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Unit 18

Standard 2.MD.5

*Solve Word Problems Involving Lengths***Unit 18 Standards**

(Student pages 109–114)

Michigan Standards for Mathematics: 2.MD.5

Domain	Measurement and Data
Cluster	Relate addition and subtraction to length.
Standard	2.MD.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.

Other Standards Addressed in This Unit

2.OA.1, 2.NBT.5, 1.OA.6

Standards for Mathematical Practice Addressed in This Unit

MP.1	Make sense of problems and persevere in solving them.
MP.2	Reason abstractly and quantitatively.
MP.4	Model with mathematics.
MP.5	Use appropriate tools strategically.
MP.7	Look for and make use of structure.
MP.8	Look for and express regularity in repeated reasoning.

Unpacking the Standards

In grade 1, students solved addition word problems in which sums were less than or equal to 20 by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. In grade 2, students extend this concept by solving addition and subtraction word problems within 100. Students also solve word problems involving lengths that are given in the same units of measure. Students again use objects, drawings, and equations with a symbol for the unknown number to represent the problems. Students represent problems on rulers, by counting on or counting back, which lays the foundation for work with number lines.

Getting Started**Introduction Activity**

The teacher distributes 1–6 centimeter cubes (or unit cubes from a set of base 10 blocks) to each student. Students receive different numbers of cubes. Students use rulers to verify that the length of each cube is 1 centimeter. Students place the cubes end-to-end to form trains. The teacher places students in pairs and displays questions about the two trains.

- *What is the total length of the two trains?*
- *What is the difference in the lengths of the two trains?*

Student pairs solve the problems with the cubes. Each pair records equations to show the solutions. Students align blocks above the centimeter side of the ruler to verify the solutions. If a solution is incorrect, students discuss strategies for determining the correct solution.

(DOK 2, Bloom's Level: Application/Apply)

Suggested Formative Assessment

Following the Introduction Activity, the teacher provides students with a word problem that can be solved using a centimeter ruler. Student pairs use the ruler to solve the problem and record the solution as an equation in math journals.

(DOK 2, Bloom's Level: Application/Apply)

Children's Literature Connections

How Do You Measure Length and Distance? – Thomas K. and Heather Adamson

Is a Blue Whale the Biggest Thing There Is? – Robert E. Wells

Let's Measure It! – Luella Connelly

Safari Park: Finding Unknowns – Stuart J. Murphy

Unit 18

Standard 2.MD.5

Solve Word Problems Involving Lengths

Vocabulary Focus

The following are essential vocabulary terms for this unit.

add	equation	meter (m)	yard (yd)
centimeter (cm)	foot/feet (ft)	subtract	
difference	inch (in)	sum	
distance	length	unknown number	

Vocabulary Activity

Fill It In

On an individual dry erase board, each student writes a sentence that includes a unit vocabulary term. The student underlines the vocabulary term and then erases only that term, leaving the rest of the sentence intact with a blank line representing the omitted term. Students exchange boards with partners, read the sentences, and supply the missing terms. Students repeat the activity with other terms not used by either partner.

(DOK 1, Bloom's Level: Comprehension/Understand)

Suggested Formative Vocabulary Assessment

Following the Vocabulary Activity, each student writes another fill-in-the-blank sentence on a sheet of paper. The teacher reads a sentence for each term to the class. After each sentence is read, students write the missing term on dry erase boards and hold up the boards. The teacher observes student responses and plans additional vocabulary instruction as needed.

(DOK 1, Bloom's Level: Comprehension/Understand)

Suggested Instructional Activities

1. The teacher displays an addition or subtraction word problem that involves centimeters. Each pair of students uses a meter stick to model the solution to the problem. For example, to solve an addition problem, one partner places a finger on the number on the meter stick that matches the first addend. The other partner moves a finger forward or backward from that point the number of spaces that matches the second number to arrive at the sum or difference. The activity may be expanded to include problems with units other than centimeters. Students can use the meter sticks to solve the problems and record the appropriate units of measure in the solutions. Students then use this procedure to identify an unknown number in a measurement equation. For example, given the equation $24 \text{ cm} + \square = 35 \text{ cm}$, one partner locates the number 24 on a meter stick (to indicate 24 cm). The other partner locates the sum, 35 cm, on the meter stick. Together the partners determine that the unknown number in the equation is 11 cm by counting on from 24 to 35. A similar procedure is followed to determine an unknown in subtraction equations such as $42 \text{ cm} - \square = 33 \text{ cm}$. Students count back from 42 to 33 to find the missing number, 9 cm.

(DOK 2, Bloom's Level: Application/Apply)

2. The teacher places a tape line on the floor of the classroom or hallway and asks for 3 or 4 volunteers to jump from the line. After each jump, the teacher marks the landing spot at the back of the heel. Students use tools to measure the length of each jump in centimeters or inches, as assigned by the teacher. The teacher records the data on chart paper. Each student pair creates a word problem using the data. Students use equations or models to find the solutions, recording responses in math journals. Partners trade problems with other pairs, solve one another's problems, and discuss the solutions.

(DOK 3, Bloom's Level: Synthesis/Create)

3. The teacher provides each student pair with two dice and a spinner labeled with units of length (inches, feet, yards, centimeters, and meters). Students roll the dice and create a 2-digit number with the results (e.g., Rolls of 1 and 5 could represent 15 or 51.). Partners roll the dice again to create another number. Partners also spin the spinner to determine a unit of measure. Students write word problems using the two numbers and the unit of measure. (The solutions to the problems must be 100 or less. If a solution is greater than 100, students either rewrite the problem, reverse the digits of one of the numbers used in the problem, or reroll the dice.) Partners exchange problems with other pairs and use models or equations to solve the problems. The two student pairs form a group of four students and discuss why the solutions to the two problems are reasonable. If a solution is not correct, students amend their work.

(DOK 3, Bloom's Level: Synthesis/Create)

Unit 18

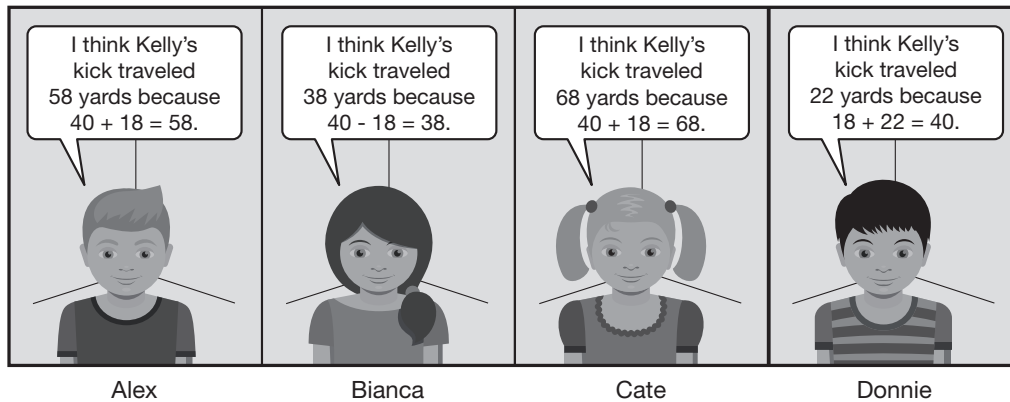
Standard 2.MD.5

Solve Word Problems Involving Lengths

Suggested Formative Assessment

The teacher displays a word problem that requires addition or subtraction of units of length and a cartoon that depicts four students with different solutions.

Darla and Kelly each kicked the football. Darla's kick traveled 18 yards. The total distance Darla and Kelly kicked the football was 40 yards. How many yards did Kelly's kick travel?



The teacher labels the four corners of the classroom A, B, C, D. At the teacher's signal, each student quickly moves to the corner that matches the initial of the cartoon character he/she believes to be correct. Students in each corner explain the reasons for their answers. With the teacher's guidance, the class determines the correct solution.

(DOK 1, Bloom's Level: Application/Apply)

Suggested Reflection/Closure Activity

The teacher distributes different word problems that require addition or subtraction of units of length. The teacher provides each student with a blank 4-frame strip of squares. Each student creates a cartoon similar to the one used during the Suggested Formative Assessment for Instructional Activities. Each student records the answer on the back of the comic strip or on a separate sheet of paper.

(DOK 3, Bloom's Level: Synthesis/Create)

Suggested Formative Assessment

The teacher displays the cartoons created during the Reflection/Closure Activity on a classroom wall or bulletin board. During the week, students determine the solutions to the problems, as time permits, and record responses in math journals. At the end of the week, the teacher and class discuss the solutions. The teacher assists students or provides interventions if necessary.

(DOK 1, Bloom's Level: Application/Apply)

Solve Word Problems Involving Lengths

Unit 18
Standard 2.MD.5

Interventions

1. Students use interlocking cubes to model solutions for equations developed from measurement word problems. For example, to model the solution to $\square + 19 = 24$, students make a train of 19 cubes and a train of 24 cubes. Since one train is 5 cubes longer than the other, the solution is 5.

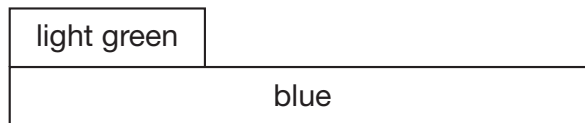
(DOK 2, Bloom's Level: Application/Apply)

2. Students use Cuisenaire® rods to solve word problems involving addition or subtraction of lengths in centimeters within 10. The teacher provides a word problem, and each student records an equation with a symbol for the unknown number. Each student then solves the problem with Cuisenaire® rods, measuring the lengths of the rods with a centimeter ruler if needed. A sample problem and solution are shown.

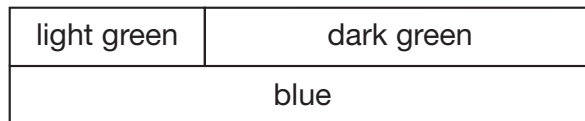
Rob catches two bugs. The first bug is 3 centimeters long. The total length of both bugs is 9 centimeters. How long is the second bug?

$$3 + \square = 9$$

Since the light green rod is 3 centimeters long and the blue rod is 9 centimeters long, students can create the following model.



Students determine that the dark green rod fills the empty space in the model. The length of the dark green rod, which is 6 centimeters, is the answer.



(DOK 2, Bloom's Level: Application/Apply)

3. To model solutions to problems involving feet, students place standard 1-foot rulers end-to-end on the floor of the classroom or hallway and step alongside them in 1-foot steps. For example, to solve a problem that requires subtraction of $13 - 6$, a student might start by placing 13 rulers end-to-end. The student stands at the beginning of the line of rulers and steps alongside the rulers in 6 one-foot steps. Each step is completed at the end of a ruler. The student then determines the solution by counting the number of rulers remaining from the end of the last step to the end of the line of rulers.



(DOK 2, Bloom's Level: Application/Apply)

Unit 18

Standard 2.MD.5

Solve Word Problems Involving Lengths

Suggested Formative Assessment

Students work in pairs to determine how to solve a word problem.

June's plant is 22 centimeters tall. Alexia's plant is 32 centimeters tall. How much shorter is June's plant than Alexia's plant?

Students discuss what they know about the problem, what they need to find, and what information in the problem can help them find the solution. Then they use connecting cubes or other objects to model the heights of the plants. Students discuss the heights of the two plants in terms of shorter or taller and answer the question, "How much shorter is June's plant than Alexia's plant?" The teacher provides clarifications and feedback as needed.

(DOK 1, Bloom's Level: Application/Apply)

Extending Student Thinking

Students work in small groups to create a memory-match game. They write four word problems involving length, each on a separate index card. They write an equation for each word problem on other cards. Students should write a combination of addition and subtraction problems. Students exchange the eight index cards with another group to play a matching game. Groups shuffle the cards and place them facedown in an array. Students alternate turns turning over two cards. If the cards match, students solve the word problem card with the equation card, and then set the cards aside. If the cards do not match, they are returned facedown. Students alternate turns. The game ends when all the cards are matched.

(DOK 3, Bloom's Level: Synthesis/Create)

Skillful Thinking

Skillful Thinking = Deeper Learning through Revised Bloom's Taxonomy, Depth of Knowledge, and 9 Traits of Critical Thinking

The 9 Traits of Critical Thinking™ include *adapt, collaborate, communicate, create, examine, inquire, link, reflect, and strive*. These traits foster high-quality thinkers. On the Skillful Thinking page in each unit of the student edition, traits are selected and identified in each questioning prompt to reinforce student use of the traits in the context of mathematics. The labeling of the traits assists students in recognizing that the application of a focus trait is needed to complete the questioning prompt. The educator should note that each questioning prompt in the student edition is not limited to the identified trait since multiple critical thinking traits may be utilized by the student to successfully respond to the prompt.



Examine – I use a variety of methods to explore and to analyze.

- ✓ Engagement Indicator – Students use analytical skills to make inferences, interpret data, integrate or organize ideas, and make connections.
- ✓ Strategy to Facilitate the **Examine** Trait – Challenge students to organize information to deepen insight by discovering patterns, trends, and connections to form conclusions.



Inquire – I seek information that excites my curiosity and inspires my learning.

- ✓ Engagement Indicator – Students demonstrate inquisitive attitudes by asking probing questions, questioning responses, and challenging the status quo.
- ✓ Strategy to Facilitate the **Inquire** Trait – Relate complex concepts to students' interests and daily lives.

Solve Word Problems Involving Lengths

Unit 18
Standard 2.MD.5

Answer Key and Codings

Page	Question	Answer	DOK Level	Bloom's Original/Revised
109	1	$7\text{ cm} - 6\text{ cm} = 1\text{ cm}$ Any related equation (e.g., $1\text{ cm} + 6\text{ cm} = 7\text{ cm}$) is also acceptable.	2	Application/Apply
	2	$7\text{ cm} + 6\text{ cm} = 13\text{ cm}$ Any related equation is acceptable.	2	Application/Apply
	3	$\square - 1 = 3$ or any related equation 4 meters	1	Application/Apply
	4	$24 + \square = 54$ or any related equation 30 inches	1	Application/Apply
110	1	C	1	Application/Apply
	2	D	2	Application/Apply
	3	C and D	2	Comprehension/Understand
	4	B	1	Comprehension/Understand
	5	A	2	Application/Apply
111	1	D	1	Application/Apply
	2	C	2	Application/Apply
	3	B	2	Application/Apply
	4	A, B, and D	2	Comprehension/Understand
112	1	B	1	Comprehension/Understand
	2	B	1	Application/Apply
	3	D	1	Comprehension/Understand
	4	A	1	Application/Apply
	5	16 inches	2	Application/Apply
113	1	5 inches Explanations will vary. $24\text{ in} - 5\text{ in} - 9\text{ in} = 10\text{ inches}$ When a 10-inch board is divided into two equal parts, each part is 5 inches long.	2	Application/Apply
	2	How many inches farther does Randa toss the beanbag than Garon? How many total inches do Garon and Monte toss the beanbag?	2	Analysis/Analyze
	Journal	Questions and answers will vary.	3	Synthesis/Create
114	Motivation Station	Answers will vary.	2	Application/Apply

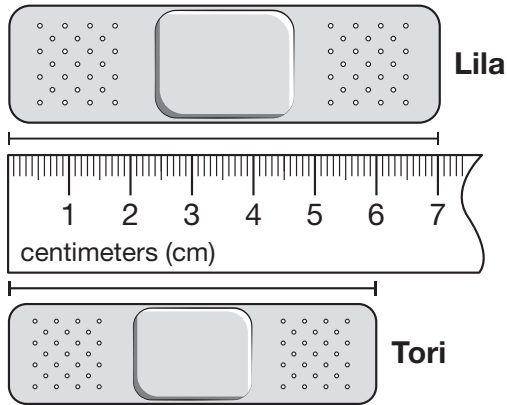
Name _____

Standard 2.MD.5

Unit 18 Introduction

Use the information to answer questions 1 and 2.

Lila and Tori fell at recess. The nurse gave each girl a bandage.



1. How many centimeters longer is Lila's bandage than Tori's bandage? Write an equation to show your answer.

Equation _____

2. What is the total length of both bandages in centimeters? Write an equation to show your answer.

Equation _____

3. Rona bought a length of rope. She cut off 1 meter of rope. Now she has 3 meters of rope. How much rope did Rona buy?

Write an equation for the problem. Use for the unknown number.

Equation _____

Answer _____

4. Joe buys 24 inches of blue trim and some gold trim. He buys a total of 54 inches of trim. How many inches of gold trim does Joe buy?

Write an equation to solve the problem. Use for the unknown number.

Equation _____

Answer _____

Words for the Wise

add	equation	meter (m)	yard (yd)
centimeter (cm)	foot/feet (ft)	subtract	
difference	inch (in)	sum	
distance	length	unknown number	



Unit 18 Partner Practice

Name _____

Standard 2.MD.5

1. Jeff runs 36 yards. Mike runs 57 yards. How much farther does Mike run than Jeff?

- A 93 yards C 21 yards
B 83 yards D 11 yards

2. Kisha measures the heights of some tomato plants. The chart shows the heights of the plants.

Plant Heights

Plant	Height
A	36 centimeters
B	12 centimeters
C	28 centimeters

What is the sum of the heights of the three plants?

- A 46 cm C 66 cm
B 56 cm D 76 cm

3. Ms. Green's office building is 27 meters taller than her house. Ms. Green's office building is 35 meters tall. How many meters tall is Ms. Green's house?

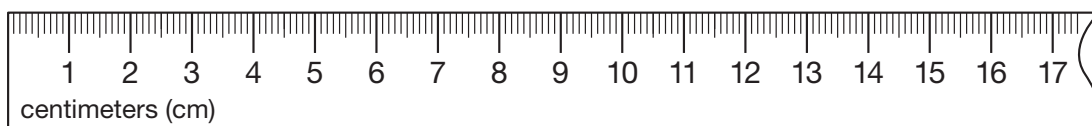
Select **all** the equations that can be used to solve the problem.

- A $27 + 35 = \square$
B $\square - 35 = 27$
C $35 - 27 = \square$
D $35 = 27 + \square$

4. A mother whale is 90 feet long. Her calf is 68 feet shorter than the mother. Which equation can be used to find the length of the calf in feet?

- A $68 - \square = 90$
B $\square = 90 - 68$
C $68 + 90 = \square$
D $\square - 68 = 90$

5. Janie and Flor each have a gum rope. Janie's rope is 4 centimeters longer than Flor's rope. Janie's rope is 12 centimeters long. How many centimeters long is Flor's gum rope? Use the ruler to help find the answer.



- A 8 centimeters C 16 centimeters
B 9 centimeters D 17 centimeters

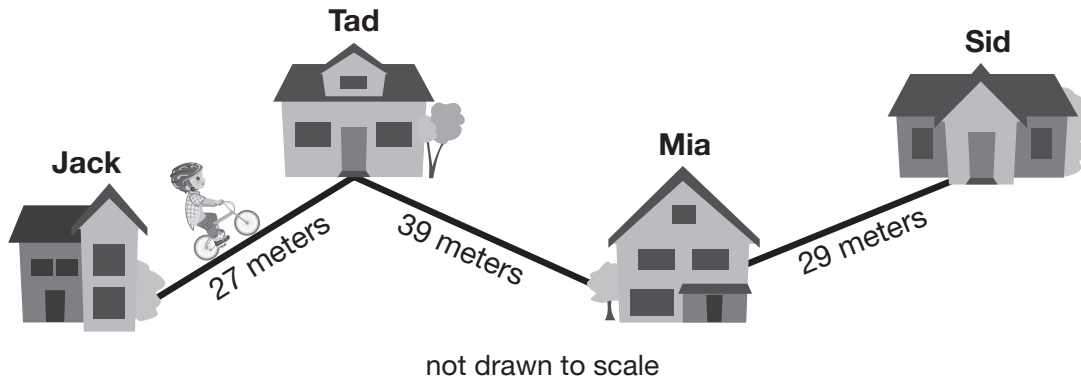
Name _____

Standard 2.MD.5

Unit 18 Independent Practice

Use the information to answer questions 1 and 2.

Jack bikes from his house to three homes on his street to deliver papers. A map of Jack's path is shown.



- How many meters does Jack bike between Tad's house and Sid's house?
 A 10 meters B 58 meters C 66 meters D 68 meters
- How many total meters does Jack bike from his house to Sid's house to deliver the papers?
 A 56 meters B 85 meters C 95 meters D 96 meters

3. Tom has two pieces of rope. One piece is 7 meters long. The second piece is 26 meters long. Tom gives 22 meters of rope to a friend. How many meters of rope does Tom have now?

- A 9 meters
 B 11 meters
 C 33 meters
 D 44 meters

4. Terry runs 47 yards with his kite. Mary runs 19 fewer yards with her kite than Terry.

Select **all** the equations that can be used to find the number of yards Mary runs.

- A $19 + \square = 47$
 B $47 - \square = 19$
 C $19 + 47 = \square$
 D $47 - 19 = \square$



Unit 18 Assessment

Name _____

Standard 2.MD.5

1. Sara and Meg join paper chains to make a chain 91 inches long. Sara's paper chain is 47 inches long. Which equation shows a way to find the length of Meg's paper chain in inches?

A $91 + 47 = \square$

B $\square + 47 = 91$

C $47 - \square = 91$

D $\square - 47 = 91$

2. Last year, Max's puppy was 12 inches long. Now, Max's puppy is 33 inches long. How much did the puppy grow?

A 19 inches

B 21 inches

C 35 inches

D 45 inches

3. Caleb has 39 feet of red yarn and 56 feet of blue yarn. Which equation shows a way to find the total length of Caleb's yarn?

A $\square = 56 - 39$

B $39 - 56 = \square$

C $\square + 56 = 39$

D $\square = 39 + 56$

4. Dana sprinted 31 meters on Monday. She also sprinted on Tuesday. Dana sprinted a total of 60 meters on Monday and Tuesday. How many meters did Dana sprint on Tuesday?

A 29 meters

B 31 meters

C 51 meters

D 91 meters

5. Brian's fishing pole has three pieces. One piece is 34 inches long. A second piece is 47 inches long. The fishing pole is 97 inches long when he puts it together. How long is the third piece? Show your work to solve the problem.

Answer _____

Name _____

Standard 2.MD.5

Unit 18 Skillful Thinking



1. Jane has a wooden board that is 24 inches long. She uses 5 inches for one project and 9 inches for another project. She divides the leftover wood into two equal parts. How many inches long is each equal part?

Answer _____

Explain how you solved the problem.



2. Garon, Randa, and Monte each toss a beanbag. Garon tosses his beanbag 39 inches. Randa tosses her beanbag 46 inches. Monte tosses his beanbag 42 inches.

What is the question if the answer is 7 inches?

What is the question if the answer is 81 inches?

Journal

Using the information in Skillful Thinking question 2, write and answer a different question about the beanbag tosses.

Question _____

Answer _____



The Lizard and the Snail

“The Lizard and the Snail” is a story with missing information. Students work in pairs. Before the students read the story, student 1 reads the words beneath the empty spaces. Student 2 provides the missing information. Then, student 1 reads the story aloud, inserting the words provided by student 2. The partners answer the math question that follows.

Once upon a time, Lonnie Lizard and Sally Snail decided to race from one end of a sidewalk to the other. All their friends came to watch, including the _____, the _____, and the _____. When _____, the referee, said, “Go!” they were off! First, Lonnie ran _____ feet. Then he stopped to play _____, and Sally passed him! When Lonnie saw that he was losing the race, he tried to catch up. He ran _____ feet and passed Sally. Lonnie saw a cloud in the sky that looked just like a (or an) _____. He stopped to admire it, and Sally raced ahead of him again! Lonnie darted ahead another _____ feet, passing Sally. He was feeling a little hungry, so he sat down and ate _____. Then he saw that Sally was almost at the end of the sidewalk! Lonnie dashed another _____ feet and reached the finish line at exactly the same time as Sally. The race was declared a tie! Lonnie and Sally each received a blue ribbon, and everyone sat down for a nice cool glass of _____.

How many feet long is the sidewalk in the story? _____

Parent Activities

1. When your child is solving a math problem, talk through the problem together. Ask questions and discuss possible solutions. Talk about how the answer is determined.
2. Have your child talk through a word problem that involves measuring length. Have your child make a drawing of the problem and then write an equation with a symbol for the unknown number. Together discuss how the drawing helps solve the problem.