Objective

Represent whole numbers as lengths on a number line.

Common Core State Standards

- **2.MD.6** Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram.

Measurement and Data

Whole Numbers as Lengths on a Number Line

As children continue to become familiar with the units and processes of measuring length, they can begin to see a ruler as a number line and a number line as a ruler. By using rods of various lengths on a number line, they also can see units on the number line as whole numbers and whole numbers as lengths. Building trains of rods on a number line will help children understand how to add using a number line.

Try It! *Perform the Try It! activity on the next page.*

Talk About It

Discuss the Try It! activity.

- **Say:** *Every space between ticks on the number line represents one.* **Ask:** *How many spaces do the 2 white rods cover?* **Say:** *So on this number line, one space equals the length of 1 white rod.*
- **Ask:** *What is the value of the purple rod? Where did we place the purple rod on the number line? Starting at 2 and adding 4 using the purple rod, where do we end up?*
- **Ask:** *What is the value of the dark green rod? Where did we place it on the number line? Starting at 6 and adding 6 using the dark green rod, where do we end up? What is the length of the train?*
- **Ask:** *How is the number line like a ruler? How is it different?*

Solve It

With children, reread the problem. Have children draw the rods on the number lines. Have them write number sentences that represent the value of the train and its length.

More Ideas

For another way to teach about representing whole numbers as lengths—

- For children who are having trouble, use 1-Inch Number Lines (BLM 12) and Inchworms™ to find various lengths of 1 through 8 inches. The larger unit and the ability to snap the Inchworms together might help children who are struggling.

Formative Assessment

Have children try the following problem.

How long is a train of 3 white rods, 2 red rods, and 1 light green rod on a centimeter number line?

A. 3   **B.** 7   **C.** 10

Try It! 25 minutes | Pairs

Here is a problem about representing whole numbers as lengths.

Ryan made a train of Cuisenaire Rods. He used 2 white rods, 1 purple rod, and 1 dark green rod. He built the train on a centimeter number line, starting at zero. At what number on the number line does the train end? What is the length of the train?

Introduce the problem. Then have children do the activity to solve the problem. Distribute Cuisenaire Rods, 1-cm Number Lines (BLM 11), crayons, paper, and pencils to children.
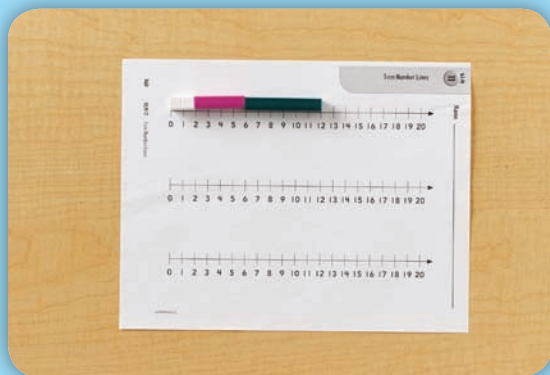
Materials

- Cuisenaire® Rods ($\frac{1}{2}$ set per pair)
- 1-cm Number Lines (BLM 11; 1 per pair)
- crayons (1 set per pair)
- paper (1 sheet per pair)
- pencils (1 per child)
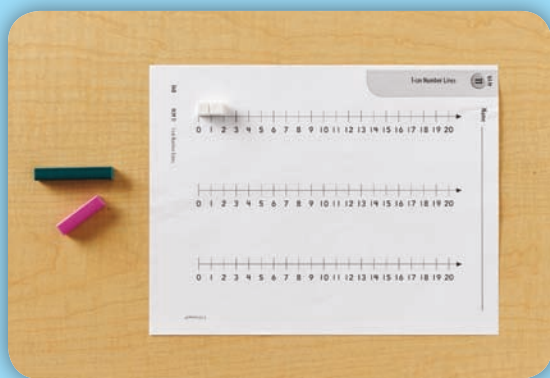
1. Ask: *Where should we start our train on the number line?* Remind children to start at zero and build the train to the right. **Ask:** *What is the value of the 2 white rods? What number does the second white rod end at?*
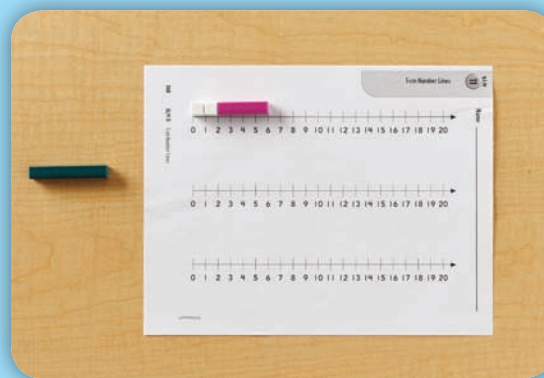
2. Say: *Now place the purple rod at the end of the white rods.* **Ask:** *How much more does the purple rod add? Where does the train end?* **Say:** *We can show this using a number sentence.* Write *2 + 4 = 6* on the board.

⚠ Look Out!

Watch for children who don't keep the train together. They might allow space between rods or allow the rods to move from zero. Explain that using a number line is like using a ruler. The left side of the train must align with 0.
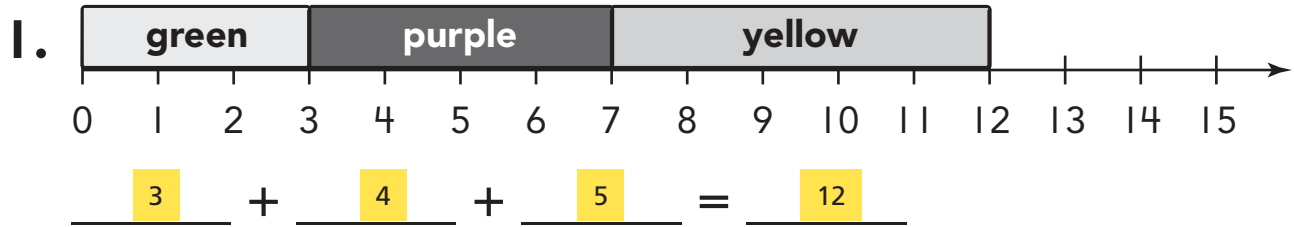
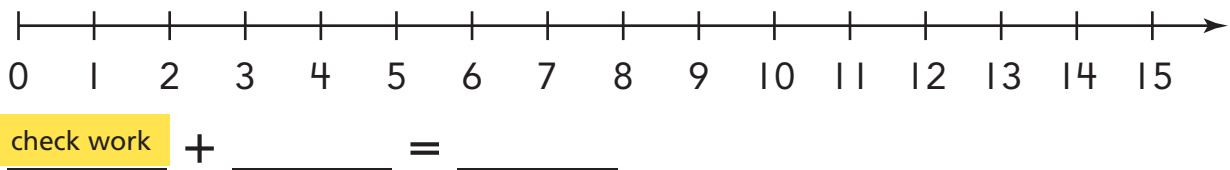**3. Say:** *Now add the dark green rod at the end of the purple rod.* **Ask:** *How much does the dark green rod add to the train? Where does the train end? What is the length of the train?* **Say:** *You can show this using a number sentence, too.* Write *6 + 6 = 12.*

Use Cuisenaire Rods. Build the model. Write a number sentence for the lengths.

1.

green	purple	yellow

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

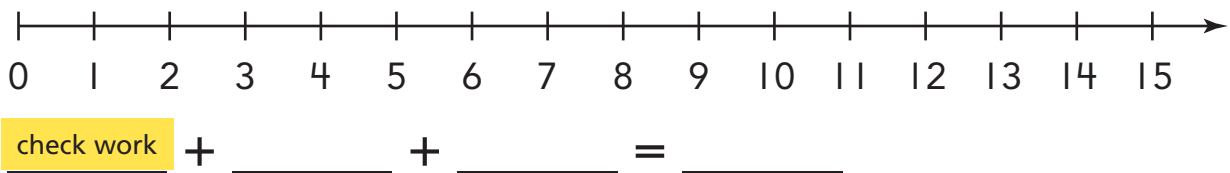_____3_____ + _____4_____ + _____5_____ = _____12_____

Use two or three Cuisenaire Rods. Build the length. Draw the model. Write a number sentence.
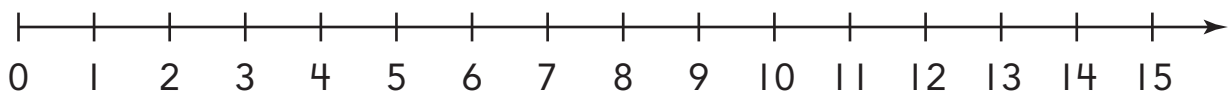
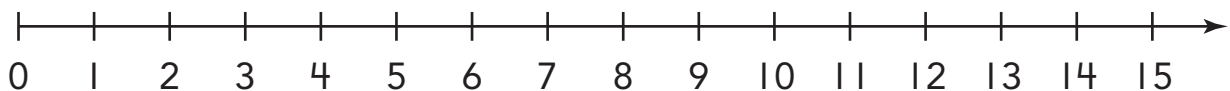**2.** 9 cm, two rods   (Check students' models.)

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

_____check work_____ + _____ = _____

3. 13 cm, three rods

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

_____check work_____ + _____ + _____ = _____

Show the total length on the number line.

4. $4 + 5 + 2 + 3 =$ _____14_____

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

5. $3 + 3 + 5 + 2 =$ _____13_____

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Challenge!   Nora and John are trying to find rods that would end at 19 on a number line. Nora says that 3 yellow rods and a purple rod would work. John says an orange and a blue rod would work. Who is correct, and why? Use words or drawings to explain.

Challenge: (Sample) Both are correct, because both total 19. Children may draw 2 number lines to show each set of rods. As long as both sets of rods are shown or described, it is correct.
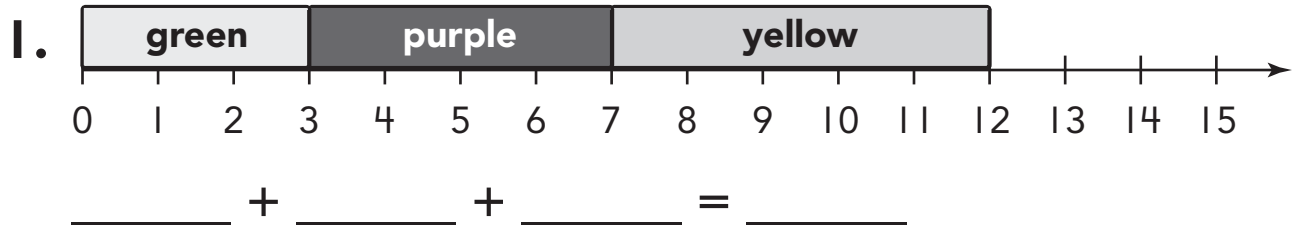
_____

_____

_____

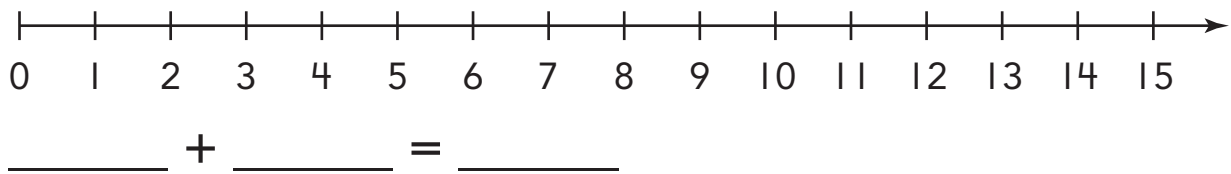_____

_____

_____

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Name _____

Use Cuisenaire Rods. Build the model. Write a number sentence for the lengths.

1.

| green | purple | yellow |

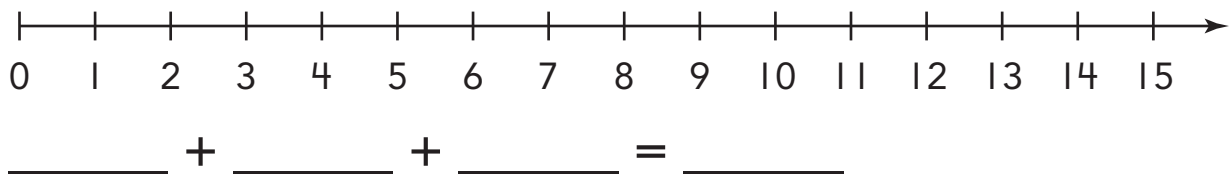0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

_____ + _____ + _____ = _____

Use two or three Cuisenaire Rods. Build the length. Draw the model. Write a number sentence.
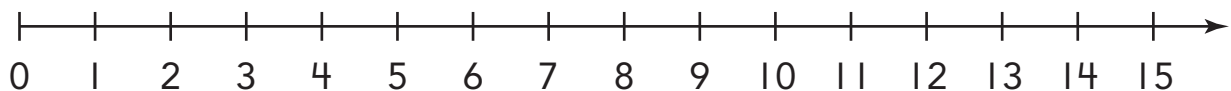
2. 9 cm, two rods

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

_____ + _____ = _____

3. 13 cm, three rods

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

_____ + _____ + _____ = _____

Show the total length on the number line.

4. 4 + 5 + 2 + 3 = _____

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

5. 3 + 3 + 5 + 2 = _____

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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Challenge! Nora and John are trying to find rods that would end at 19 on a number line. Nora says that 3 yellow rods and a purple rod would work. John says an orange and a blue rod would work. Who is correct, and why? Use words or drawings to explain.

_____

_____

_____

_____

_____

_____

Name

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20