

Measurement Math Curriculum



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This curriculum and accompanying kit will help students learn proper measurement skills.

Curriculum Structure

The *Measurement Math* curriculum is composed of the following lessons. Approximate lesson times are included.

Lesson	Title	Approximate Time
One	Metric and Standard Readings	60 minutes
Two	How to Read a Ruler and Tape Measure	60 minutes
Three	How to Read and Use a Caliper	60 minutes
Four	Decimals	60 minutes
Five	Conversions	60 minutes
Six	Measurement Using a Tape Measure	60 minutes
Seven	Measurement Using a Caliper	60 minutes
	Total	7 hours

Lesson Structure

Each lesson begins with a Lesson Overview, Lesson Objectives, and a Lesson at a Glance table which lists the lesson activities, materials required, suggested preparation steps, and approximate class time.

Lesson Sections

The actual lesson follows the overview, which will contain some of the sections described below.

FOCUS

Every lesson begins with a FOCUS activity intended to capture participants' attention. This may be in the form of a small or large class discussion, a game, a review of previous lesson information, or a demonstration. During this activity, participants are introduced to the topic of the lesson.

LEARN

The LEARN activity in each lesson varies in its presentation mode. It may be a slide presentation, group activity, or demonstration.

REVIEW

The majority of lessons end with a REVIEW activity intended to briefly review the lesson's key messages or main points.

Lesson One – Metric and Standard Readings

Lesson Overview

In this lesson, students will learn the basics of metric and standard readings and how to convert from one reading to the other.

Lesson Objectives

After completing this lesson, participants will be able to:

- Understand metric and standard reading
- Convert measurements from metric to standard
- Convert measurements from standard to metric

Lesson at a Glance

Activity	Materials	Preparation	Approximate class time
FOCUS	• <i>History of the Metric System</i> • Computer/cell phone	1. Print/photocopy <i>History of the Metric System</i> (one per participant).	15 minutes
LEARN	• <i>Metric and Standard Reading Guided Note Packet</i> • <i>Metric and Standard Reading</i> slide presentation • <i>Metric System Foldable</i> • <i>Matching Game</i> • <i>Matching Game – Answer Key</i>	1. Print/Photocopy <i>Metric and Standard Reading Guided Note Packet</i> , <i>Matching Game</i> and <i>Metric System Foldable</i> (one per participant). 2. Prepare to show <i>Metric and Standard Reading</i> slide presentation.	35 minutes
REVIEW	• <i>Metric and Standard Reading Quiz</i> • <i>Metric and Standard Reading Quiz – Answer Key</i> • <i>Metric and Standard Reading Exit Ticket Questions</i> • Sticky notes	1. Print/photocopy <i>Metric and Standard Reading Quiz</i> (one per participant). 2. Print/photocopy <i>Exit Ticket Questions</i> (Teacher copy only). 3. Hand out four sticky notes to each student.	10 minutes

Lesson One – Metric and Standard Readings

FOCUS: Metric and Standard Readings

15 minutes

Purpose:

Participants will work with partners or individually on the *History of the Metric System*. This is a fun activity that allows participants to briefly look at the history of the metric system.

Materials:

- *History of the Metric System*
- Cell Phone/Computer

Facilitation Steps:

1. Have participants take a *History of the Metric System* sheet as they enter the classroom.
2. Allow 5-7 minutes for participants to read and answer the questions, working with a partner if they so choose. Encourage participants that do not have a phone or computer available to partner up with someone that does.
3. Lead a group discussion on the questions and answers. The last two questions do not have a correct answer and should encourage creativity.

Name: _____

Date: _____

History of the Metric System

If you are a citizen of any country in the world, with the exception of Liberia, Myanmar, and the United States, there is no escaping the metric system. The metric system is based on units of 10 and features measurements such as meters, liters, and kilograms. It was first adopted following the French Revolution and devised by a group of French scientists.



Measuring was a lot more difficult before there was a standard unit of measurement. Prior to the metric system, there were over 400 ways to measure areas of land in France alone. With that in mind, it was the goal of scientists to devise a system of standard measurements so that everyone was on the same page.

The metric system’s developers gathered inspiration from logic and nature, two things that would never change in their minds. For example, one meter was one ten-millionth of the distance between the North Pole and the Equator.

The metric system was not an overnight success story, and its creators knew this would be a long journey. Napoleon abolished it in 1812 and the system wasn’t reinstated until 1840. While the metric system was abolished in France, other countries would come to adopt it, usually in times of unrest.

By the mid-20th century, meters, kilometers, and milliliters were standard units in much of the world and would continue their world popularity to the present day. As stated earlier, only Liberia, Myanmar, and the United States remain with different measurement systems in place.

1. Which three countries around the world do not currently use the metric system?

2. What are some issues that may have arisen in the past with so many different types of measurements? Brainstorm with a classmate.

3. What are some benefits of a universal measuring system?

Lesson One – Metric and Standard Readings

LEARN: Metric and Standard Readings

35 minutes

Purpose:

Participants will follow the slide presentation instruction with the guided note packet provided. Participants will also create a metric system “foldable” and work through several practice problems. Students will learn about the standard and metric system of measurement, conversions within systems, and conversions between systems.

Materials:

- *Metric and Standard Reading* slide presentation
- *Metric and Standard Reading Guided Note Packet*
- *Metric System Foldable*
- *Matching Game*
- *Matching Game – Answer Key*
- Calculator (phone/computer calculator will be sufficient)

Facilitation Steps:

1. Walk through the *Metric and Standard Reading* slide presentation (Slides #1-8). Lead a discussion with the tips in the notes section of the slide presentation.
2. Participants should follow along while taking notes in the *Metric and Standard Reading Guided Notes Packet*.
3. Pass out the *Metric System Foldable*. Demonstrate the foldable in front of the class and have a finished version available for participants to view.
4. Continue presenting the *Metric and Standard Reading* slide presentation (Slides 9-20).
5. Participants should follow along, filling in the *Metric and Standard Reading Guided Notes Packet*.
6. If time permits, have participants practice what they have learned with the *Matching Game*.

Name: _____

Date: _____

Metric and Standard Readings Guided Note Packet

There are two main types of measurement systems used throughout the world. These systems are:

- 1.
- 2.

The only countries that use the standard system of measurement are:

- 1.
- 2.
- 3.

Typical Standard Readings

Length	Capacity	Weight
1.	1.	1.
2.	2.	2.
3.	3.	
4.	4.	

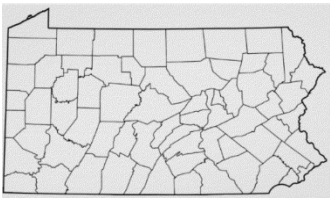
Which of the following measurement units would be best for finding the length of a pencil?

- A. Inches
- B. Feet
- C. Yards
- D. Miles



Which of the following measurement units would be best for finding the width of Pennsylvania?

- A. Inches
- B. Feet
- C. Yards
- D. Miles



Measurement Math Curriculum

Standard Conversion Example:

1. Convert 2.2 miles to feet.

More Practice:

Convert the following:

1. 1.7 ft = _____ in
2. 4 yd = _____ in
3. 1.4 mi = _____ yd
4. 30 in = _____ ft
5. 180 in = _____ yd

Metric System:

-

-

-

Which of the following would be an appropriate measurement unit for the length of a classroom?

- A. Millimeter
- B. Centimeter
- C. Meter
- D. Kilometer



Measurement Math Curriculum

Which of the following would be an appropriate measurement unit for the diameter of a marble?

- A. Millimeter
- B. Centimeter
- C. Meter
- D. Kilometer



Metric Conversion Example:

1. Convert the following:

$$543 \text{ cm} = \underline{\hspace{2cm}} \text{ m}$$

More Practice:

Convert the following:

- 1. 444 m = _____ cm
- 2. 65 mm = _____ m
- 3. 100 cm = _____ km
- 4. 2 km = _____ mm
- 5. 12hm = _____ m

Application Problem:

Ron services hot tubs for a living. When servicing a hot tub, Ron needs 135 mL of a special chemical. If Ron plans on servicing 342 hot tubs this year and the chemical only comes in one liter containers, how many containers of the chemical will Ron need?

Conversion Table – Standard to Metric

Convert from:	To:	Multiply by:
1.		
2.		
3.		
4.		
5.		

Measurement Math Curriculum

Conversion Table – Metric to Standard

Convert from: To: Multiply by:

- 1.
- 2.
- 3.
- 4.
- 5.

Example:

Convert the following:

1. 15 in = _____ cm

2. 10 km = _____ mi

More Practice:

Convert the following:

1. 18 yd = _____ m

2. 320 mm = _____ in

3. 4.5 mi = _____ m

4. 2,045 cm = _____ yd

5. 129 m = _____ ft

Application Problem:

James is building a shed off of a blueprint he found online. The height of the door is said to be 203.2 cm. How high is the door in inches? Round to the nearest inch.

Metric System Foldable

How to create a foldable:

1. Fold the paper into thirds. Use the tables as your guide.
2. Cut the left and right fold along the lines provided by the table.
3. On the left outer side, write the units of measure from peta to meter (one per cut).
4. On the right side, outside, write the units of measurement from meter to femto (one per cut).
6. On the inside of each cut , write the abbreviation, the multiplier in scientific notation, and the overall multiplier.
7. Down the middle of the foldable, write example conversions of your choosing.

Name: _____

Date: _____

Measurement Matching

Directions:

1. Cut out all 16 of the cards.
2. Shuffle the cards and lay them out upside down in a 4x4 grid.
3. Player 1 turns over two cards. If they are equivalent, player 1 keeps the match and goes again. If they are not equivalent, turn them back over and it is now player 2's turn. This cycle will continue until all matches are found.
4. Once all matches are found, players will count up their matches. The player with the most number of matches wins!

300 centimeters	2.8 miles	44 kilometers	118.11 inches
2.88 meters	1.5 feet	4,928 yards	12.8016 meters
457.2 millimeters	1,420 inches	228.6 millimeters	36.068 meters
14 yards	9 inches	27.3402 miles	288 centimeters

Measurement Matching – Answer Key

Card	Match
1,420 inches	36.068 meters
9 inches	228.6 millimeters
300 centimeters	118.11 inches
2.8 miles	4928 yards
44 kilometers	27.3403 miles
2.88 meters	288 centimeters
14 yards	12.8016 meters
1.5 feet	457.2 millimeters

Lesson One – Metric and Standard Readings

REVIEW: Metric and Standard Readings

10 minutes

Purpose:

This review activity is a great informative assessment. Participants will demonstrate their knowledge of the lesson taught and let the teacher know what questions they have.

Materials:

- *Metric and Standard Readings Quiz*
- *Metric and Standard Readings Quiz – Answer Key*
- *Metric and Standard Readings Exit Ticket*
- Sticky Notes (4 per participant)

Facilitation Steps: Choose to either use the quiz or the exit ticket activity.

Quiz:

1. Distribute the quiz and give students about five minutes to finish it.
2. Collect the quizzes to grade or review questions as a class.

Exit Ticket:

1. Break the board up into four sections, posting a question from the *Metric and Standard Reading Exit Ticket* in each section.
2. Pass out four sticky notes to each participant.
3. Participants will write their answers/questions down, one per sticky note.
4. As the participants leave, they will place their answers on the board in the appropriate question section.
5. After the participants have left, the teacher will evaluate the participants' performance and keep the questions to help guide the teaching for the next lesson.

Name: _____

Date: _____

Metric and Standard Readings Quiz

Directions: Select the best answer for each of the following questions.

1. Convert 42 inches to feet.
 - A. 4.5 feet
 - B. 3 feet
 - C. 3.5 feet
 - D. 4 feet
2. Convert 104 centimeters to millimeters.
 - A. 1,040 millimeters
 - B. 10.4 millimeters
 - C. 10,400 millimeters
 - D. 1.40 millimeters
3. Convert 23 meters to yards.
 - A. 7.21785 yards
 - B. 230 yards
 - C. 2.40595 yards
 - D. 5.4068 yards
4. Convert 2.2 kilometers to miles.
 - A. 2,200 miles
 - B. 1.36702 miles
 - C. 2.3401 miles
 - D. 7,217.85 miles
5. Quill has a rectangular pool with a length of 12 meters and a width of 8 meters. What is the perimeter of Quill's pool in feet?

Metric and Standard Readings Quiz – Answer Key

Directions: Select the best answer for each of the following questions.

1. Convert 42 inches to feet.

A. 4.5 feet

B. 3 feet

C. 3.5 feet

D. 4 feet

2. Convert 104 centimeters to millimeters.

A. 1,040 millimeters

B. 10.4 millimeters

C. 10,400 millimeters

D. 1.40 millimeters

3. Convert 23 meters to yards.

A. 7.21785 yards

B. 230 yards

C. 2.40595 yards

D. 25.1531 yards

4. Convert 2.2 kilometers to miles.

A. 2,200 miles

B. 1.36702 miles

C. 2.3401 miles

D. 7,217.85 miles

5. Quill has a rectangular pool with a length of 12 meters and a width of 8 meters. What is the perimeter of Quill's pool in feet? **$12 + 12 + 8 + 8 = 40m \approx 131.234 ft.$**

Metric and Standard Readings Exit Ticket

For instructor use only:

Split up the board into four sections. Write one of the questions below in each of the sections. Hand out four sticky notes to each participant and have them write one answer per sticky note. As participants leave the room, they will place each answer on the board in the appropriate section.

This is a great way as an instructor to informally assess your participants and their understanding of the lesson. Make sure you keep note of any questions or concerns to address later.

For questions 1-3, compare the following quantities with the $<$, $>$, or $=$ symbol.

- | | | |
|-----------|----------------------|----------|
| 1. 34 m | <input type="text"/> | 105 ft |
| 2. 102 in | <input type="text"/> | 275 cm |
| 3. 1.4 mi | <input type="text"/> | 7,392 ft |

4. What questions or concerns do you have about today's lesson?

Lesson Two – How to Read a Ruler and Tape Measure

Lesson Overview

In this lesson, participants will learn the basics of how to read a ruler and tape measure.

Lesson Objectives

After completing this lesson, participants will be able to:

- Identify standard units of measure
- Read fractions on a standard ruler and tape measure
- Read a metric ruler and tape measure
- Convert metric into standard and vice versa

Lesson at a Glance

Activity	Materials	Preparation	Approximate class time
FOCUS	• <i>Fraction War cards</i>	1. Print/Photocopy <i>Fraction War</i> (one per group). 2. Cut out a deck of cards for each group. *Laminating the cards will save you work in the long run.	10-15 minutes
LEARN	• <i>How to Read a Ruler and Tape Measure Guided Note Packet</i> • <i>How to Read a Ruler and Tape Measure Guided Note Packet – Answer Key</i> • <i>How to Read a Ruler and Tape Measure</i> slide presentation	1. Print/Photocopy <i>How to Read a Ruler and Tape Measure Guided Note Packet</i> (one per participant). 2. Prepare to show the <i>How to Read a Ruler and Tape Measure</i> slide presentation.	40 minutes
REVIEW	• <i>How to Read a Ruler and Tape Measure Exit Ticket</i> • <i>Plickers Cards</i> • Smart Device (instructor use only)	1. Create a Plickers account. 2. Input participant names. 3. Input multiple-choice questions 4. Print/photocopy <i>Plickers Cards</i> (one per participant).	5-10 minutes

Lesson Two – How to Read a Ruler and Tape Measure

FOCUS: How to Read a Ruler and Tape Measure

10-15 minutes

Purpose:

To be successful in the lesson, participants must understand the value of fractions, specifically halves, fourths, eighths, and sixteenths. This activity will foster friendly competition and help participants review fractions in these denominations. The more familiar participants are with fractions, the easier reading a ruler or tape measure will be.

Materials:

- *Fraction War*

Facilitation Steps:

1. Have participants break off into pairs.
2. Pass out 28 pre-cut cards to each pair.
3. The participants will shuffle the cards and select 14 cards each, creating a face-down pile.
4. Each participant will take the top card off of their deck and place it in the middle of the desk.
5. The participant with the highest card keeps both cards, adding them to the bottom of their pile.
8. The process is repeated until one player has all of the cards and is declared the winner.
9. In the case of equivalent fractions, a “fraction war” will ensue. In a “fraction war,” an additional card will be placed face down and another card will be flipped in the center. The higher of the cards will take all of the cards in the center.

Fraction War

1. Participants will break off into pairs.
2. The teacher will pass out 28 pre-cut cards to each pair.
3. The participants will shuffle the cards and select 14 cards each, creating a face-down pile.
4. Each participant will take the top card off of their deck and place it in the middle of the desk.
5. The participant with the highest card keeps both cards, adding them to the bottom of their pile.
6. The process is repeated until one player has all of the cards and is declared the winner.
7. In the case of equivalent fractions, a “fraction war” will ensue. In a “fraction war” an additional card will be placed face down and another card will be flipped in the center. The higher of the cards will take all of the cards in the center.

Tip for instructors:

- Laminating the cards will make them more durable and long-lasting.

$\frac{3}{4}$	$\frac{3}{16}$	$\frac{1}{2}$	$\frac{1}{8}$
$\frac{5}{8}$	$\frac{7}{16}$	$\frac{1}{4}$	$\frac{3}{8}$
$\frac{7}{18}$	$\frac{9}{16}$	$\frac{11}{16}$	$\frac{13}{16}$
$\frac{9}{8}$	$1\frac{3}{4}$	$\frac{11}{8}$	$\frac{7}{4}$
$\frac{17}{16}$	$\frac{5}{4}$	$\frac{19}{16}$	$\frac{9}{4}$
$\frac{13}{8}$	$\frac{15}{8}$	$\frac{3}{2}$	$\frac{5}{2}$
1	2	$\frac{11}{4}$	$\frac{17}{8}$

Lesson Two – How to Read a Ruler and Tape Measure

LEARN: How to Read a Ruler and Tape Measure

40 minutes

Purpose:

Participants will follow the slide presentation with the guided note packet provided and work through several example problems. Participants will learn about the standard units of measure on a ruler and tape measure, and how to read them.

Materials:

- *How to Read a Ruler and Tape Measure* slide presentation
- *How to Read a Ruler and Tape Measure Guided Note Packet*
- *How to Read a Ruler and Tape Measure Guided Note Packet – Answer Key*

Facilitation Steps:

1. Walk through the *How to Read a Ruler and Tape Measure* slide presentation (Slides #1-7). Lead a discussion using the tips in the notes section of the slide presentation.
2. Participants should follow along and take notes in the *How to Read a Ruler and Tape Measure Guided Notes Packet*.
3. Take a break from the notes to address any questions or concerns that participants may have.
4. Continue on with the *How to Read a Ruler and Tape Measure* slide presentation (Slides #8-13).
5. Participants should follow along, filling in the *How to Read a Ruler and Tape Measure Guided Notes Packet*.

Name: _____

Date: _____

How to Read a Ruler and Tape Measure Guided Note Packet

Standard units of measure:

-

-

Steps to using a ruler and tape measure:

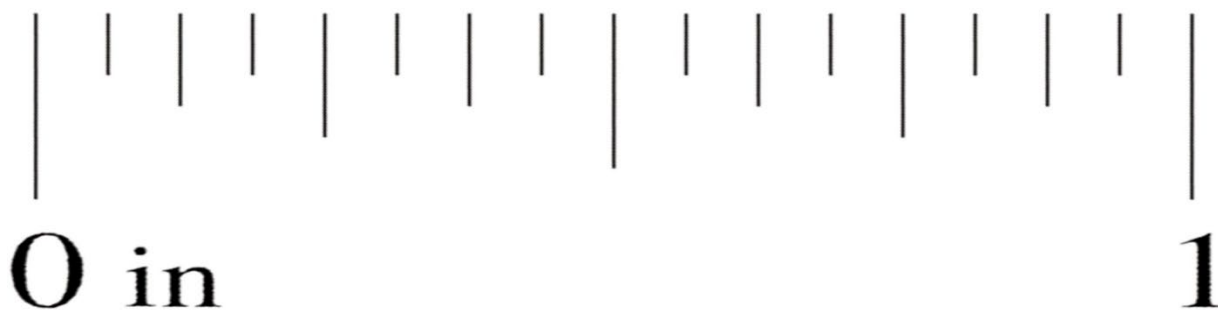
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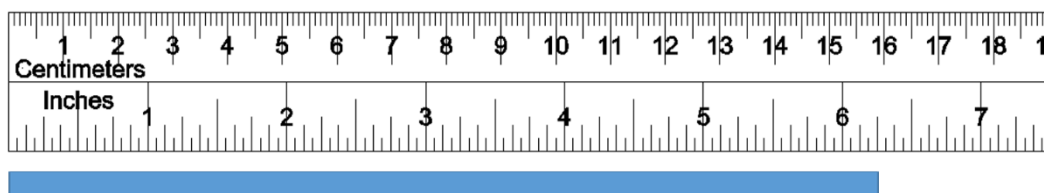
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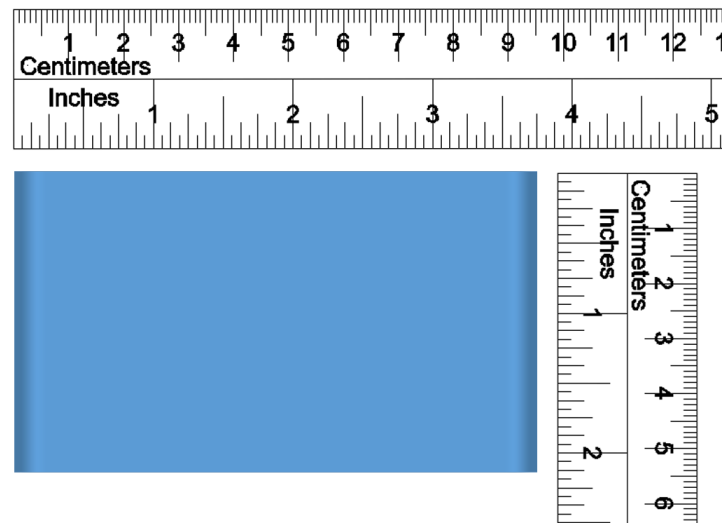
What's in an inch?



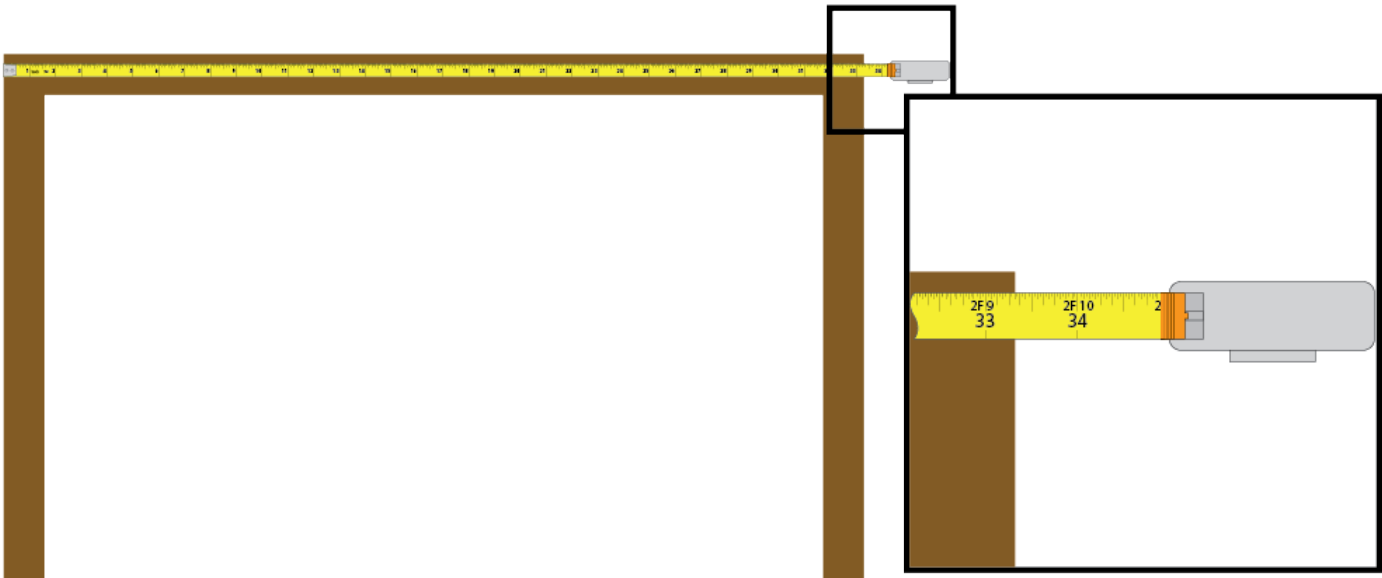
Example: How long is the rectangle below?



Practice: What are the dimensions of the rectangle below?



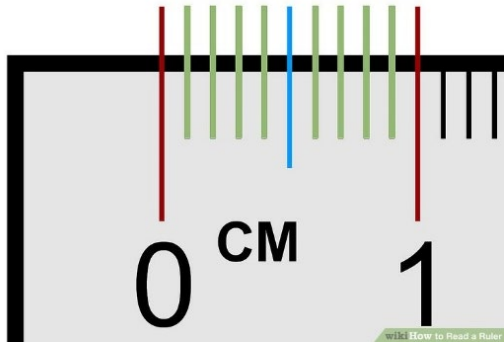
Application: A carpenter is measuring a door frame. What is the width of the door shown below (not drawn to scale)?



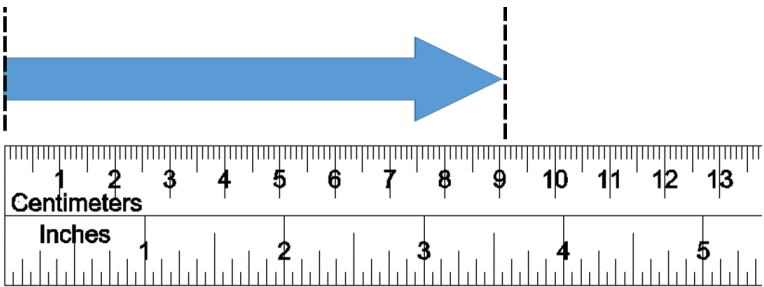
Reading a Metric Ruler

-
-

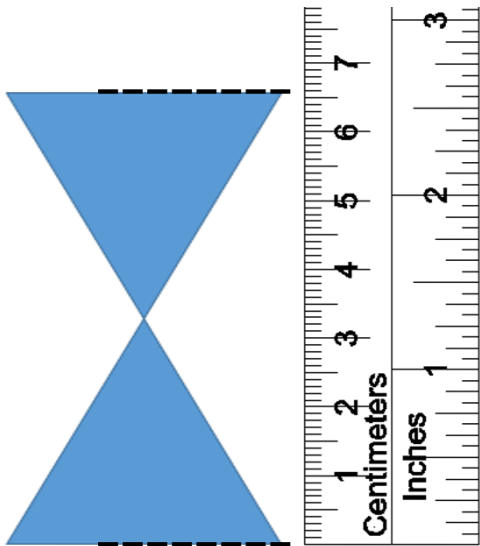
What's in a centimeter?



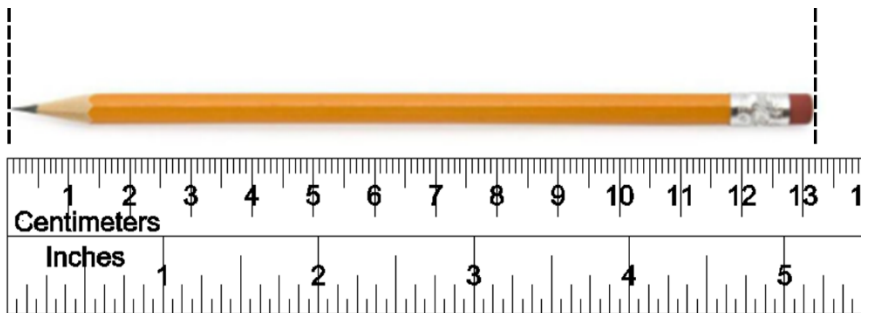
Example: What is the length of the arrow shown below?



Practice: What is the height of the hourglass below?



Application: Steve is creating a 3D-printed version of his pencil. In order to re-create the pencil, he needs to enter the length of his pencil into the computer program. What is the length of Steve's pencil?



How to Read a Ruler and Tape Measure Guided Note Packet – Answer Key

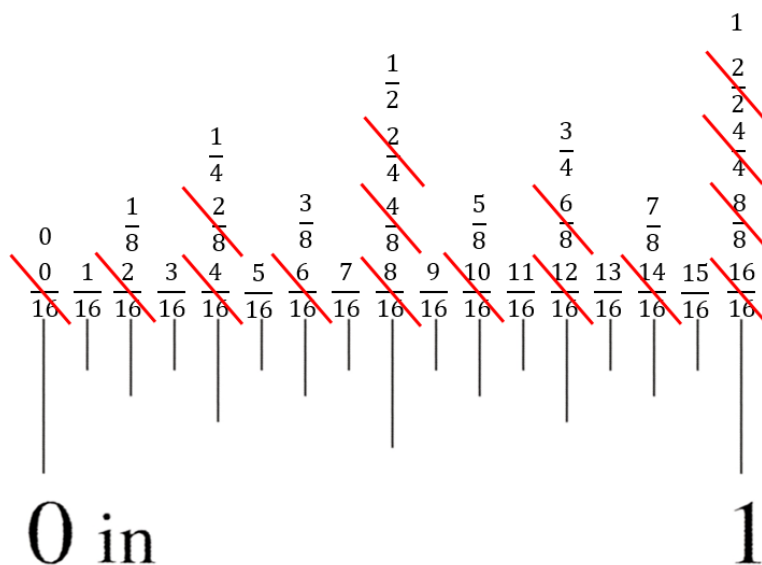
Standard units of measure:

- Rulers and tape measures usually measure in inches and/or centimeters
- A standard ruler is 12 inches, whereas a standard tape measure is 25 feet

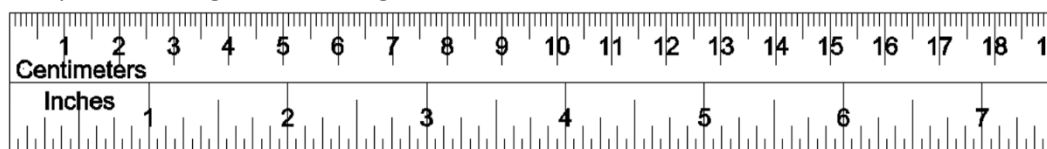
Steps to using a ruler and tape measure

- Place the zero hash mark of the ruler or tape measure at one end of the object that you intend to measure
- Make sure the ruler or tape measure is aligned with the object
- Note or mark the hash mark on the ruler or tape measure where the object ends
- The measurement is the dimensional length of the object

What's in an inch?

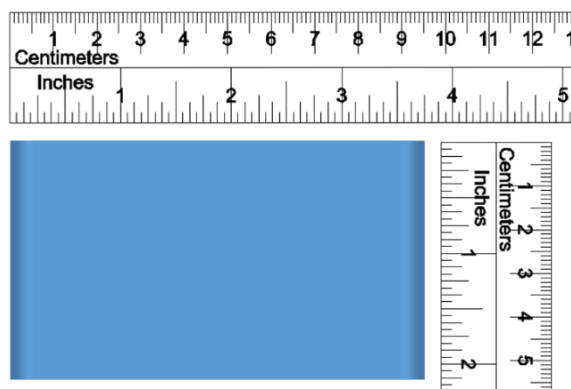


Example: How long is the rectangle below?



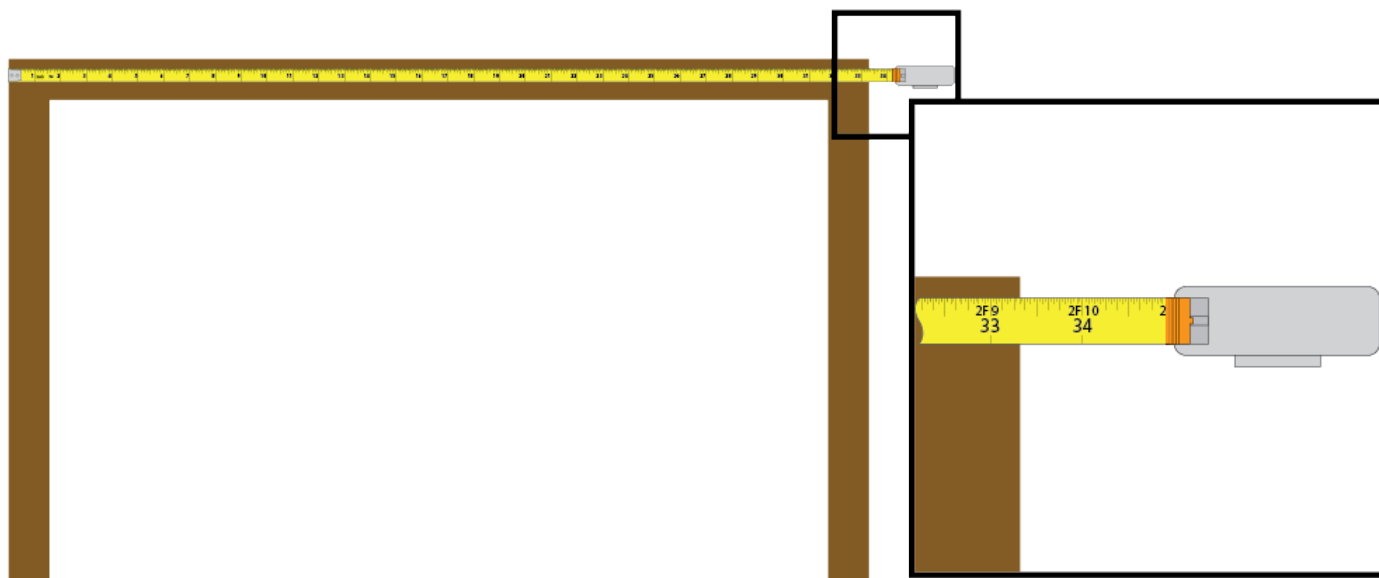
Answer: $6\frac{1}{4}$ inches

Practice: What are the dimensions of the rectangle below?



Answer: $2\frac{1}{8}$ in $\times$ $3\frac{3}{4}$ in

Application: A carpenter is measuring a door frame. What is the width of the door shown below (not drawn to scale)?

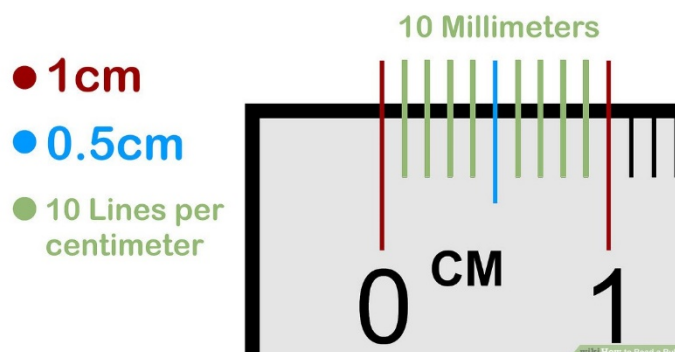


Answer: $33\frac{5}{16}$ inches

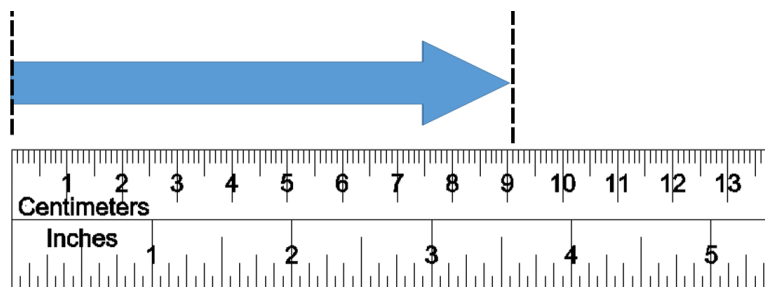
Reading a metric ruler

- A metric ruler contains centimeters and millimeters
- Each centimeter is broken down into ten sections, or one millimeter

What's in a centimeter?

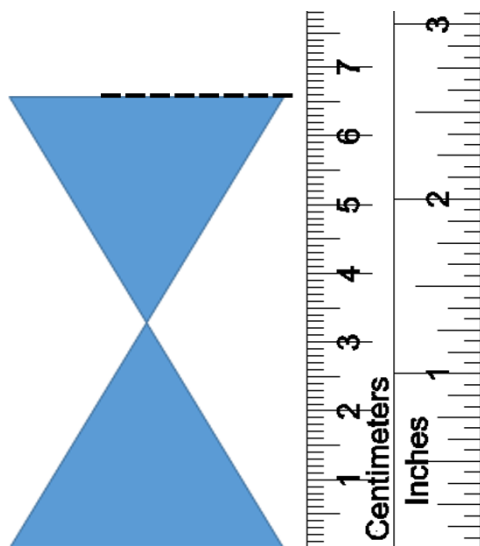


Example: What is the length of the arrow shown below?



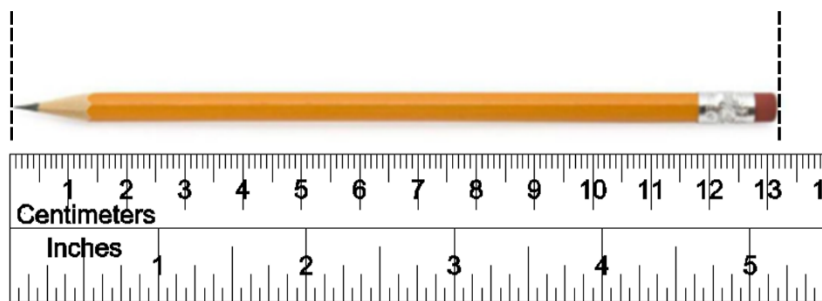
Answer: 9.1 centimeters

Practice: What is the height of the hourglass below?



Answer: 6.6 centimeters

Application: Steve is creating a 3-D printed version of his pencil. In order to re-create the pencil, he needs to enter the length of his pencil into the computer program. What is the length of Steve's pencil?



Answer: 13.2 centimeters

Lesson Two – How to Read a Ruler and Tape Measure

REVIEW: How to Read a Ruler and Tape Measure

5-10 minutes

Purpose:

Materials:

- *How to Read a Ruler and Tape Measure Exit Ticket*
- Plickers Cards
- Smartphone or tablet (instructor use only)

Facilitation Steps:

1. Create a free account on: www.plickers.com
2. Download the Plickers app onto a smartphone or similar device.
3. Create a Class with all participants listed by name (each name is associated with a number that coincides with a Plickers card).
4. Click create a “New Set” of questions.
5. Input the five questions located on *How to Read a Ruler and Tape Measure Exit Ticket*.
6. Add each question to the queue.
7. Print out the set of cards provided, one for each participant. If you plan on continuing with Plickers in the future, it may be best to laminate the cards, as the participants will keep them.
8. Pass out Plickers cards, one to each participant, assigning each card to the specific participant that the card corresponds with.
9. On your smart device, open the Plickers app, navigate to the queue, click on the first question, and select “Play Now.”
10. As each participant holds their QR code up, scan them until the entire class has answered.
11. When finished, select see results and move onto the next question.
12. After finishing all the questions, you can look back and see what percent of your class got each question correct, as well as how individual students scored.

How to Read a Ruler and Tape Measure Exit Ticket

1. What is 32 centimeters in inches?

A. 10.2394 inches

B. 12.5984 inches

C. 14.5692 inches

D. 12.2390 inches

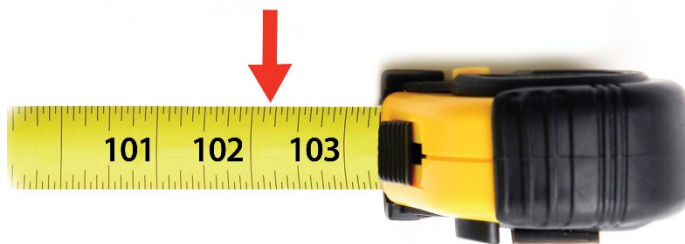
2. What is the measurement shown on the tape measure below in inches?

A. $102\frac{3}{16}$ inches

B. $101\frac{7}{8}$ inches

C. $102\frac{1}{8}$ inches

D. $102\frac{7}{8}$ inches



3. What is the measurement shown on the ruler below?

A. $1\frac{5}{16}$ inches

B. $1\frac{1}{4}$ inches

C. $1\frac{1}{2}$ inches

D. $1\frac{3}{8}$ inches



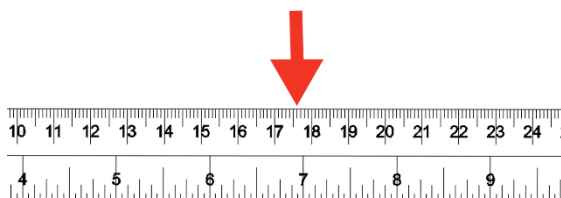
4. What is the measurement shown on the ruler below in centimeters?

A. 17.4 cm

B. 17 cm

C. 17.6 cm

D. 17.8 cm



5. What is the measurement shown on the ruler below?

A. $\frac{3}{16}$

B. $\frac{5}{16}$

C. $\frac{1}{4}$

D. $\frac{3}{8}$



Lesson Three – How to Read and Use a Caliper

Lesson Overview

In this lesson, participants will learn the basics on the different types of calipers and how to read and use a caliper.

Lesson Objectives

After completing this lesson, participants will be able to:

- Identify different types of calipers
- Read a caliper
- Measure interior/exterior/depth measurements using a caliper
- Convert metric readings on a caliper to standard and vice versa

Lesson at a Glance

Activity	Materials	Preparation	Approximate class time
FOCUS	• Length Conversions Kahoot • Calculator • Computer/Phone	1. Load and prepare Kahoot game on instructor device.	5-10 minutes
LEARN	• <i>How to Read and Use a Caliper Guided Note Packet</i> • <i>How to Read and Use a Caliper Guided Note Packet – Answer Key</i> • <i>How to Read and Use a Caliper</i> slide presentation	1. Print/Photocopy <i>How to Read and Use a Caliper Guided Note Packet</i> (one per participant). 2. Prepare to show <i>How to Read and Use a Caliper</i> slide presentation.	40 minutes
REVIEW	• <i>How to Read and Use a Caliper Quick Quiz</i> • <i>How to Read and Use a Caliper Quick Quiz – Answer Key</i> • Calculator	1. Print/photocopy <i>How to Read and-Use a Caliper Quick Quiz</i> (one per participant).	10-15 minutes

Lesson Three – How to Read and Use a Caliper

FOCUS: How to Read and Use a Caliper

5-10 minutes

Purpose:

Participants will play a five-question game of Kahoot. This activity will act as a spiral review of the previous lessons and material that will be helpful in Lesson Three. The conversions will consist of metric to metric, standard to standard, metric to standard, and standard to metric.

Materials:

- Length Conversions Kahoot (<https://play.kahoot.it/v2/?quizId=86a653a9-668e-402d-ab05-bd8be2c90808>)
- Cell Phone/Computer
- Calculator
- *How to Read and Use a Caliper Guided Note Packet* (participants can use for the conversion tables)

Facilitation Steps:

1. Have the Kahoot on the board ready to play. The “game pin” will be displayed.
2. Participants will log on to either their computers or phones and navigate to kahoot.it on the browser of their choosing.
3. Participants will enter their name and wait for the game to begin. While waiting, participants can be encouraged to get out their *How to Read and Use a Caliper Guided Note Packet* and calculator to be more prepared for the game.
4. Run through Kahoot after everyone is signed in. After each question, if most participants answer incorrectly, discuss/solve the problem with the participants.
5. At the end of the game, a winner will be announced. The instructor and participant have the option to take a picture with their trophy for the school website or social media.

Lesson 3 – How to Read and Use a Caliper

LEARN: How to Read and Use a Caliper

42 minutes

Purpose:

Participants will follow the slide presentation instruction with the guided note packet and work through several example problems. Participants will learn about the different types of calipers, how to use a caliper, and how to read a caliper. Examples will be provided with a Vernier caliper, dial caliper, and a digital caliper.

Materials:

- *How to Read and Use a Caliper* slide presentation
- *How to Read and Use a Caliper Guided Note Packet*
- *How to Read and Use a Caliper Guided Note Packet – Answer Key*
- Calculator (Phone/Computer calculator will be sufficient)
- Optional material: If you have access to the different types of calipers, seeing them in person may be helpful to participants

Facilitation Steps:

1. Walk through the *How to Read and Use a Caliper* slide presentation (Slides #1-17). Lead a discussion of the tips in the notes section of the presentation.
2. Participants should follow along and take notes in the *How to Read and Use a Caliper Guided Notes Packet*.
3. If different types of calipers are available, pass the calipers around the room so that participants can visualize what they just learned.
4. Continue with the *How to Read and Use a Caliper* slide presentation (Slides 18-33).
5. Participants will follow along, filling in the *How to Read and Use a Caliper Guided Notes Packet*.

Name: _____

Date: _____

How to Read and Use a Caliper Guided Note Packet

What is a caliper?

-

-

-

What is a caliper used for?

-

-

-

Name commonly used calipers:

-

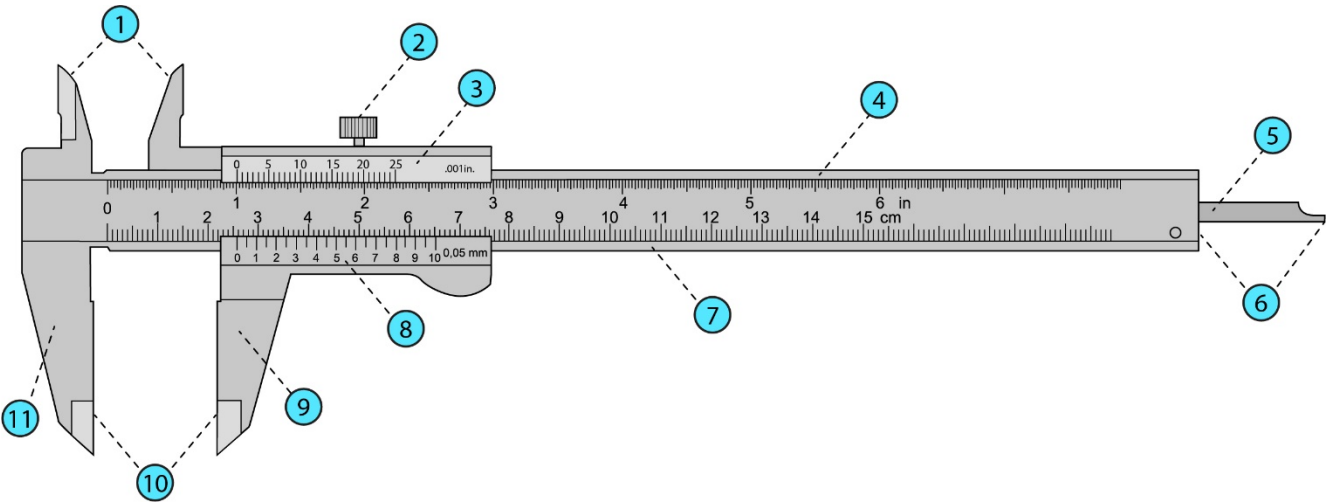
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-

-

Parts of a Caliper:

Label the parts of the Vernier caliper below:



- | | | |
|----|----|-----|
| 1. | 5. | 9. |
| 2. | 6. | 10. |
| 3. | 7. | 11. |
| 4. | 8. | |

Reading Vernier calipers:

- 1.
- 2.
- 3.

Example:

Standard Reading:

Metric Reading:

Reading dial calipers:

- 1.
- 2.
- 3.

Measurement Math Curriculum

4.

5.

Example:

Reading digital calipers:

1.

2.

Example:

Steps to measuring inside dimensions:

1.

2.

3.

4.

5.

6.

Example:

Steps to measuring outside dimensions:

1.

2.

Measurement Math Curriculum

3.

4.

Example:

Steps to measuring length/distance:

1.

2.

3.

Example:

Steps to measuring depth:

1.

2.

3.

4.

5.

Example:

How to Read and Use a Caliper Guided Note Packet – Answer Key

What is a caliper?

- A caliper is a measuring tool that measures the distance between two opposite sides of an object, or the depth of an object
- Dates back to ancient Rome and China
- Used in medicine, science, engineering, woodworking, and forestry

What is a caliper used for?

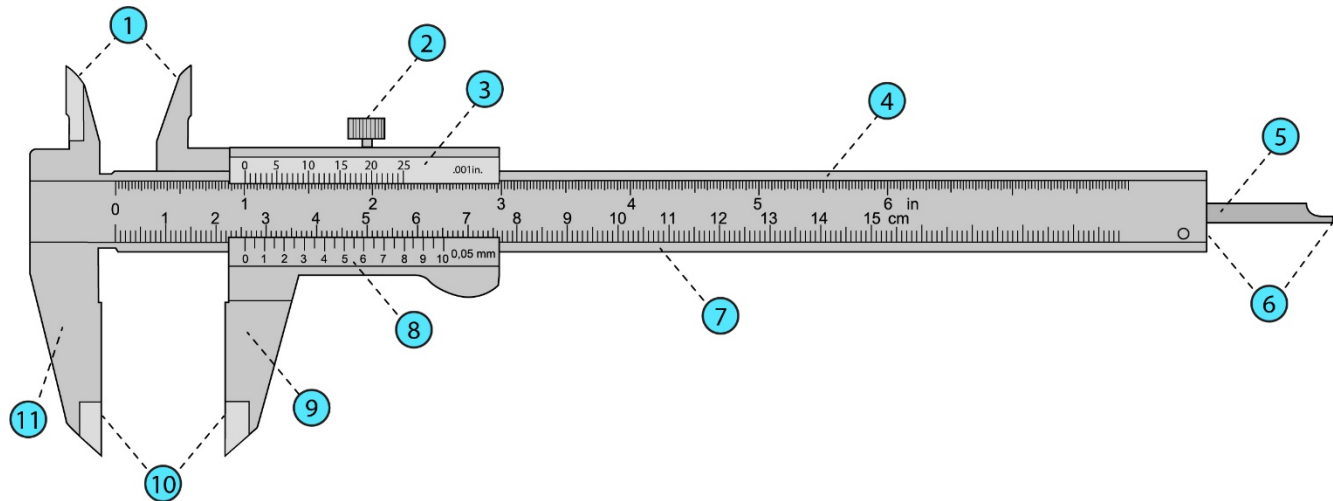
- Measuring thickness
- Measuring internal/external diameters
- Measuring the inside/outside, or depth of an object

Commonly used calipers

- Dial caliper
- Vernier caliper
- Digital caliper
- Spring joint caliper

Parts of a Caliper:

Label the parts of the Vernier caliper below:



1. Inside Jaws 2. Retaining/Locking Screw 3. Vernier Scale (inches) 4. Rail (inches) 5. Depth Probe 6. Front end of the rail 7. Main Scale (mm) 8. Vernier Scale (mm) 9. Sliding Jaw 10. Outside Jaws 11. Fixed Jaw

Reading Vernier calipers:

1. Read the main scale measurement.
2. Read the secondary scale measurement.
3. Find the sum of the two measurements.

Example:

Standard Reading:

5.9 inches

Metric Reading:

1.8 centimeters

Reading dial calipers:

1. Zero out the dial.

2. Adjust the jaws to measure the object.

3. Look at the sliding jaw and not the last main scale that it passed.

4. Look at the dial and determine which number the hand is pointing to.

5. The sum of the two readings is the final measurement.

Example:

5.45 centimeters

Reading digital calipers:

1. If in inches mode, read the number displayed.

2. The display will give a final measurement of up to a thousandth of an inch.

Example:

2.395 inches

Steps to measuring inside dimensions:

1. Loosen the retaining/locking screw.

2. Adjust the upper jaws so that it is slightly smaller than the hole being measured.

3. Slide the jaws into the hole.

4. Adjust the upper jaws until they hit the walls of the hole.

5. Turn the retaining/locking screw to set in place.

6. Take the measurement.

Example:

2.2 centimeters

Steps to measuring outside dimensions:

1. Unlock the top screw, and adjust the jaws to fit around the object being measured.

2. Slide until the jaws are clamped tightly around the object.

3. Turn the retaining/locking screw so that the lower jaws are set.

4. Take the measurement.

Example:

2.34 centimeters

Steps to measuring length/distance:

1. Place either the upper or lower jaws better the two objects.
2. Adjust the jaws to fit tightly between the two objects.
3. Take the measurement.

Example:

The distance from point A to point B is 3.47 inches.

Steps to measuring depth:

1. Unlock the retaining/locking screw.
2. Adjust the jaws using the thumb screw; the probe will extend from the end of the caliper.
3. Position the probe so that it is flat against the bottom of the hole.
4. Lock the retaining/locking to tighten the jaws.
5. Remove the probe and take the measurement.

Example:

1.6 centimeters

Lesson Three – How to Read and Use a Caliper

REVIEW: How to Read and Use a Caliper

10 minutes

Purpose:

This Exit Ticket activity is a great formative assessment. The *How to Read and Use a Caliper Quick Quiz* will give the instructor immediate feedback on how well the participants understood the lesson. The assessment will also help point out trouble areas from past lessons, such as conversions.

Materials:

- *How to Read and Use a Caliper Quick Quiz*
- *How to Read and Use a Caliper Quick Quiz – Answer Key*
- Calculator

Facilitation Steps:

1. Hand out the *How to Read and Use a Caliper Quick Quiz*.
2. Participants will have 10 minutes to complete the five-question quiz.
3. After the participants have left, grade the quizzes and provide feedback on missed questions.

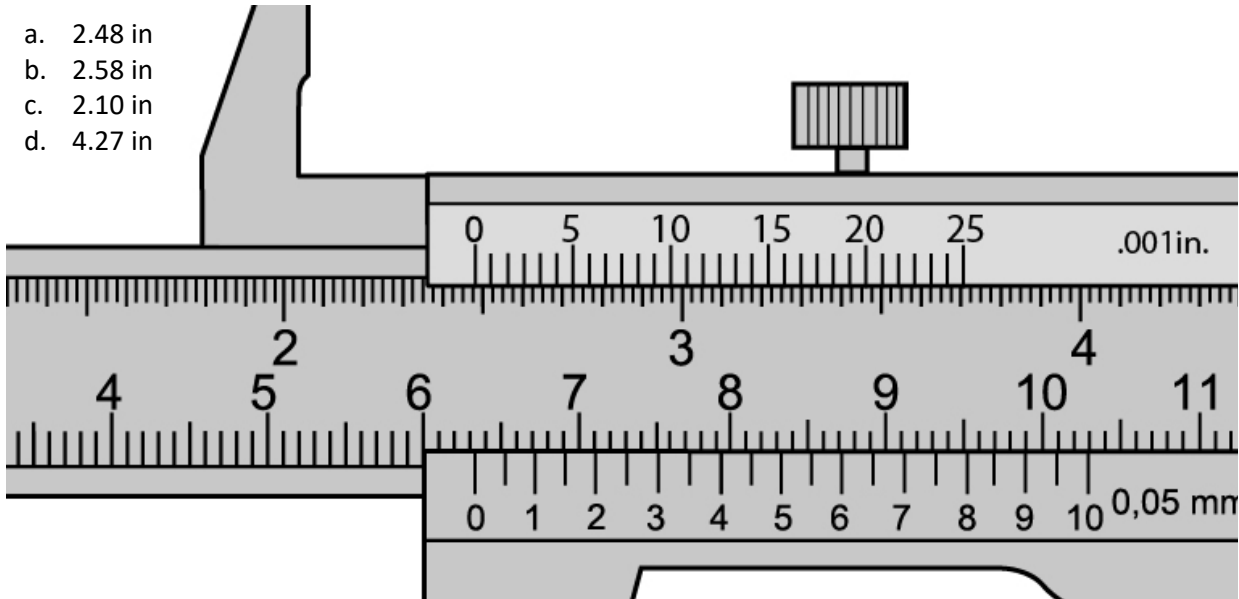
Name: _____

Date: _____

How to Read and Use a Caliper Quick Quiz

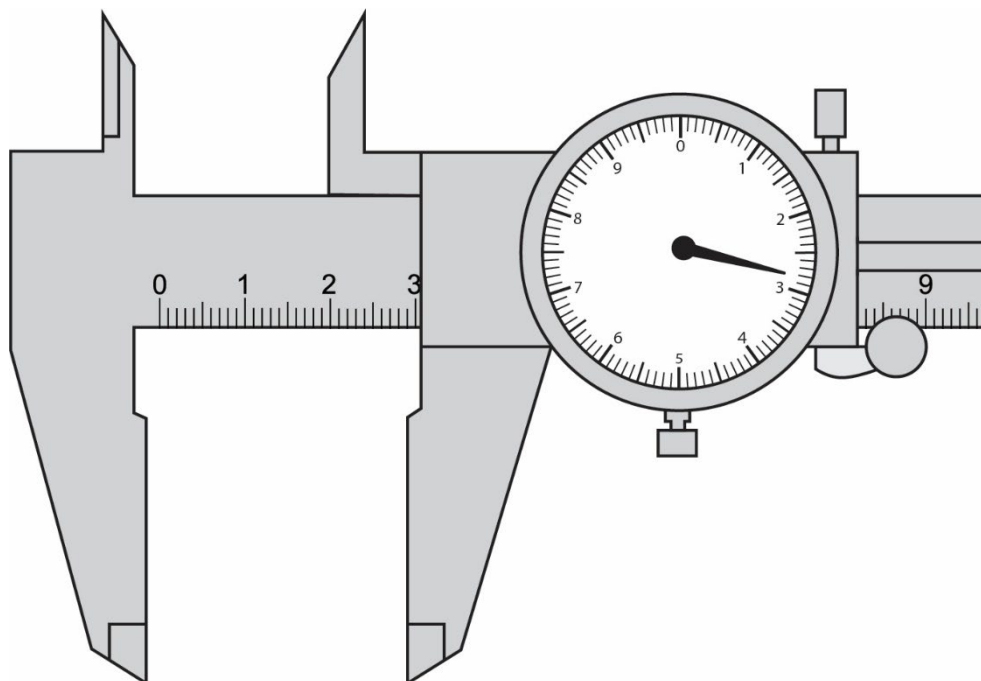
1. What is the measurement shown on the caliper below?

- a. 2.48 in
- b. 2.58 in
- c. 2.10 in
- d. 4.27 in



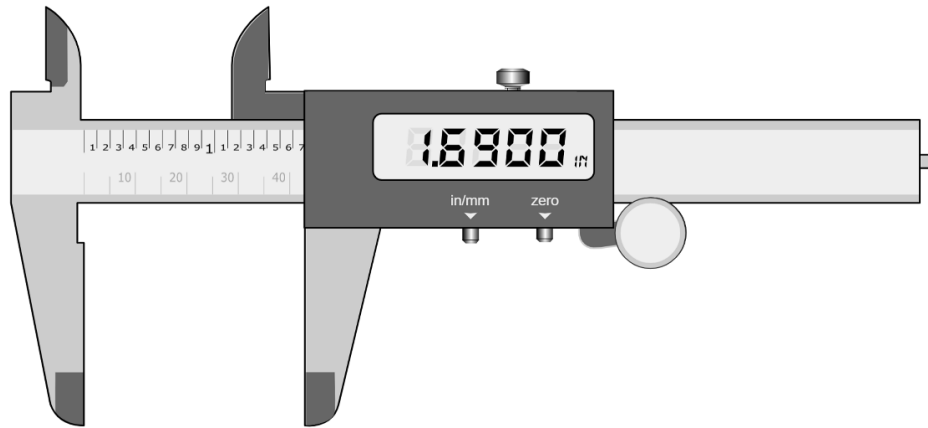
2. What is the measurement shown on the caliper below?

- a. 3.448 cm
- b. 3.408 cm
- c. 5.428 cm
- d. 3.028 cm



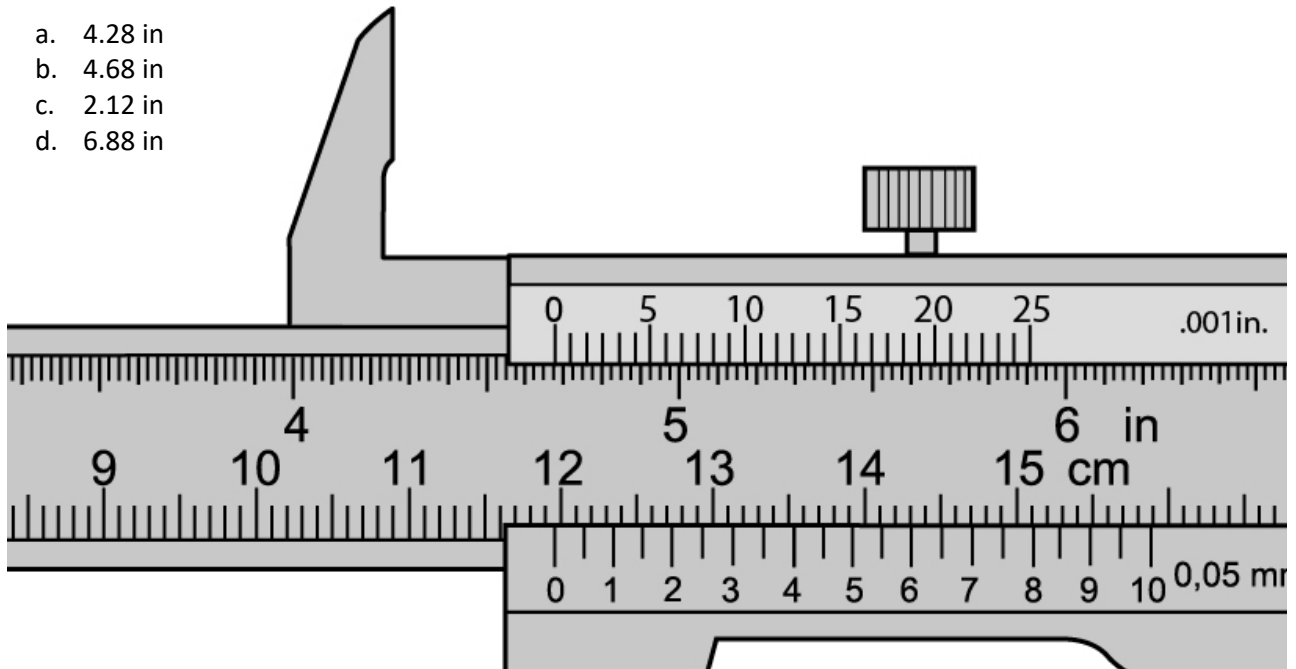
3. What is the measurement shown on the caliper below?

- a. 1.96 in
- b. 2.09 in
- c. 10.096 in
- d. 1.69 in



4. What is the measurement on the caliper below in inches?

- a. 4.28 in
- b. 4.68 in
- c. 2.12 in
- d. 6.88 in



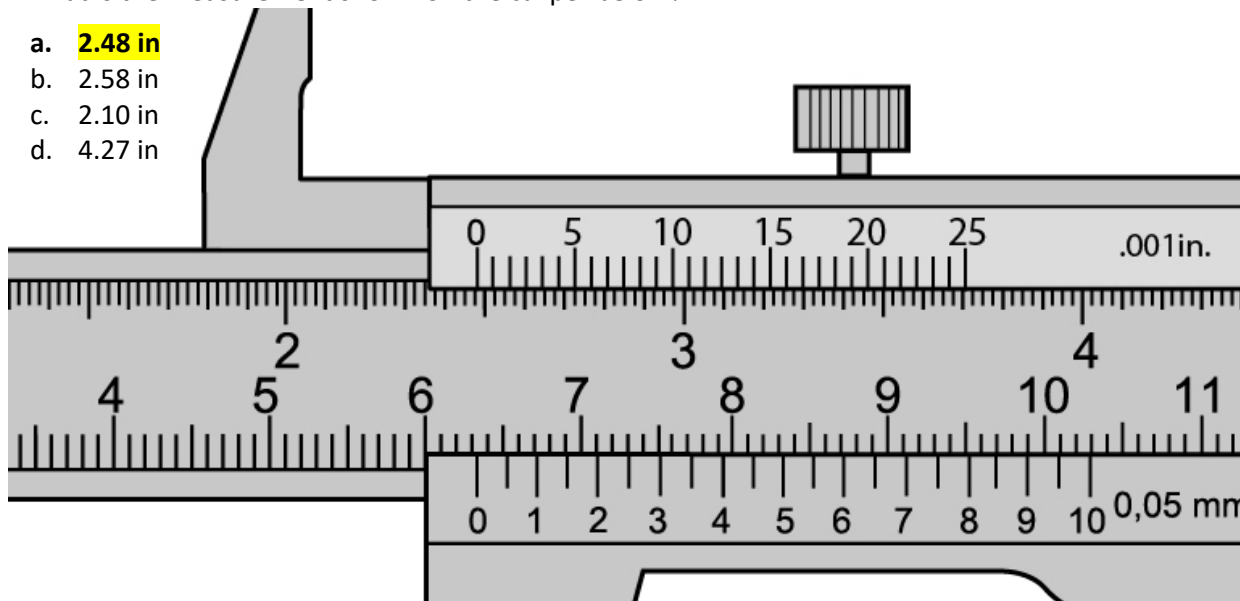
5. Which of the following is used when measuring the inside diameter of a PVC pipe?

- a. Outside jaws
- b. Depth probe
- c. Rail
- d. Inside jaws

How to Read and Use a Caliper Quick Quiz – Answer Key

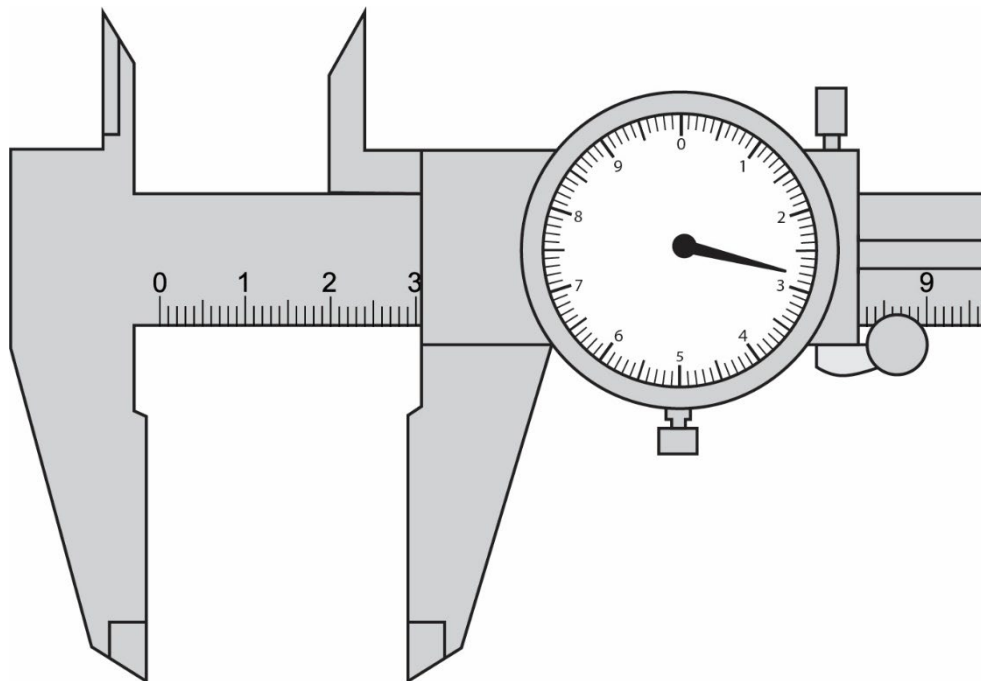
1. What is the measurement shown on the caliper below?

- a. **2.48 in**
- b. 2.58 in
- c. 2.10 in
- d. 4.27 in



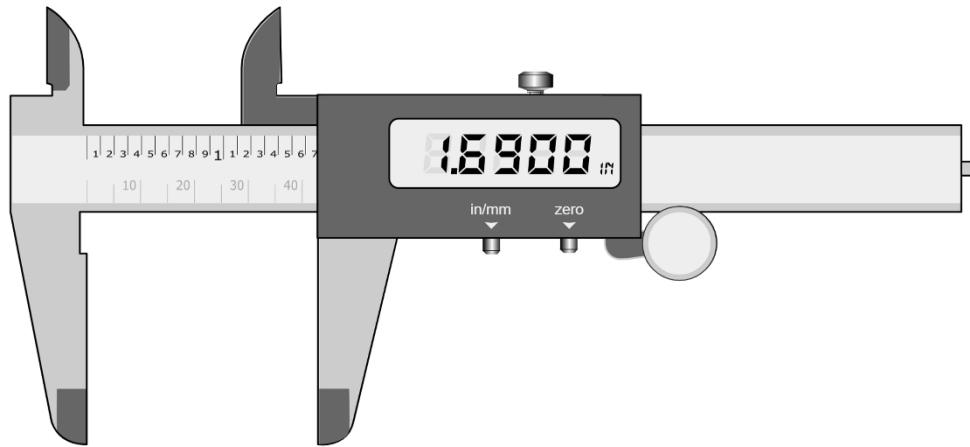
2. What is the measurement shown on the caliper below?

- a. 3.448 cm
- b. 3.408 cm
- c. 5.428 cm
- d. **3.028 cm**



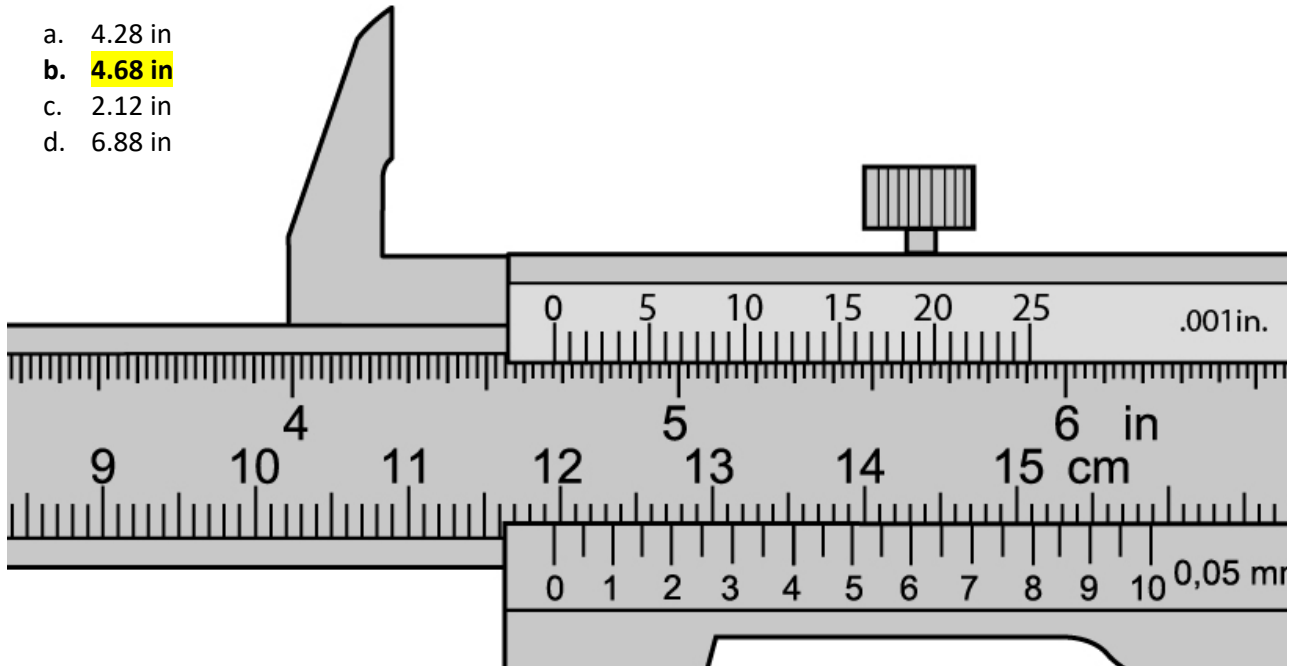
3. What is the measurement shown on the caliper below?

- a. 1.96 in
- b. 2.09 in
- c. 10.096 in
- d. **1.69 in**



4. What is the measurement on the caliper below in inches?

- a. 4.28 in
- b. **4.68 in**
- c. 2.12 in
- d. 6.88 in



5. Which of the following is used when measuring the inside diameter of a PVC pipe?

- a. Outside jaws
- b. Depth probe
- c. Rail
- d. **Inside jaws**

Lesson Four – Decimals

Lesson Overview

In this lesson, participants will learn the basics about reading and writing decimals, how to understand place value, and adding, subtracting, multiplying, and dividing decimals.

Lesson Objectives

After completing this lesson, participants will be able to:

- Read and write decimals
- Use decimals
- Identify place value
- Add/subtract/multiply and divide decimals

Lesson at a Glance

Activity	Materials	Preparation	Approximate class time
FOCUS	• <i>Decimals Activity</i> • Spinner (provided) • Two colored pencils	1. Print/Photocopy <i>Decimals Activity</i> (one per pair). 2. Cut out spinners.	10-15 minutes
LEARN	• <i>Decimals</i> slide presentation • <i>Decimals Guided Note Packet</i> • <i>Decimals Guided Note Packet – Answer Key</i>	1. Print/Photocopy <i>Decimals Guided Note Packet</i> (one per participant).	40 minutes
REVIEW	• <i>Decimals Quick Quiz</i> • <i>Decimals Quick Quiz – Answer Key</i>	1. Print/photocopy <i>Decimals Review</i> (one per participant).	5-10 minutes

Lesson Four – Decimals

FOCUS: Decimals

10-15 minutes

Purpose:

To be successful in the lesson, participants must understand the four basic operations. Decimal addition, subtraction, multiplication, and division is linked directly to the addition, subtraction, multiplication, and division of integers.

Materials:

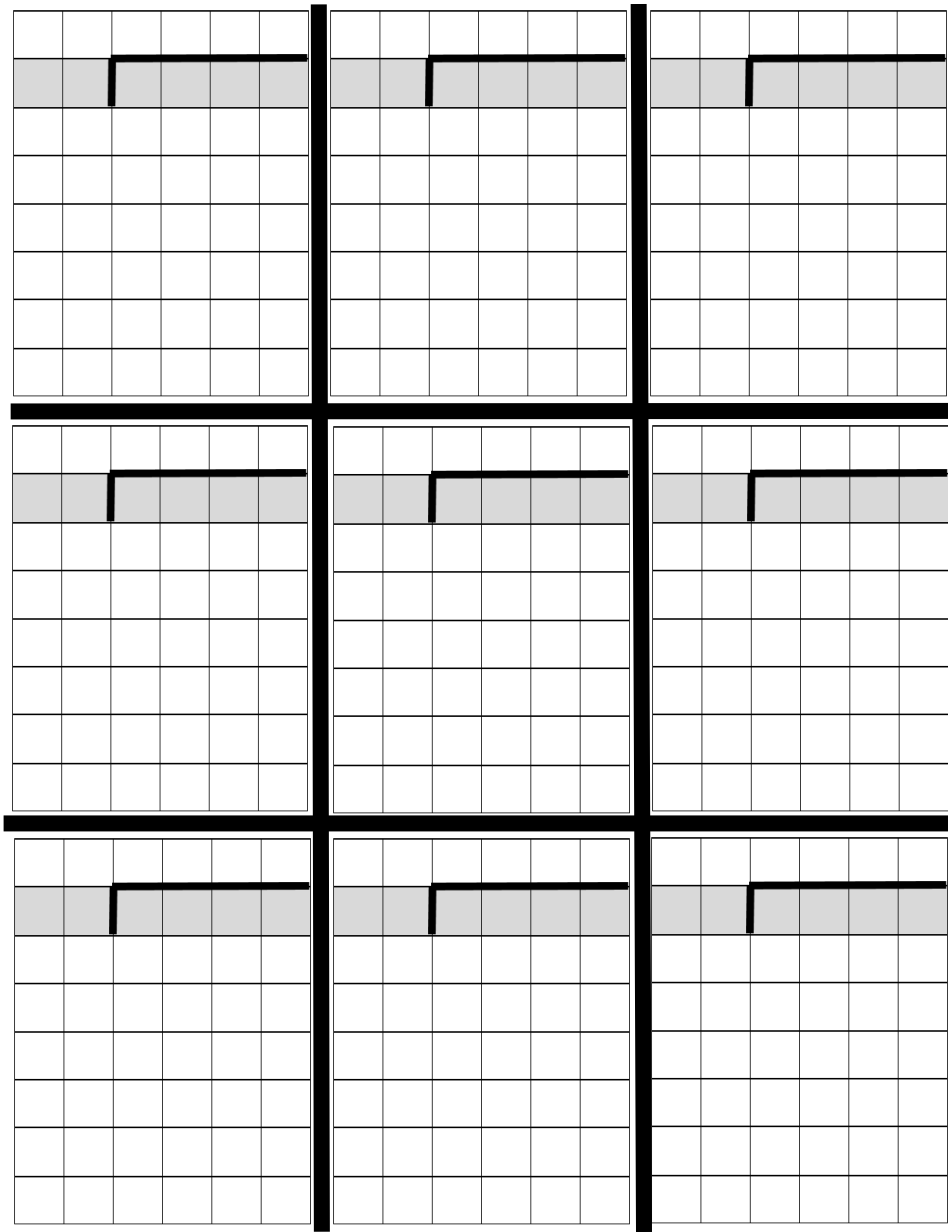
- *Decimals Activity* (one per pair)
- One spinner per pair (template provided; digital spinners may also be used)
- Two different colored pencils

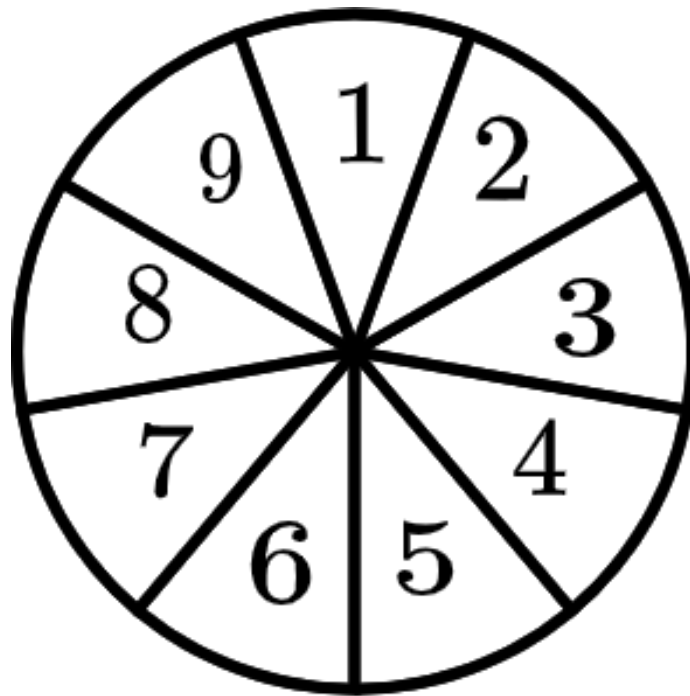
Facilitation Steps:

1. Participants will break out into groups of two.
2. Pass out a spinner, game sheet, and two-colored pencils to each group.
3. Explain the directions of the activity:
 - Player 1 spins the spinner to fill in the four-digit dividend and the 2-digit divisor. Player 1 may fill in the game spot of their choosing.
 - Player 1 must correctly solve the long division problem in order to keep their space.
 - Player 2 spins the spinner to fill in the four-digit dividend and the 2-digit divisor. Player 2 may fill in any remaining spot.
 - Player 2 must correctly solve the long division problem in order to keep their space.
 - This process continues until one player gets three in a row.

4. After the game is complete, recollect the spinners and colored pencils.

Decimals Activity





Lesson Four – Decimals

LEARN: Decimals

40 minutes

Purpose:

Participants will follow the slide presentation instruction with the guided note packet and work through several example problems. Participants will learn how to read and write decimal numbers as well as how to add, subtract, multiply, and divide decimals.

Materials:

- *Decimals Guided Note Packet*
- *Decimals Guided Note Packet – Answer Key*
- *Decimals* slide presentation

Facilitation Steps:

1. Guide participants through the *Decimals* slide presentation and *Decimals Guided Note Packet*.
2. Demonstrate each example problem throughout and allow participants time to work on the practice problems individually as time allows.
3. After each set of practice problems, go over the correct answers and address any questions.

Name: _____

Date: _____

Decimals Guided Note Packet

What is a decimal?

-

Why do we use decimals?

-

Place Value:

Example: In the decimal number 4.20397, which number is in the hundredths position?

Practice: In the decimal number 3.21956, which number is in the ten-thousandths position?

Practice: Write a number with the following conditions:

- 5 in the hundredths and hundred-thousandths position
- 2 in the tenths and thousandths position
- 6 in the ten-thousandths position
- 3 in the ones position

Reading Decimals

When reading decimals follow the guidelines below:

-

-

-

-

Example: Write the decimal 1.234 as if you were reading it.

Practice: Write the decimal 3.29 as if you were reading it.

Measurement Math Curriculum

Practice: Write “five and three thousand two hundred fifty-nine ten-thousandths” as a decimal number.

Adding/Subtracting Decimals

In order to add/subtract decimals, follow the steps below:

1.

2.

3.

4.

Example: Add 1.34 and 2.924.

Practice: Find the sum of the following:

1. 1.542 and 1.28

2. 2.4 and 3.284

3. 4.129 and 2.124

Practice: Subtract the following:

1. $5.242 - 1.298$

2. $4.218 - 1.2$

3. $2.149 - 2.04$

Multiplying Decimals

In order to multiply decimals follow the steps below:

1.

2.

3.

Example: Multiply: 1.78 and 3.48

Measurement Math Curriculum

Dividing Decimals

In order to divide decimals, follow the steps below:

1.

2.

3.

4.

Example: Divide 6.234 by 2.12. Round to the nearest thousandth.

Practice: Multiply the following:

1. $2.52 \cdot 4.291$

2. $8.76 \cdot 7.2$

3. $3.429 \cdot 1.46$

Practice: Divide the following (round to the nearest thousandth):

1. $9.248 \div 2.78$

2. $4.219 \div 8.21$

3. $6.6 \div 1.48$

Decimals Guided Note Packet – Answer Key

What is a decimal?

- A decimal number is a number whose whole number part and fractional part are separated by a decimal point.

For example: 2.3, 1.57, -1.5429 , $8.\bar{7}$

Why do we use decimals?

- Decimal numbers are used in situations where more precision than just a whole number is required.

For example, the weight of a letter, length of a board, cost of an item, or number of acres on a property

Place Value:

Ones	Decimal Point	Tenths	Hundredths	Thousandths	Ten-thousandths	Hundred-thousandths
	●					

2.39527

Example: In the decimal number 4.20397, which number is in the hundredths position?

Answer: 0

Practice: In the decimal number 3.21956, which number is in the ten-thousandths position?

Answer: 5

Practice: Write a number with the following conditions:

- 5 in the hundredths and hundred-thousandths position
- 2 in the tenths and thousandths position
- 6 in the ten-thousandths position
- 3 in the ones position

Answer: 3.25265

Reading Decimals

When reading decimals, follow the guidelines below:

- Read the whole number first.
- Use “and” to denote the decimal point.
- Continue reading the number to the right of the decimal point normally, but end with the last place value.
- If there are no whole numbers, do not use the word “and.”

Example: Write the following decimal 1.234 as if you were reading it.

One and two hundred thirty-four thousandths.

Practice: Write the following decimal, 3.29 as if you were reading it.

Three and twenty-nine hundredths.

Practice: Write “five and three thousand two hundred fifty-nine ten-thousandths” as a decimal number.

Answer: 5.3259

Adding/Subtracting Decimals

In order to add/subtract decimals, follow the steps below:

- 1. Write down the numbers vertically with the decimal points lined up.**
- 2. Put in zeros as place holders so that the numbers have the same length.**
- 3. Follow basic addition/subtraction rules.**
- 4. Bring the decimal point straight down into the answer.**

Example: Add 1.34 and 2.924. **Answer: 4.264**

Practice: Find the sum of the following:

1. 1.542 and 1.28 **Answer: 2.822**
2. 2.4 and 3.284 **Answer: 5.684**
3. 4.129 and 2.124 **Answer: 6.253**

Practice: Subtract the following:

1. $5.242 - 1.298$ **Answer: 3.944**
2. $4.218 - 1.2$ **Answer: 3.018**
3. $2.149 - 2.04$ **Answer: 0.109**

Multiplying Decimals

In order to multiply decimals follow the steps below:

- 1. Use traditional multiplication of integer rules (pretend there is no decimal point).**
- 2. Add the number of spaces from the right each decimal point is in each number.**
- 3. Move the decimal point in the answer to the left the number of spaces from step 2.**

Example: Multiply: 1.78 and 3.48 **Answer: 6.1944**

Dividing Decimals

In order to divide decimals, follow the steps below:

- 1. If the divisor is not a whole number, move the decimal point to the right to make it a whole number.**
- 2. Move the decimal point in the dividend the same number of places.**
- 3. Use long division, same rules as basic integer division.**
- 4. Place the decimal point directly above the decimal point in the dividend.**

Example: Divide 6.234 by 2.12. Round to the nearest thousandth.

Answer: 2.941

Measurement Math Curriculum

Practice: Multiply the following:

1. $2.52 \cdot 4.291$ **Answer: 10.81332**

2. $8.76 \cdot 7.2$ **Answer: 63.072**

3. $3.429 \cdot 1.46$ **Answer: 5.00634**

Practice: Divide the following: (Round to the nearest thousandth)

1. $9.248 \div 2.78$ **Answer: 3.327**

2. $4.219 \div 8.21$ **Answer: 0.514**

3. $6.6 \div 1.48$ **Answer: 4.459**

Lesson Four – Decimals

REVIEW: Decimals

5-10 minutes

Purpose:

The purpose of reviewing the lesson on decimals will be to formatively assess the participants.

Materials:

- *Decimals Quick Quiz*
- *Decimals Quick Quiz – Answer Key*

Facilitation Steps:

1. Hand out the *Decimals Quick Quiz*.
2. Participants will take the quiz without a calculator.
3. When finished, the participants will hand the test to the teacher.

Name: _____

Date: _____

Decimals Quick Quiz

1. Write the decimal 2.586 as if you were reading it.

2. Find the sum of 5.391 and 9.0102.

3. Subtract $2.102 - 1.002$.

4. Find the product of $2.001 \cdot 5.294$.

5. Divide $4.296 \div 1.445$.

6. Which number is in the one-hundredths position of 1.5236?

Decimals Quick Quiz – Answer Key

Round to the nearest ten-thousandth if necessary.

1. Write the decimal 2.586 as if you were reading it.

Two and five hundred eighty-six thousandths

2. Find the sum of 5.391 and 9.0102.

14.4012

3. Subtract $2.102 - 1.002$.

1.1

4. Find the product of $2.001 \cdot 5.294$.

10.5933

5. Divide $4.296 \div 1.445$.

2.9730

6. Which number is in the hundredths position of 1.5236?

2

Lesson Five – Conversions

Lesson Overview

In this lesson, participants will learn how to convert decimals to fractions and fractions to decimals. Participants will also learn how to compare decimals and fractions and use them in real-world application problems.

Lesson Objectives

After completing this lesson, participants will be able to:

- Convert fractions to decimals
- Convert decimals to fractions
- Compare decimals and fractions
- Solve word problems using decimals and fractions

Lesson at a Glance

Activity	Materials	Preparation	Approximate class time
FOCUS	• <i>Conversions Activity</i>	1. Print/Photocopy <i>Conversion Activity</i> (one per pair).	5-10 minutes
LEARN	• <i>Conversions</i> slide presentation • <i>Conversions Guided Note Packet</i> • <i>Conversions Guided Note Packet – Answer Key</i> • Calculator	1. Print/Photocopy <i>Conversions Guided Note Packet</i> (one per participant).	45 minutes
REVIEW	• <i>Conversions Exit Ticket</i> • <i>Conversions Exit Ticket – Answer Key</i>	1. Print/photocopy one <i>Conversions Exit Ticket</i> per pair.	5-10 minutes

Lesson Five – Conversions

FOCUS: Conversions

5-10 minutes

Purpose:

The focus activity is meant to help participants understand the importance of comparing similar objects. This will lead into the lesson on comparing decimals and fractions, by converting all values to decimals.

Materials:

- *Conversions Activity*

Facilitation Steps:

1. Have participants break out into pairs.
2. Hand out the first five cards in deck 1 to each group.
3. Ask the participants to place the objects in order by weight from least to greatest.
4. Hand out the five cards in deck 2 to each group.
5. Ask the participants to place the objects in order by weight from least to greatest.
6. After the participants have had enough time to try both decks, discuss the differences between the two.
7. Lead the discussion to the point of comparing different types of numbers and how it is easier to compare numbers that look the same.

Conversions Activity:

Which One Weighs More?

In this activity, participants will try to arrange a set of five cards, each with an image, by the weight of the object pictured. Each object is different and all of the weights are similar, which makes it nearly impossible to complete.

The participants will then get another set of 5 cards, each with a different number of the same object. The participants will be asked to place them in order of weight as well.

Discuss what makes the second group easier and tie this into comparing numbers of various types.

Preparation:

Print or copy one set of the two decks of cards for each group. Laminating the cards may help them last longer.

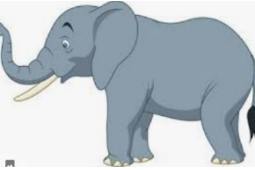
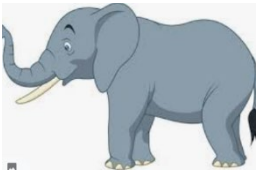
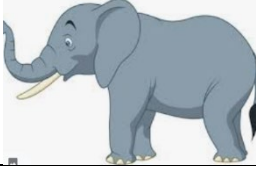
Cut out each deck of cards and have them ready for when participants come in.

Teacher Guide:

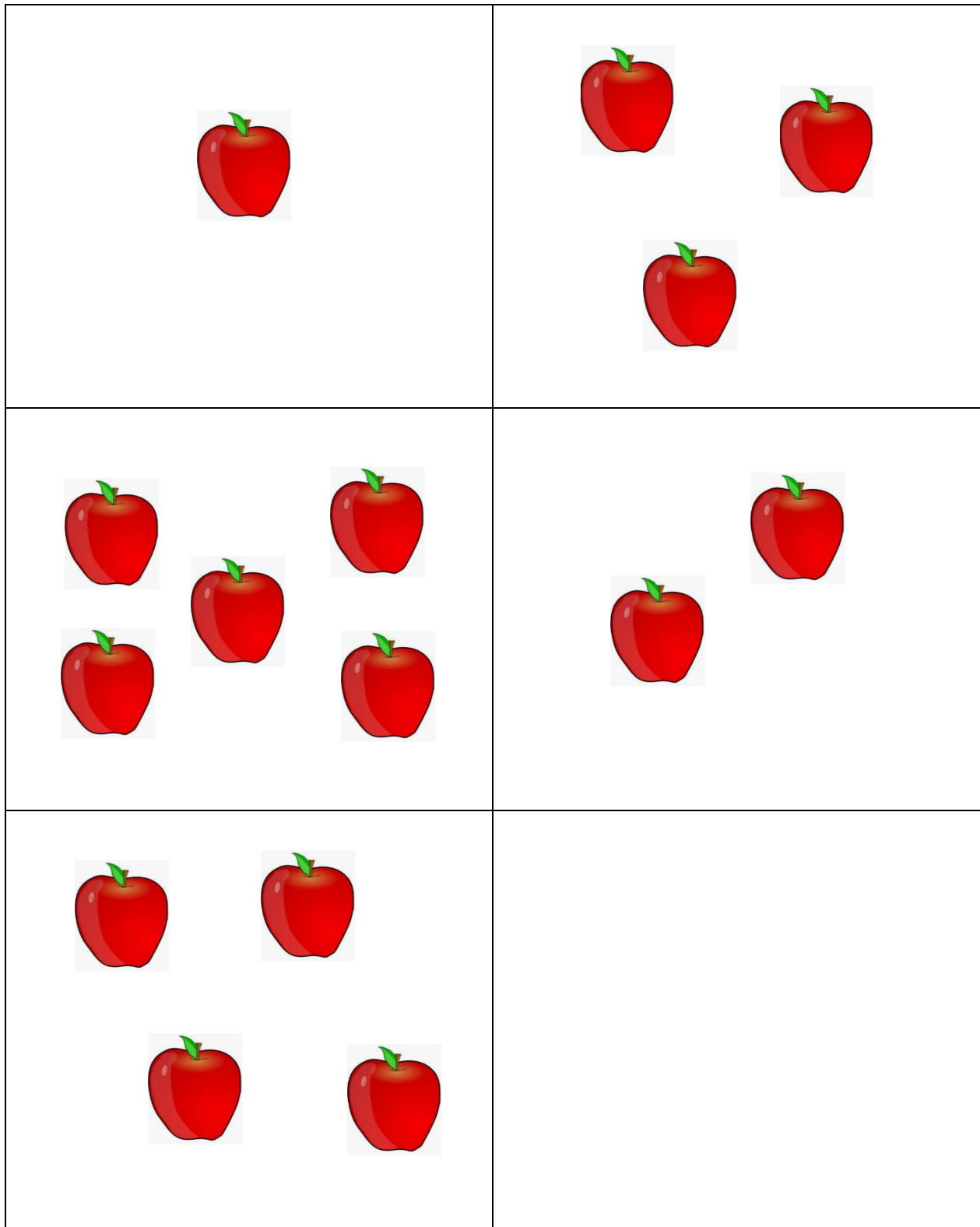
1. Have participants break out into pairs.
2. Hand out the first 5 cards in deck 1 to each group.
3. Ask the participants to place the objects in order by weight from least to greatest.
4. The teacher will then hand out the 5 cards in deck 2 to each group.
5. Again ask the participants to place the objects in order by weight from least to greatest.
6. After the participants have had enough time to try both decks, discuss the differences between the two.
7. Lead the discussion to the point of comparing different types of numbers, and how it is easier to compare numbers that look the same.

Measurement Math Curriculum

Deck 1:

Deck 2



Lesson Five – Conversions

LEARN: Conversions

45 minutes

Purpose:

Participants will follow the PowerPoint instruction with the guided note packet and work through several example problems. Participants will learn about decimals, fractions, and how to convert and compare decimals and fractions.

Materials:

- *Conversions* slide presentation
- *Conversions Guided Note Packet*
- *Conversions Guided Note Packet – Answer Key*
- Calculator

Facilitation Steps:

1. Lead participants through the *Conversions* slide presentation, guiding them through the *Conversions Guided Note Packet*, examples, and practice problems (all slides).
2. When discussing slides #14-17, remind participants of the lessons learned during the *Conversions Activity*.

Name: _____

Date: _____

Conversions Guided Note Packet

Fractions → Decimals

Steps to converting a fraction to a decimal:

1.

2.

Example:

Convert $\frac{2}{5}$ to a decimal.

Example:

Convert $3\frac{2}{7}$ to a decimal. Round to the nearest thousandth.

Example:

Convert $\frac{1}{3}$ to a decimal.

Example:

Convert $\frac{18}{5}$ to a decimal.

Measurement Math Curriculum

Practice:

Convert the following fractions to decimals:

1. $\frac{4}{11}$

2. $\frac{3}{8}$

3. $\frac{15}{2}$

Decimals → Fractions

Steps to converting decimals to fractions:

1.

2.

3.

4.

Example:

Convert 0.1232 to a fraction.

Measurement Math Curriculum

Example:

Convert 3.2 to a fraction.

Example:

Convert $2.\bar{3}$ to a fraction.

Practice:

Convert the following decimals to a fraction:

1. 2.12

2. $3.\bar{4}$

3. 5.882

Comparing Decimals and Fractions:

-

-

Example:

Compare the following:

$$\frac{1}{4} \quad \bigcirc \quad \frac{3}{8}$$

Example:

Compare the following numbers:

$$3.4 \quad \bigcirc \quad 3\frac{2}{5}$$

Practice:

Compare the following numbers:

1. 2.6  $2\frac{3}{7}$

2. $\frac{5}{9}$  $\frac{3}{4}$

Application:

Gavin is looking to get a mirror for his bathroom. When he measures the width of the vanity, he gets $23\frac{3}{16}$ inches. While shopping, all of the mirror measurements are given in decimals. Assuming Gavin wants the mirror and vanity to be the same size, how wide of a mirror does Gavin need in decimal form?

Conversions Guided Note Packet – Answer Key

Fractions → Decimals

Steps to converting a fraction to a decimal:

1. Divide the numerator by the denominator.

2. Add the decimal to the whole number, if applicable.

Example:

Convert $\frac{2}{5}$ to a decimal. **0.4**

Example:

Convert $3\frac{2}{7}$ to a decimal. Round to the nearest thousandth.

3.286

Example:

Convert $\frac{1}{3}$ to a decimal. **$0.\overline{3}$**

Example:

Convert $\frac{18}{5}$ to a decimal. **3.6**

Practice:

Convert the following fractions to decimals:

1. $\frac{4}{11}$ **$0.\overline{36}$**

2. $\frac{3}{8}$ **0.375**

3. $\frac{15}{2}$ **7.5**

Decimals → Fractions

Steps to converting decimals to fractions:

1. Identify the place value of the last digit of the decimal.

2. Divide the decimal by the place value (without the decimal point).

3. Find the greatest common divisor (GCD) of the numerator and denominator.

4. Reduce the fraction by dividing the numerator and denominator by the GCD.

Example:

Convert 0.1232 to a fraction. **$\frac{77}{625}$**

Example:

Convert 3.2 to a fraction. **$3\frac{1}{5}$**

Example:

Convert $2.\bar{3}$ to a fraction. $2\frac{1}{3}$

Practice:

Convert the following decimals to a fraction:

1. 2.12 $2\frac{3}{25}$

2. $3.\bar{4}$ $3\frac{4}{9}$

3. 5.882 $5\frac{441}{500}$

Comparing Decimals and Fractions:

- When comparing fractions to fractions, it is easiest when the two fractions have a common denominator.
- When comparing a fraction and a decimal, it is best to convert the fraction to a decimal and compare.

Example:

Compare the following:

$\frac{1}{4}$ $<$ $\frac{3}{8}$

Example:

Compare the following numbers:

3.4 $=$ $3\frac{2}{5}$

Practice:

Compare the following numbers:

1. 2.6 $>$ $2\frac{3}{7}$

2. $\frac{5}{9}$ $<$ $\frac{3}{4}$

Application:

Gavin is looking to get a mirror for his bathroom. When he measures the width of the vanity, he gets $23\frac{3}{16}$ inches. While shopping, all of the mirror measurements are given in decimals. Assuming Gavin wants the mirror and vanity to be the same size, how wide of a mirror does Gavin need in decimal form?

23.1875 inches

Lesson Five – Conversions

REVIEW: Conversions

5-10 minutes

Purpose:

The exit activity will give participants one last exposure to converting decimals and fractions and recognizing equivalent fractions.

Materials:

- *Conversions Exit Activity*
- *Conversions Exit Activity – Answer Key*

Facilitation Steps:

1. Pass out the *Conversions Exit Activity*.
2. Participants will match the decimals on the left with the equivalent fractions on the right.
3. Participants must finish the activity correctly before they leave for the day.
4. Help guide struggling participants so that they can experience success before class is over.

Name: _____

Date: _____

Conversions Exit Activity

Match the decimals on the left with their equivalent fraction on the right.

0.02

$$\frac{1}{3}$$

0.14

$$\frac{1}{10}$$

0.35

$$\frac{1}{50}$$

$0.\bar{3}$

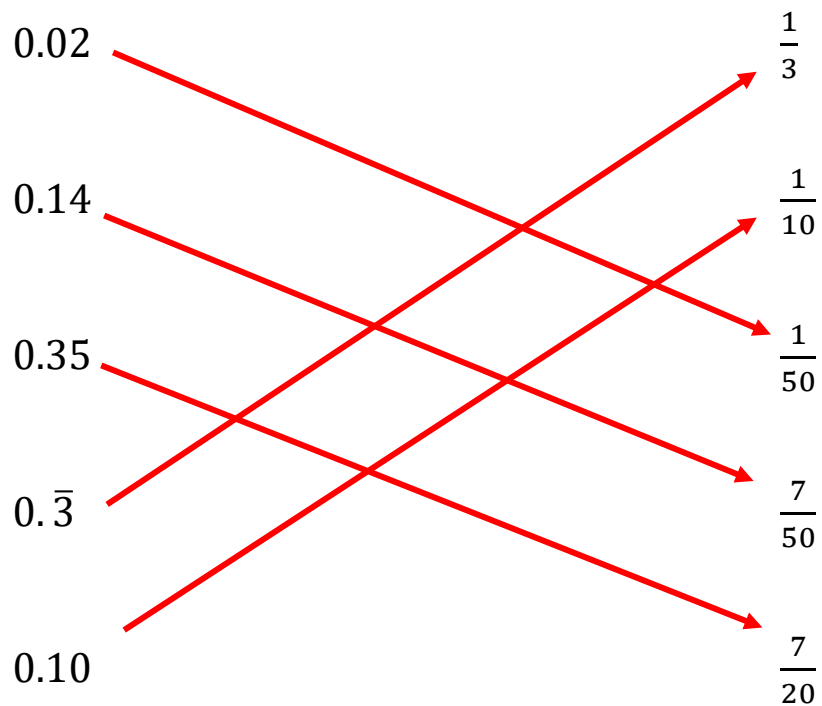
$$\frac{7}{50}$$

0.10

$$\frac{7}{20}$$

Conversions Exit Activity – Answer Key

Match the decimals on the left with their equivalent fraction on the right.



Lesson Six – Measurements Using a Tape Rule and Tape Measure

Lesson Overview

In this lesson, participants will learn the basics on how to take measurements using a ruler, add and subtract fractions, and combine measurements.

Lesson Objectives

After completing this lesson, participants will be able to:

- Take accurate standard and metric measurements using a ruler
- Add and subtract fractions
- Combine measurements
- Solve word problems using measurement skills

Lesson at a Glance

Activity	Materials	Preparation	Approximate class time
FOCUS	• <i>Ruler and Tape Measure Station Activity</i> • <i>Ruler and Tape Measure Station Worksheet</i>	1. Print/Photocopy <i>Ruler and Tape Measure Station Activity</i> (one copy of the stations). 2. Print/Photocopy <i>Ruler and Tape Measure Station Worksheet</i> (one copy for every two participants) and cut in half.	15 minutes
LEARN	• <i>Measurements Using a Ruler and Tape Measure</i> slide presentation • <i>Measurements Using a Ruler and Tape Measure Guided Note Packet</i> • <i>Measurements Using a Ruler and Tape Measure Guided Note Packet – Answer Key</i> • Five Manipulatives • Ruler	1. Print/Photocopy <i>Measurements using a Ruler and Tape Measure Guided Note Packet</i> (one per participant). 2. Make sure participants each have a ruler and the five manipulatives.	35 minutes
REVIEW	• <i>Measurements Using a Ruler and Tape Measure Exit Ticket</i> • <i>Measurements Using a Ruler and Tape Measure Exit Ticket – Answer Key</i> • Five Manipulatives • Ruler	1. Print/photocopy <i>Measurements Using a Ruler and Tape Measure Exit Ticket</i> (one per participant). 2. Make sure participants each have a ruler and the five manipulatives.	10 minutes

Lesson Six – Measurements Using a Ruler and Tape Measure

FOCUS: Measurements Using a Ruler and Tape Measure

15 minutes

Purpose:

In this focus activity, participants will review materials that will benefit them in the upcoming lessons, such as reading a ruler, comparing fractions and decimals, and identifying appropriate measurements.

Materials:

- *Ruler and Tape Measure Station Activity*
- *Ruler and Tape Measure Station Worksheet*

Facilitation Steps:

1. Set up four stations in the four corners of the classroom. When participants come in, they will grab a *Ruler and Tape Measure Station Worksheet* and begin on a station of their choosing. The participants will only have 10 minutes to complete the activity, so they will need to work quickly.
2. As participants work, monitor their progress, encourage them, and make sure they are moving at an appropriate pace.
3. At the end of ten minutes, bring the class back together and discuss the results of the stations, explaining how the material will be used in the upcoming lesson.

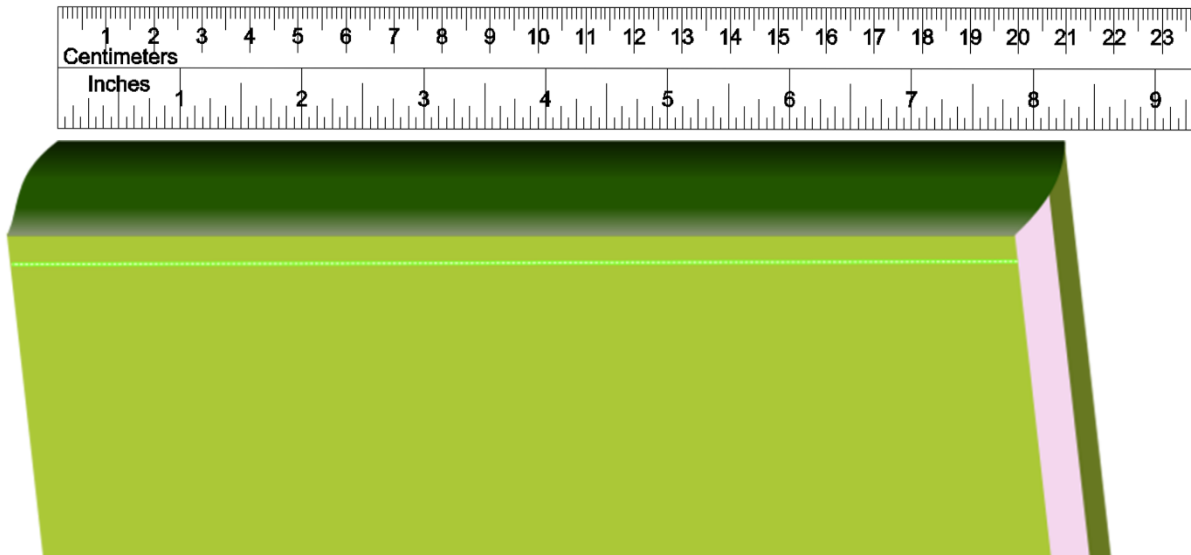
Station 1:

Read the measurements shown in the diagrams below:

1.



2.



3.



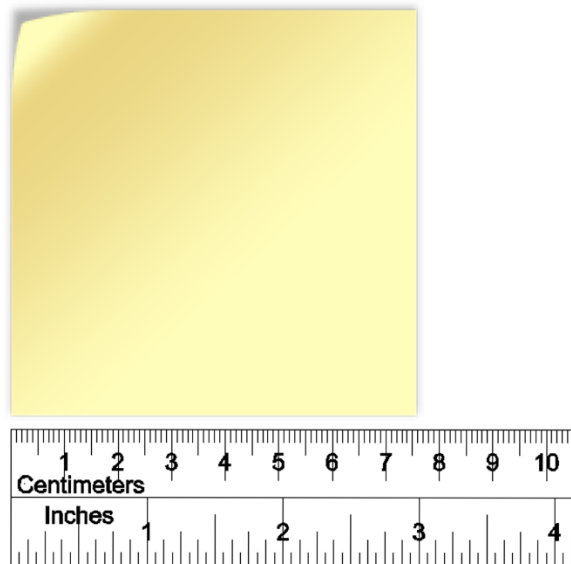
Station 2:

Read the measurements shown in the diagrams below:

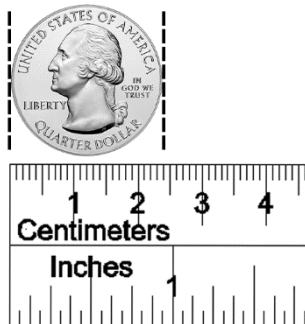
1.



2.



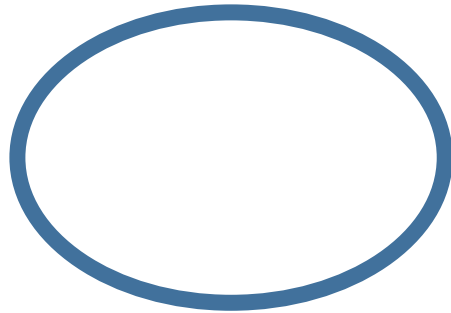
3.



Station 3:

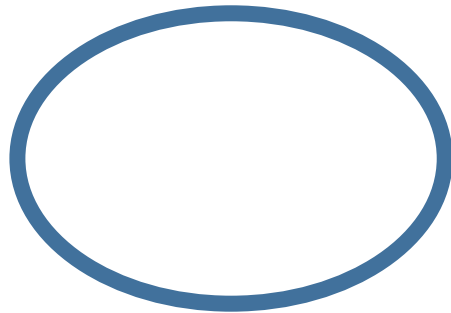
Compare the following fractions with $<$, $>$, or $=$:

1. $\frac{3}{5}$



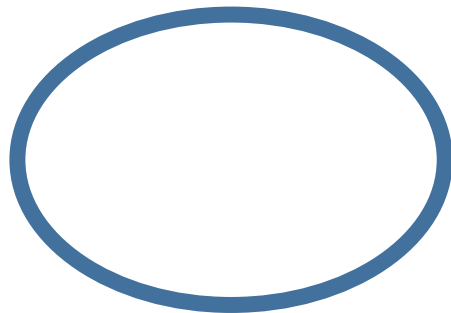
$\frac{5}{8}$

2. $\frac{5}{16}$



$\frac{1}{4}$

3. $\frac{1}{2}$



$\frac{8}{16}$

Station 4:

Identify the appropriate measurement for each scenario below:

1. The length of a soccer field.

- A. yards
- B. feet
- C. centimeters
- D. miles

2. The diameter of a soda bottle cap.

- A. millimeter
- B. meter
- C. inch
- D. feet

3. The length of the Mississippi River.

- A. feet
- B. miles
- C. yard
- D. meters.

Name: _____

Date: _____

Ruler and Tape Measure Station Worksheet

Station 1:

- 1.
- 2.
- 3.

Station 2:

- 1.
- 2.
- 3.

Station 3:

- 1.
- 2.
- 3.

Station 4:

- 1.
- 2.
- 3.

Name: _____

Date: _____

Ruler and Tape Measure Station Worksheet

Station 1:

- 1.
- 2.
- 3.

Station 2:

- 1.
- 2.
- 3.

Station 3:

- 1.
- 2.
- 3.

Station 4:

- 1.
- 2.
- 3.

Lesson Six – Measurements Using a Ruler and Tape Measure

LEARN: Measurements Using a Ruler and Tape Measure

35 minutes

Purpose:

Participants will follow the slide presentation instruction with the guided note packet and work through several example problems. Participants will learn how to physically use a ruler and tape measure. This lesson will go through the process of actually taking the measurement.

Materials:

- *Measurements Using a Ruler and Tape Measure* slide presentation
- *Measurements Using a Ruler and Tape Measure Guided Note Packet*
- *Measurements Using a Ruler and Tape Measure Guided Note Packet – Answer Key*
- Five manipulatives
- Ruler

Facilitation Steps:

1. Start the lesson with the *Measurements Using a Ruler and Tape Measure* slide presentation, going through the basics of how to take a measurement (both standard and metric) using a ruler (Slides #1-6).
2. Demonstrate the measurements using the five objects that were provided with the lesson.
3. Do a quick review on adding and subtracting fractions before moving on to combining measurements (Slide #7-17).
4. As the participants measure the objects in the practice session, ensure that they are using the rulers appropriately. Look for any possible measurement errors and answer any questions that may arise.

Name: _____

Date: _____

Measurements Using a Ruler and Tape Measure Guided Note Packet

Taking measurements with a ruler (standard):

-

-

-

-

Taking measurements with a ruler (metric):

-

-

Example: Find the length of Side A on **Object 4** in inches.

Practice:

Using **Object 4**, find the following measurements in inches:

1. **Side B**

2. **Side F**

3. **Side I**

Practice:

Using **Object 4**, find the following measurements in centimeters:

1. **Side N**

2. **Side D**

3. **Side L**

Steps to adding/subtracting fractions:

1.

2.

3.

Example: Add $\frac{1}{4} + \frac{5}{8}$

Practice: Add the following fractions:

1. $\frac{3}{4} + \frac{1}{6}$

2. $\frac{1}{2} + \frac{3}{8}$

3. $\frac{1}{16} + \frac{7}{8}$

Practice: Subtract the following fractions:

1. $\frac{7}{16} - \frac{1}{8}$

2. $\frac{1}{2} - \frac{5}{8}$

3. $\frac{5}{6} - \frac{3}{4}$

Combining Measurements:

-

-

Example: Using **Object 4**, find the perimeter of the inside figure, **MNOPL**, in inches.

Practice: Using **Object 4**, find the following measurements in inches:

1. **Side B – Side F**

2. **Side H + Side G + Side E**

3. **Side C + Side D**

Practice: Using **Object 4**, find the following measurements in centimeters:

1. **Side L + Side O**

2. **Side K – Side G**

3. **Side M + Side N**

Application:

Simon is fabricating a stop sign and needs to know the perimeter. Simon knows that one side of the stop sign is $7\frac{1}{4}$ inches. What is the perimeter of the stop sign?

Application:

Terez needs to cover the edges of a piece of drywall with tape. The drywall section is the same size and shape as the rectangle created by **Side O** and **Side N** in **Object 1**. What is the perimeter in centimeters?

Measurements Using a Ruler and Tape Measure Guided Note Packet – Answer Key

Taking measurements with a ruler (standard):

- Place the flat end of the ruler against is the object you are measuring.
- Line the zero mark on the ruler up the end of the object to be measured.
- Start from the zero end and take note of where the object ends
- Take and note the measurement (in inches).

Taking measurements with a ruler (metric):

- The measurement process with metric units is exactly the same as measuring using standard measurement.
- Make sure to use the appropriate side of the ruler or tape measure showing cm and mm.

Example: Find the length of **Side A** on **Object 4** in inches.

5 inches

Practice: Using **Object 4**, find the following measurements in inches:

1. **Side B** **$5 \frac{5}{16}$ inches**
2. **Side F** **$3 \frac{5}{8}$ inches**
3. **Side I** **$1 \frac{5}{8}$ inches**

Practice:

Using **Object 4**, find the following measurements in centimeters:

1. **Side N** **2.4 centimeters**
2. **Side D** **4.8 centimeters**
3. **Side L** **5.2 centimeters**

Steps to adding/subtracting fractions:

1. Find the least common denominator between the fractions.
2. Multiply the numerator and denominator of each fraction by the number needed to get to the LCD.
3. Add/subtract the numerators.

Example: Add $\frac{1}{4} + \frac{5}{8}$ **$\frac{7}{8}$**

Practice: Add the following fractions:

1. $\frac{3}{4} + \frac{1}{6}$ **$\frac{11}{12}$**
2. $\frac{1}{2} + \frac{3}{8}$ **$\frac{7}{8}$**
3. $\frac{1}{16} + \frac{7}{8}$ **$\frac{15}{16}$**

Practice: Subtract the following fractions:

1. $\frac{7}{16} - \frac{1}{8}$ $\frac{5}{16}$
2. $\frac{1}{2} - \frac{5}{8}$ $-\frac{1}{8}$
3. $\frac{5}{6} - \frac{3}{4}$ $\frac{1}{12}$

Combining Measurements:

- When combining multiple measurements, simply add or subtract the values of each measurement, depending on the situation.
- Common combinations of measurements: Perimeter, sum/difference of two lengths.

Example: Using **Object 4**, find the perimeter of the inside figure, **MNOPL**, in inches.

$7\frac{7}{16}$ inches

Practice: Using **Object 4**, measure the sides listed in inches and complete the math:

1. Side B – Side F $1\frac{11}{16}$ inches
2. Side H + Side G + Side E 4 inches
3. Side C + Side D $3\frac{1}{4}$ inches

Practice: Using **Object 4**, measure the sides listed in centimeters and complete the math:

1. Side L + Side O 8 cm
2. Side K – Side G 2.7 cm
3. Side M + Side N 8.8 cm

Application:

Simon is fabricating a stop sign and needs to know the perimeter. Simon knows that one side of the stop sign is $7\frac{1}{4}$ inches. What is the perimeter of the stop sign? 58 inches

Application:

Terez needs to cover the edges of a piece of drywall with tape. The drywall section is the same size and shape as the rectangle created by **Side O** and **Side N** in **Object 1**. What is the perimeter in centimeters? 21.8 cm

Lesson Six – Measurements Using a Ruler and Tape Measure

REVIEW: Measurements Using a Ruler and Tape Measure

10 minutes

Purpose:

This five-question quick assessment is a great way to gather information on how well the participants understand the lesson material.

Materials:

- *Measurements Using a Ruler and Tape Measure Exit Ticket*
- *Measurements Using a Ruler and Tape Measure Exit Ticket – Answer Key*
- Five manipulatives
- Ruler

Facilitation Steps:

1. Pass out an exit ticket to each participant.
2. Participants will have 10 minutes to complete the activity.
3. Collect the exit tickets when the participants finish.

Name: _____

Date: _____

Measurements Using a Ruler and Tape Measure Exit Ticket

Using a ruler, measure the following side lengths in inches:

1. **Object 4, Side L**

2. **Object 4, Side B**

3. **Object 1, Side A**

4. **Object 1, Side K**

5. **Object 2, Side H**

Measurements Using a Ruler and Tape Measure Exit Ticket – Answer Key

Using a ruler, measure the following side lengths in inches:

1. Object 4, Side L

2 inches

2. Object 4, Side B

$5 \frac{5}{16}$ inches

3. Object 1, Side A

$2 \frac{7}{16}$ inches

4. Object 1, Side K

$1 \frac{3}{4}$ inches

5. Object 2, Side H

$2 \frac{1}{16}$ inches

Lesson Seven – Measurements Using a Caliper

Lesson Overview

In this lesson, participants will learn the basics of how to take actual measurements using a caliper, add/subtract fractions, and combine measurements.

Lesson Objectives

After completing this lesson, participants will be able to:

- Take accurate measurements using a caliper.
- Take metric measurements using a caliper.
- Add and subtract decimals.
- Combine two measurements together.
- Solve word problems involving the use of a caliper.

Lesson at a Glance

Activity	Materials	Preparation	Approximate class time
FOCUS	• <i>Caliper KWL Activity</i> • Computer/projector • YouTube Video	1. Print/photocopy <i>Caliper KWL Activity</i> (one per participant).	5-10 minutes
LEARN	• <i>Measurements Using a Caliper</i> slide presentation • <i>Measurements Using a Caliper Guided Note Packet – Answer Key</i> • Five manipulatives • Caliper	1. Print/photocopy <i>Measurements Using a Caliper Guided Note Packet</i> (one per participant).	45 minutes
REVIEW	• <i>Measurements Using a Caliper Exit Ticket</i> • <i>Measurements Using a Caliper Exit Ticket – Answer Key</i>	1. Print/photocopy <i>Measurements Using a Caliper Exit Ticket</i> (one per participant).	5-10 minutes

Lesson Seven – Measurements Using a Caliper

FOCUS: Measurements Using a Caliper

5-10 minutes

Purpose:

This lesson's focus activity will not only act as a refresher to the *How to Read a Caliper* lesson, but also as a segue into this lesson on actually taking measurements with a caliper.

Materials:

- *Caliper KWL Activity*
- Computer/Projector
- YouTube Video
(<https://www.youtube.com/watch?v=T0JapTfUOVs>)

Facilitation Steps:

1. Pass out the KWL worksheet to participants as they enter the room.
2. Give participants 3 minutes to fill out the worksheet.
3. Play the *Intro to Calipers* video as a refresher from the previous caliper lesson.
4. Call on a few participants to see what they want to learn in today's lesson and see if you can address those questions throughout.

Name: _____

Date: _____

Caliper KWL Activity

K_{now}	W_{ant to know}	L_{earn}
----------------------------	------------------------------------	-----------------------------

Lesson Seven – Measurements Using a Caliper

LEARN: Measurements Using a Caliper

45 minutes

Purpose:

Participants will follow the slide presentation instruction with the guided note packet and work through several example problems. Participants will learn how to accurately take a measurement using a caliper as well as how to add and subtract decimals.

Materials:

- *Measurements Using a Caliper* slide presentation
- *Measurements Using a Caliper Guided Note Packet*
- *Measurements Using a Caliper Guided Note Packet – Answer Key*
- Five manipulatives
- Caliper

Facilitation Steps:

1. The instructor will guide participants through the *Measurements Using a Caliper* slide presentation, helping them to fill in the *Measurements Using a Caliper Guided Note Packet* as they go through the slide presentation.
2. The instructor will demonstrate how each example works with the proper manipulatives and a caliper.
3. The instructor will let the participants try the practice problems on their own before going over the correct answers.

Name: _____

Date: _____

Measurements Using a Caliper Guided Note Packet

Taking Measurements using a Caliper (Standard)

-

-

-

Example:

Using a caliper and **Object 1**, find the length of **Side O** in inches.

Practice:

Using a caliper and **Object 1**, find the length of the following:

1. **Side B**

2. **Side H**

3. **Side C**

Inside and Depth Measurements

-

-

Example:

Using a caliper and **Object 1**, find the diameter of **circle Q** in inches.

Practice:

Using a caliper and **Object 1**, find the following inside measurements in inches:

1. **Side I** to **Side K**

2. **Side G** to **Side K**

Adding/Subtracting Decimals

1.

2.

3.

Example:

Add $4.235 + 5.12$.

Example:

Subtract $9.884 - 2.113$.

Practice:

Add/Subtract the following decimals:

1. $1.49 + 5.238$

2. $8.89 - 4.25$

3. $4.2 + 1.094$

Combining Measurements

-

-

Example:

Using a caliper and **Object 1**, find and sum of the lengths of **Side L** and **Side M**.

Practice:

Using a caliper and **Object 1**, find the lengths of the following sides and complete the required math:

1. **Side N – Side D**

2. **Side A + Side C**

3. **Side F – Side B**

Applications:

Sal is trying to re-create a unique piece of flooring similar to that of **Object 4**. He needs to know the widest length between side H and side J. Use the inside jaws on the caliper to find the distance from **Side H** to **Side J**.

Measurements Using a Caliper Guided Note Packet – Answer Key

Taking Measurements using a Caliper (Standard)

- Identify what type of measurement you are intending to take (inside/outside/depth)
- Extend the caliper arms until the desired measurement is taken
- Take the measurement

Example:

Using a caliper and **Object 1**, find the length of **Side O** in inches.

2.75 inches

Practice:

Using a caliper and **Object 1**, find the length of the following:

1. Side B **0.625**
2. Side H **1.375**
3. Side C **1.5**

Inside and Depth Measurements

- Use the upper “inside” jaws when finding the inside measurement or diameter of an object
- Use the depth probe when trying to find the depth of an object

Example:

Using a caliper and **Object 1**, find the diameter of **Circle Q** in inches.

1.250 inches

Practice:

Using a caliper and **Object 1**, find the following inside measurements in inches:

1. Side I to Side K **1.095**
2. Side G to Side K **2.469**

Adding/Subtracting Decimals

1. Write the decimals vertically with the decimal points aligned vertically as well.
2. Add or subtract starting from the right side and move towards the left.
3. Bring down the decimal vertically, and write your answer.

Example:

Add $4.235 + 5.12$ **9.355**

Example:

Subtract $9.884 - 2.113$ **7.771**

Practice:

Add/Subtract the following decimals:

1. $1.49 + 5.238$ **6.728**

2. $8.89 - 4.25$ **4.64**

3. $4.2 + 1.094$ **5.294**

Combining Measurements

- **When combining measurements, take each individual measurement**

- **Add or subtract the measurements depending on the given situation**

Example:

Using a caliper and **Object 1**, find and sum of the lengths of **Side L** and **Side M**.

1.625

Practice:

Using a caliper and **Object 1**, find the lengths of the following sides and complete the required math:

1. **Side N – Side D** **0.6875**

2. **Side A + Side C** **3.9375**

3. **Side F – Side B** **0.625**

Applications:

Sal is trying to re-create a unique piece of flooring similar to that of **Object 4**. He needs to know the widest length between **Side H** and **Side J**. Use the inside jaws on the caliper to find the distance from **Side H** to **Side J**.

0.657

Lesson Seven – Measurements using a Caliper

REVIEW: Measurements Using a Caliper

5-10 minutes

Purpose:

This exit ticket activity is a great formative assessment to test how well participants can accurately measure using a caliper.

Materials:

- *Measurements Using a Caliper Exit Ticket*
- Five manipulatives
- Caliper

Facilitation Steps:

1. Pass out the *Measurements Using a Caliper Exit Ticket* to each participant.
2. Give participants 5 minutes to complete the activity.
3. Once the participants complete the five questions, have them hand in their *Exit Ticket*.
4. Correct the responses and look for errors in the students' answers. Address errors found the following day.

Name: _____

Date: _____

Measurements Using a Caliper Exit Ticket

Using a caliper, find the following measurements of the given objects in inches.

1. **Object 3**, outside measurement from **Side D** to **Side N**.
2. **Object 3**, outside measurement from **Side H** to **Side L**.
3. **Object 4**, inside measurement from **Side L** to **Side N**.
4. **Object 1**, outside measurement from **Side M** to **Side O**.
5. **Object 1**, the length of **Side E**.

Measurements Using a Caliper Exit Ticket – Answer Key

Using a caliper, find the following measurements of the given objects in inches.

1. **Object 3**, outside measurement from **Side D** to **Side N**
2.25
2. **Object 3**, outside measurement from **Side H** to **Side L**
1.375
3. **Object 4**, inside measurement from **Side L** to **Side N**
2.237
4. **Object 1**, outside measurement from **Side M** to **Side O**
1.5
5. **Object 1**, the length of **Side E**
0.9375