TEACHER GUIDE

What is measurement?

Measurement is a number **comparing** an attribute (length, weight, capacity) of an object to the same attribute of a unit of measure (inch, pound, gallon, etc.).

CONCRETE	**Making the Concept of Measurement Hands-On** Students need to understand how one object can have two different measurements. They also need to understand *why* measuring with a smaller unit will result in a larger measurement and *why* measuring with a larger unit will result in a smaller measurement. Besides students' homemade rulers, blank fraction tiles and cuisenaire rods are helpful in making those connections for students and prepare them to show their thinking using written representations.
PICTORIAL	**Using Visuals to Show Equivalent Measurements** Tape diagrams, number lines, and tables help students represent the relationship between two units over and over again. Tape diagrams and number lines are length models but can be used to show equivalent measurements with weight and capacity as well. Students can represent this same information in tables with a bit more flexibility. Tables do not have to follow a set order, so students can begin to use relational thinking to work with larger measurements.
ABSTRACT	**Converting Between Units of Measurement** Students will begin to see the pattern that when a measurement is converted from a larger measurement unit to a smaller measurement unit, the measurement itself is multiplied by the conversion factor (i.e. the relationship between both units). There is no need to rush to this conclusion because students will come to this understanding on their own through their work with various visual models.

Key Vocabulary

- Measurement
- Attribute
- Length
- Weight
- Mass
- Capacity
- Liquid Volume
- Conversion
- Customary
- Metric
- Units of measure in both systems

BUILD YOUR OWN RULER

Learning Goal

Students will have a concrete understanding of how a single object can have different measurements. They will understand why a smaller measurement unit results in a larger measurement and a larger unit results in a smaller measurement.

Activity Overview

In this activity, students will be make their own rulers and use those rulers to measure different objects around the room and answer questions on the activity sheet (page 8). Students will create the rulers by gluing small pieces of paper onto a ruler "base" (page 5), alternating with different colored but same sized units each time until the ruler base is covered.

Required Materials

- White paper
- Colored paper (4 different colors)
- Glue

Preparing for the Activity

- Print pages 5-7. For every 5 students you will need to print 1 copy of page 5 on white paper, 2 copies of page 6 on two different colored pieces of paper, and 2 copies of page 7 on two different colored pieces of paper.
- Cut out each of the ruler "bases" and the colored units that students will use to alternate and glue onto their rulers.
- Make copies of the student activity sheet.

Tips & Suggestions

- Important: Students who made rulers with the larger units should label their rulers "Ruler A." Rulers made with smaller units should be labeled "Ruler B." This will be useful when students work on the activity sheet.
- Instead of each student making two rulers, have half the class make rulers with the larger units and the other half of the class make rulers with the smaller units. Then, have students work on the activity sheet in pairs, with each partner having a ruler with different sized units.

RULER C

MEASURING LENGTH

Comparing Measurements. Measure the length of each object below with both rulers and record the measurements.

Length of a Desk Ruler A _____ Ruler B _____

Length of a Book Ruler A _____ Ruler B _____

Predicting Measurements. Measure the length of each object with Ruler A. Use that measurement to *predict* what the measurement would be if you measured with Ruler B.

Length of a Pencil Ruler A _____ Ruler B _____

Length of a Chair Ruler A _____ Ruler B _____

Explain how you predicted what the measurements would be if you measured with Ruler B. Then, measure with Ruler B to see if your predictions were correct!

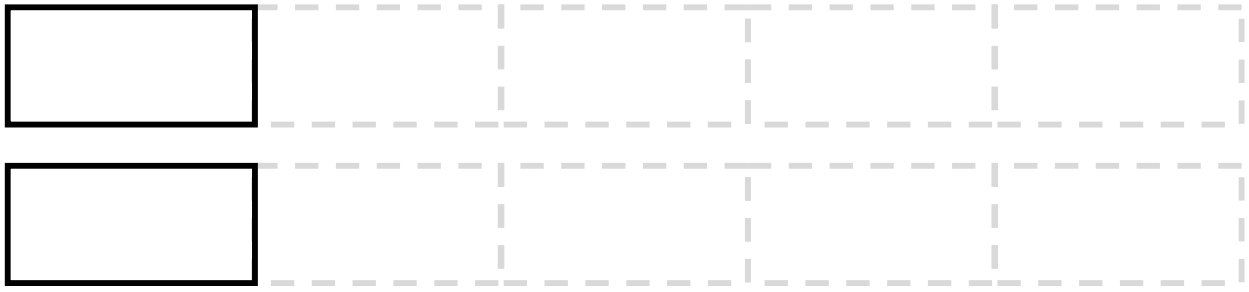
Thinking about Measurement. What do you notice about the measurements of each object when you measured with Ruler A compared to when you measured with Ruler B?

Did the length of these objects change? If not, why did the measurements change?

You measure an object with Ruler A, Ruler B, and Ruler C. Which ruler would give you the largest measurement? Which ruler would give you the smallest measurement? Explain how you know.

EQUIVALENT MEASUREMENTS

Use the models below to represent equivalent measurements.



_____ = _____

EQUIVALENT measurements

The new rug in the classroom is 5 feet long. How many inches long is the rug?

1 ft.	2 ft.	3 ft.	4 ft.	5 ft.
12 in.				

#1

EQUIVALENT measurements

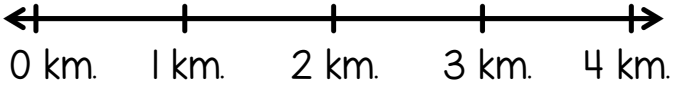
The new action movie at the theater is 3 hours long. How many minutes is the movie?

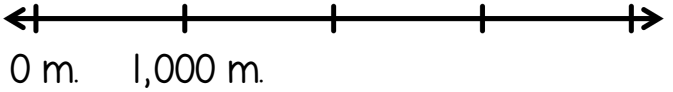
1 hr.	2 hr.	3 hr.
60 min.		

#2

EQUIVALENT measurements

Jessica ran 4 kilometers this week. How many meters did Jessica run this week?

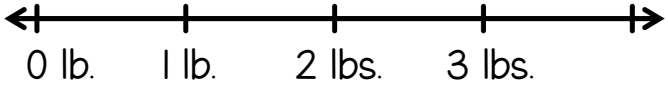


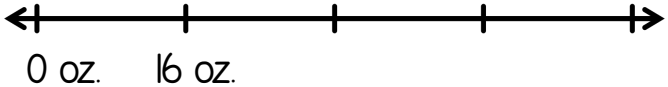


#3

EQUIVALENT measurements

Mrs. Ransom bought 3 pounds of ground beef. How many ounces of beef did she buy?





#4

EQUIVALENT measurements

The width of the window is 4 feet 7 inches. How many inches wide is the window?

1 ft.	12 in.
2 ft.	
3 ft.	
4 ft.	

#5

EQUIVALENT measurements

Jake made 3 gallons and 1 quart of punch for a party. How many quarts of punch did Jake make?

1 gallon	4 quarts
2 gallons	
3 gallons	

#6

EQUIVALENT measurements

A seamstress needs 5 yards and 2 feet of fabric to make a dress. How many feet of fabric should the seamstress purchase?

Show your thinking using a tape diagram, number lines, or a table.

#7

EQUIVALENT measurements

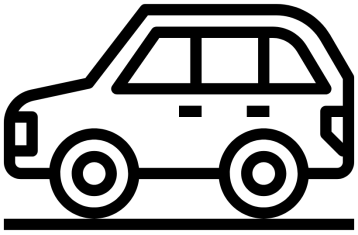
Katie worked on her painting for 2 hours and 36 minutes. How many minutes did she work on her painting?

Show your thinking using a tape diagram, number lines, or a table.

#8

EQUIVALENT measurements

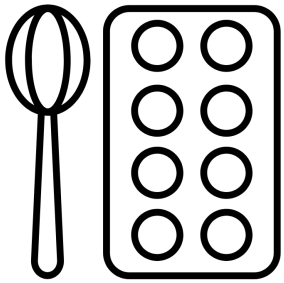
Erin drives 6 kilometers to school. Jade drives 7,160 meters to school. How many more meters does Jade drive than Erin on the way to school?



#9

EQUIVALENT measurements

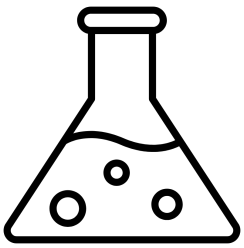
A baker used 3 kilograms of flour for last week's cupcake orders. He used 4,236 grams of flour for this week's orders. How many grams of flour did the baker use altogether?



#10

EQUIVALENT measurements

Ahmed is working on a science project. He pours 1 liter of water into a beaker and then adds 55 milligrams of vinegar to the beaker. How many milligrams of the saltwater solution is in the beaker?



#11

EQUIVALENT measurements

The adult picnic table at the park is 3 meters long. The kids picnic table is 150 centimeters long. How much longer is the adult picnic table than the kids picnic table?

#12

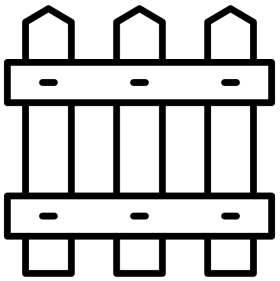
EQUIVALENT measurements

Ja'liya poured 3 pints of apple juice into a pitcher. She added 5 cups of cranberry juice to the pitcher. How many cups of apple cranberry juice did Ja'liya make?

#13

EQUIVALENT measurements

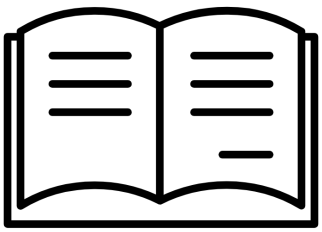
A painter paints 7 yards of a fence on Saturday. On Sunday, he paints 9 more feet of the fence. How many total feet of fence did the painter paint over the weekend?



#14

EQUIVALENT measurements

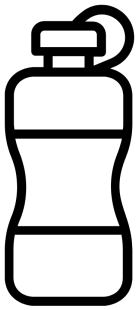
Sally reads for 4 hours this week. Lucy reads for 172 minutes this week. How many more minutes did Sally read than Lucy this week?



#15

EQUIVALENT measurements

A soccer teams has 5 gallons of water for their game on Saturday. If the team drinks 15 pints of water during the game, how many pints of water are leftover?



#16

MEASUREMENT WAR

Learning Goal

Students will practice converting measurements and comparing measurements within the same measurement system.

Preparing for the Activity

- Print each deck of cards on colored card stock and laminate.
- Place each deck of cards in separate plastic bags.

How to Play

- Students will play this game in pairs (one student vs. another student).
- Choose a deck of cards to play with. There are 26 game cards for weight, length, capacity, and time for both customary and metric measurement.
- Split the deck evenly between both players (each will receive 13 cards).
- Without looking at their cards, both students will flip over the top card. Each player will then convert the measurements into the same unit of measure in order to compare them. The player whose card has the greater measurement gets to take both cards and add them to their deck.
- If both players flip over cards that are equivalent, they will then lay 3 cards face down on top of the card they originally played and play a 4^{th} card face up. Whichever player's 4^{th} card has the greater measurement will take ALL of the cards played in that round.
- The game continues until one players has "won" all 26 cards in the deck.

Tips & Suggestions

- As students play this game, encourage them to use their measurement math mats to help them convert the measurements.
- You can use these Measurement War cards in small groups, whole group playing the teacher against the students, or at a math center.
- Direct students to explain their thinking to their opponent after each round so that students can check each other's work.

Measurement war
WEIGHT

Customary System

Measurement war
WEIGHT

1 pounds

Measurement war
WEIGHT

2 pounds

Measurement war
WEIGHT

3 pounds

Measurement war
WEIGHT

4 pounds

Measurement war
WEIGHT

5 pounds

Measurement war
WEIGHT

6 pounds

Measurement war
WEIGHT

16 ounces

Measurement war
WEIGHT

32 ounces

Measurement war
WEIGHT

48 ounces

Measurement war
WEIGHT

64 ounces

Measurement war
WEIGHT

80 ounces

Measurement war
WEIGHT

96 ounces

Measurement war
WEIGHT

3 lbs 2 oz

Measurement war
WEIGHT

5 lbs 7 oz

Measurement war
WEIGHT

4 lbs 12 oz

Measurement war
WEIGHT

2 lbs 9 oz

Measurement war
WEIGHT

1 lb 15 oz

Measurement war
WEIGHT

2 lbs 10 oz

Measurement war
WEIGHT

5 lbs 1 oz

Measurement war
WEIGHT

82 ounces

Measurement war
WEIGHT

52 ounces

Measurement war
WEIGHT

41 ounces

Measurement war
WEIGHT

88 ounces

Measurement war
WEIGHT

60 ounces

Measurement war
WEIGHT

91 ounces

Measurement war
WEIGHT

14 ounces

Measurement war
LENGTH

Customary System

Measurement war
LENGTH

1 yards

Measurement war
LENGTH

2 yards

Measurement war
LENGTH

3 yards

Measurement war
LENGTH

4 yards

Measurement war
LENGTH

1 foot

Measurement war
LENGTH

2 feet

Measurement war
LENGTH

6 feet

Measurement war
LENGTH

12 feet

Measurement war
LENGTH

12 inches

Measurement war
LENGTH

24 inches

Measurement war
LENGTH

36 inches

Measurement war
LENGTH

48 inches

Measurement war
LENGTH

72 inches

Measurement war
LENGTH

2 ft 11 in

Measurement war
LENGTH

3 ft 7 in

Measurement war
LENGTH

1 ft 9 in

Measurement war
LENGTH

5 ft 4 in

Measurement war
LENGTH

1 yd 8 in

Measurement war
LENGTH

2 yds 3 in

Measurement war
LENGTH

1 ft 5 in

Measurement war
LENGTH

6 ft 3 in

Measurement war
LENGTH

65 inches

Measurement war
LENGTH

50 inches

Measurement war
LENGTH

22 inches

Measurement war
LENGTH

18 inches

Measurement war
LENGTH

32 inches

Measurement war
CAPACITY

Customary System

Measurement war
CAPACITY

1 gallon

Measurement war
CAPACITY

2 gallons

Measurement war
CAPACITY

3 gallons

Measurement war
CAPACITY

1 quart

Measurement war
CAPACITY

2 quarts

Measurement war
CAPACITY

6 quarts

Measurement war
CAPACITY

8 quarts

Measurement war
CAPACITY

12 quarts

Measurement war
CAPACITY

1 pints

Measurement war
CAPACITY

4 pints

Measurement war
CAPACITY

5 pints

Measurement war
CAPACITY

6 pints

Measurement war
CAPACITY

3 cups

Measurement war
CAPACITY

4 cups

Measurement war
CAPACITY

8 cups

Measurement war
CAPACITY

9 cups

Measurement war
CAPACITY

10 cups

Measurement war

CAPACITY

15 cups

Measurement war

CAPACITY

2 pints
1 cup

Measurement war

CAPACITY

3 quarts
1 pint

Measurement war

CAPACITY

1 gallon
2 quarts

Measurement war

CAPACITY

3 quarts

Measurement war

CAPACITY

10 pints

Measurement war

CAPACITY

3 quarts
1 pint

Measurement war

CAPACITY

4 quarts

Measurement war

CAPACITY

2 pints

Measurement war
TIME

HOURS, DAYS & SECONDS

Measurement war
TIME

1 hour

Measurement war
TIME

2 hours

Measurement war
TIME

3 hours

Measurement war
TIME

4 hours

Measurement war
TIME

2 minutes

Measurement war
TIME

3 minutes

Measurement war
TIME

5 minutes

Measurement war
TIME

8 minutes

Measurement war
TIME

1 hour
56 minutes

Measurement war
TIME

2 hours
13 minutes

Measurement war
TIME

145 minutes

Measurement war
TIME

120 minutes

Measurement war
TIME

75 minutes

Measurement war
TIME

60 minutes

Measurement war
TIME

145 seconds

Measurement war
TIME

120 seconds

Measurement war
TIME

150 seconds

Measurement war
TIME

20 minutes
15 seconds

Measurement war
TIME

240 minutes

Measurement war
TIME

150 minutes
30 seconds

Measurement war
TIME

3 hour
35 minutes

Measurement war
TIME

480 seconds

Measurement war
TIME

15 minutes
75 seconds

Measurement war
TIME

7 minutes

Measurement war
TIME

2 hours
65 minutes

Measurement war
TIME

180 seconds

Measurement war
LENGTH

Metric System

Measurement war
LENGTH

1 kilometer

Measurement war
LENGTH

2 kilometers

Measurement war
LENGTH

3 kilometers

Measurement war
LENGTH

1 meter

Measurement war
LENGTH

2 meters

Measurement war
LENGTH

3 meters

Measurement war
LENGTH

150 centimeters

Measurement war
LENGTH

3,000 centimeters

Measurement war
LENGTH

1
centimeter

Measurement war
LENGTH

2
centimeters

Measurement war
LENGTH

3
centimeters

Measurement war
LENGTH

4
centimeters

Measurement war
LENGTH

2,000
meters

Measurement war
LENGTH

250 meters

Measurement war
LENGTH

180
millimeters

Measurement war
LENGTH

20
millimeters

Measurement war
LENGTH

15
millimeters

Measurement war
LENGTH

135 meters

Measurement war
LENGTH

3,000 meters

Measurement war
LENGTH

280 centimeters

Measurement war
LENGTH

280 millimeters

Measurement war
LENGTH

1,300 meters

Measurement war
LENGTH

900 meters

Measurement war
LENGTH

4,000 millimeters

Measurement war
LENGTH

1,600 millimeters

Measurement war
LENGTH

500 millimeters

Measurement war
WEIGHT

Metric System

Measurement war
WEIGHT

1 kilogram

Measurement war
WEIGHT

2 kilograms

Measurement war
WEIGHT

3 kilograms

Measurement war
WEIGHT

1 gram

Measurement war
WEIGHT

2 grams

Measurement war
WEIGHT

3 grams

Measurement war
WEIGHT

1,000 grams

Measurement war
WEIGHT

3,000 grams

Measurement war

WEIGHT

2,000 milligrams

Measurement war

WEIGHT

1,000 milligrams

Measurement war

WEIGHT

15 milligrams

Measurement war

WEIGHT

140 grams

Measurement war

WEIGHT

2,500 grams

Measurement war

WEIGHT

4,200 grams

Measurement war

WEIGHT

8,000 milligrams

Measurement war

WEIGHT

4 kilograms

Measurement war

WEIGHT

7,800 milligrams

Measurement war
WEIGHT

2,200 grams

Measurement war
WEIGHT

5,500 milligrams

Measurement war
WEIGHT

8 grams

Measurement war
WEIGHT

750 milligrams

Measurement war
WEIGHT

750 grams

Measurement war
WEIGHT

20 milligrams

Measurement war
WEIGHT

1,400 grams

Measurement war
WEIGHT

1,500 grams

Measurement war
WEIGHT

8,300 milligrams

Measurement war
CAPACITY

Metric System

Measurement war
CAPACITY

1 kiloliter

Measurement war
CAPACITY

2 kiloliters

Measurement war
CAPACITY

3 kiloliters

Measurement war
CAPACITY

4 kiloliters

Measurement war
CAPACITY

1 liter

Measurement war
CAPACITY

2 liters

Measurement war
CAPACITY

3 liters

Measurement war
CAPACITY

4 liters

Measurement war
CAPACITY

100 milliliters

Measurement war
CAPACITY

1,000 milliliters

Measurement war
CAPACITY

250 milliliters

Measurement war
CAPACITY

4,000 milliliters

Measurement war
CAPACITY

3,000 liters

Measurement war
CAPACITY

2,500 liters

Measurement war
CAPACITY

600 liters

Measurement war
CAPACITY

5,500 milliliters

Measurement war
CAPACITY

4,000 liters

Measurement war
CAPACITY

750 milliliters

Measurement war
CAPACITY

6,100 milliliters

Measurement war
CAPACITY

800 liters

Measurement war
CAPACITY

2,500 milliliters

Measurement war
CAPACITY

18 milliliters

Measurement war
CAPACITY

25 liters

Measurement war
CAPACITY

50 liters

Measurement war
CAPACITY

8,000 milliliters

Measurement war
CAPACITY

750 liters

terms of use

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