LESSON 8: Converting Measurements with Ratios

[Objective]
The student will use ratio reasoning to convert measurement units.

[Prerequisite Skills]
ratios, equivalent ratios

[Materials]
Student pages **S70 – S84**
Calculators (optional)

[Essential Questions]
1. How can we use ratios to convert units of measurement?
2. What is a conversion factor?
3. Why do we need to convert units of measurement?

[Words For Word Wall]
ratios, identity property of multiplication, conversion factor, convert

[Grouping]
Cooperative Pairs (CP), Whole Group (WG), Individual (I)
*For Cooperative Pairs (CP) activities, assign the roles of Partner A and Partner B to students. This allows each student to be responsible for designated tasks within the lesson.

[Levels of Teacher Support]
Modeling (M), Guided Practice (GP), Independent Practice (IP)

[Multiple Representations]
SOLVE, Algebraic Formula, Verbal Description, Graphic Organizer

[Warm-Up] (IP, I, WG) S70 (Answers are on T161.)
Have students turn to S70 in their books to begin the Warm-Up. Students will complete problems with equivalent ratios. Monitor students to see if any of them need help during the Warm-Up. Have students complete the problems and then review the answers as a class. **{Algebraic Formula}**

[Homework]
Take time to go over the homework from the previous night.

[Lesson] [4 days (1 day = 80 minutes) - M, GP, IP, WG, CP]

SOLVE Problem (IP, CP, WG) S71 (Answers on T162.)

Have students turn to S71 in their books. The first problem is a SOLVE problem. Students are going to complete all steps of the SOLVE problem since this is all prior knowledge. During the lesson they will learn how to convert measurements using ratios. **{SOLVE, Verbal Description, Graphic Organizer}**

Discovery Activity – Converting Ratios - Extend the SOLVE Problem (M, GP, WG, CP) S71, S72 (Answers on T162, T163).

WG, M, CP, GP: Have students turn to S71 in their books. Assign the roles of Partner A and Partner B. **{Algebraic Formula, Verbal Description, Graphic Organizer}**

MODELING

Discovery Activity – Converting Ratios- Extend the SOLVE Problem

Step 1: Direct students to the questions below the SOLVE problem. Ask partners to discuss Questions 1 and 2 and then share answers with the whole group.

- Partner A, what word in the SOLVE problem tells us that we need to change the unit of measure of the fence from feet to inches? (**convert**) Record.
- Partner B, explain the "L" Step. (We multiplied the feet times the number of inches in one foot.) Record.

Step 2: Direct students' attention to Problem 3.

- Have students discuss why we used multiplication for the plan.
- Partner A, describe the process. [If we look at the information given (1 foot = 12 inches), we know that the measurement in feet will be less than inches. For every foot we have 12 inches, so we multiplied.] Record.
- Partner B, explain the relationship. (For every foot we have 12 inches, so we multiplied.) Record.

Step 3: Have students turn to S72 and discuss Questions 4 – 8. Students can use the SOLVE problem from S71 to answer the questions and then share answers as a whole group.

- Partner A, if the measurement that we are converting is a larger (foot) to a smaller (inch) unit, what operation do we use? (multiplication) Record.
- Partner B, describe the measurement fact that we used to convert the feet to inches in the SOLVE problem. (1 foot = 12 inches) Record.
- Partner A, when we write that 1 foot is equal to 12 inches what are we doing to the two measurements? (comparing two different types) Record.
- Partner B, what is the term we use when we are comparing two values of different types? (**ratio**) Record.
- Partner A, describe the three ways that we learned to write a ratio using the values from the SOLVE problem. (12 inches to 1 foot;12 inches:1 foot; $\frac{12 \text{ inches}}{1 \text{ foot}}$) Record.

Step 4: Direct students to Question 9. Have them discuss the question and be prepared to explain their answer.

- Partner A, what is the value of the ratio written as $\frac{12 \text{ inches}}{1 \text{ foot}}$? (1) Record.
- Partner B, explain why this is true. (Any time a fraction is written with the same value in the numerator and the denominator, the fraction is equal to 1.) Record.

Step 5: Direct students' attention to the graphic organizer at the bottom of S72. Students can use the information from the SOLVE problem on S71 and Questions 1 – 9 to complete the graphic organizer.

Length of the fence in feet	How we determined the length in inches	Length of the fence in inches	Using the ratio to change from feet to inches	Product	Final answer
8 feet	**8 • 12 = 96**	**96 inches**	$\frac{\textbf{8 feet}}{\textbf{1}} \bullet \frac{\textbf{12 inches}}{\textbf{1 foot}}$	$\frac{\textbf{96}}{\textbf{1}} \bullet \frac{\textbf{feet}}{\textbf{foot}} \bullet \frac{\textbf{inch}}{\textbf{1}}$	$\frac{\textbf{96 inches}}{\textbf{1}}$ **= 96 inches**

- Partner A, identify the length of the fence in feet from the SOLVE problem. (8 feet) Record.
- Partner B, how did we determine the length in inches? What was the L plan? (8 • 12 = 96) Record.
- Partner A, what was the length of the fence in inches? (96 inches) Record.

Step 6: Have student pairs discuss other possible plans (L Step) to find the value of 8 feet in inches using the ratio of inches to feet that they identified in Question 9.

- Partner B, explain how we can write the given value of 8 feet as a fraction. (Write 8 feet as the numerator and 1 as the denominator: $\frac{8 \text{ feet}}{1}$)
- Partner A, why can we do this? (Any value can be written as a fraction by placing it over the denominator of 1.)
- Partner B, what operation did we use in the L Step on S71? (multiplication)
- Partner A, what operation will we use with the ratios? (multiplication)
- Partner B, describe how we wrote the ratio that we will use to multiply. (12 inches over 1 foot: $\frac{12 \text{ inches}}{1 \text{ foot}}$)
- Record the ratio sentence to change from feet to inches in Column 4. ($\frac{8 \text{ feet}}{1} \bullet \frac{12 \text{ inches}}{1 \text{ foot}}$)

Step 7: Direct students' attention to Question 10.

- Partner A, identify the property that allows us to multiply by the ratio of $\frac{12 \text{ inches}}{1 \text{ foot}}$. (**Identity property of multiplication** because $\frac{12 \text{ inches}}{1 \text{ foot}}$ is equal to 1.) Record.
- Direct students' attention to the Product column.
- Partner B, explain the process we use to multiply two fractions. (Multiply numerators and then denominators.)

$$\frac{8 \text{ feet}}{1} \bullet \frac{12 \text{ inches}}{1 \text{ foot}} = \frac{8 \bullet 12 \bullet \text{feet} \bullet \text{inches}}{1 \bullet 1 \bullet \text{foot}} = \frac{96}{1} \bullet \frac{\text{feet}}{\text{foot}} \bullet \frac{\text{inch}}{1}$$

- Partner A, explain why we can cancel the fraction that is $\frac{\text{feet}}{\text{foot}}$? (Any fraction that has the same value for the numerator and denominator has a value of 1.)
- Partner B, what is the last step?

$\frac{96}{1} \bullet \frac{\cancel{\text{feet}}}{\cancel{\text{foot}}} \bullet \frac{\text{inch}}{1} = \frac{96 \text{ inches}}{1}$ Record in the graphic organizer.

- Complete Question 11.

Converting Ratios using the Conversion Factor

(M, GP, CP, WG) S73 (Answers on T164.)

M, GP, WG, CP: Have students turn to S73 in their books. Students will summarize what they have learned about converting measures with ratios and apply that concept of a conversion factor. Make sure students know their designation as Partner A or Partner B. **{Algebraic Formula, Verbal Description, Graphic Organizer}**

MODELING

Converting Ratios using the Conversion Factor

Step 1: Have students turn to S73 in their books to summarize the information from S72.

- Partner A, Explain what the ratio $\frac{12 \text{ inches}}{1 \text{ foot}}$ tells us. (There are 12 inches in 1 foot.) Record.
- Partner B, what is the value of the ratio $\frac{12 \text{ inches}}{1 \text{ foot}}$? (1) Record.

- Partner A, explain how we found the number of inches in 8 feet using the graphic organizer. (We multiplied 8 feet by $\frac{12 \text{ inches}}{1 \text{ foot}}$.) Record.
- Partner B, did that change the value of 8 feet? (No.) Record. Explain why. ($\frac{12 \text{ inches}}{1 \text{ foot}}$ is equal to 1.) Record.
- Partner A, what is the vocabulary term we use to label any value we multiply? (factor) Record.
- Partner B, when we changed the way we represented 8 feet to 96 inches, what word did we use to describe that change in the SOLVE problem on S71? (convert) Record.
- Have students discuss Question f. Any fraction we use to convert a measurement is called a (**conversion factor**). Record.

Step 2: Direct students' attention to the Example Problem at the bottom of the page. Let's practice using the conversion factor.
Example Problem: How many inches are in 2 yards? (1 yard = 36 inches)

- Partner A, what is Step 1? (Write the given value as a ratio.)
- Partner B, how can we write 2 yards as a ratio? ($\frac{2 \text{ yards}}{1}$) Record.

Measurement 1	Measurement 2	Conversion Factor
36 inches	1 yard	$\frac{36 \text{ inches}}{1 \text{ yard}}$ or $\frac{1 \text{ yard}}{36 \text{ inches}}$

- Partner A, what is Step 2? (Determine the conversion factor to use from the given measurement.) Circle it in the graphic organizer.
- Partner B, what is the conversion factor we should use? ($\frac{36 \text{ inches}}{1 \text{ yard}}$) Record.
- Partner A, explain why we chose $\frac{36 \text{ inches}}{1 \text{ yard}}$. (When we multiply the given value times this conversion factor, the units of yards will cancel and our answer will be in inches.)

Step 3: Complete using the conversion factor.

$$\frac{2 \text{ yards}}{1} \bullet \frac{36 \text{ inches}}{1 \text{ yard}} = \frac{2 \bullet 36 \bullet \text{yards} \bullet \text{inches}}{1 \text{ yard}} = \frac{72 \bullet \cancel{\text{yards}} \bullet \text{inches}}{1 \cancel{\text{yard}}} = 72 \text{ inches}$$

Converting Measurements with Ratios – Graphic Organizer

(CP, WG, M, GP, IP) S74 (Answers on T165.)

M, GP, CP, WG: Have students turn to S74 in their books. Make sure students know their designation as Partner A or Partner B. **{Verbal Description, Graphic Organizer}**

MODELING

Converting Measurements with Ratios – Graphic Organizer

Step 1: Direct students' attention to Problem 1 and use the following instructions to complete this step.

- Partner A, determine what the problem is asking you to find. (the weight of the truck in tons)
- Partner B, what is the given measure? (6,000 pounds) Record.
- Partner A, what information is given in Problem 1 to help create the conversion factor? (2,000 pounds = 1 ton)
- Partner B, what format do we use to write the conversion factor? (As a ratio in fraction form; because the two values are equal when we write them as a ratio, the value is 1.)

Step 2: Partner A, what are the two ways we can write the conversion factor? ($\frac{2{,}000 \text{ pounds}}{1 \text{ ton}}$ or $\frac{1 \text{ ton}}{2{,}000 \text{ pounds}}$) Record.

- Partner B, what is the first step to solve the problem? (Write the given measure as a ratio. $\frac{6{,}000 \text{ pounds}}{1}$) Record.
- Partner A, what is the second step to solve the problem? (Choose which conversion factor to use.)
- Circle the appropriate conversion factor in the conversion factor column.
- Partner B, how do we know which conversion factor to use? (We use the conversion factor that will allow us to cancel the units of the original given measure.) $\frac{6{,}000 \text{ pounds}}{1} \bullet \frac{1 \text{ ton}}{2{,}000 \text{ pounds}}$

Step 3: Have student pairs complete the computation.

$$\left(\frac{6{,}000 \text{ pounds}}{1} \bullet \frac{1 \text{ ton}}{2{,}000 \text{ pounds}} = \frac{6{,}000 \cancel{\text{pounds}} \bullet \text{ton}}{2{,}000 \cancel{\text{pounds}}} = \frac{6{,}000 \text{ tons}}{2{,}000} = 3 \text{ tons}\right)$$

Record.

- Partner A, what property allows us to "cancel" the pounds units? (identity property of multiplication; pounds divided by pounds = 1)
- Partner B, what is the final answer? (6,000 pounds = 3 tons)

IP, CP, WG: Have students work with their partners to complete Problems 2 – 5 on S74. Monitor closely to make sure students are using the appropriate vocabulary. Then come back together as a class and share their results. **{Verbal Description, Algebraic Formula, Graphic Organizer}**

SOLVE Problems with Conversion Factors

(M, GP, CP, WG, IP)
S75, S76(Answers on T166, T167.)

M, GP, WG, CP: Have students turn to S75 in their books. The first problem is a SOLVE problem. Students will be converting measurements using a conversion factor. **{SOLVE, Verbal Description, Graphic Organizer}**

MODELING

SOLVE Problems with Conversion Factors

Step 1: Have students turn to page S75 and read the SOLVE problem on the top of the page. Have the student pairs complete the S and O steps and then go over the answers together as a whole group.

Step 2: Partner B, describe to Partner A how we could line up a plan to solve our problem. Discuss possible ways to describe how to line up a plan to include creating a conversion factor and using it to complete the conversion.

Step 3: Partner A, what is the first step of the L plan? (Create a conversion factor.) Record.

- Partner B, what is the second step of the L plan? (Multiply the number of quarts times the conversion factor of gallons to quarts.) Record.
- Have student pairs discuss if there are any other steps for the plan. (No)
- Partner A, what will be the operation we use? (multiplication) Record.
- Partner B, why is the operation multiplication? (When we convert measurements, we create a conversion factor and multiply it by the given amount.)

Step 4: Have student pairs discuss and determine an estimate for the V Step and then carry out the plan.

$$\frac{24 \text{ quarts}}{1} \bullet \frac{1 \text{ gallon}}{4 \text{ quarts}} = \frac{24 \cancel{\text{quarts}} \bullet \text{gallon}}{4 \cancel{\text{quarts}}} = 6 \text{ gallons}$$

Step 5: Have students complete the E Step and review the answers as a whole group.

- Does your answer make sense? (Compare your answer to the question.) (Yes, because I found the number of gallons of strawberries needed.) Record.
- Is your answer reasonable? (Compare your answer to the estimate.) (Yes, because it matches my estimate of about 6 gallons.) Record.
- Is your answer accurate? (Check your work.) (Yes)
- Write your answer in a complete sentence. (She needs 6 gallons of strawberries for her project.) Record.

IP, CP, WG: Have students work with their partners to complete the SOLVE Problem on S76. Then have students come back together as a class and share their results. **{Verbal Description, Graphic Organizer, Pictorial Representation}**

SOLVE Problem (IP, CP, WG) S77 (Answers on T168.)

Have students turn to S77 in their books. The first problem is a SOLVE problem. Students are going to complete all steps of the SOLVE problem using multiplication. **{SOLVE, Verbal Description, Graphic Organizer}**

Discovery Activity – Converting Ratios with Multiple Steps - Extend the SOLVE Problem (M, GP, WG, CP) S77, S78, S79 (Answers on T168, T169, T170).

WG, M, CP, GP: Have students turn to S77 in their books. Assign the roles of Partner A or Partner B. **{Algebraic Formula, Verbal Description, Graphic Organizer}**

MODELING

Discovery Activity – Converting Ratios with Multiple Steps- Extend the SOLVE Problem

Step 1: Direct students to the question below the SOLVE problem on S77. Ask partners to discuss Questions 1 and 2 and then share answers with the whole group.

- Partner A, what process did we follow to convert the length of the fence from feet to inches? (We multiplied the feet times the inches in a foot.) Record.
- Partner B, what process did we follow to convert the length of the fence from inches to centimeters? (We multiplied the inches times the number of centimeters in one inch.) Record.

Step 2: Direct students' attention to the chart at the top of S78. Use the questions in the chart to note observations and conclusions as students compare the SOLVE problem on S77 with the SOLVE problem on S71.

Question	Observation
What is the difference between the SOLVE problem on S71 and the first SOLVE problem from the beginning of the lesson?	There are two different conversions.
What ratio did we use for the conversion factor to change feet to inches?	$\frac{12 \text{ inches}}{1 \text{ foot}}$
How can we find the number of inches in 8 feet using the conversion factor?	$\frac{8 \text{ feet}}{1} \bullet \frac{12 \text{ inches}}{1 \text{ foot}} = \frac{96 \bullet \cancel{\text{feet}} \bullet \text{inches}}{\cancel{\text{foot}}} = 96 \text{ inches}$
What ratio can we use for the conversion factor to change inches to centimeters?	$\frac{2.54 \text{ cm}}{1 \text{ inch}}$
How can we find the number of centimeters in 96 inches using the conversion factor?	$\frac{96 \text{ inches}}{1} \bullet \frac{2.54 \text{ cm}}{1 \text{ inch}} = \frac{96 \bullet 2.54 \bullet \cancel{\text{inches}} \bullet \text{cm}}{\cancel{\text{inch}}} \approx 243.84 \text{ cm}$
What will need to be done when we complete the conversion?	We will need to go back and S the problem to determine if the final answer is in the correct units.

- Have student pairs discuss the difference in the two SOLVE problems.
- Partner A, what is different about the SOLVE problem on S77 and the SOLVE problem from the beginning of the lesson? (The SOLVE problem on S77 has two different conversions.) Record.
- Partner B, what ratio did we use for the conversion factor to change feet to inches?

  $\left(\frac{12 \text{ inches}}{1 \text{ foot}} \right)$ Record.

- Partner A, explain how we can find the number of inches in 8 feet using the conversion factor.
  $\left(\frac{8 \text{ feet}}{1} \bullet \frac{12 \text{ inches}}{1 \text{ foot}} = \frac{96 \bullet \cancel{\text{feet}} \bullet \text{inches}}{\cancel{\text{foot}}} = 96 \text{ inches}\right)$ Record.

Step 3: Partner B, what ratio can we use for the conversion factor to change inches to centimeters? $\left(\frac{2.54 \text{ cm}}{1 \text{ inch}}\right)$ Record.

- Partner A, explain how we can find the number of centimeters in 96 inches using the conversion factor. Record.
  $\left(\frac{96 \text{ inches}}{1} \bullet \frac{2.54 \text{ cm}}{1 \text{ inch}} \approx \frac{96 \bullet 2.54 \bullet \cancel{\text{inches}} \bullet \text{cm}}{\cancel{\text{inch}}} \approx 243.84 \text{ cm}\right)$ Record.

Step 4: Partner B, what will need to be done when we complete the conversion? (We will need to go back and S the problem to determine if the final answer is in the correct units.) Record.

Step 5: Direct students' attention to the Example Problem below the graphic organizer.

- Example Problem: How many centimeters are in 2 yards?
- Partner A, what is Step 1? (Write the given value as a ratio.)
- Partner B, how can we write 2 yards as a ratio? ($\frac{2 \text{ yards}}{1}$) Record.
- Partner A, what is Step 2? (Determine the conversion factors to use from the given measurement.)
- Partner B, what conversion factors should we use?
  ($\frac{36 \text{ inches}}{1 \text{ yard}}$ and $\frac{2.54 \text{ cm}}{1 \text{ inch}}$) Record.
- Partner A, why did we choose those conversion ratios? (When we multiply the values, the units will be equal to 1.) Record.
- Partner B, what is Step 3? (Complete using the conversion factors.) Record.
- Complete the conversion.
- Partner A, explain how you found the number of centimeters in two yards.
  $\left(\frac{2 \text{ yards}}{1} \bullet \frac{36 \text{ inches}}{1 \text{ yard}} \bullet \frac{2.54 \text{ cm}}{1 \text{ inch}} = \frac{2 \bullet 36 \bullet 2.54 \bullet \cancel{\text{yard}} \bullet \cancel{\text{inches}} \bullet \text{cm}}{1 \cancel{\text{yard}} \bullet \cancel{\text{inches}}} \approx 182.88 \text{ cm}\right)$
- Partner B, why do we write the final answer with the approximate symbol? (The conversion of centimeters to inches is not exact.) Record.

Converting Measurement with Ratios – Graphic Organizer

(CP, WG, M, GP, IP) S79 (Answers on T170.)

M, GP, CP, WG: Have students turn to S79 in their books. Make sure students know their designation as Partner A or Partner B. **{Verbal Description, Graphic Organizer}**

MODELING

Converting Measurements with Ratios – Graphic Organizer

Step 1: Direct students' attention to Problem 1 and use the following instructions to complete this step.

- Partner A, determine what the problem is asking you to find. (The weight of the elephant in kilograms)
- Partner B, what is the given measure? (4 tons) Record.
- Partner A, what information is given in Problem 1 to help create the conversion factor? (2,000 pounds = 1 ton; 1 pound ≈ 0.453 kg)
- Partner B, what format do we use to write the conversion factor? (As a ratio in fraction form; because the two values are equal when we write them as a ratio, the value is 1.)

Step 2: Partner B, what is the first step to solve the problem? (Write the given measure as a ratio. $\frac{4 \text{ tons}}{1}$) Record.

- Partner A, what is the second step to solve the problem? (Write the two conversion factors.)
- Partner B, how do we know which conversion factors to use? (We use the conversion factors that will allow us to cancel the units of the original given measure.)

Step 3: Have student pairs complete the computation.

$$\frac{4 \text{ tons}}{1} \bullet \frac{2{,}000 \text{ lbs}}{1 \text{ ton}} \bullet \frac{0.453 \text{ kg}}{1 \text{ lb}} \approx 3{,}624 \text{ kg}$$

- Partner A, what property allows us to "cancel" the tons and pounds units? (identity property of multiplication; tons divided by tons = 1 and pounds divided by pounds = 1)
- Partner B, what is the final answer? (≈ 3,624 kg)

IP, CP, WG: Have students work with their partners to complete Problems 2 - 4 on S79. Monitor closely to make sure students are using the appropriate vocabulary. Have students come back together as a class and share their results. **{Verbal Description, Algebraic Formula, Graphic Organizer}**

SOLVE Problems with Conversion Factors

(M, GP, CP, WG, IP)
S80, S81 (Answers on T171, T172.)

M, GP, WG, CP: Have students turn to S80 in their books. The first problem is a SOLVE problem. Students will be converting measurements using a conversion factor. **{SOLVE, Verbal Description, Graphic Organizer}**

MODELING

SOLVE Problems with Conversion Factors

Step 1: Have students turn to page S80 and read the SOLVE problem on the top of the page. Have the student pairs complete the S and O steps and then go over the answers together as a whole group.

Step 2: Partner B, describe to Partner A how we could line up a plan to solve the problem. Discuss possible ways to describe how to line up a plan to include creating conversion factors and using it to complete the conversions.

Step 3: Partner A, what is the first step of the L plan? (Create a conversion factor for quarts to gallons.) Record.

- Partner B, what is the second step of the L plan? (Multiply the number of gallons times the conversion factor of quarts to gallons.) Record.
- Have student pairs discuss if there are any other steps for the plan. (Yes)

Step 4: Partner A, what is the next step of the plan? (Create a conversion factor for liters to quarts.) Record.

- Partner B, is there another step for L? (Yes) What is that step? (Multiply the number of quarts times the conversion factor for liters to quarts.) Record.
- Partner A, what will be the operation we use? (multiplication) Record.
- Partner B, why is the operation multiplication? (When we convert measurements, we create a conversion factor and multiply it by the given amount.)
- Partner A, is the L Step complete? (Yes)

Step 5: Have student pairs discuss and determine an estimate for the V Step and then carry out the plan.

$$\frac{3 \text{ gallons}}{1} \bullet \frac{4 \text{ quarts}}{1 \text{ gallon}} = 12 \text{ quarts};$$

$$\frac{12 \text{ quarts}}{1} \bullet \frac{0.946 \text{ L}}{1 \text{ quart}} \approx 11.35 \text{ L}$$

Step 6: Have students complete the E Step and review the answers as a whole group.

- Does your answer make sense? (Compare your answer to the question.) (Yes, because I found the amount of milk in liters.) Record.
- Is your answer reasonable? (Compare your answer to the estimate.) (Yes, because it matches my estimate of about 10 liters.) Record.
- Is your answer accurate? (Check your work.) (Yes) Record.
- Write your answer in a complete sentence. (Kelsey bought about 11.35 liters of milk, and it is enough to make her recipe.) Record.

IP, CP, WG: Have students work with their partners to complete the SOLVE Problem on S81. Then come back together as a class and share their results. **{Verbal Description, Graphic Organizer}**

If time permits... **(IP, CP) S82 (Answers on T173.)**

Have students complete the problems on S82.

[Closure]

To wrap up the lesson, go back to the essential questions and discuss them with students.

- How can we use ratios to convert units of measurement? *(You can use ratios with numerators and denominators that represent the same amount. Choose the ratio that allows you to (simplify) divide out the common units.)*
- What is a conversion factor? *(a fraction that has a numerator and a denominator that are equivalent measures making the fraction equal to 1)*
- Why do we need to convert units of measurement? *(to have the same units and become more precise with our answers)*

[Homework] Assign S83 and S84 for homework. (Answers on T174 and T175.)

[Quiz Answers] T176–T178

1. **A** 2. **C** 3. **B** 4. **C** 5. **D** 6. **B** 7. **A** 8. **D** 9. **A** 10. **C**

The quiz can be used at any time as extra homework or to see how students progress on converting measurements with ratios.

Here is the key to **S70**.

Warm–Up

Directions: Complete the following problems with equivalent ratios.

1. $\frac{8}{24} = \frac{x}{3}$ ***x* = 1**

2. $\frac{21}{35} = \frac{3}{x}$ ***x* = 5**

3. $\frac{6}{36} = \frac{x}{12}$ ***x* = 2**

4. $\frac{x}{9} = \frac{54}{81}$ ***x* = 6**

5. $\frac{14}{42} = \frac{7}{x}$ ***x* = 21**

6. $\frac{15}{75} = \frac{3}{x}$ ***x* = 15**

Here is the key to **S71**.

Directions: Complete the following SOLVE problem with your partner.

~~Tanisha is helping her grandmother plant flowers.~~|~~They plant flowers in the backyard~~. | Her grandmother wants to put a piece of fence along the front of the flower bed. | If the length of the flower bed is 8 feet and we convert the length of the fence to inches, | what will be the length of the fence in inches? Use the measurement equivalent of 1 foot = 12 inches. |

S Underline the question.
The problem is asking me to find **the length of the fence in inches.**

O Identify the facts.
Eliminate the unnecessary facts.
List the necessary facts. **length of flower bed is 8 feet, 1 foot = 12 inches**

L Write in words what your plan of action will be.
Multiply the length of the flower bed in feet by the number of inches in a foot.
Choose an operation or operations. **Multiplication**

V Estimate your answer. **About 100 inches**
Carry out your plan. **8 • 12 = 96 inches**

E Does your answer make sense? (Compare your answer to the question.) **Yes, because I found the length of the fence in inches.**
Is your answer reasonable? (Compare your answer to the estimate.) **Yes, because it is close to my estimate of about 100 inches.**
Is your answer accurate? (Check your work.) **Yes**
Write your answer in a complete sentence. **The length of the fence is 96 inches.**

Let's now extend our problem.

1. What word in the SOLVE problem tells us that we need to change the unit of measure of the length of the fence from feet to inches? **convert**

2. What process did we follow to convert the length of the fence from feet to inches? **We multiplied the feet times the number of inches in one foot.**

3. Why did we choose multiplication? **If we look at the information given (1 foot = 12 inches), we know that the measurement in feet will be less than inches. For every foot we have 12 inches, so we multiplied.**

Here is the key to **S72**.

Directions: Complete this page with your teacher and partner.

4. Let's go back to the SOLVE problem. If the measurement that we are converting is a larger (foot) to a smaller (inch) unit, what operation do we use? **multiplication**

5. What was the measurement fact that we used to convert the feet to inches in the SOLVE problem? **1 foot = 12 inches**

6. When we write that 1 foot is equal to 12 inches we are **comparing** the two different types of measurements.

7. What is the term we use when we are comparing two values of different types? **ratio**

8. What are the three ways that we can write a ratio using the values from the SOLVE problem?
12 inches to 1 foot; 12 inches:1 foot; $\frac{\textbf{12 inches}}{\textbf{1 foot}}$

9. What is the value of the ratio $\frac{12 \text{ inches}}{1 \text{ foot}}$? **1** Explain why this is true.
Any time a fraction is written with the same value in the numerator and the denominator, the fraction is equal to 1.

Look at the graphic organizer below. Use the information from the SOLVE problem and Questions 1 – 9 to fill in the answers.

Length of the fence in feet	How we determined the length in inches	Length of the fence in inches	Using the ratio to change from feet to inches	Product	Final answer
8 feet	**8 • 12 = 96**	**96 inches**	$\frac{\textbf{8 feet}}{\textbf{1}} \bullet \frac{\textbf{12 inches}}{\textbf{1 foot}}$	$\frac{\textbf{96}}{\textbf{1}} \bullet \frac{\textbf{feet}}{\textbf{foot}} \bullet \frac{\textbf{inch}}{\textbf{1}}$	$\frac{\textbf{96 inches}}{\textbf{1}}$ **= 96 inches**

10. What property allows us to multiply by the ratio of $\frac{12 \text{ inches}}{1 \text{ foot}}$?
Identity property of multiplication because $\frac{\textbf{12 inches}}{\textbf{1 foot}}$ **is equal to 1.**

11. What is the value of $\frac{\text{feet}}{\text{foot}}$? **1** What is the final answer? **96 inches**

Here is the key to **S73**.

Directions: Complete this page with your teacher and partner.

Let's summarize:

a. Explain what the ratio $\frac{12 \text{ inches}}{1 \text{ foot}}$ tells us.

There are 12 inches in 1 foot.

b. What is the value of the ratio $\frac{12 \text{ inches}}{1 \text{ foot}}$? **1**

c. How did we find the number of inches in 8 feet using the graphic organizer? **We multiplied 8 feet by $\frac{12 \text{ inches}}{1 \text{ foot}}$.** Did that change the value of 8 feet? **No** Explain why. $\frac{12 \text{ inches}}{1 \text{ foot}}$ **is equal to 1.**

d. What do we call any value we multiply? **factor**

e. When we changed the way we represented 8 feet to 96 inches, what word did we use to describe that change? **convert**

f. Any fraction we use to convert a measurement is called a **conversion factor**.

Let's practice using the conversion factor.

Example Problem: How many inches are in 2 yards? (1 yard = 36 inches)

Step 1: Write the given value as a ratio. $\frac{\textbf{2 yards}}{\textbf{1}}$

Measurement 1	Measurement 2	Conversion Factor
36 inches	**1 yard**	$\frac{\textbf{36 inches}}{\textbf{1 yard}}$ **or** $\frac{\textbf{1 yard}}{\textbf{36 inches}}$

Step 2: Determine the conversion factor to use from the given measurement.

$\frac{\textbf{36 inches}}{\textbf{1 yard}}$

Step 3: Complete using the conversion factor.

$$\frac{\textbf{2 yards}}{\textbf{1}} \bullet \frac{\textbf{36 inches}}{\textbf{1 yard}} = \frac{\textbf{2} \bullet \textbf{36} \bullet \textbf{yards} \bullet \textbf{inches}}{\textbf{1 yard}} = \frac{\textbf{72} \bullet \cancel{\textbf{yards}} \bullet \textbf{inches}}{\textbf{1} \cancel{\textbf{yard}}} = \textbf{72 inches}$$

Here is the key to **S74**.

Directions: Complete this page with your teacher and partner.

Problem	Given Measure	Conversion Factor	Solve
1. A new pick-up truck weighs 6,000 pounds. What is the weight in tons? (2,000 pounds = 1 ton)	**6,000 pounds**	$\frac{\text{2,000 pounds}}{\text{1 ton}}$ **or** $\frac{\text{1 ton}}{\text{2,000 pounds}}$	$\frac{\text{6,000 lbs}}{1} \bullet \frac{\text{1 ton}}{\text{2,000 lbs}} = \frac{\text{6,000 lbs} \bullet \text{ton}}{\text{2,000 lbs}}$ $\frac{\text{6,000 tons}}{\text{2,000}} = \text{3 tons}$
2. The length of an American football field is 360 feet. What is the length in yards? (3 feet = 1 yard)	**360 feet**	$\frac{\text{3 feet}}{\text{1 yard}}$ **or** $\frac{\text{1 yard}}{\text{3 feet}}$	$\frac{\text{360 feet}}{1} \bullet \frac{\text{yard}}{\text{3 feet}} = \frac{\text{360 feet} \bullet \text{yard}}{\text{3 feet}}$ $\frac{\text{360 yards}}{\text{3}} = \text{120 yards}$
3. A recipe for lemonade uses 4 cups of fresh lemon juice. What is the amount in ounces? (8 ounces = 1 cup)	**4 cups**	$\frac{\text{8 ounces}}{\text{1 cup}}$ **or** $\frac{\text{1 cup}}{\text{8 ounces}}$	$\frac{\text{4 cups}}{1} \bullet \frac{\text{8 ounces}}{\text{1 cup}} = \frac{\text{32 cups} \bullet \text{ounces}}{\text{1 cup}}$ $\frac{\text{32 ounces}}{1} = \text{32 ounces}$
4. Jamil's height is 2 meters. What is the height in centimeters? (1 meter = 100 cm)	**2 meters**	$\frac{\text{1 meter}}{\text{100 cm}}$ **or** $\frac{\text{100 cm}}{\text{1 meter}}$	$\frac{\text{2 meters}}{1} \bullet \frac{\text{100 cm}}{\text{1 meter}} = \frac{\text{200 meter} \bullet \text{cm}}{\text{1 meter}}$ $\frac{\text{200 cm}}{1} = \text{200 cm}$
5. A container of milk will hold 3,000 millliters. What is the amount in liters? (1 L = 1,000 ml)	**3,000 ml**	$\frac{\text{1,000 ml}}{\text{1 L}}$ **or** $\frac{\text{1 L}}{\text{1,000 ml}}$	$\frac{\text{3,000 ml}}{1} \bullet \frac{\text{1 L}}{\text{1,000 ml}} = \frac{\text{3,000 ml} \bullet \text{L}}{\text{1,000 ml}}$ $\frac{\text{3,000 L}}{\text{1,000}} = \text{3 L}$

Here is the key to **S75**.

Directions: Complete the following SOLVE problem with your teacher and partner.

~~Sonnia's mom wants to make strawberry jelly to sell at a school fundraiser.~~ | ~~At the farmer's market, the fruit stand sells strawberries for $15.00 per gallon.~~ | She needs 24 quarts of strawberries for the project. | How many gallons of strawberries does she need? (1 gallon is equal to 4 quarts.) |

S Underline the question.
The problem is asking me to find **the number of gallons of strawberries she needs for her project.**

O Identify the facts.
Eliminate the unnecessary facts.
List the necessary facts.
needs 24 quarts of strawberries; 1 gallon = 4 quarts

L Write in words what your plan of action will be.
Create a conversion factor. Multiply the number of quarts times the conversion factor of gallons to quarts.
Choose an operation or operations. **Multiplication**

V Estimate your answer. **about 6 gallons**
Carry out your plan.

$$\frac{\textbf{24 quarts}}{\textbf{1}} \bullet \frac{\textbf{1 gallon}}{\textbf{4 quarts}} = \frac{\textbf{24 } \cancel{\textbf{quarts}} \textbf{ • gallon}}{\textbf{4 } \cancel{\textbf{quarts}}} = \textbf{6 gallons}$$

E Does your answer make sense? (Compare your answer to the question.) **Yes, because I found the number of gallons of strawberries needed.**

Is your answer reasonable? (Compare your answer to the estimate.) **Yes, because it matches my estimate of about 6 gallons.**

Is your answer accurate? (Check your work.) **Yes**

Write your answer in a complete sentence. **She needs 6 gallons of strawberries for her project.**

Here is the key to **S76**.

Directions: Complete the following SOLVE problem with your partner.

~~The students on the track team at school run every day after school.~~ | ~~Last week there was no school on Thursday because of a teacher conference.~~ | Each student on the team has a goal to run 3 miles per day. | What is the distance of 3 miles when converted to feet? (1 mile = 5,280 feet) |

S Underline the question.
The problem is asking me to find **the distance of 3 miles converted to feet.**

O Identify the facts.
Eliminate the unnecessary facts.
List the necessary facts. **Student's goal is 3 miles; 1 mile = 5,280 feet**

L Write in words what your plan of action will be.
Create a conversion factor. Multiply the number of miles run times the conversion factor of feet to miles.
Choose an operation or operations. **Multiplication**

V Estimate your answer. **about 15,000 feet**
Carry out your plan.

$$\frac{\textbf{3 miles}}{\textbf{1}} \bullet \frac{\textbf{5,280 feet}}{\textbf{1 mile}} = \frac{\textbf{3 } \cancel{\textbf{miles}} \textbf{ } \bullet \textbf{ 5,280 feet}}{\textbf{1 } \cancel{\textbf{mile}}} = \textbf{15,840 feet}$$

E Does your answer make sense? (Compare your answer to the question.) **Yes, because I found the distance in feet.**

Is your answer reasonable? (Compare your answer to the estimate.) **Yes, because it is close to my estimate of about 15,000 feet.**

Is your answer accurate? (Check your work.) **Yes**

Write your answer in a complete sentence. **The distance of 3 miles converted to feet is 15,840 feet.**

Here is the key to **S77**.

Directions: Complete the following SOLVE problem with your partner.

~~Tanisha is helping her grandmother plant flowers.~~| ~~They plant flowers in the backyard.~~ | Her grandmother wants to put a piece of fence along the front of the flowerbed. | If the length of the flowerbed is 8 feet and we convert the length of the fence to inches, | what will be the length of the fence in centimeters? (1 foot = 12 inches; | 1 inch ≈ 2.54 centimeters) |

S Underline the question.
The problem is asking me to find **the length of the fence in centimeters.**

O Identify the facts.
Eliminate the unnecessary facts.
List the necessary facts. **length of flower bed is 8 feet, 1 foot = 12 inches, 1 inch ≈ 2.54 centimeters**

L Write in words what your plan of action will be.
Multiply the length of the flower bed in feet by the number of inches in a foot. Multiply the length of the flower bed in inches by the number of centimeters in an inch.
Choose an operation or operations. **Multiplication**

V Estimate your answer. **About 100 inches; about 250 centimeters**
Carry out your plan.
8 • 12 = 96 inches; 96 • 2.54 243.84 centimeters

E Does your answer make sense? (Compare your answer to the question.) **Yes, because I found the length of the fence in centimeters.**

Is your answer reasonable? (Compare your answer to the estimate.) **Yes, because it is close to my estimate of about 250 centimeters.**

Is your answer accurate? (Check your work.) **Yes**

Write your answer in a complete sentence. **The length of the fence is approximately 243.84 centimeters.**

Let's now extend our problem.

1. What process did we follow to convert the length of the fence from feet to inches? **We multiplied the feet times the number of inches in one foot.**

2. What process did we follow to convert the length of the fence from inches to centimeters? **We multiplied the inches times the number of centimeters in one inch.**

Here is the key to **S78**.

Directions: Complete this page with your teacher and partner.

Question	Observation
What is the difference between the SOLVE problem on S77 and the first SOLVE problem from the beginning of the lesson?	**There are two different conversions.**
What ratio did we use for the conversion factor to change feet to inches?	$\frac{\textbf{12 inches}}{\textbf{1 foot}}$
How can we find the number of inches in 8 feet using the conversion factor?	$\frac{\textbf{8 feet}}{\textbf{1}} \bullet \frac{\textbf{12 inches}}{\textbf{1 foot}} = \frac{\textbf{96 } \cancel{\textbf{feet}} \textbf{ • inches}}{\cancel{\textbf{foot}}} = \textbf{96 inches}$
What ratio can we use for the conversion factor to change inches to centimeters?	$\frac{\textbf{2.54 cm}}{\textbf{1 inch}}$
How can we find the number of centimeters in 96 inches using the conversion factor?	$\frac{\textbf{96 inches}}{\textbf{1}} \bullet \frac{\textbf{2.54 cm}}{\textbf{1 inch}} = \frac{\textbf{96•2.54•}\cancel{\textbf{inches}}\textbf{•cm}}{\cancel{\textbf{inch}}} \approx \textbf{243.84 cm}$
What will need to be done when we complete the conversion?	**We will need to go back and S the problem to determine if the final answer is in the correct units.**

LET'S PRACTICE

Example Problem 1: How many centimeters are in two yards?

Step 1: Write the given value as a ratio. $\frac{\textbf{2 yards}}{\textbf{1}}$

Step 2: Which conversion ratios should we use? $\frac{\textbf{36 inches}}{\textbf{1 yard}}$ **and** $\frac{\textbf{2.54 cm}}{\textbf{1 inch}}$
Why? **When we multiply the values, the units will be equal to 1.**

Step 3: Complete using the conversion factors.

$$\frac{\textbf{2 yards}}{\textbf{1}} \bullet \frac{\textbf{36 inches}}{\textbf{1 yard}} \bullet \frac{\textbf{2.54 cm}}{\textbf{1 inch}} = \frac{\textbf{2•36•2.54•}\cancel{\textbf{yard}}\textbf{•}\cancel{\textbf{inches}}\textbf{•cm}}{\textbf{1 }\cancel{\textbf{yard}}\textbf{ • }\cancel{\textbf{inches}}} \approx \textbf{182.88 centimeters}$$

Why do we write the final answer as ≈ 243.84 centimeters?
The conversion of centimeters to inches is not exact.

Here is the key to **S79**.

Directions: Complete this page with your teacher and partner.

Problem	Given Measure	Solve using Conversion Factors
1. At the zoo, an elephant weighs 4 tons. What is the elephant's weight in kg? (2,000 pounds = 1 ton) (1 pound ≈ 0.453 kg)	**4 tons**	$\frac{4 \text{ tons}}{1} \bullet \frac{2{,}000 \text{ lbs}}{1 \text{ ton}} \bullet \frac{0.453 \text{ kg}}{1 \text{ lb}} \approx 3{,}624 \text{ kg}$
2. How many liters of punch are in 5 gallons? (1 gallon = 4 quarts) (1 quart ≈ 0.946 L)	**5 gallons**	$\frac{5 \text{ gallons}}{1} \bullet \frac{4 \text{ quarts}}{1 \text{ gallon}} \bullet \frac{0.946 \text{ L}}{1 \text{ quart}} \approx 18.92 \text{ L}$
3. The length of the hallway at school is 75 feet. What is the distance in meters? (1 yard = 3 feet) (1 yard ≈ 0.914 meters)	**75 feet**	$\frac{75 \text{ feet}}{1} \bullet \frac{1 \text{ yard}}{3 \text{ feet}} \bullet \frac{0.914 \text{ m}}{1 \text{ yard}} = \frac{68.55}{3} \text{ m} \approx 22.85 \text{ m}$
4. The height of the door is 3 yards. What is the height in cm? (1 yard = 36 inches) (1 inch ≈ 2.54 cm)	**3 yards**	$\frac{3 \text{ yard}}{1} \bullet \frac{36 \text{ inches}}{1 \text{ yard}} \bullet \frac{2.54 \text{ cm}}{1 \text{ inch}} \approx 274.32 \text{ cm}$

Here is the key to **S80**.

Directions: Complete the following SOLVE problem with your teacher and partner.

Kelsey is making a recipe that requires 10 liters of milk.| She bought 3 gallons of milk at the store. | How many liters of milk did she buy, and will she have enough to make the recipe? (1 gallon = 4 quarts; | 1 quart ≈ 0.946 L) | Round your answer to the nearest hundredth.

S Underline the question.
The problem is asking me to find **the amount of milk she bought in liters and if she has enough milk for the recipe.**

O Identify the facts.
Eliminate the unnecessary facts.
List the necessary facts. **bought 3 gallons; needs 10 liters**
1 gallon = 4 quarts; 1 quart ≈ 0.946 L

L Write in words what your plan of action will be.
Create a conversion factor for quarts to gallons. Multiply the number of gallons times the conversion factor of quarts to gallons. Create a conversion factor for liters to quarts. Multiply the number of quarts times the conversion factor of liters to quarts.
Choose an operation or operations. **Multiplication**

V Estimate your answer. **about 10 liters**
Carry out your plan.

$$\frac{3 \text{ gallons}}{1} \bullet \frac{4 \text{ quarts}}{1 \text{ gallon}} = 12 \text{ quarts,}$$

$$\frac{12 \text{ quarts}}{1} \bullet \frac{0.946 \text{ L}}{1 \text{ quarts}} \approx 11.35 \text{ L}$$

E Does your answer make sense? (Compare your answer to the question.) **Yes, because I found the amount of milk in liters.**

Is your answer reasonable? (Compare your answer to the estimate.) **Yes, because it is close to my estimate of about 10 liters.**

Is your answer accurate? (Check your work.) **Yes**

Write your answer in a complete sentence. **Kelsey bought about 11.35 liters of milk, and it is enough to make her recipe.**

Here is the key to **S81**.

Directions: Complete the following SOLVE problem with your partner.

~~Lizzie was planting a rectangular flower garden in her back yard.~~ | ~~She wanted to put a brick border around her garden.~~ | The perimeter of the garden is 18 yards. | How many meters of border will she need to purchase? (1 yard = 3 feet; | 1 foot ≈ 0.305 m) | Round all answers to the nearest hundredth.

S Underline the question.
The problem is asking me to find **the length of border she needs in meters.**

O Identify the facts.
Eliminate the unnecessary facts.
List the necessary facts. **perimeter is 18 yards; buys amount in meters**
1 yard = 3 feet; 1 foot ≈ 0.305 m

L Write in words what your plan of action will be.
Create a conversion factor for feet to yards. Multiply the number of yards times the conversion factor of feet to yards. Create a conversion factor for meters to feet. Multiply the number of feet times the conversion factor of meters to feet.
Choose an operation or operations. **Multiplication**

V Estimate your answer. **about 20 meters**
Carry out your plan.

$$\frac{18 \text{ yards}}{1} \bullet \frac{3 \text{ feet}}{1 \text{ yard}} = 54 \text{ feet;}$$

$$\frac{54 \text{ feet}}{1} \bullet \frac{0.305 \text{ m}}{1 \text{ foot}} \approx 16.47 \text{ meters}$$

E Does your answer make sense? (Compare your answer to the question.) **Yes, because I found the amount of border in meters.**

Is your answer reasonable? (Compare your answer to the estimate.) **Yes, because it is close to my estimate of about 20 meters.**

Is your answer accurate? (Check your work.) **Yes**

Write your answer in a complete sentence. **Lizzie needs about 16.47 meters of border.**

Here is the key to **S82**.

Directions: Complete this page with your partner.

1. Mrs. Harrison buys 4 pounds of sugar at the store. How many grams of sugar are in the container? (1 pound = 16 ounces; 1 ounce ≈ 28.35 grams)

$$\frac{4 \text{ pounds}}{1} \bullet \frac{16 \text{ ounces}}{1 \text{ pound}} \bullet \frac{28.35 \text{ g}}{1 \text{ ounce}} \approx 1814.4 \text{ grams}$$

2. How many milliliters are in 12 quarts? (1 quart ≈ 0.946 liters; 1 liter = 1,000 ml)

$$\frac{12 \text{ quarts}}{1} \bullet \frac{0.946 \text{ liter}}{1 \text{ quart}} \bullet \frac{1{,}000 \text{ ml}}{1 \text{ liter}} \approx 11{,}352 \text{ mililiters}$$

3. How many feet are in 9 kilometers? (1 km = 0.62 miles; 1 mile = 5,280 feet)

$$\frac{9 \text{ km}}{1} \bullet \frac{0.62 \text{ miles}}{1 \text{ km}} \bullet \frac{5{,}280 \text{ feet}}{1 \text{ mile}} \approx 29{,}462.4 \text{ feet}$$

4. How many ounces are in 15 gallons? (1 gallon = 4 quarts; 1 quart = 2 pints; 1 pint = 2 cups; 1 cup = 8 ounces)

$$\frac{15 \text{ gallons}}{1} \bullet \frac{4 \text{ quarts}}{1 \text{ gallon}} \bullet \frac{2 \text{ pints}}{1 \text{ quart}} \bullet \frac{2 \text{ cups}}{1 \text{ pint}} \bullet \frac{8 \text{ ounces}}{1 \text{ cup}} = 1{,}920 \text{ ounces}$$

Here is the key to **S83**.

Homework

Name_____ Date _____

Directions: Complete the following SOLVE problems.

~~The art club is making banners for a school open house.~~ | They bought a roll of ribbon to use for the border of the banner that has 15 yards of ribbon. | How many centimeters of ribbon are on the roll? (1 yard = 0.914 meters; | 1 meter = 100 cm) |

1. S Underline the question.
The problem is asking me to find **the amount of ribbon in centimeters.**

2. O Identify the facts.
Eliminate the unnecessary facts.
List the necessary facts.
15 yards of ribbon, 1 yard ≈ 0.914 m, 1 meter = 100 cm

3. L Write in words what your plan of action will be.
Create a conversion factor for yards to meters. Multiply the number of yards times the conversion factor of yards to meters. Create a conversion factor for meters to centimeters. Multiply the number of meters times the conversion factor of meters to centimeters.
Choose an operation or operations. **Multiplication**

4. V Estimate your answer. **about 1,400 centimeters**
Carry out your plan.

$$\frac{15 \text{ yards}}{1} \bullet \frac{0.914 \text{ m}}{1 \text{ yard}} \approx 13.71 \text{ meters}$$

$$\frac{13.71 \text{ m}}{1} \bullet \frac{100 \text{ cm}}{1 \text{ meter}} \approx 1{,}371 \text{ centimeters}$$

5. E Does your answer make sense? (Compare your answer to the question.)
Yes, because I found the length of the ribbon in centimeters.

Is your answer reasonable? (Compare your answer to the estimate.) **Yes, because it is close to my estimate of about 1,400 centimeters.**

Is your answer accurate? (Check your work.) **Yes**

Write your answer in a complete sentence. **The roll of ribbon has 1,371 centimeters.**

Here is the key to **S84**.

Homework

Name_____ Date _____

Jason has a dog that weighs 18 kilograms.| ~~He has to give the dog medicine and the directions on the medicine give the dosage chart, but the dog weights are given in pounds.~~ | What is the weight of Jason's dog in pounds? (1 pound ≈ 0.453 kg) | Round your answer to the nearest hundredth.

6. S Underline the question.
The problem is asking me to find **the weight of Jason's dog in pounds.**

7. O Identify the facts.
Eliminate the unnecessary facts.
List the necessary facts. **dog weighs 18 kilograms,**
1 pound ≈ 0.453 kg

8. L Write in words what your plan of action will be.
Create a conversion factor for pounds to kilograms. Multiply the number of kilograms times the conversion factor of pounds to kilograms.
Choose an operation or operations. **Multiplication**

9. V Estimate your answer. **about 36 pounds**
Carry out your plan.
$\frac{18\ \cancel{kg}}{1} \bullet \frac{1\ \text{pound}}{0.453\ \cancel{kg}} \approx 39.74\ \text{pounds}$

10.E Does your answer make sense? (Compare your answer to the question.)
Yes, because I found the weight of the dog in pounds.

Is your answer reasonable? (Compare your answer to the estimate.)
Yes, because it is close to my estimate of about 36 pounds.

Is your answer accurate? (Check your work.) **Yes**

Write your answer in a complete sentence. **Jason's dog weighs approximately 39.74 pounds.**

Name _____ Date _____

Quiz

1. Which of the following equations can be used to determine how many centimeters are in 4 feet? (1 foot = 12 inches; 1 inch ≈ 2.54 cm)

A. $\frac{4 \text{ ft}}{1} \bullet \frac{12 \text{ inches}}{1 \text{ foot}} \bullet \frac{2.54 \text{ centimeters}}{1 \text{ inch}}$

B. $\frac{4 \text{ ft}}{1} \bullet \frac{1 \text{ foot}}{12 \text{ inches}} \bullet \frac{2.54 \text{ centimeters}}{1 \text{ inch}}$

C. $\frac{1}{4 \text{ ft}} \bullet \frac{12 \text{ inches}}{1 \text{ foot}} \bullet \frac{1 \text{ inch}}{2.54 \text{ centimeters}}$

D. $\frac{4 \text{ ft}}{1} \bullet \frac{1 \text{ inch}}{12 \text{ feet}} \bullet \frac{2.54 \text{ centimeters}}{1 \text{ inch}}$

---

2. How many centimeters are in 4 feet? (1 foot = 12 inches; 1 inch ≈ 2.54 cm)

A. 4 feet ≈ 1.21 cm

B. 4 feet ≈ 12.19 cm

C. 4 feet ≈ 121.92 cm

D. 4 feet ≈ 1219.2 cm

---

3. Which of the following equations can be used to determine how many meters are in 20 miles? (1 mile = 1,760 yards; 1 meter = 1.09 yards)

A. $\frac{20 \text{ miles}}{1} \bullet \frac{1 \text{ yard}}{1{,}760 \text{ miles}} \bullet \frac{1 \text{ meter}}{1.09 \text{ yards}}$

B. $\frac{20 \text{ miles}}{1} \bullet \frac{1{,}760 \text{ yards}}{1 \text{ mile}} \bullet \frac{1 \text{ meter}}{1.09 \text{ yards}}$

C. $\frac{20 \text{ miles}}{1} \bullet \frac{1 \text{ yard}}{1{,}760 \text{ miles}} \bullet \frac{1.09 \text{ meter}}{1 \text{ yard}}$

D. $\frac{20 \text{ miles}}{1} \bullet \frac{1{,}760 \text{ yards}}{1 \text{ mile}} \bullet \frac{1.09 \text{ yards}}{1 \text{ meter}}$

4. How many meters are in 20 miles? (1 mile = 1,760 yards; 1 meter ≈ 1.09 yards) Round your answer to the nearest meter.

A. 20 miles ≈ 3,229.4 meters

B. 20 miles ≈ 23,292.4 meters

C. 20 miles ≈ 32,294 meters

D. 20 miles ≈ 322,940 meters

---

5. Which of the following equations can be used to determine how many grams are in 3 pounds? (1 pound = 16 ounces;1 ounce ≈ 28.35 grams)

A. $\frac{3 \text{ pounds}}{1} \bullet \frac{1 \text{ pound}}{16 \text{ ounces}} \bullet \frac{28.35 \text{ ounces}}{1 \text{ gram}}$

B. $\frac{3 \text{ pounds}}{1} \bullet \frac{16 \text{ ounces}}{1 \text{ pound}} \bullet \frac{1 \text{ ounce}}{28.35 \text{ grams}}$

C. $\frac{3 \text{ pounds}}{1} \bullet \frac{1 \text{ ounce}}{16 \text{ pounds}} \bullet \frac{28.35 \text{ grams}}{1 \text{ ounce}}$

D. $\frac{3 \text{ pounds}}{1} \bullet \frac{16 \text{ ounces}}{1 \text{ pound}} \bullet \frac{28.35 \text{ grams}}{1 \text{ ounce}}$

---

6. How many grams are in 3 pounds? (1 pound = 16 ounces; 1 ounce ≈ 28.35 grams)

A. 3 pounds ≈ 136.08 grams

B. 3 pounds ≈ 1,360.8 grams

C. 3 pounds ≈ 1603.8 grams

D. 3 pounds ≈ 13,608 grams

---

7. Which of the following equations can be used to determine how many grams are in 9 pounds? (1 pound = 16 ounces; 1 ounce ≈ 28.35 grams)

A. $\frac{9 \text{ pounds}}{1} \bullet \frac{16 \text{ ounces}}{1 \text{ pound}} \bullet \frac{28.35 \text{ grams}}{1 \text{ ounce}}$

B. $\frac{9 \text{ pounds}}{1} \bullet \frac{1 \text{ ounce}}{16 \text{ pounds}} \bullet \frac{28.35 \text{ grams}}{1 \text{ ounce}}$

C. $\frac{1}{9 \text{ pounds}} \bullet \frac{16 \text{ ounces}}{1 \text{ pound}} \bullet \frac{1 \text{ gram}}{1 \text{ ounce}}$

D. $\frac{9 \text{ pounds}}{1} \bullet \frac{1 \text{ pound}}{16 \text{ ounces}} \bullet \frac{1 \text{ ounce}}{28.35 \text{ grams}}$

8. How many grams are in 9 pounds? (1 pound = 16 ounces; 1 ounce ≈ 28.35 grams)

A. 9 pounds ≈ 4.082 grams
B. 9 pounds ≈ 40.82 grams
C. 9 pounds ≈ 408.24 grams
D. 9 pounds ≈ 4,082.4 grams

---

9. Which of the following equations can be used to determine how many milliliters are in 12 gallons? (1 gallon ≈ 3.785 liters; 1 liter = 1,000 ml)

A. $\frac{12 \text{ gallons}}{1} \bullet \frac{3.785 \text{ liters}}{1 \text{ gallon}} \bullet \frac{1{,}000 \text{ ml}}{1 \text{ liter}}$

B. $\frac{12 \text{ gallons}}{1} \bullet \frac{1 \text{ gallon}}{3.785 \text{ liters}} \bullet \frac{1{,}000 \text{ ml}}{1 \text{ liter}}$

C. $\frac{1}{12 \text{ gallons}} \bullet \frac{3.785 \text{ liters}}{1 \text{ gallon}} \bullet \frac{1{,}000 \text{ ml}}{1 \text{ liter}}$

D. $\frac{12 \text{ gallons}}{1} \bullet \frac{3.785 \text{ liters}}{1 \text{ gallon}} \bullet \frac{1 \text{ liter}}{1{,}000 \text{ ml}}$

---

10. How many milliliters are in 12 gallons? (1 gallon ≈ 3.785 liters; 1 liter = 1,000 ml)

A. 12 gallons ≈ 454 milliliters
B. 12 gallons ≈ 4,540 milliliters
C. 12 gallons ≈ 45,420 milliliters
D. 12 gallons ≈ 454,200 milliliters