 2 items that weigh about 1 gram.

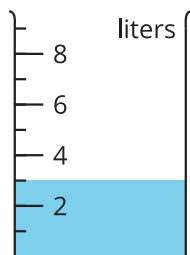
- A. a piece of gum
- B. a notebook
- C. a door key
- D. a pen cap
- E. a toothbrush

3. Select **all** the containers that show  $3\frac{1}{2}$  liters of water.

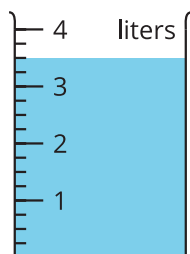
A.



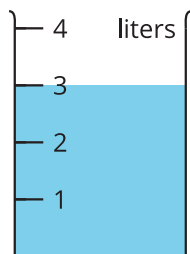
B.



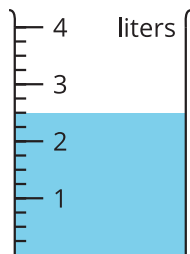
C.



D.

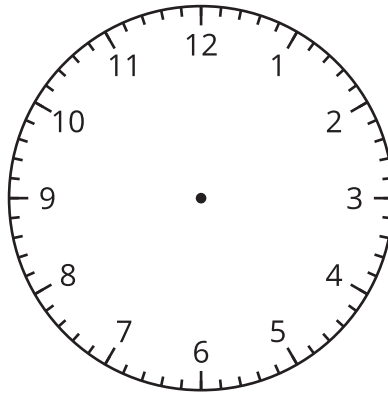


E.



# Measuring Length, Time, Liquid Volume, and Weight: Section C Checkpoint

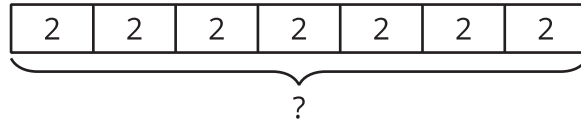
1. Show 11:49 a.m. on the clock.



2. Tyler is in line for a roller coaster. He entered the line at 9:35 a.m. and got on the roller coaster at 10:19 a.m. How long did Tyler wait? Explain or show your reasoning.

# Measuring Length, Time, Liquid Volume, and Weight: Section D Checkpoint

1. Select the situation that the diagram represents.

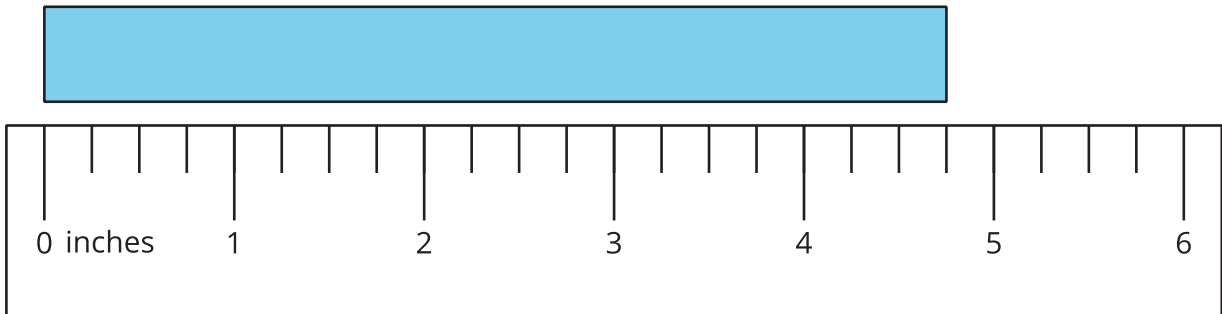


- A. There are 2 bottles of water. Each bottle has 7 liters of water. How many liters of water are there altogether?
  - B. Han put 14 liters of water in 7 bottles. He put the same amount in each bottle. How many liters of water did Han put in each bottle?
  - C. Clare has 7 bottles of water and Jada has 2 bottles. How many bottles of water do they have altogether?
  - D. There are 7 bottles of water. Each bottle has 2 liters of water. How many liters of water are there altogether?
2. A farmer picked 96 kilograms of apples one day. He put the apples in 8 boxes and the boxes all had the same weight.

How many kilograms of apples are in each box? Explain or show your reasoning.

# Measuring Length, Time, Liquid Volume, and Weight: End-of-Unit Assessment

1. How long is the rectangle?

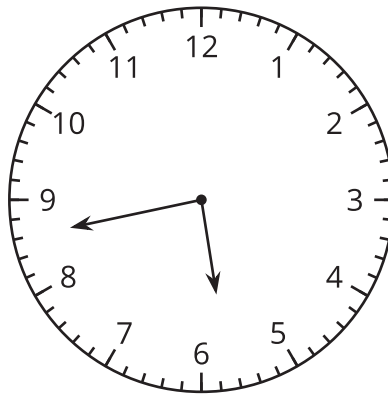


- A.  $4\frac{1}{4}$  inches
- B.  $4\frac{1}{2}$  inches
- C.  $4\frac{3}{4}$  inches
- D.  $5\frac{1}{4}$  inches

2. Select 3 items that weigh about 1 kilogram.

- A. pencil
- B. laptop computer
- C. pineapple
- D. paper clip
- E. car
- F. dictionary

3. Select **all** statements that apply to the time shown on the clock.

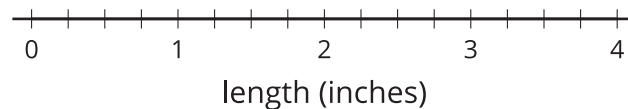


- A. The clock shows 5:43.
- B. The clock shows 8:28.
- C. In 18 minutes it will be 6:01.
- D. In 18 minutes it will be 5:25.
- E. In 18 minutes it will be 8:46.

4. Here are the lengths of some pencils in inches:

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

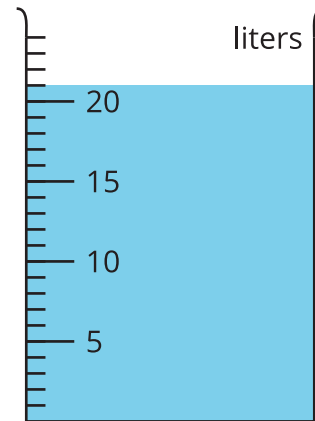
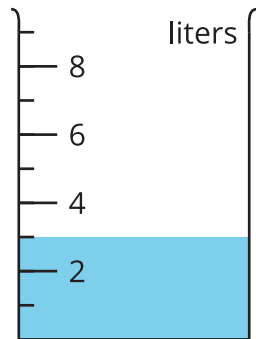
Use the lengths of the pencils to complete the line plot.





5. Here are two containers partly filled with water.

a. How many liters of water are in each container?



b. How many more liters are there in the larger container? Explain how you know.

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6. A young humpback whale weighs 835 kg. A young killer whale weighs 143 kg. How much heavier is the humpback whale than the killer whale? Explain or show your reasoning.

7. The school is hosting an end-of-year party for 48 students. Each student will be served 2 cups of lemonade.
- a. How many cups of lemonade will be served to the students at the party? Explain or show your reasoning.
  
  
  
  
  
  
  
  
  
  
  - b. Each bottle has 8 cups of lemonade. How many bottles of lemonade does the school need? Explain or show your reasoning.

# Assessment Answer Keys

Check Your Readiness A, B, C and D  
End-of-Unit Assessment

# Assessment Answer Keys

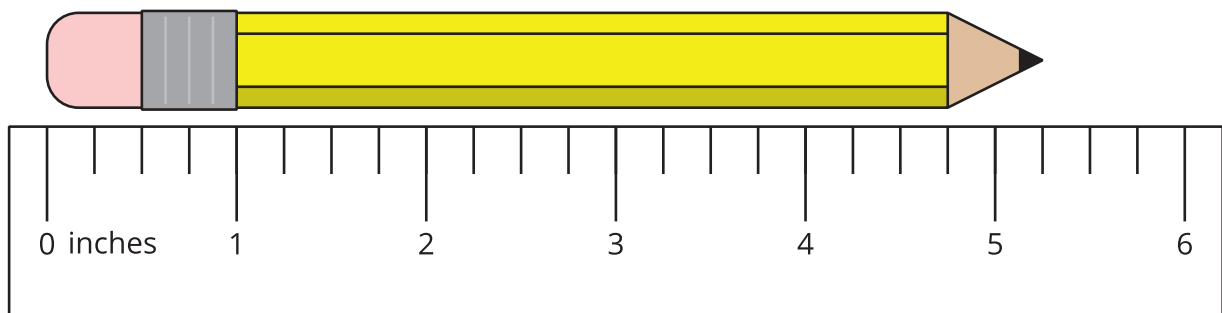
## Assessment: Section A Checkpoint

### Problem 1

#### Goals Assessed

- Measure lengths using rulers marked with halves and fourths of an inch to generate data for making a line plot.

How long is the pencil?



### Solution

$5\frac{1}{4}$  or  $\frac{21}{4}$  inches

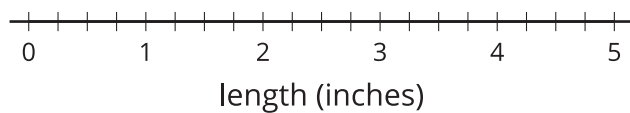
### Problem 2

#### Goals Assessed

- Measure lengths using rulers marked with halves and fourths of an inch to generate data for making a line plot.

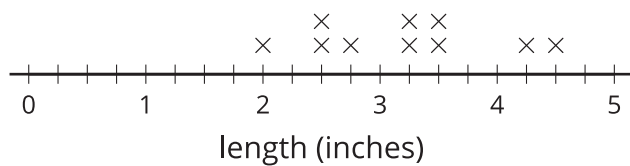
Here are some pencil lengths in inches. Use the measurements to complete the line plot.

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



Solution

Pencil Lengths



Note: Students may not include a title on the line plot.

## Assessment: Section B Checkpoint

### Problem 1

#### Goals Assessed

- Measure and estimate weights and liquid volumes of objects.

Which fruit weighs about 1 kilogram?

- A. one blueberry
- B. one pineapple
- C. one grape
- D. one raspberry

### Solution

B

### Problem 2

#### Goals Assessed

- Measure and estimate weights and liquid volumes of objects.

Select **2** items that weigh about 1 gram.

- A. a piece of gum
- B. a notebook
- C. a door key
- D. a pen cap
- E. a toothbrush

## Solution

["A", "D"]

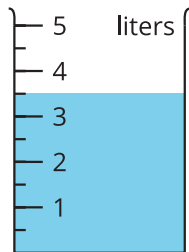
## Problem 3

**Goals Assessed**

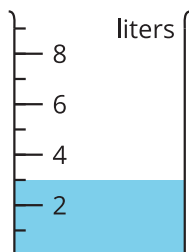
- Measure and estimate weights and liquid volumes of objects.

Select **all** the containers that show  $3\frac{1}{2}$  liters of water.

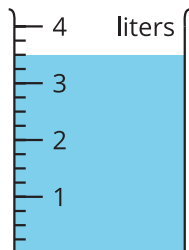
A.



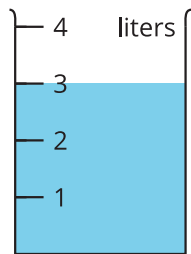
B.



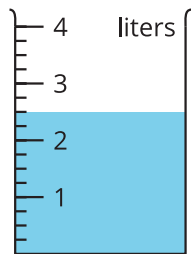
C.



D.



E.



Solution

["A", "C"]



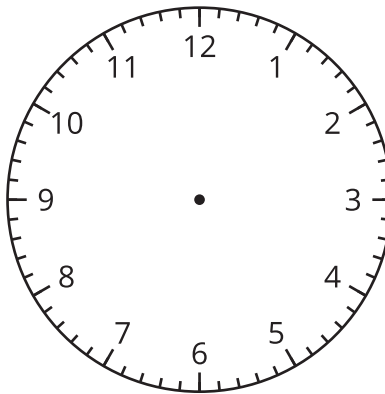
## Assessment: Section C Checkpoint

### Problem 1

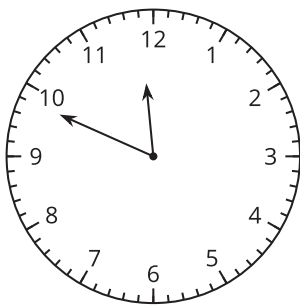
#### Goals Assessed

- Tell time to the minute.

Show 11:49 a.m. on the clock.



### Solution



### Problem 2

#### Goals Assessed

- Solve problems involving addition and subtraction of time intervals in minutes.

Tyler is in line for a roller coaster. He entered the line at 9:35 a.m. and got on the roller coaster at 10:19 a.m. How long did Tyler wait? Explain or show your reasoning.

### Solution

44 minutes. Sample response: I counted up 25 minutes from 9:35 to get to 10:00, then counted 19 more minutes to get to 10:19.  $25 + 19 = 44$ .

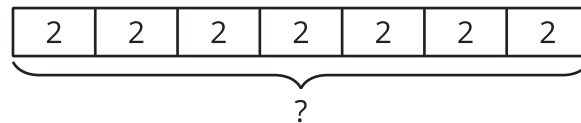
## Assessment: Section D Checkpoint

### Problem 1

#### Goals Assessed

- Solve problems involving the four operations and measurement contexts.

Select the situation that the diagram represents.



- A. There are 2 bottles of water. Each bottle has 7 liters of water. How many liters of water are there altogether?
- B. Han put 14 liters of water in 7 bottles. He put the same amount in each bottle. How many liters of water did Han put in each bottle?
- C. Clare has 7 bottles of water and Jada has 2 bottles. How many bottles of water do they have altogether?
- D. There are 7 bottles of water. Each bottle has 2 liters of water. How many liters of water are there altogether?

### Solution

D

### Problem 2

#### Goals Assessed

- Solve problems involving the four operations and measurement contexts.

A farmer picked 96 kilograms of apples one day. He put the apples in 8 boxes and the boxes all had the same weight.

How many kilograms of apples are in each box? Explain or show your reasoning.

### Solution

12 kilograms

Sample response: I know  $8 \times 10 = 80$  and  $8 \times 2 = 16$  so  $8 \times 12 = 80 + 16$ , so there were 12 kilograms in each box.

## Assessment: End-of-Unit Assessment

### Problem 1

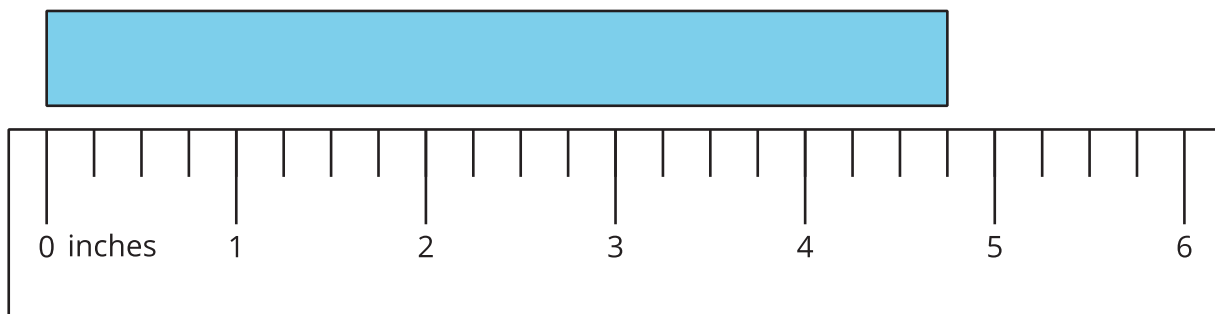
#### Standards Alignments

Addressing 3.MD.B.4

#### Narrative

Students measure the length of a rectangle with a ruler marked in quarter inches. Students may select response A if they see that the rectangle is more than 4 inches and notice that it is  $\frac{1}{4}$  inch less than 5 inches. Students may select B if they do not accurately identify  $4\frac{1}{2}$  as  $4\frac{2}{4}$ . They may select D if they see that the length is  $\frac{1}{4}$  away from 5 but fail to reason that it is less than 5.

How long is the rectangle?



- A.  $4\frac{1}{4}$  inches
- B.  $4\frac{1}{2}$  inches
- C.  $4\frac{3}{4}$  inches
- D.  $5\frac{1}{4}$  inches

Solution

C

---

Problem 2**Standards Alignments**

Addressing 3.MD.A.2

**Narrative**

Students choose objects that weigh about 1 kilogram. The distractors are not close to 1 kilogram so if students select A, D, or E, they probably do not have a good understanding of weight or of the kilogram unit.

Select **3** items that weigh about 1 kilogram.

- A. pencil
- B. laptop computer
- C. pineapple
- D. paper clip
- E. car
- F. dictionary

## Solution

["B", "C", "F"]

## Problem 3

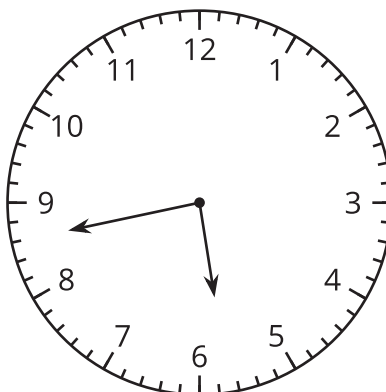
**Standards Alignments**

Addressing 3.MD.A.1

**Narrative**

Students read the time from a clock and then solve an addition problem which goes to the next hour. Students who select responses B and E are likely interchanging the hour and minute hands. Students who select both responses A and D have either misread the question or have performed the wrong operation. If a student selects A but not C then they may need more work adding minutes in a situation where the time goes past the next hour.

Select **all** statements that apply to the time shown on the clock.



- A. The clock shows 5:43.
- B. The clock shows 8:28.
- C. In 18 minutes it will be 6:01.
- D. In 18 minutes it will be 5:25.
- E. In 18 minutes it will be 8:46.

Solution

["A", "C"]

Problem 4

### Standards Alignments

Addressing 3.MD.B.4

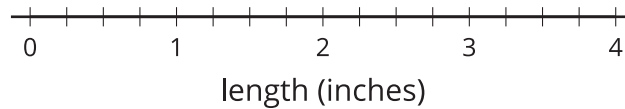
### Narrative

Students create a line plot for measurements given in fractions. The fractions are not labeled on the line plot so students will need to identify both fourths and halves. Some of the measurements for the most common length are given as  $2\frac{2}{4}$  and others as  $2\frac{1}{2}$ .

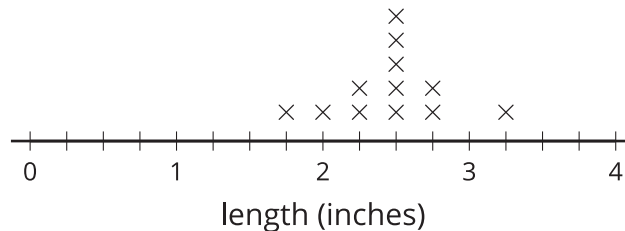
Here are the lengths of some pencils in inches:

$$\begin{array}{cccccc}
 2\frac{3}{4} & 2\frac{2}{4} & 1\frac{3}{4} & 2\frac{1}{2} & 2\frac{1}{4} & 2\frac{1}{2} \\
 2\frac{3}{4} & 2\frac{1}{2} & 2 & 3\frac{1}{4} & 2\frac{2}{4} & 2\frac{1}{4}
 \end{array}$$

Use the lengths of the pencils to complete the line plot.



Solution



### Problem 5

#### Standards Alignments

Addressing 3.MD.A.2

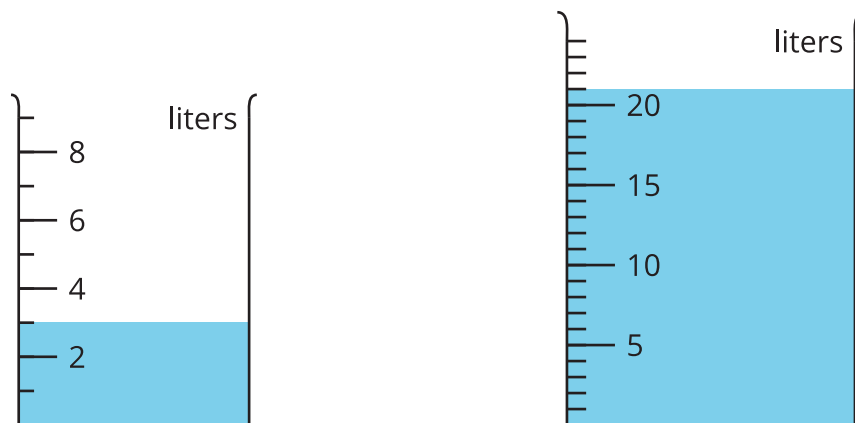
#### Narrative

Students read the volume of liquid in two different containers and then compare them. In both images, every tick mark represents 1 liter. Students may read the values incorrectly if they think that every tick mark on the small container represents 2 liters and every tick mark on the large container represents 5 liters. If students misread the volumes then the second question should be evaluated based on their arithmetic with the numbers they used.

Here are two containers partly filled with water.

- How many liters of water are in each container?





- b. How many more liters are there in the larger container? Explain how you know.

### Solution

- a. The first container has 3 liters of water and the second has 21 liters of water.  
 b. 18 since  $21 - 3 = 18$

### Problem 6

#### Standards Alignments

Addressing 3.MD.A.2

#### Narrative

Students subtract within 1,000 to answer a question about weights. Students may add 835 and 143 if they do not read the question carefully. This would be the total weight of the two whales in kilograms. Students may subtract by place value, as shown in the solution, or they may use a number line or other diagram.

A young humpback whale weighs 835 kg. A young killer whale weighs 143 kg. How much heavier is the humpback whale than the killer whale? Explain or show your reasoning.

### Solution

692 kg. Sample response:

$835 - 100 = 735$	$700 - 5 = 695$
$735 - 35 = 700$	$695 - 3 = 692$

---

Problem 7**Standards Alignments**

Addressing 3.MD.A.2, 3.OA.A.3

**Narrative**

Students use multiplication and division to solve problems about liquid volume. Students may make drawings, write expressions or equations, or reason with words to solve these problems. If students use their answer to the first problem to solve the second problem then their work should be evaluated accordingly. Students can also answer the second question independently of the first. They may reason, for example, that one bottle of lemonade serves a group of 4 students and then find  $48 \div 4$  to see how many bottles are needed.

The school is hosting an end-of-year party for 48 students. Each student will be served 2 cups of lemonade.

- a. How many cups of lemonade will be served to the students at the party? Explain or show your reasoning.
- b. Each bottle has 8 cups of lemonade. How many bottles of lemonade does the school need? Explain or show your reasoning.

**Solution**

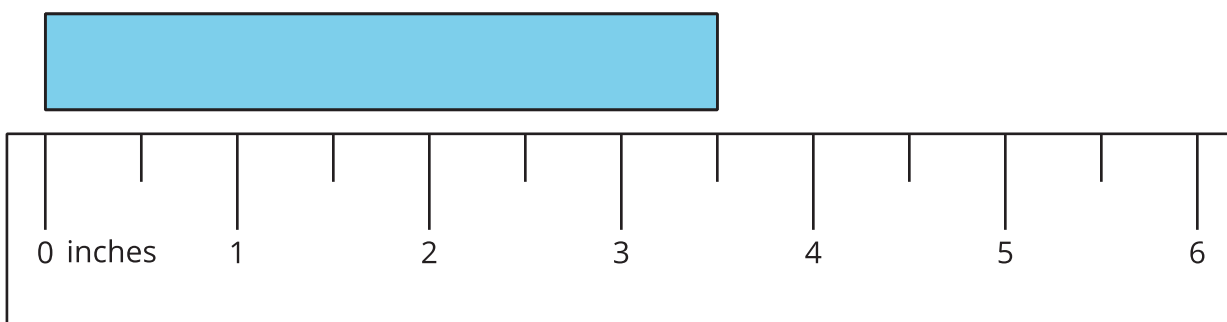
- a. 96. Sample response: I found  $2 \times 48$  by adding  $2 \times 40$  which is 80 and  $2 \times 8$  which is 16.
- b. 12. Sample response: There are 80 cups of lemonade in 10 bottles and then 2 bottles more is 16 for a total of 96 cups.

# Lesson Cool Downs

# Lesson 1: Measure in Halves of an Inch

## Cool Down: Length in Half Inches

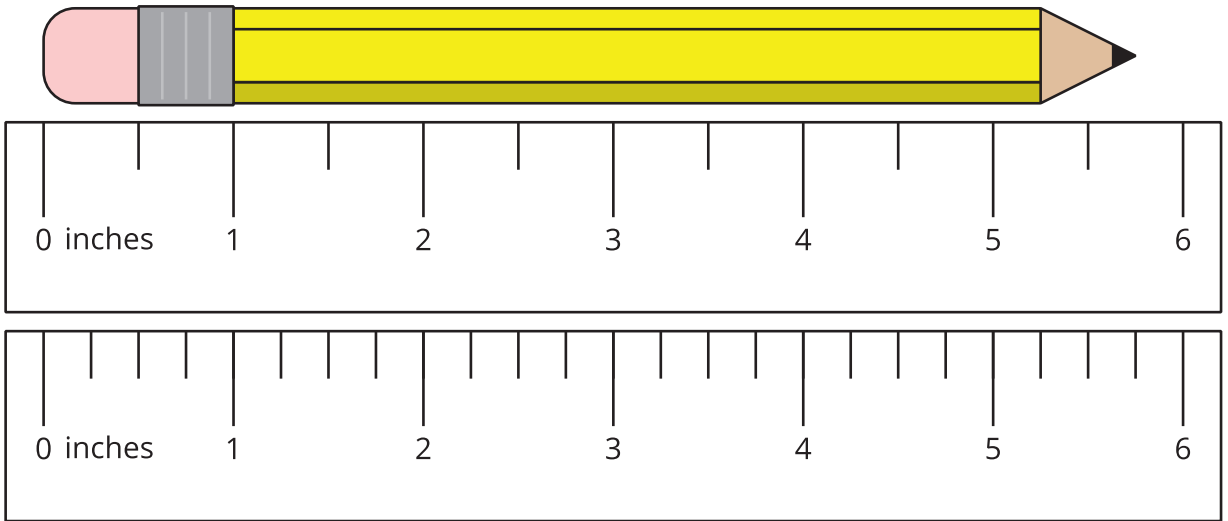
What is the length of the rectangle?



## Lesson 2: Measure in Fourths of an Inch

### Cool Down: Which Ruler?

1. Which ruler would you use to measure the length of the pencil? Explain your reasoning.

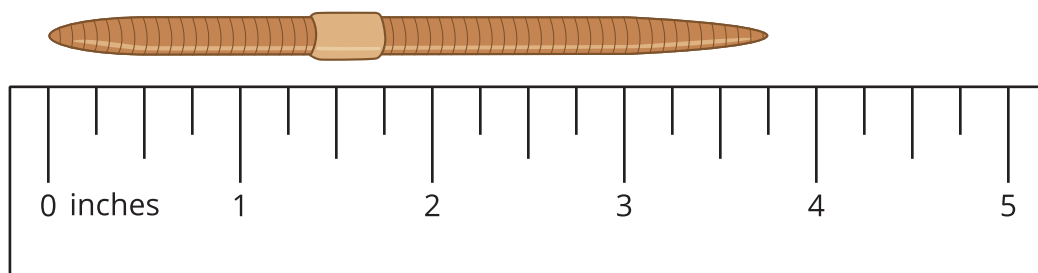


2. What is the length of the pencil?

# Lesson 3: Measure in Halves and Fourths of an Inch

## Cool Down: How Long?

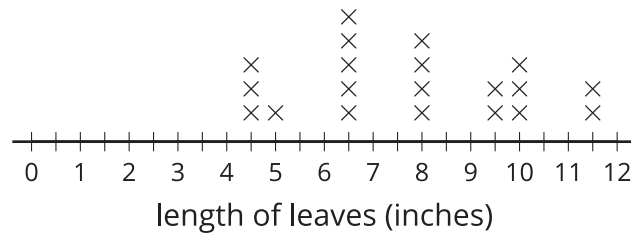
What is the length of the worm in inches?



# Lesson 4: Interpret Measurement Data on Line Plots

## Cool Down: Interpret and Choose

Select all the statements that are true about the measurements in the line plot.



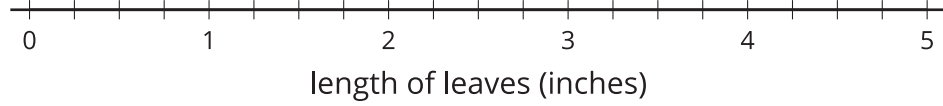
- A. Five leaves had a length of  $6\frac{1}{2}$  inches.
- B. Six leaves had a length of  $9\frac{1}{2}$  inches.
- C. There were 12 leaves measured.
- D. There were 20 leaves measured.
- E. The shortest leaf was 5 inches.
- F. The shortest leaf was  $4\frac{1}{2}$  inches.

# Lesson 5: Represent Measurement Data on Line Plots

## Cool Down: Complete the Line Plot

The list shows lengths of leaves in inches. Use the measurements to complete the line plot.

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





# Lesson 6: Estimate and Measure Weight

## Cool Down: About a Kilogram

Select **all** the objects that could have a weight of about a kilogram.

- A. a bicycle
- B. a book
- C. a marble
- D. a pencil
- E. a bunch of bananas

# Lesson 7: Introduction to Liquid Volume

## Cool Down: Liquid Volume Reflection

What did you learn about liquid volume and how to measure it?

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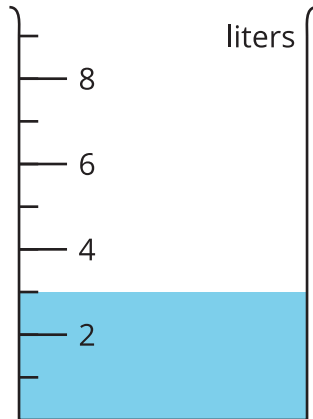
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# Lesson 8: Estimate and Measure Liquid Volume

## Cool Down: Measure in Liters

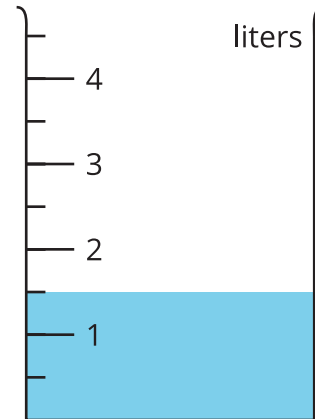
What is the volume of the liquid shown in each image?

1



\_\_\_\_\_

2

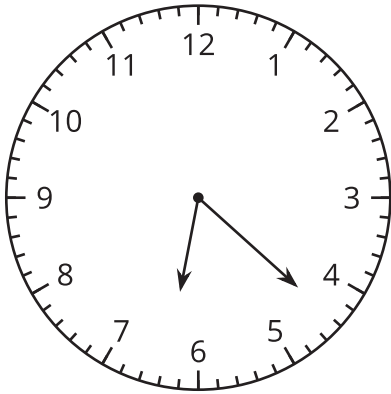


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# Lesson 9: Time to the Nearest Minute

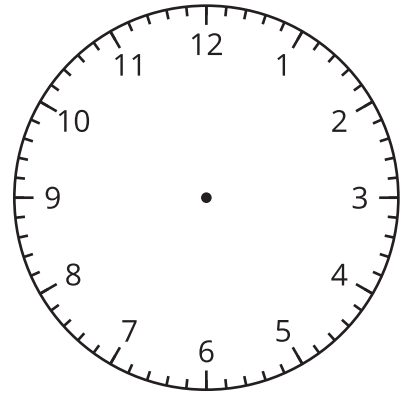
## Cool Down: Times Like These

1



What time is shown? \_\_\_\_\_

2



Show 10:13 a.m. on the clock.

# **Lesson 10: Solve Problems Involving Time (Part 1)**

## **Cool Down: Soccer Time**

Clare leaves school at 3:25 p.m. Her soccer practice begins at 4:15 p.m. How much time does she have to get to the soccer field? Explain or show your reasoning.



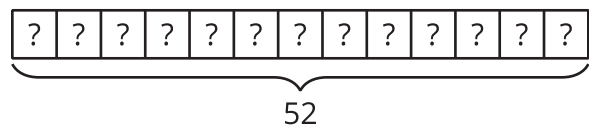
# Lesson 12: Ways to Represent Measurement Situations

## Cool Down: Which Diagram Matches?

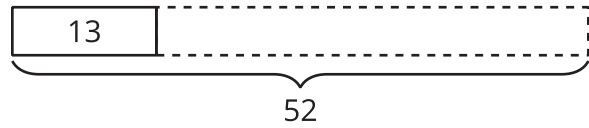
Which diagram matches this situation? Explain your reasoning.

A pumpkin farmer used 52 liters to water 13 seedlings equally. How much water was used on each seedling?

A



B



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# **Lesson 13: Problems with Missing Information**

## **Cool Down: Winner, Winner**

The winning pig weighed 48 kilograms when his owner decided to raise him to show at the fair. At the fair weigh-off, the pig weighed 124 kilograms. How much weight did the pig gain? Explain or show your reasoning.



## Cool Down: A Show at the Carnival

- Grade 3 Unit 6**  
**Lesson 14**

# Lesson 15: Ways to Solve Problems and Show Solutions

## Cool Down: Problem Solving Reflection

Choose a prompt to respond to. Write a few sentences to reflect on problem solving.

- The most important part of problem solving is to remember . . .
- The most important thing to remember when solving problems like we did in this unit is . . .
- The math in this unit reminded me of \_\_\_\_ from outside of school because . . .

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# Instructional Masters

# Instructional Masters for Measuring Length, Time, Liquid Volume, and Weight

address	title	students written requires			card stock	color paper
		per copy	on?	cutting? recommended?		
Activity Grade3.6.1.1.1	Measure Around the Room	5	yes	yes	yes	no
Activity Grade3.6.12.2	Card Sort: Giant Pumpkins	2	no	yes	no	no
Activity Grade3.6.13.2	Info Gap: Pig Weigh-Off	2	no	yes	no	no
Activity Grade3.6.13.1	Info Gap: Pumpkin Weigh-Off	2	no	yes	no	no
Activity Grade3.6.3.WU	Notice and Wonder Rulers	4	no	yes	yes	no
Activity Grade3.6.5.2	Let's Make a Line Plot	2	yes	no	no	no
Center	Estimate and Measure Stage 2 Recording Sheet	1	yes	no	no	no
Center	Target Measurement Stage 1 Recording Sheet	2	yes	no	no	no
Center	Estimate and Measure Stage 3 Recording Sheet	1	yes	no	no	no
Center	Target Measurement Stage 2 Recording Sheet	2	yes	no	no	no
Center	Creating Line Plots Stage 1 Recording Sheet	1	yes	no	no	no
Center	Creating Line Plots Stage 2 Recording Sheet	1	yes	no	no	no

Center	Number Puzzles Addition and Subtraction Stage 5 Recording Sheet	2	yes	no	no	no
Center	Target Numbers Stage 7 Recording Sheet	1	yes	no	no	no
Center	Compare Stage 3 Multiplication Cards	2	no	yes	no	no
Center	Compare Stage 3-8 Directions	2	yes	no	no	no
Center	How Close? Stage 5 Recording Sheet	1	yes	no	no	no

Measure Around the Room

0 inches	1	2	3	4	5	6	7	8	9

0 inches	1	2	3	4	5	6	7	8	9

0 inches	1	2	3	4	5	6	7	8	9

0 inches	1	2	3	4	5	6	7	8	9

0 inches	1	2	3	4	5	6	7	8	9

Card Sort: Giant Pumpkins

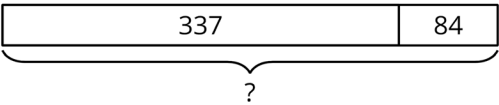
Giant Pumpkins

A

Giant pumpkins grow from seedlings. A farmer used 84 liters to water their seedlings with 12 liters each. How many seedlings were there?

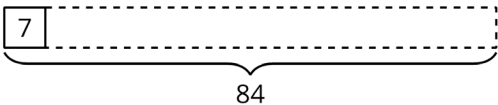
Giant Pumpkins

B



Giant Pumpkins

C



Giant Pumpkins

D

One farmer says he used 337 liters each day to water his giant pumpkin. Another farmer used 84 liters less each day. How much water did she use each day?

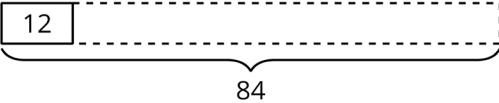
Giant Pumpkins

E

A father and a daughter use 337 liters each day to water their pumpkin and 84 liters a day to water their watermelon. How much water do they use all together each day?

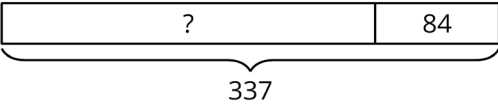
Giant Pumpkins

F



Giant Pumpkins

G



Giant Pumpkins

H

A giant pumpkin gained 12 kilograms each day for 7 days. How much weight did the pumpkin gain during that week?

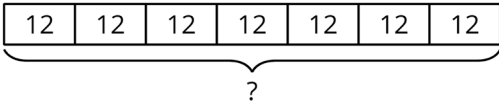
Giant Pumpkins

I

A pack of giant pumpkin seeds weighs 7 grams. A farmer has 84 grams of seeds. How many packs does she have?

Giant Pumpkins

J



Info Gap: Pig Weigh-Off

Info Gap: Pig Weigh-Off  
**Problem Card 1**

Lin stopped at the pig weigh-off. The winning pig's owner said, "This pig gained a lot of weight between the time I decided to show him at the fair and today's weigh-off."

How much weight did the pig gain?

Info Gap: Pig Weigh-Off  
**Data Card 1**

- The pig weighed 36 kilograms when his owner decided to raise him to show at the fair.
- At the fair weigh-off the pig weighed 120 kilograms.

Info Gap: Pig Weigh-Off  
**Problem Card 2**

Lin met another pig's owner at the weigh-off. That pig's owner said, "This pig weighed a lot less when I decided to show him at the fair."

How much did the pig weigh before gaining weight for the fair?

Info Gap: Pig Weigh-Off  
**Data Card 2**

- The pig gained 67 kilograms while being raised to show at the fair.
- At the fair weigh-off the pig weighed 116 kilograms.



Pumpkin Weigh-Off

**Problem Card 1**

A fair is holding a pumpkin weigh-off. The farmer who grew the winning pumpkin says during some days in August, his pumpkin gained a lot of weight each day.

How much did the weight of the pumpkin increase during this time?

Pumpkin Weigh-Off

**Data Card 1**

- The pumpkin's weight increased 13 kilograms each day during these days in August.
- There were 5 days in August when the pumpkin gained this much weight each day.

Pumpkin Weigh-Off

**Problem Card 2**

Another farmer said, "There were some days in August when my pumpkin's weight increased by a lot each day too!"

How much did the weight of the pumpkin increase each day during this time?

Pumpkin Weigh-Off

**Data Card 2**

- The pumpkin's weight increased 72 kilograms during this time.
- There were 6 days in August that the pumpkin's weight increased a lot each day.

Notice and Wonder Rulers



Let's Make a Line Plot



## Estimate and Measure Stage 2 Recording Sheet

Directions:

- Choose an object.
- Choose a unit to measure the length. (inches, feet, centimeters)
- Estimate how many units long your object is.
- Measure and record the actual measurement.

[illegible]

Target Measurement Stage 1 Recording Sheet

Directions:

- Partner A:
  - Choose a target length in inches (up to 10) or centimeters (up to 30).
  - Begin to draw a line with a straightedge.
- Partner B:
  - Say "Stop!" when you think the length of the line is equal to the target measurement.
- Both partners measure the line and find the difference between its length and the target measurement. The difference is Partner B's score for the round.
- Take turns. After 8 rounds, the player with the lowest total score wins.

round	Partner A			Partner B		
	target length	actual length	points	target length	actual length	points
1						
2						
3						
4						
5						
6						
7						
8						

## Estimate and Measure Stage 3 Recording Sheet

Directions:

- Choose an object.
- Estimate how many inches long your object is.
- Measure and record the actual measurement to the nearest  $\frac{1}{4}$  inch.

[illegible]

Target Measurement Stage 2 Recording Sheet

Directions:

- Partner A:
  - Choose a target length in quarter inches (up to 10).
  - Begin to draw a line with a straightedge.
- Partner B:
  - Say "Stop!" when you think the length of the line is equal to the target measurement.
- Both partners measure the line and find the difference between its length and the target measurement. The difference is Partner B's score for the round.
- Take turns. After 8 rounds, the player with the lowest total score wins.

round	Partner A			Partner B		
	target length	actual length	points	target length	actual length	points
1						
2						
3						
4						
5						
6						
7						
8						

Directions:

- Measure up to 8 objects to the nearest inch or centimeter.
- Create a line plot of your measurement data. Don't forget to add a title and label.
- Ask your partner 2 questions that can be answered based on the data in your line plot.





# Creating Line Plots Stage 2 Recording Sheet

## Directions:

- Measure up to 8 objects to the nearest quarter inch.
- Create a line plot of your measurement data. Don't forget to add a title and label.
- Ask your partner 2 questions that can be answered based on the data in your line plot.



# Number Puzzles Addition and Subtraction Stage 5 Recording Sheet

## Puzzle 1

Fill in digits to make each equation true.  
You may only use each digit (0–9) once.

$$\begin{array}{|c|} \hline \square \\ \hline \end{array} \begin{array}{|c|} \hline 5 \\ \hline \end{array} \begin{array}{|c|} \hline 0 \\ \hline \end{array} + \begin{array}{|c|} \hline \square \\ \hline \end{array} \begin{array}{|c|} \hline 5 \\ \hline \end{array} \begin{array}{|c|} \hline 0 \\ \hline \end{array} = 700$$

$$\begin{array}{|c|} \hline 8 \\ \hline \end{array} \begin{array}{|c|} \hline \\ \hline \end{array} \begin{array}{|c|} \hline 2 \\ \hline \end{array} - \begin{array}{|c|} \hline \\ \hline \end{array} \begin{array}{|c|} \hline 2 \\ \hline \end{array} \begin{array}{|c|} \hline 1 \\ \hline \end{array} = 371$$

	2	9	+	1	2	
						= 456

$$\begin{array}{|c|} \hline \square \\ \hline 0 \\ \hline 0 \\ \hline - \\ \hline 1 \\ \hline 5 \\ \hline \square \\ \hline \end{array} = 442$$

$$\begin{array}{|c|} \hline 3 \\ \hline \end{array} \begin{array}{|c|} \hline 5 \\ \hline \end{array} \begin{array}{|c|} \hline \phantom{00} \\ \hline \end{array} - \begin{array}{|c|} \hline 1 \\ \hline \end{array} \begin{array}{|c|} \hline 0 \\ \hline \end{array} \begin{array}{|c|} \hline \phantom{00} \\ \hline \end{array} = 251$$

**Puzzle 2**

Fill in digits to make each equation true.  
You may only use each digit (0-9) once.

$$150 + \boxed{\phantom{0}}\boxed{0}\boxed{\phantom{0}} = 759$$

$$\boxed{\phantom{0}}\boxed{0}\boxed{0} - 187 = \boxed{5}\boxed{1}\boxed{\phantom{0}}$$

$$\boxed{5}\boxed{2}\boxed{\phantom{0}} + \boxed{1}\boxed{4}\boxed{\phantom{0}} = 668$$

$$\boxed{6}\boxed{\phantom{0}}\boxed{\phantom{0}} - 531 = 111$$

$$\boxed{4}\boxed{\phantom{0}}\boxed{\phantom{0}} + 322 = 773$$

**Puzzle 3**

Fill in digits to make each equation true.  
You may only use each digit (0-9) once.

$$\square \square 4 \square 0 + \square \square 6 \square 0 = 800$$

$$\square \square 0 \square 0 - \square \square 5 \square 5 = 545$$

$$351 + \square 4 \square \square = 818$$

$$541 - \square 2 \square \square = 257$$

$$785 - 682 = \square \square \square 3$$

**Puzzle 4**

Fill in digits to make each equation true.  
You may only use each digit (0-9) once.

$$\boxed{\phantom{0}}\boxed{0}\boxed{5} + \boxed{1}\boxed{\phantom{0}}\boxed{\phantom{0}}\boxed{7} = 912$$

$$\boxed{\phantom{0}}\boxed{0}\boxed{0} - 271 = \boxed{3}\boxed{\phantom{0}}\boxed{\phantom{0}}\boxed{9}$$

$$\boxed{\phantom{0}}\boxed{2}\boxed{8} + \boxed{\phantom{0}}\boxed{\phantom{0}}\boxed{5}\boxed{6} = 484$$

$$\boxed{\phantom{0}}\boxed{0}\boxed{5} - 100 = \boxed{6}\boxed{0}\boxed{\phantom{0}}\boxed{\phantom{0}}$$

$$\boxed{2}\boxed{\phantom{0}}\boxed{\phantom{0}}\boxed{3} + \boxed{3}\boxed{\phantom{0}}\boxed{\phantom{0}}\boxed{2} = 635$$

Target Numbers Stage 7 Recording Sheet

Directions:

- On your turn:
  - Start at 1,000. Roll 3 number cubes. For each cube, decide whether the number you rolled will represent hundreds, tens, or ones. Write an equation to represent the difference.
- Take turns until you've played 6 rounds.
- Each round, the difference from the previous equation is the starting number in the new equation.
- The partner who gets a difference closest to 0 without going below 0 wins.

roll and choose	equation
<div>____ hundreds</div> <div>____ tens</div> <div>____ ones</div>	<div>1,000 - _____ = _____</div>
<div>____ hundreds</div> <div>____ tens</div> <div>____ ones</div>	<div>_____ - _____ = _____</div>
<div>____ hundreds</div> <div>____ tens</div> <div>____ ones</div>	<div>_____ - _____ = _____</div>
<div>____ hundreds</div> <div>____ tens</div> <div>____ ones</div>	<div>_____ - _____ = _____</div>
<div>____ hundreds</div> <div>____ tens</div> <div>____ ones</div>	<div>_____ - _____ = _____</div>
<div>____ hundreds</div> <div>____ tens</div> <div>____ ones</div>	<div>_____ - _____ = _____</div>

## Compare Stage 3 Multiplication Cards

Compare Stage 3

$$12 \times 9$$

Compare Stage 3

$$12 \times 7$$

Compare Stage 3

$$13 \times 7$$

Compare Stage 3

$$14 \times 6$$

Compare Stage 3

$$15 \times 6$$

Compare Stage 3

$$10 \times 20$$

Compare Stage 3

$$21 \times 4$$

Compare Stage 3

$$19 \times 5$$

## Compare Stage 3 Multiplication Cards

Compare Stage 3

$$18 \times 5$$

Compare Stage 3

$$17 \times 4$$

Compare Stage 3

$$16 \times 6$$

Compare Stage 3

$$14 \times 7$$

Compare Stage 3

$$31 \times 3$$

Compare Stage 3

$$20 \times 4$$

Compare Stage 3

$$8 \times 9$$

Compare Stage 3

$$9 \times 7$$



## Compare Stage 3 Multiplication Cards

Compare Stage 3

$$12 \times 5$$

Compare Stage 3

$$13 \times 4$$

Compare Stage 3

$$15 \times 3$$

Compare Stage 3

$$9 \times 5$$

## Compare Stage 3-8 Directions

### Directions:

- Split the deck between the players.
- Each player turns over a card.
- Compare the values. The player with the greater value keeps both cards.
- If the values are the same, each player turns over one more card. The player with the greater value keeps all four cards.
- Play until you run out of cards. The player with the most cards at the end of the game wins.

Record any sets of cards that are challenging to compare:

How Close? Stage 5 Recording Sheet

Directions:

- Each partner:
  - Take 4 cards.
  - Choose 2–3 cards to multiply.
  - Write an equation to show the product of the numbers you chose.
  - Your score for each round is the difference between your product and 100.
- Take new cards so that you have 4 cards to start the next round.
- At the end of the game, add your score for each round. The player with the lowest score wins.

round	multiplication equation	points for the round
1		
2		
3		
4		
5		
6		
7		
8		

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