Name _____

Measurement Benchmarks

You can use benchmarks to estimate measurements.

The chart shows benchmarks for customary units of measurement.

Benchmarks for Some Customary Units					
 1 ft about 1 foot	 1 yd about 1 yard	 about 1 cup	 about 1 gallon	 about 1 ounce	 about 1 pound

Here are some more examples of estimating with customary units.

- The width of a professional football is about 1 foot.
- A large fish bowl holds about 1 gallon of water.
- A box of cereal weighs about 1 pound.

The chart shows benchmarks for metric units of measurement.

Benchmarks for Some Metric Units					
 about 1 centimeter	 about 1 meter	 about 1 milliliter	 about 1 liter	 about 1 gram	 about 1 kilogram

Here are some more examples of estimating with metric units.

- The width of a large paper clip is about 1 centimeter.
- A pitcher holds about 1 liter of juice.
- Three laps around a track is about 1 kilometer.

Use benchmarks to choose the customary unit you would use to measure each.

1. length of a school bus

_____

2. weight of a computer

_____

Use benchmarks to choose the metric unit you would use to measure each.

3. the amount of liquid a bottle of detergent holds

_____

4. distance between two cities

_____

Name _____

Estimation Match-Up

Match each sentence on the left with an appropriate unit on the right.

1. The weight of Tom's pick-up truck is more than one _____.	centimeter
2. A cat's tail has a length that is more than one _____.	gallon
3. A milk carton holds more than one _____ of milk.	ton
4. A crayon is less than one _____ long.	meter
5. A water balloon is filled with less than one _____ of water.	mile
6. A paper clip weighs less than one _____.	fluid ounce
7. Tina's puppy weighs more than one _____.	pound
8. A marathon runner jogged more than one _____.	ounce

9. **Stretch Your Thinking** Suppose two objects are the same size. Must they weigh the same amount? Give an example to explain.

_____

_____

_____

Name _____

Customary Units of Length

A ruler is used to measure length. A ruler that is 1 foot long shows 12 inches in 1 foot. A ruler that is 3 feet long is called a yardstick. There are 3 feet in 1 yard.

How does the size of a foot compare to the size of an inch?

Step 1 A small paper clip is about 1 inch long. Below is a drawing of a chain of paper clips that is about 1 foot long. Number each paper clip, starting with 1.

Step 2 Complete this sentence.

In the chain of paper clips shown, there are 12 paper clips.

Step 3 Compare the size of 1 inch to the size of 1 foot.

There are 12 inches in 1 foot.

So, 1 foot is 12 times as long as 1 inch.

Complete.

1. 5 feet = _____ inches

2. 3 yards = _____ feet

3. 5 yards = _____ feet

4. 4 feet = _____ inches

5. 6 feet = _____ inches

6. 8 yards = _____ feet

Name _____

Inching Closer

Solve each problem.

1. In a football game, a running back gained $4\frac{1}{2}$ yards on one play. What is this distance in inches?

_____

2. Margie is $5\frac{1}{3}$ feet tall. How many inches tall is she?

_____

3. A quarterback threw a football 10 yards 2 feet 1 inch. How many inches did the quarterback throw the football?

_____

4. From a standing position, Meg jumps 7 feet 4 inches and Victor jumps 9 feet 2 inches. How many inches farther does Victor jump than Meg?

_____

5. Jeremy ran 5 yards 2 feet 3 inches. In the same time, John ran 9 yards 1 foot 10 inches. How many inches farther did John run than Jeremy?

_____

6. A rectangular flower garden measures 3 yards 1 foot 8 inches wide and 1 yard 2 feet 3 inches long. How many inches of fencing is needed to enclose the entire flower garden?

_____

7. Write Math **Explain** how you solved Problem 6.

_____

_____

_____

_____

Name _____

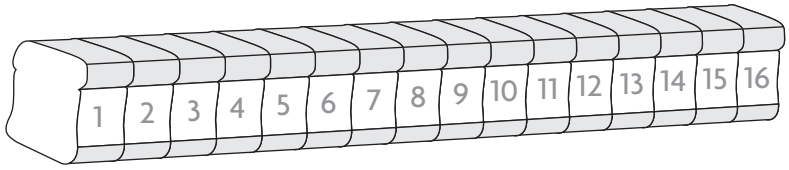
Customary Units of Weight

Ounces and **pounds** are customary units of weight. A **ton** is a unit of weight that is equal to 2,000 pounds.

A slice of bread weighs about 1 ounce. Some loaves of bread weigh about 1 pound.

How does the size of 1 ounce compare to the size of 1 pound?

Step 1 You know a slice of bread weighs about 1 ounce. Below is a drawing of a loaf of bread that weighs about 1 pound. Number each slice of bread, starting with 1.



Step 2 Complete this sentence.

In the loaf of bread shown above, there are 16 slices of bread.

Step 3 Compare the size of 1 ounce to the size of 1 pound.

There are 16 ounces in 1 pound.

So, 1 pound is 16 times as heavy as 1 ounce.

Complete.

1. 2 pounds = _____ ounces

Think: 2 × 16 = 32

2. 2 tons = _____ pounds

3. 7 pounds = _____ ounces

4. 4 pounds = _____ ounces

5. 3 tons = _____ pounds

6. 10 pounds = _____ ounces

Name _____

Weighty Matters

Solve each problem.

1. A truck weighs 1 ton 1,350 pounds. The weight limit for a bridge is given in pounds. How many pounds does the truck weigh?

_____

2. Jasmine's new kitten weighs 2 pounds 6 ounces. Feeding instructions are given for weights in ounces. How many ounces does the kitten weigh?

_____

3. At the zoo, one elephant weighs 7 tons 400 pounds. Another elephant weighs 4 tons 1,800 pounds. How many more pounds does the first elephant weigh?

_____

4. Jim's dog weighs 18 pounds 10 ounces. His cat weighs 6 pounds 3 ounces. How many more ounces does Jim's dog weigh than his cat?

_____

5. Owen's math book weighs 2 pounds 13 ounces. His science book weighs 1 pound 15 ounces. His backpack weighs 1 pound 1 ounce. What is the total weight in ounces of the backpack and the two books?

_____

6. A truck is transporting 6 cars to a dealership. Each car weighs 1 ton 1,400 pounds. What is the total weight in pounds of the cars the truck is transporting?

_____

7. 

Explain how you solved Problem 3.

_____

_____

_____

_____

Name _____

Customary Units of Liquid Volume

Liquid volume is the measure of the space a liquid occupies. Some basic units for measuring liquid volume are **gallons, half gallons, quarts, pints, cups,** and **fluid ounces**. The table at the right shows the relationships among some units of liquid volume.

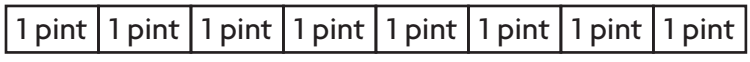
1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 half gallon = 2 quarts
1 gallon = 4 quarts

How does the size of a gallon compare to the size of a pint?

Step 1 Use the information in the table. Draw a bar to represent 1 gallon.

Step 2 The table shows that 1 gallon is equal to 4 quarts. Draw a bar to show 4 quarts.

Step 3 The table shows that 1 quart is equal to 2 pints. Draw a bar to show 2 pints for each of the 4 quarts.



Step 4 Compare the size of 1 gallon to the size of 1 pint.

There are 8 pints in 1 gallon.

So, 1 gallon is 8 times as much as 1 pint.

Complete. Draw a model to help.

1. 2 quarts = _____ pints

2. 1 gallon = _____ cups

3. 1 pint = _____ fluid ounces

4. 3 pints = _____ cups

5. 3 quarts = _____ cups

6. 1 half gallon = _____ pints

Name _____

Using Measures of Liquid Volume

Solve each problem.

1. At his lemonade stand, Ishmael has enough lemonade mix to make 3 gallons 2 quarts 1 pint of lemonade. How many 1-cup servings of lemonade can he make?

_____

2. Irene has 1 gallon of milk. She uses 4 fluid ounces of milk in each bowl of cereal. How many bowls of cereal can she fill before she has used all the milk?

_____

3. One day at lunch, the cafeteria sold thirty-four 1-pint containers of milk. The cafeteria also sold forty-eight 12-fl-oz bottles of water. Did the cafeteria sell more fluid ounces of water or milk? How many more?

_____

4. Mrs. Nelson bought a 2-gallon container of ice cream. How many 2-fl-oz scoops of ice cream can be served from this container?

_____

5. Write Math **Explain** how you solved Problem 3.

_____

_____

_____

_____

Name _____

Line Plots

Howard gave a piece of paper with several survey questions to his friends. Then he made a list to show how long it took for his friends to answer the survey. Howard wants to know how many surveys took longer than $\frac{2}{12}$ hour.

Time for Survey Answers (in hours)

$\frac{1}{12}$ $\frac{3}{12}$ $\frac{1}{12}$ $\frac{2}{12}$ $\frac{6}{12}$ $\frac{3}{12}$ $\frac{5}{12}$

Make a line plot to show the data.

Step 1 Order the data from least to greatest.

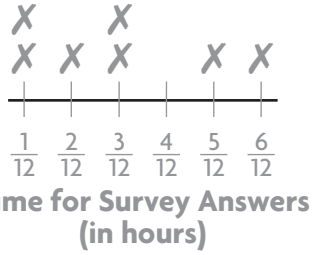
$\frac{1}{12}, \frac{1}{12}, \frac{2}{12}, \frac{3}{12}, \frac{3}{12}, \frac{5}{12}, \frac{6}{12}$

Step 2 Make a tally table of the data.

Survey	
Time (in hours)	**Tally**
$\frac{1}{12}$	||
$\frac{2}{12}$	|
$\frac{3}{12}$	||
$\frac{5}{12}$	|
$\frac{6}{12}$	|

Step 3 Label the fractions of an hour on the number line from least to greatest. Notice that $\frac{4}{12}$ is included even though it is not in the data.

Step 4 Plot an *X* above the number line for each piece of data. Write a title for the line plot.



Step 5 Count the number of *X*s that represent data points greater than $\frac{2}{12}$ hour.

There are 4 data points greater than $\frac{2}{12}$ hour.

So, 4 surveys took more than $\frac{2}{12}$ hour.

Use the line plot above for 1 and 2.

1. How many of the surveys that Howard gave to his friends were answered? _____

2. What is the difference in hours between the longest time and the shortest time that it took Howard's friends to answer the survey?

_____

Name _____

Discover the Line Plot

The students in Richie's class were asked how much juice they drink at breakfast. Use the clues to make a line plot. Draw your line plot in the space below. Remember to include a title.

1. The most any student drinks is $1\frac{1}{2}$ cups of juice.
2. The response given most often was $\frac{3}{4}$ cup. The number of responses was 1 more than the next greatest amount.
3. Two students said that they don't drink any juice in the morning.
4. The students drink a total of $8\frac{1}{4}$ cups of juice.
5. Three students drink 1 cup of juice each.
6. Together, only three students gave a response of $\frac{1}{4}$, $\frac{1}{2}$, $1\frac{1}{4}$, or $1\frac{1}{2}$; and none of these had more than 1 response.

7. Stretch Your Thinking What fraction of the students drank more than $\frac{1}{2}$ cup of juice? **Explain.**

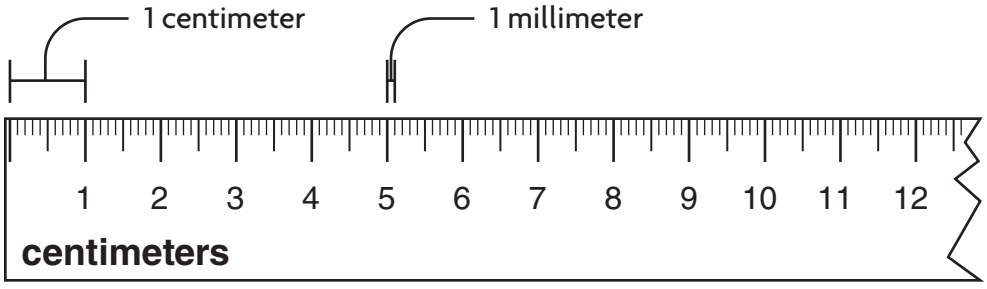
Name _____

Metric Units of Length

Meters (m), **decimeters** (dm), centimeters (cm), and **millimeters** (mm) are all metric units of length. You can use a ruler and a meterstick to find out how these units are related.

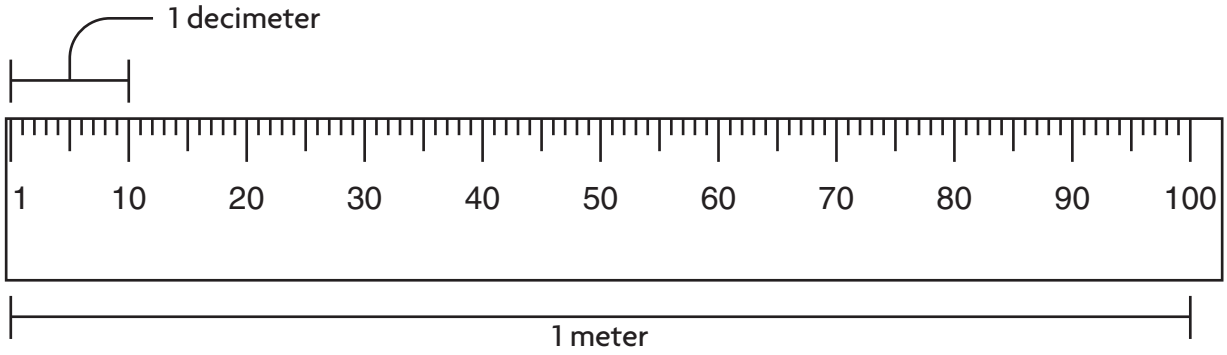
Materials: ruler, meterstick

Step 1 Look at a metric ruler. Most look like the one below.



The short marks between each centimeter mark show millimeters. 1 centimeter has the same length as a group of 10 millimeters.

Step 2 Look at a meterstick. Most look like the one below.



1 decimeter has the same length as a group of 10 centimeters.

Step 3 Use the ruler and the meterstick to compare metric units of length.

1 centimeter = 10 millimeters

1 decimeter = 10 centimeters

1 meter = 10 decimeters

1 meter = 100 centimeters

Complete.

1. 3 meters = _____ decimeters

2. 5 meters = _____ centimeters

3. 4 centimeters = _____ millimeters

4. 9 decimeters = _____ centimeters

Name _____

Going to Greater Lengths

The kilometer is a metric unit of length that is equal to 1,000 meters. Use this information and what you already know about metric length to answer the questions.

1. Edward entered into a 5-kilometer race. How many meters will he need to run?

_____

2. Nancy walked 2 kilometers from her house to the library. How many decimeters did she walk?

_____

3. Jed rode his bike 1.5 kilometers from home to school. How many centimeters did Jed ride?

_____

4. Ursula hiked $6\frac{1}{2}$ kilometers through the woods. How many decimeters did she hike?

_____

5. An Olympic swimming pool is 50 meters long. How many lengths would Ian have to swim in order to swim 1 kilometer?

_____

6. Terence ran 3 kilometers in the same time it took Ali to run 2,400 meters. Who ran farther? How much farther?

_____

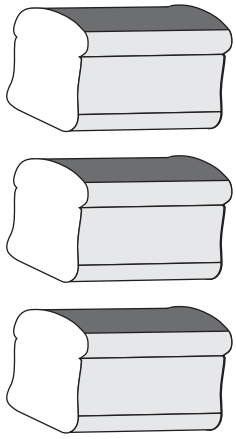
7. Stretch Your Thinking The **hectometer** is another metric unit of length. 1 hectometer = 100 meters. What is the relationship between kilometers and hectometers?

_____

Name _____

Metric Units of Mass and Liquid Volume

Mass is the amount of matter in an object. Metric units of mass include grams (g) and kilograms (kg). 1 kilogram represents the same mass as 1,000 grams.



One large loaf of bread has a mass of about 1 kilogram. Jacob has 3 large loaves of bread. About how many grams is the mass of the loaves?

3 kilograms = 3 × 1,000 grams

= 3,000 grams

Liters (L) and **milliliters** (mL) are metric units of liquid volume. 1 liter represents the same liquid volume as 1,000 milliliters.

A large bowl holds about 2 liters of juice. Carmen needs to know the liquid volume in milliliters.

2 liters = 2 × 1,000 milliliters

= 2,000 milliliters

Complete.

1. 4 kilograms = _____ grams

2. 9 liters = _____ milliliters

3. 3 liters = _____ milliliters

4. 7 kilograms = _____ grams

5. 5 kilograms = _____ grams

6. 8 liters = _____ milliliters

Name _____

More Volume, Less Mass

The milligram is a metric unit of mass. One gram is equal to 1,000 milligrams. The kiloliter is a unit of metric volume that is equal to 1,000 liters. Use this information and what you know about metric units to answer the questions.

1. A small swimming pool contains 6 kiloliters of water. How many liters of water does the pool contain?

_____

2. A scientist has a 3-gram sample of soil to analyze. How many milligrams is the soil sample?

_____

3. About 1 kiloliter of water runs past a certain point in a freshwater stream each minute. How many 2-liter bottles could be filled from 1 kiloliter of water?

_____

4. A pill contains 200 milligrams of medicine. If Barb takes one pill each day, how many grams of medicine does she take in 10 days?

_____

5. Helen places a 2-gram mass on one side of a scale. How many milligrams would it take to balance the scale?

_____

6. A storage tank holds 4 kiloliters of water. How many liters of water does the tank hold?

_____

7. Write Math **Explain** how you found the answer to Problem 4.

_____

_____

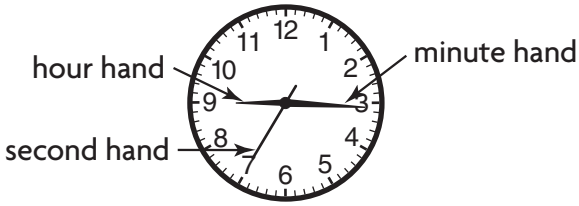
_____

Name _____

Units of Time

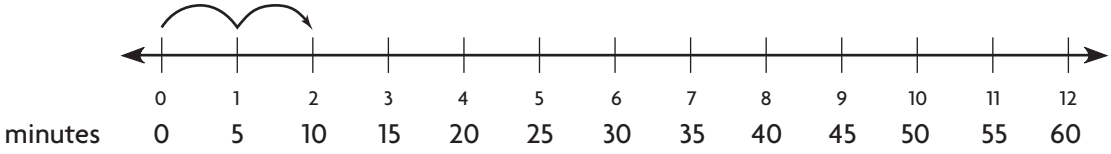
Some analog clocks have an hour hand, a minute hand, and a **second** hand.

There are 60 seconds in a minute. The second hand makes 1 full turn every minute. There are 60 minutes in an hour. The minute hand makes 1 full turn every hour. The hour hand makes 1 full turn every 12 hours.



You can think of the clock as unrolling to become a number line.

The hour hand moves from one number to the next in 1 hour.



The minute hand moves from one number to the next in 5 minutes.

Use the table at the right to change between units of time.

Units of Time
1 minute = 60 seconds
1 hour = 60 minutes
1 day = 24 hours
1 week = 7 days
1 year = 12 months
1 year = 52 weeks

1 hour = 60 minutes, or 60 × 60 seconds, or 3,600 seconds.

So, 1 hour is 3,600 times as long as 1 second.

1 day = 24 hours, so 3 days = 3 × 24 hours, or 72 hours.

1 year = 12 months, so 5 years = 5 × 12 months, or 60 months.

Complete.

1. 3 hours = _____ minutes

2. 2 years = _____ weeks

3. 6 days = _____ hours

4. 5 weeks = _____ days

5. 8 minutes = _____ seconds

6. 7 years = _____ months

Name _____

Passing the Time

Solve each problem.

1. Barry left his flashlight on. The batteries lost power after 2 weeks 5 days 15 hours. How many hours was it before the flashlight lost power?

_____

2. A rocket launch is scheduled to take place in 3 weeks 4 days 22 hours. How many hours is it until the rocket is launched?

_____

3. In October 2010, the winning time in the men's division of the Chicago Marathon was 2 hours 6 minutes 24 seconds. How many seconds did it take the winner to run the marathon?

_____

4. Patti and her friends want to see one of two movies. One movie starts in 1 day 2 hours 20 minutes. The other movie starts in 1 day 4 hours 10 minutes. The later movie starts at 5:00 P.M. At what time does the earlier movie start?

_____

5. Write Math **Explain** how you solved Problem 1.

_____

_____

_____

_____

Name _____

Problem Solving • Elapsed Time

Opal finished her art project at 2:25 P.M. She spent 50 minutes working on her project. What time did she start working on her project?

Read the Problem		
What do I need to find?	**What information do I need to use?**	**How will I use the information?**
I need to find Opal's start time.	End time: 2:25 P.M. Elapsed time: 50 minutes	I can draw a diagram of a clock. I can then count back 5 minutes at a time until I reach 50 minutes.

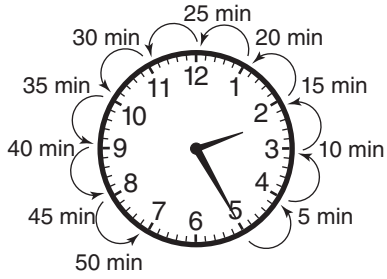
Solve the Problem

I start by showing 2:25 P.M. on the clock.
Then I count back 50 minutes by 5s.

Think: As I count back, I go past the 12.
The hour must be 1 hour less than the ending time.

The hour will be 1 o'clock.

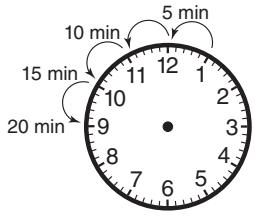
So, Opal started on her project at 1:35 P.M.



Draw hands on the clock to help you solve the problem.

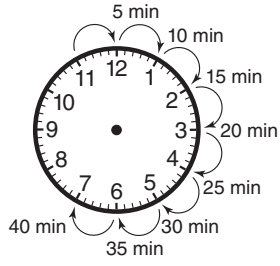
1. Bill wants to be at school at 8:05 A.M. It takes him 20 minutes to walk to school. At what time should Bill leave his house?

Bill should leave his house at _____.



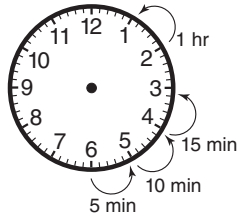
2. Mr. Gleason's math class lasts 40 minutes. Math class starts at 9:55 A.M. At what time does math class end?

Math class ends at _____.



3. Hannah rode her bike for 1 hour and 15 minutes until she got a flat tire at 2:30 P.M. What time did Hannah start riding her bike?

Hannah started riding her bike at _____.



Name _____

Do You Have the Time?

Read each problem to find the time.

1. Jordan needs to leave for school at 8:15 A.M. It takes her 20 minutes total to get dressed and brush her teeth, and 15 minutes to eat breakfast. What time does she need to wake up?

_____

2. Louis starts walking at 4:30 P.M. He walks for 35 minutes before stopping for a snack. He takes 15 minutes to eat his snack. At what time will he start walking again?

_____

3. Trevor spent 15 minutes in the shoe store, 25 minutes in the candle store, and then 10 minutes in the card store. Trevor left the card store at 10:45 A.M. What time did he arrive at the shoe store?

_____

4. Soccer practice begins at 5:30 P.M. The team spends the first 15 minutes doing stretches, and then the next 10 minutes doing dribbling drills. If the coach gives a 5-minute water break before the next activity, what time will that activity start?

_____

5. Betsy finished her math and science homework at 4:25 P.M. If she took 15 minutes to complete her math homework and 20 minutes to complete her science homework, what time did she start?

_____

6. Write Math Describe the steps you took to solve Problem 4.

_____

_____

_____

_____

Name _____

Mixed Measures

Gabrielle's puppy weighs 2 pounds 7 ounces. What is the weight of the puppy in ounces?

Step 1 Think of 2 pounds 7 ounces as 2 pounds + 7 ounces.

Step 2 Change the pounds to ounces.

Think: 1 pound = 16 ounces

So, 2 pounds = 2 × 16 ounces, or 32 ounces.

Step 3 Add like units to find the answer.

So, Gabrielle's puppy weighs 39 ounces.

```
 32 ounces
+ 7 ounces
 39 ounces
```

Gabrielle played with her puppy for 2 hours 10 minutes yesterday and 1 hour 25 minutes today. How much longer did she play with the puppy yesterday than today?

Step 1 Subtract the mixed measures. Write the subtraction with like units lined up.

Think: 25 minutes is greater than 10 minutes.

Step 2 Rename 2 hours 10 minutes to subtract.

1 hour = 60 minutes

So, 2 hr 10 min = 1 hr + 60 min + 10 min, or 1 hr 70 min.

Step 3 Subtract like units.

1 hr − 1 hr = 0 hr; 70 min − 25 min = 45 min

So, she played with the puppy 45 minutes longer yesterday than today.

```
  2 hr 10 min
− 1 hr 25 min
```

```
    1   70
  2 hr 10 min
− 1 hr 25 min
  0 hr 45 min
```

Complete.

1. 4 yd 2 ft = _____ ft
2. 1 hr 20 min = _____ min
3. 4 qt 1 pt = _____ pt

Add or subtract.

4. 2 gal 1 qt + 3 gal 2 qt
5. 3 lb 12 oz − 1 lb 8 oz
6. 4 yr 9 mo − 1 yr 10 mo

Name _____

Mixed Measures

Solve each problem.

1. Ted's new puppy weighed 8 pounds 11 ounces two months ago. One month later, the puppy had gained 2 pounds 7 ounces. During the second month, the puppy gained 3 pounds 5 ounces. How much does Ted's puppy weigh now?

_____

2. Gilda made 2 gallons of lemonade to sell at her lemonade stand. At the end of the day, she had 2 quarts 1 pint left over. How many 1-cup servings did Gilda sell?

_____

3. Four friends competed in a relay race. Each friend ran one leg of the race. Ann ran her leg in 2 minutes 15 seconds. Kyra ran her leg in 1 minute 53 seconds. Marie ran her leg in 2 minutes 9 seconds. Zoe ran the final leg in 1 minute 58 seconds. What was the total time for the relay team?

_____

4. Ron timed his flight from Los Angeles to New York. The plane was in the air for 4 hours 52 minutes 45 seconds. The return trip took longer because of a headwind. Ron recorded the flight time as 5 hours 34 minutes 14 seconds. How much longer was the return flight?

_____

5. Write Math **Explain** how you converted units to solve Problem 2.

_____

_____

_____

_____

Name _____

Algebra • Patterns in Measurement Units

Use the relationship between the number pairs to label the columns in the table.

?	?
1	8
2	16
3	24
4	32

Step 1 List the number pairs. 1 and 8; 2 and 16; 3 and 24; 4 and 32

Step 2 Describe the relationship between the numbers in each pair.

The second number is 8 times as great as the first number.

Step 3 Look for a relationship involving 1 and 8 in the table below.

Length	Weight	Liquid Volume	Time
1 foot = 12 inches 1 yard = 3 feet 1 yard = 36 inches	1 pound = 16 ounces 1 ton = 2,000 pounds	1 cup = 8 fluid ounces 1 pint = 2 cups 1 quart = 2 pints 1 gallon = 4 quarts	1 minute = 60 seconds 1 hour = 60 minutes 1 day = 24 hours 1 week = 7 days 1 year = 12 months 1 year = 52 weeks

So, the label for the first column is Cups.
The label for the second column is Fluid Ounces.

Each table shows a pattern for two customary units. Label the columns of the table.

1.

1	12
2	24
3	36
4	48

2.

1	2,000
2	4,000
3	6,000
4	8,000

Name _____

Two-Step Patterns

Use unit relationships and write a pattern to solve each problem.

1. Jessie hops for 1 minute then rests for 15 seconds. She repeats this pattern for several minutes. Write a pattern showing the number of seconds when Jessie switches from one activity to the next. After how many seconds will she start resting for the fourth time?

_____

2. A snail creeps up a plank 8 centimeters each day and slides back down 15 millimeters each night. Write a numerical pattern showing the number of millimeters where the snail changes direction. On which day will the snail have moved 275 millimeters up from its starting point?

_____

3. Joel is doing an experiment. He adds 2 gallons of water to a large tub each week. During the week, 1 quart 1 cup of water evaporates. Write a numerical pattern showing the number of cups of water before and after Joel adds water. How long will it take until there are more than 100 cups of water in the tub?

_____

4. **Stretch Your Thinking** In Problem 2, after how many days will the snail be 65 centimeters ahead? **Explain.**

_____

_____

_____

_____