

MICROMETERS

Description

This Activity Plan is designed as one among many through which students will rotate within the Automotive Service Technician component of Skills Exploration 10–12.

A micrometer is a detailed measuring instrument capable of making very exact measurements even to 1/1000 of an inch. Automotive technicians use micrometers in order to ensure that the work they do is extremely accurate.

Note: Micrometers are expensive, sensitive measuring instruments. Not all schools can afford to purchase them. This activity should be considered a secondary supplementary activity to be introduced only if tools and facilities exist.

Lesson Outcomes

The student will be able to measure a variety of objects and obtain precise measurements to within very exact specifications.

Assumptions

Prior to doing the activity themselves, students will have been given some theory, and the instructor will have demonstrated the proper procedure of using a micrometer.

Terminology

Anvil: the shiny part of the micrometer that the spindle moves toward and that the sample is set against.

Frame: the main supporting structure of the micrometer.

Index line: the horizontal line on the sleeve that is used as an indicator line for which mark to read on the thimble.

Micrometer: a detailed measuring instrument used to measure very fine, exact measurements.

Spindle: the shiny cylindrical part of the micrometer that the thimble moves toward the anvil.

Ratchet screw: found on the end of the thimble, used for “final tightening” on an object to get a consistent measurement from person to person.

Thimble: the part of the micrometer that is usually turned with the thumb. The thimble has graduated markings.

Estimated Time

45–60 minutes

Recommended Number of Students

20, based on the *BC Technology Educators' Best Practice Guide*, 1–3 students per micrometer. If not enough micrometers are available, students could work in small groups with each group member measuring a different object.

Facilities

Automotive shop

Tools

Micrometers (as many as possible)

Materials

A variety of solid objects of various thicknesses. Ideally the objects should be some sort of metal material.

Note: Before proceeding through the activity, the instructor should be thoroughly familiar with the included Resources section of the Activity Plan, in particular the Micrometer Simulator website.

Resources

Micrometer Caliper—Merriam-Webster Visual Dictionary Online

http://visual.merriam-webster.com/science/measuring-devices/measure-thickness/micrometer-caliper_2.php

How to Use a Micrometer

www.youtube.com/watch?v=oHqaLMEHInE

Micrometer Simulator

www.stefanelli.eng.br/en/aka-micrometer-caliper-outside-inch-thousandths.html

Worksheets

- Micrometer Measurement Exercise
- Reading a Micrometer
- Measurement Quiz
- Micrometer Test

Evaluation Guidelines

Included is a worksheet that students can be given to record their micrometer measurements.

ACTIVITY: USING A MICROMETER

1. Find 10–12 metal objects around the automotive shop and set them up in an organized, distributed manner.
2. Have each student measure the thickness of each object and record it on the worksheet provided.
3. Begin by holding the frame with one hand and slowly turning in the thimble with the other until the anvil and spindle almost touch the object.
4. Slowly turn the ratchet screw until it tightens around the object and begins to ratchet (makes a clicking sound).
5. Lock the thimble in place and read the micrometer setting. **Note:** Refer to “How to Read a Micrometer” on page 5.
6. Record your findings on the Micrometer Measurement Exercise worksheet on the next page.

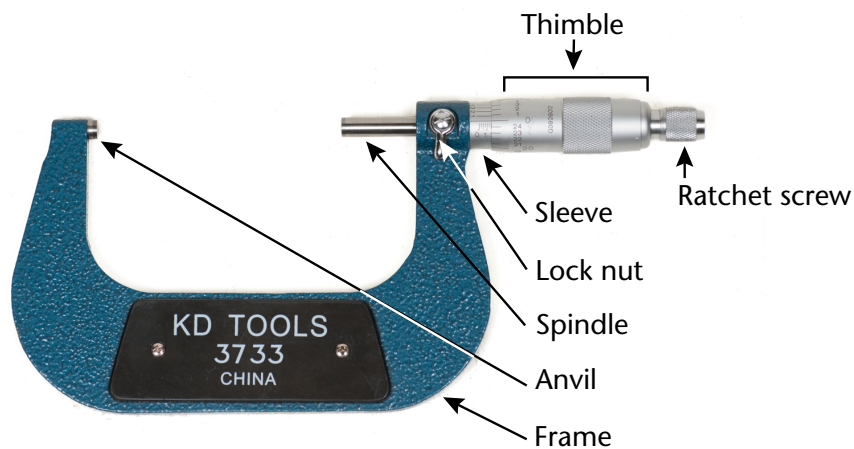


Figure 1—Micrometer parts



Figure 2—Measuring a piston



Figure 3—Measuring a brake rotor

Micrometer Measurement Exercise

Name _____

Date _____

Thickness of Object 1 (_____)

Thickness of Object 2 (_____)

Thickness of Object 3 (_____)

Thickness of Object 4 (_____)

Thickness of Object 5 (_____)

Thickness of Object 6 (_____)

Thickness of Object 7 (_____)

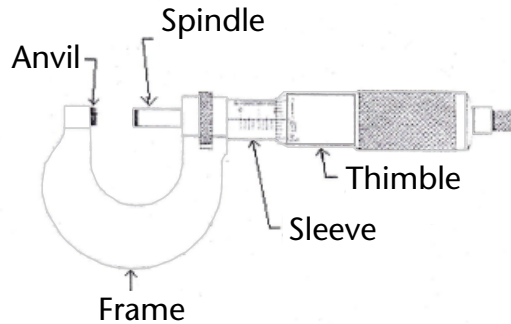
Thickness of Object 8 (_____)

Thickness of Object 9 (_____)

Thickness of Object 10 (_____)

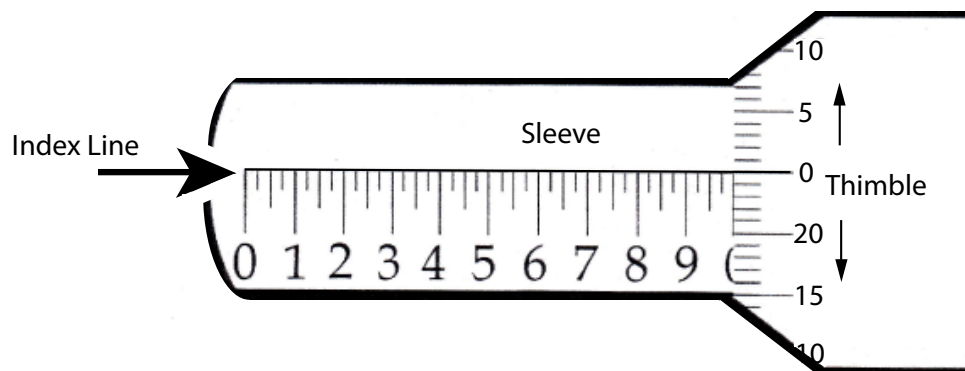
How to Read a Micrometer

Reading a micrometer takes practice.



To learn to read the mike you need to understand the **thimble** and the **sleeve**.

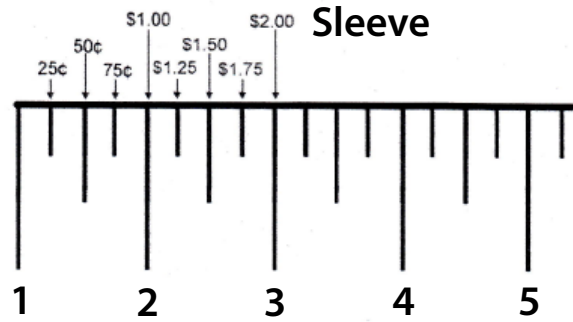
Here we are going to learn to read the micrometer by figuring out the markings on the thimble and the sleeve.



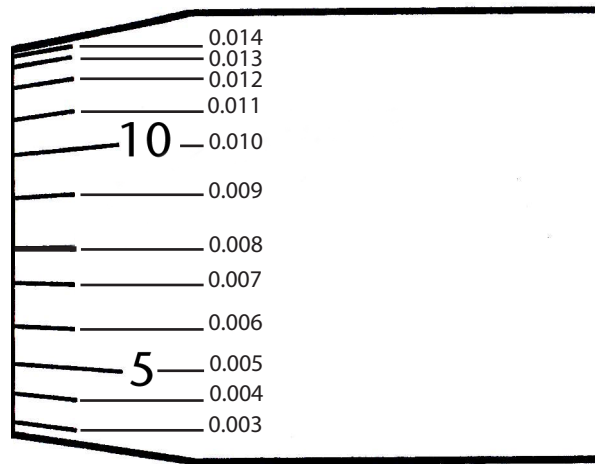
The **sleeve** does not move. It looks like a ruler with 10 numbers. The space between each number is divided into quarters. As the **thimble** rotates around this sleeve it covers up or reveals the numbers marked on the sleeve.

The thimble has numbers and markings on it from 0 to 24. One complete revolution of the thimble (from 0 all the way around to 0 again) moves the micrometer exactly 0.025 inches. Thus each revolution of the thimble moves it to the next "quarter" line on the sleeve.

It is easy to read a micrometer if you think of markings on the sleeve as dollars and quarter and the thimble as "pennies".



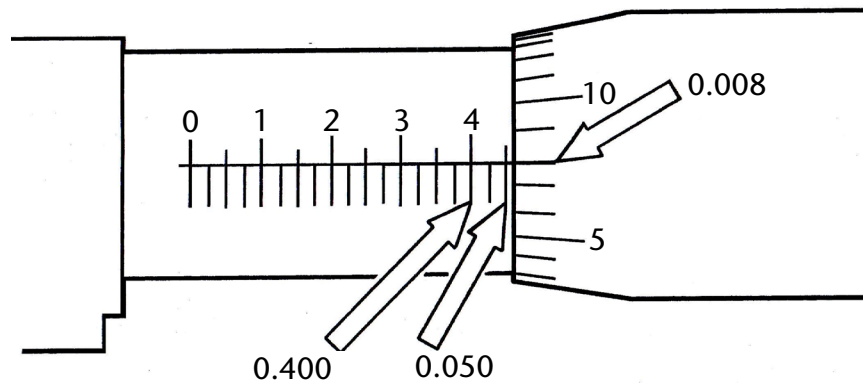
Now it gets a little easier to read the mike.



To read the micrometer, simply add up the "dollars", "quarters" and "pennies" in the correct order. See example below.

The reading is composed of:

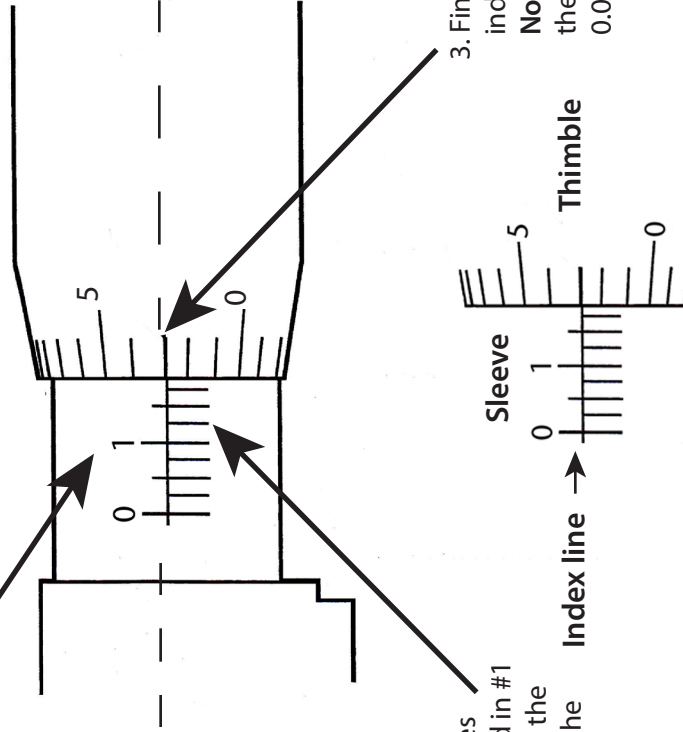
- 4 Large graduations or 4×0.100 = 0.400
- 2 Small graduations or 2×0.025 = 0.050
- 8 Graduations on the thimble or 8×0.001 = 0.008
- = 0.458"



Name: _____

Reading the Micrometer

1. Write down the last visible number before the thimble edge on #1.



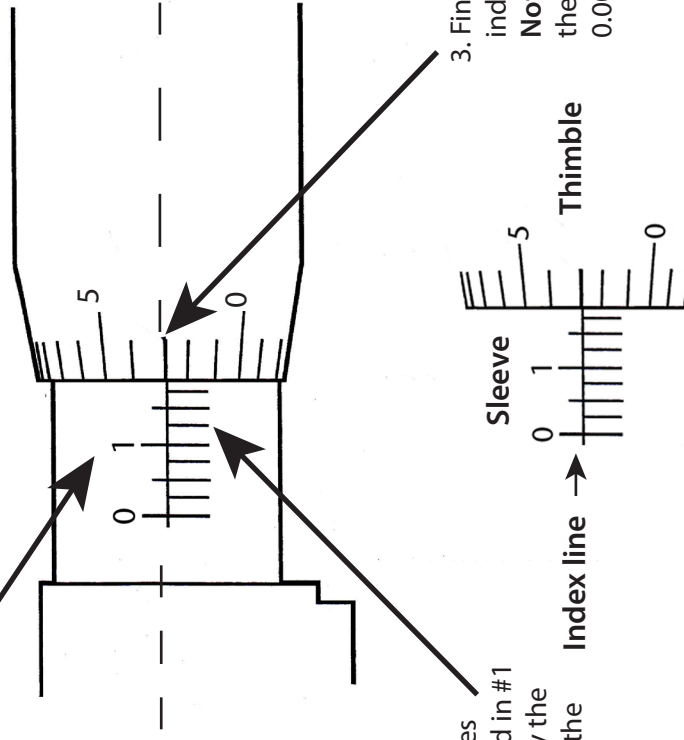
2. Count the number of small lines between the number identified in #1 and the thimble edge. Multiply the number of lines by .025. Write the answer down on #2.

3. Find the closest number to the index line on the thimble.
Note: The number must be below the Index Line. Each line is worth 0.001. Write the number down in #3.

#1 _____
+
#2 _____
+
#3 _____
Total _____

Reading the Micrometer Answer Key

1. Write down the last visible number before the thimble edge on #1.



2. Count the number of small lines between the number identified in #1 and the thimble edge. Multiply the number of lines by .025. Write the answer down on #2.

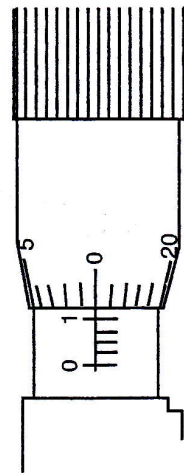
3. Find the closest number to the index line on the thimble.
Note: The number must be below the Index Line. Each line is worth 0.001. Write the number down in #3.

$$\begin{array}{r}
 \#1 \quad \underline{0.100} \\
 + \\
 \#2 \quad \underline{0.075} \\
 + \\
 \#3 \quad \underline{0.003} \\
 \text{Total} \quad \underline{0.178}
 \end{array}$$

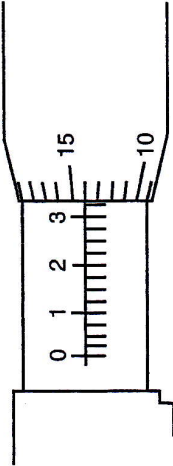
Measurement Quiz

Name: _____ Date: _____

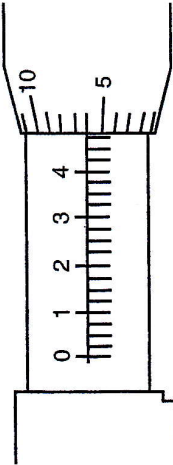
Make readings from the micrometers shown below and place answers in the proper blanks.



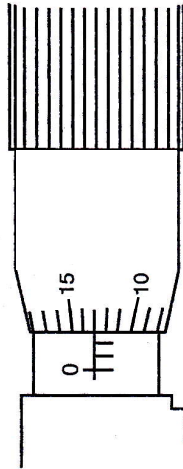
1.



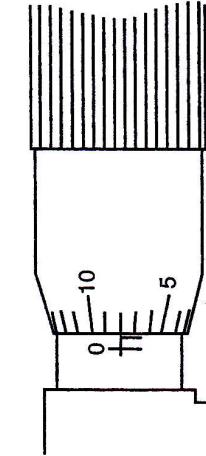
2.



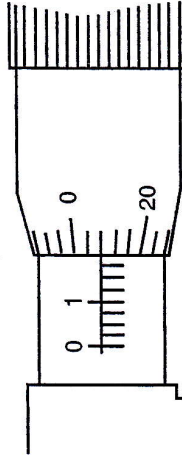
3.



4.



5.



6.

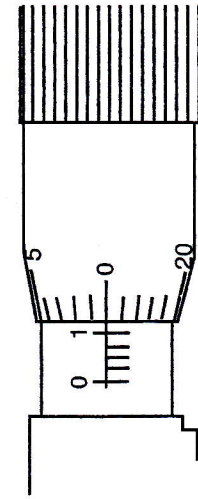
1. _____
2. _____
3. _____

4. _____
5. _____
6. _____

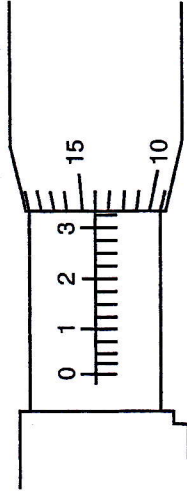
Measurement Quiz Answer Key

Name: _____ Date: _____

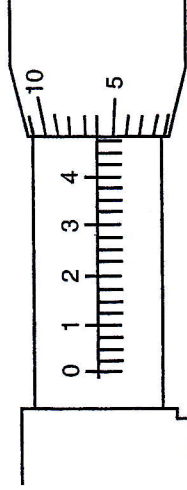
Make readings from the micrometers shown below and place answers in the proper blanks.



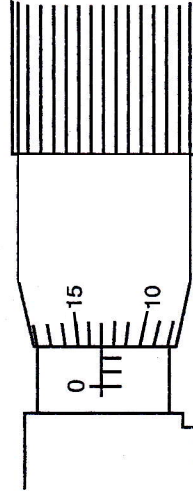
1.



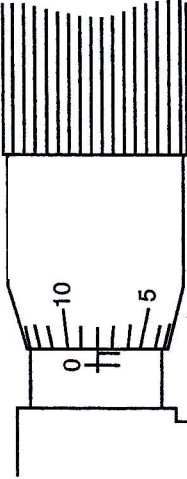
2.



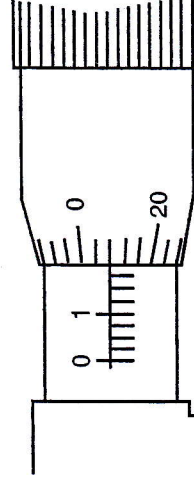
3.



4.



5.



6.

1. **0.125**

2. **0.339**

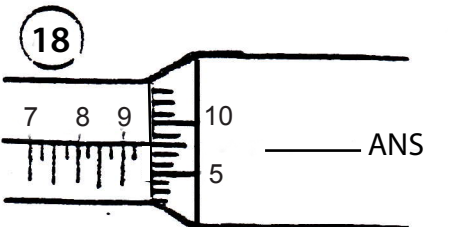
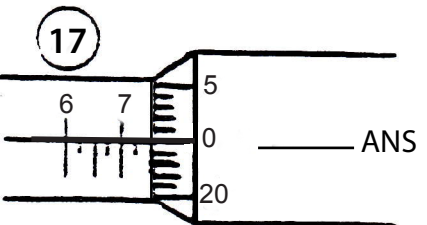
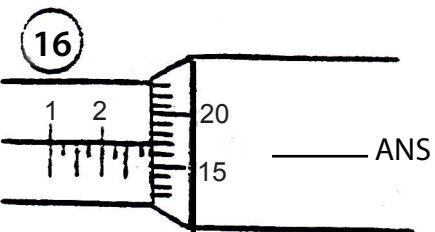
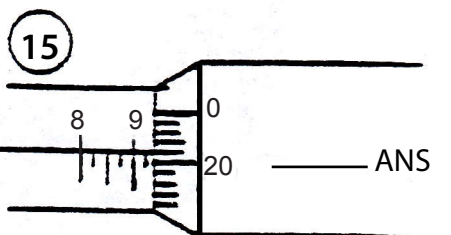
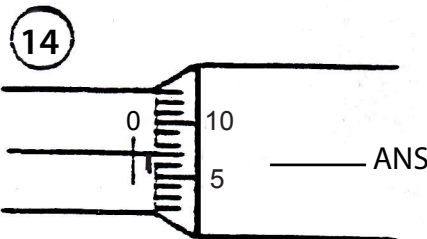
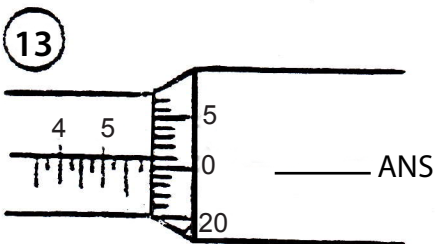
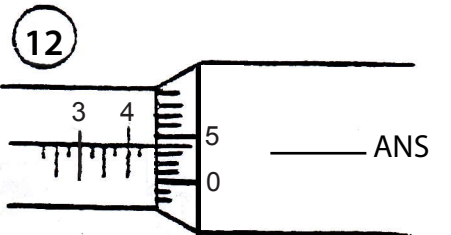
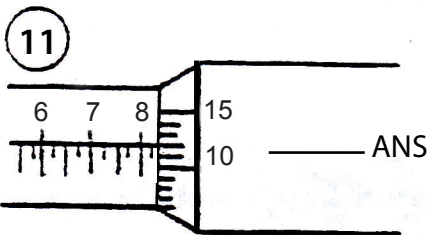
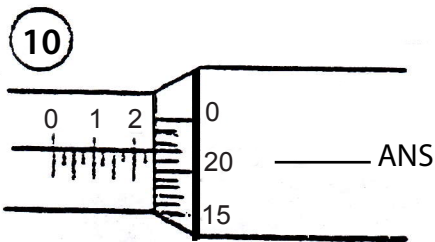
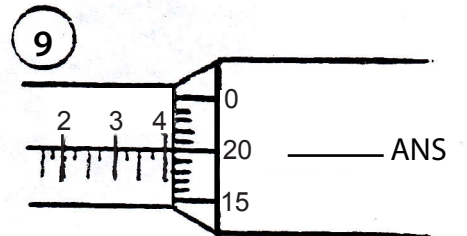
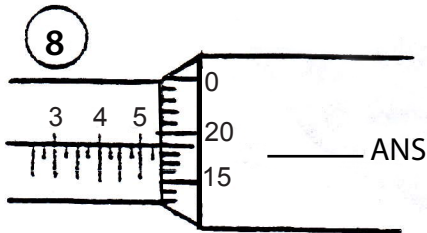
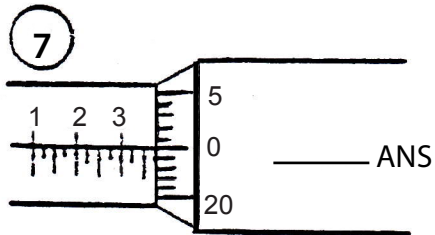
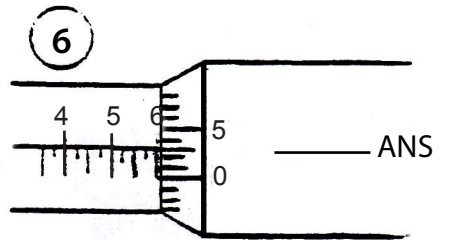
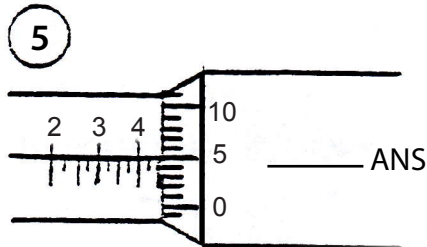
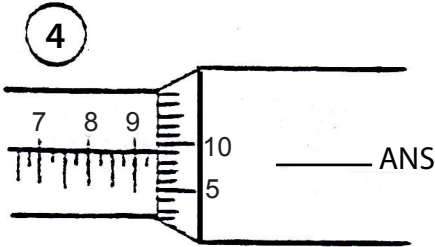
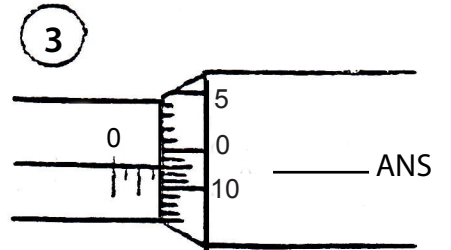
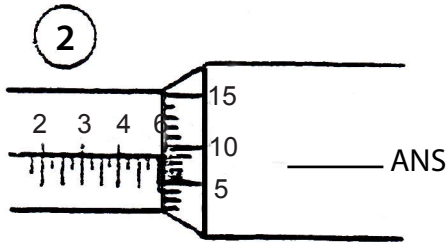
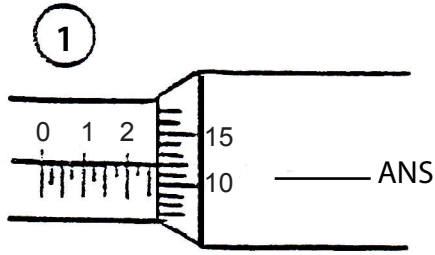
3. **0.481**

4. **0.063**

5. **0.033**

6. **0.198**

Micrometer Test



Micrometer Test Answer Key

