

Tools and Measuring Instruments

Name: _____ Hour _____ Date: _____

Date Assignment is due: _____ Why late? _____ Score: + ✓ -
Day of Week Date If your project was late, describe why

1. Identify common hand tools

2. Identify common engine service tools

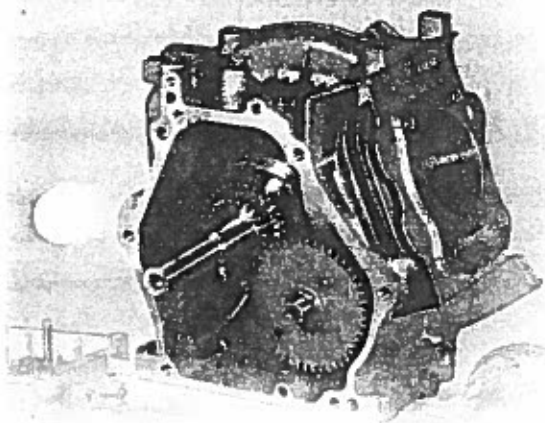
3. Identify power tools commonly used for small engine and outdoor power equipment service

4. Differentiate between common precision measuring instruments.

VOCABULARY

Define the following terms in your OWN words.

- Adjustable Wrench –
- Allen Wrench –
- Ball Peen Hammer –
- Box-end Wrench –
- Combination Slip-Joint Pliers –
- Combination Wrench –
- Diagonal Side Cutting Pliers –
- Needle Nose Pliers –
- Offset Screwdriver –
- Open-end Wrench –
- Phillips Screwdriver –
- Pliers –
- Retaining Ring Pliers –
- Socket Sets –
- Torque –
- Torque Wrench –
- Vise Grip Pliers –



CHAPTER 2

Tools and Measuring Instruments

Name _____ Date _____ Class _____

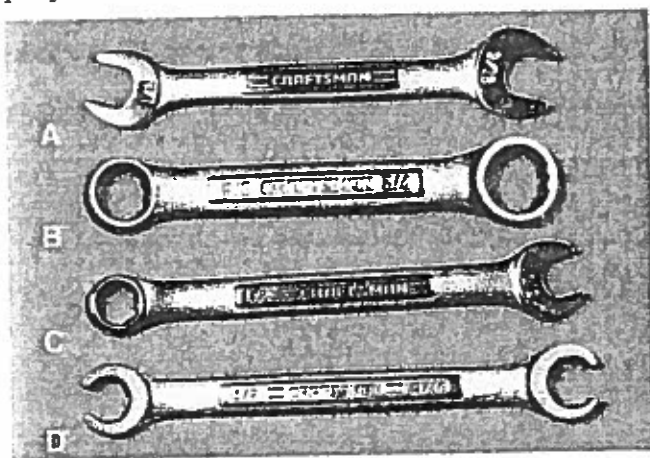
Learning Objectives

After studying this chapter, you will be able to:

- Identify common hand tools.
- Use common hand tools properly.
- Identify common engine service tools.
- Identify power tools commonly used for small engine and outdoor power equipment service.
- Differentiate between common precision measuring instruments.
- Select and use the appropriate precision measuring instruments to accurately and precisely measure various engine components.

Instructions: After studying the chapter, complete the following questions and problems.

1. Identify the wrenches in the following figure by their proper names.

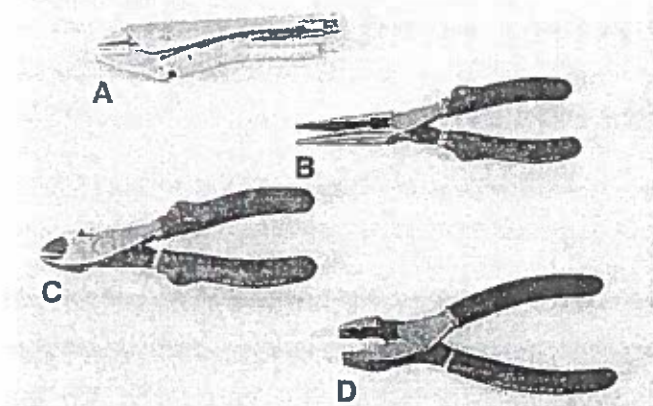


1. A. _____
 B. _____
 C. _____
 D. _____

2. The safest way to use a wrench for loosening or tightening is to _____ it in the direction of rotation.

2. _____

3. Identify the types of pliers shown in the following figure and indicate their common applications.



4. A(n) _____ screwdriver has a pointed, cross-shaped end, which fits screws with cross-shaped recesses in their heads.
5. _____ is used to make the faces for soft hammers.
- Brass
 - Lead
 - Plastic or rubber
 - All of the above.
6. A prick punch has a point angle of _____ and a center punch has a point angle of _____.
- 60°, 80°
 - 60°, 90°
 - 45°, 90°
 - 90°, 60°
7. A cylindrical punch used for driving straight pins, tapered pins, and roll pins is called a(n) _____.
8. *True or False?* A fine hacksaw blade should be used for cutting thin metal, and a course hacksaw blade should be used for cutting thick metal.
9. A file with double cut teeth _____.
- produces the smoothest cut
 - has a relatively aggressive cut
 - is best suited for soft metals
 - All of the above.
10. For shearing bolts or rivets, the cutting edge of a cold chisel should be _____.
- curved
 - straight
 - serrated
 - None of the above.
11. When small items are accidentally dropped into small crevices or recesses, _____ and _____ tools can often be used to retrieve them.

3. A. _____

B. _____

C. _____

D. _____

4. _____

5. _____

6. _____

7. _____

8. _____

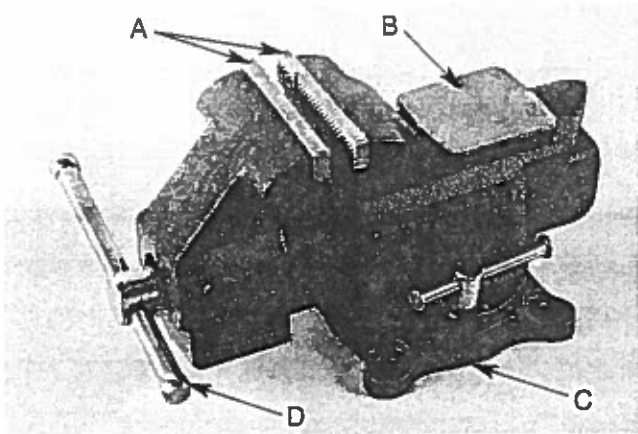
9. _____

10. _____

11. _____

Name _____

12. Identify the parts of the machinist's vise in the following illustration.



12. A. _____
 B. _____
 C. _____
 D. _____

13. If a flywheel holder is not available, a(n) _____ can be used to hold the flywheel while the flywheel nut is removed.
14. On a severely worn engine, a(n) _____ may need to be used to shave the top portion of the cylinder before the piston can be removed.
15. A ring spreader must be used to install new rings because _____.
 A. the ring are under so much tension they cannot be spread by hand
 B. the ring spreader cuts the ring groove so the rings will fit better
 C. the rings may become distorted if they are installed by hand
 D. None of the above.
16. A ring compressor is used to _____.
 A. compress the rings so they will not catch on the wear ridge when the piston is removed
 B. reshape distorted rings so they can be reused
 C. clean carbon out of the ring grooves so the rings seat properly
 D. None of the above.
17. *True or False?* A glaze breaker is used to remove cylinder taper during an engine rebuild.
18. _____ are test instruments used to measure engine speed.
19. A spark tester must be connected between the spark plug wire and a(n) _____ part of the engine.
20. A compression tester measures the _____.
 A. distance traveled by the piston
 B. maximum air pressure created in the cylinder
 C. amount of valve lift
 D. None of the above.

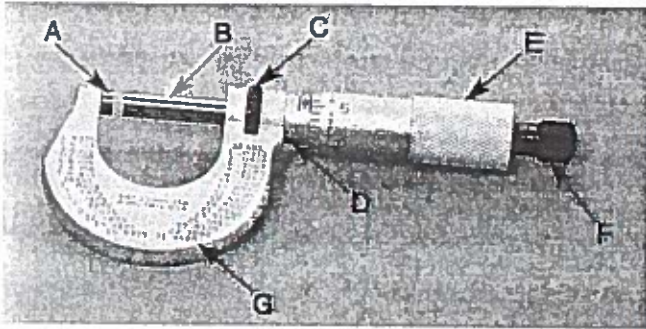
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

21. Why is it important to clamp a workpiece to a workbench or drill press table before drilling a hole in it?

22. True or False? A workpiece should be put into firm contact with a bench grinder's abrasive wheel before the grinder is turned on.

23. Some cleaning tanks are equipped with a(n) _____, which automatically closes the lid in case of fire.

24. Label the parts of the micrometer in the following illustration.



22. _____

23. _____

24. A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

G. _____

25. To measure the diameter of a cylinder, you should use a(n) _____ micrometer.

26. A(n) _____ micrometer should be used for taking measurements in narrow grooves.

27. Each small space on the sleeve of a standard micrometer represents a distance of _____ an inch.

28. Each space on the thimble of a standard micrometer represents a distance of _____ an inch.

29. Assume that the micrometers in the following illustration are 0-1" standard micrometers. Read the scales and record your answers in the appropriate blanks.

25. _____

26. _____

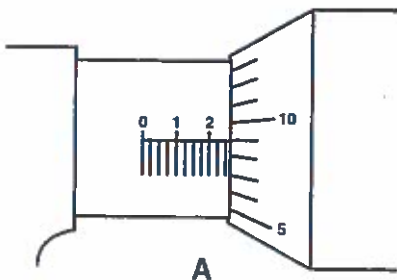
27. _____

28. _____

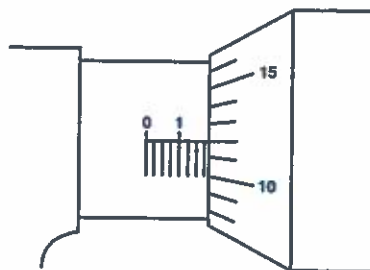
29. A. _____

B. _____

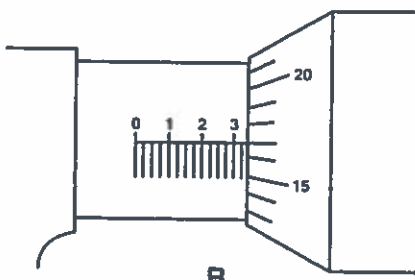
C. _____



A



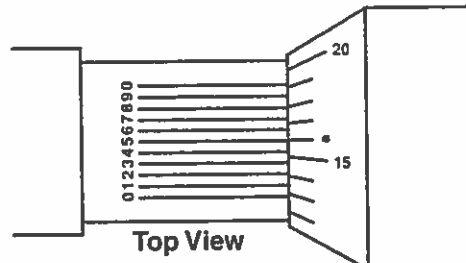
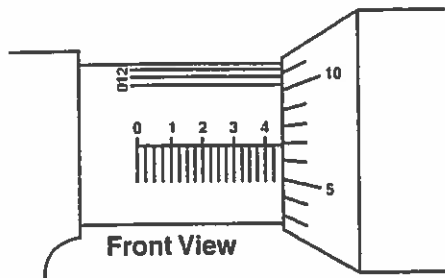
C



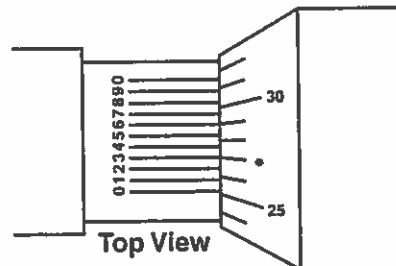
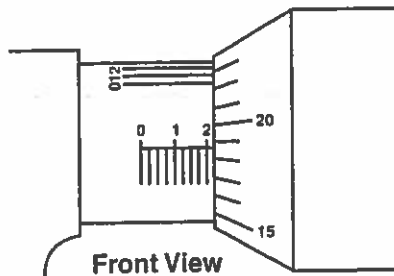
B

Name _____

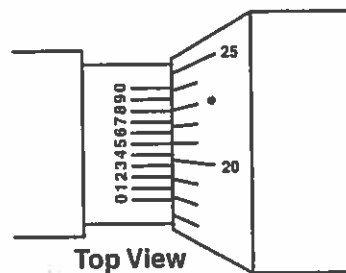
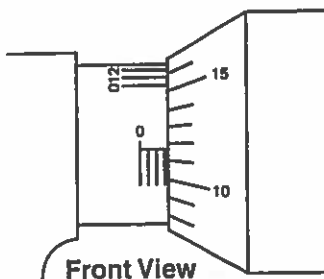
30. Assume that the micrometers in the following illustration are 0–1" Vernier micrometers. Read the scales and record your answers in the appropriate blanks.



A



B



C

31. To measure an inside dimension with a telescoping gauge, it is also necessary to use a(n) _____ micrometer.
32. A(n) _____ gauge is used to measure holes that are too small to be measured with a telescoping gauge.
33. A tool called a(n) _____ gauge is used to measure very small gaps between surfaces.
34. True or False? A dial indicator can be used to measure part movement and runout.
35. An instrument used to determine the number of threads per inch on a bolt, nut, or threaded hole is called a(n) _____ gauge.

30. A. _____

B. _____

C. _____

31. _____

32. _____

33. _____

34. _____

35. _____

Tools of the Small Engine Mechanic Video Worksheet

Name _____

Date: _____

1. Circle the type of wrench that will grip a bolt better (1:45).

Twelve Point

Six Point

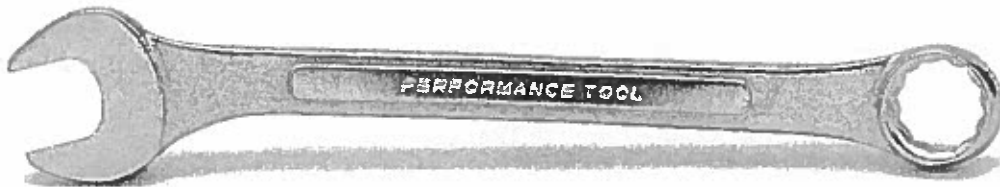
2. Circle the type of wrench that only grips two sides of a nut or wrench and will likely slip off a stubborn nut or bolt (1:57).

Box End Wrench

Open End Wrench

Flare Wrench

3. Circle the type of wrench that is shown below (2:15).



Combination Wrench

Open End Wrench

Flare Wrench

4. Circle the name of the tool shown below (2:31)?

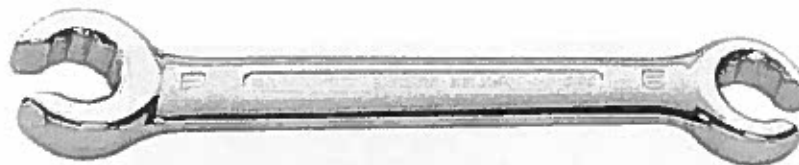


Combination Wrench

Open End Wrench

Adjustable Wrench

5. Circle the type of wrench shown below (3:40).

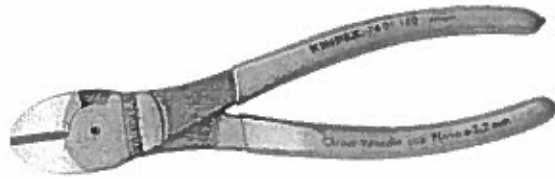


Combination Wrench

Open End Wrench

Flare Wrench

6. Circle the type of tool shown below (6:00).



Wire Cutters

Diagonal Cutters

Wire Strippers

7. Circle the type of plier shown below (7:00).



Pointed Pliers

Needle Nose Pliers

Retaining Pliers

8. List three types of common screwdrivers (7:28)

- a.
- b.
- c.

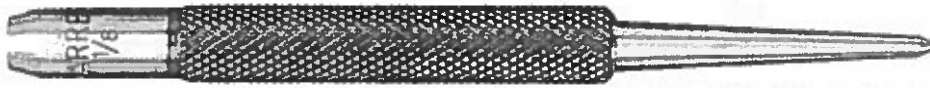
9. List two common types of hammers (8:42)

- a.
- b.

10. Describe what caused the end of this chisel to look like the picture below and what must be done to repair it (9:57)?



11. Circle the type of punch that is shown below (10:27).



Ridge Punch

Tapered Punch

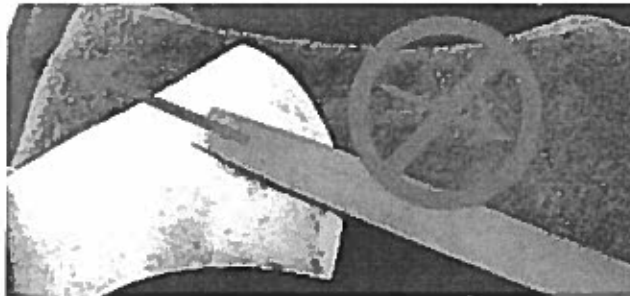
Center Punch

12. What direction should the teeth of a hacksaw blade face (11:29)?

Towards the handle

Towards the front

13. Circle below what can happen to a file that is dragged on the return stroke (12:52)?



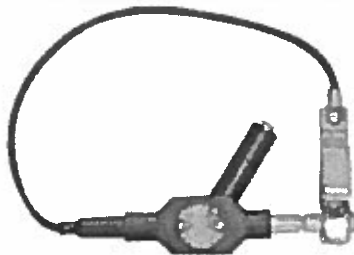
Nothing

It can be dulled

It hardens the metal

14. Why should a gear puller NEVER be used to remove a flywheel (13:50)?

15. Circle the type of tool below (18:35)



Gas Analyzer

Starter Current Tester

Spark Tester

16. When using a compression tester, what position should the throttle be in to get maximum compression readings (19:11)?

Idle Position

Half Throttle Position

Full Throttle Position

17. How far away should the tool rest be adjusted away from the bench grinder wheel (20:35)?

$\frac{1}{8}$ "

$\frac{3}{16}$ "

$\frac{1}{4}$ "

18. Identify the type of micrometer shown below (21:24).



Inside Micrometer

Depth Micrometer

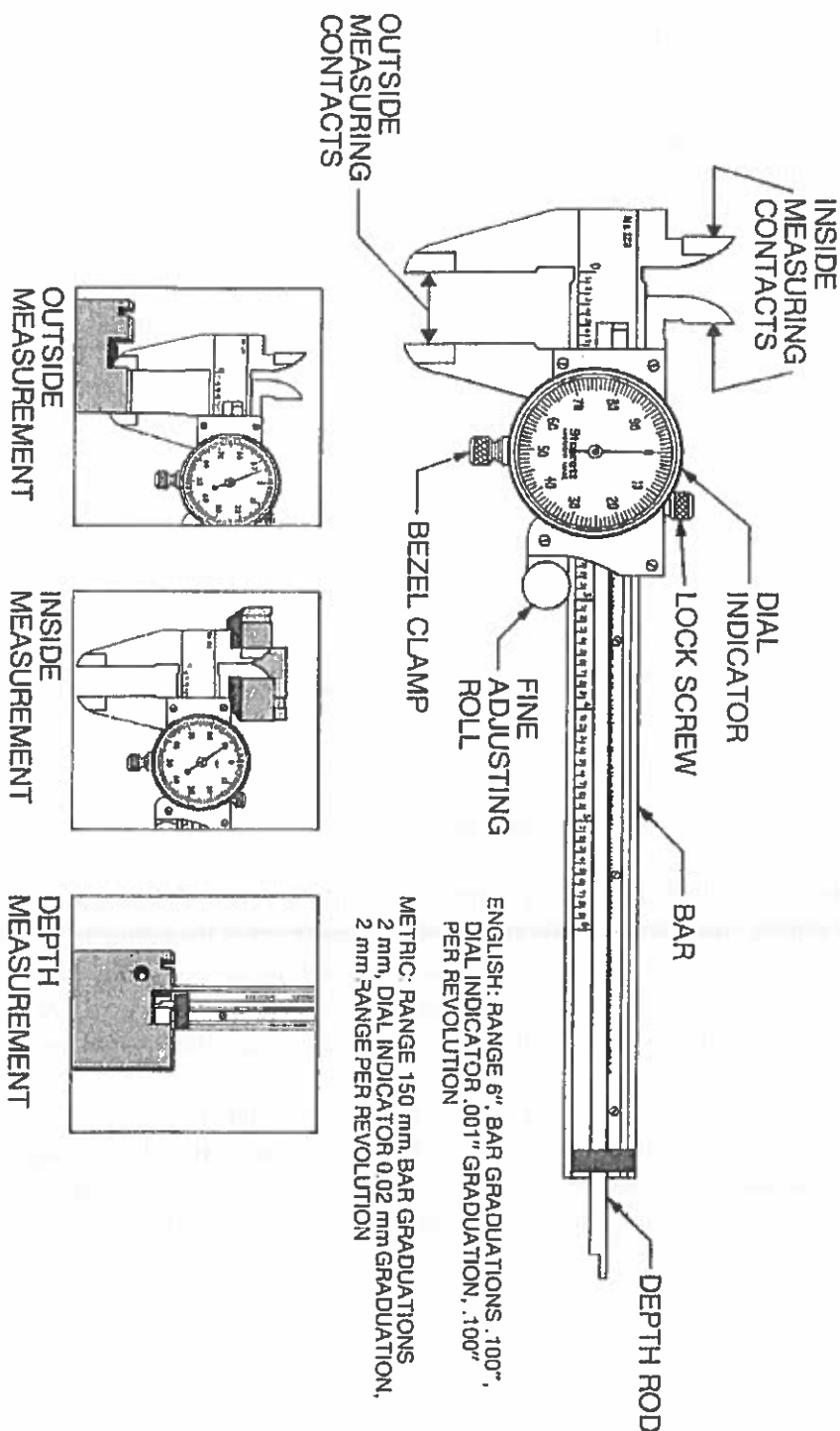
Outside Micrometer

Activity Sheet 6

HOW TO USE A DIAL CALIPER

Starrett®

DIAL CALIPER



The L. S. Starrett Company, Athol, Massachusetts 01331, U.S.A.

Printed in U.S.A.

Activity Sheet 6

HOW TO USE A DIAL CALIPER - Continued

The manufacturing industry uses numerous measuring instruments to insure quality. These instruments, such as micrometers, calipers, and gages, are often used to measure parts for accuracy. Even the slightest variation of size can cause a part not to fit properly or not to work properly.

A dial caliper is one type of precise measuring instrument used in the manufacturing industry. Several types of measurements can be taken with a dial caliper. The outside measuring contacts can measure the outside diameter, the length, the height, or the thickness of a part. The inside measuring contacts can measure the inside diameter of a part. The depth rod at the end of the bar can measure the depth of a part.

The dial caliper on the adjacent page has a range from .001" to 6". The dial caliper is a relatively simple instrument to use.

Setting the Dial Caliper to Zero

Before a dial caliper is used to measure a part, it should be checked to make sure its zero setting is correct. This can be accomplished quickly in a few short steps.

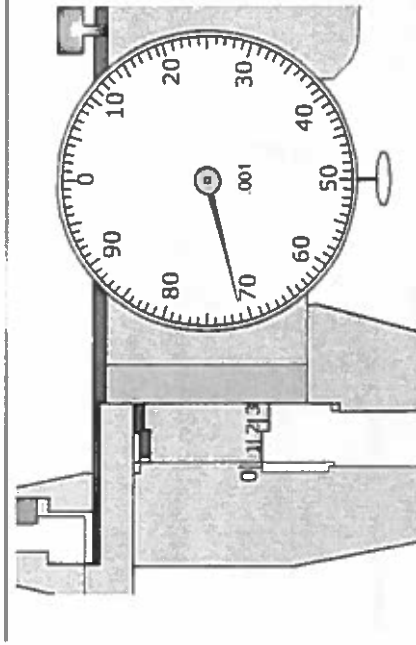
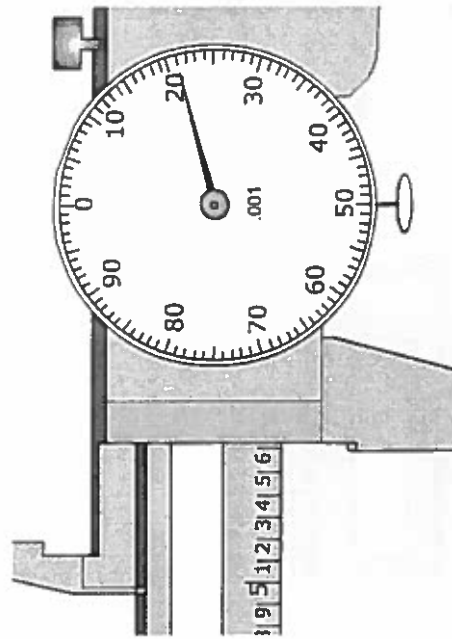
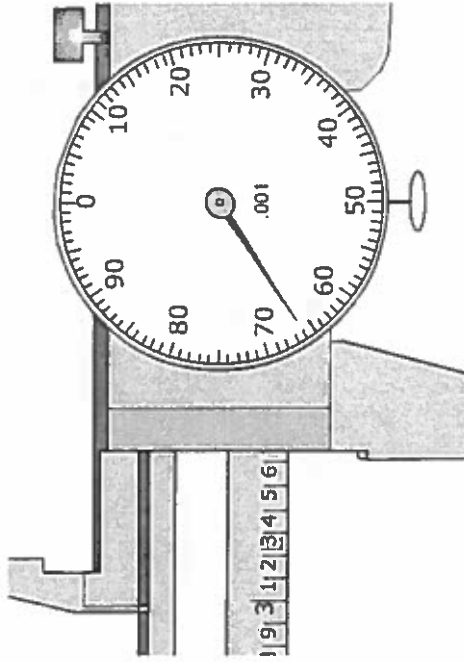
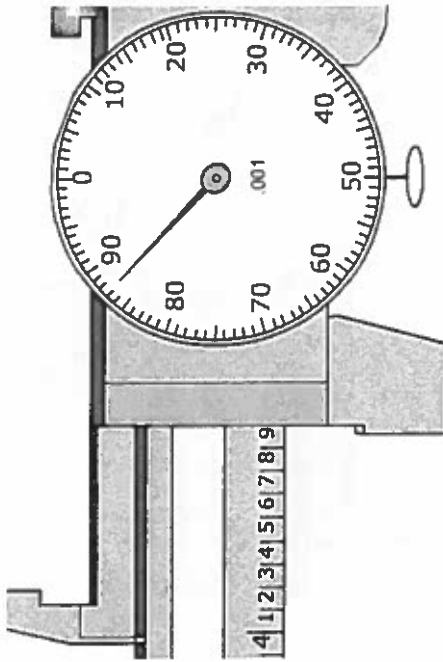
1. Wipe clean with a cloth the blades of the outside measuring contacts.
2. Close the contacts and hold with light pressure.
3. The dial indicator should be on 0.
4. If the dial indicator is not on 0, loosen the bezel clamp. Rotate the bezel so that the dial indicator is pointing to 0.
5. Tighten the bezel clamp.

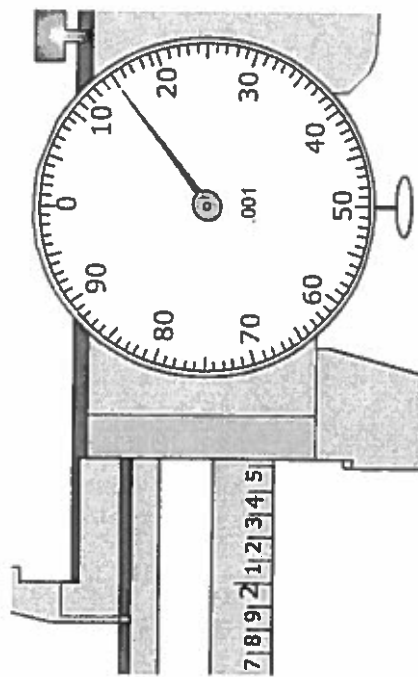
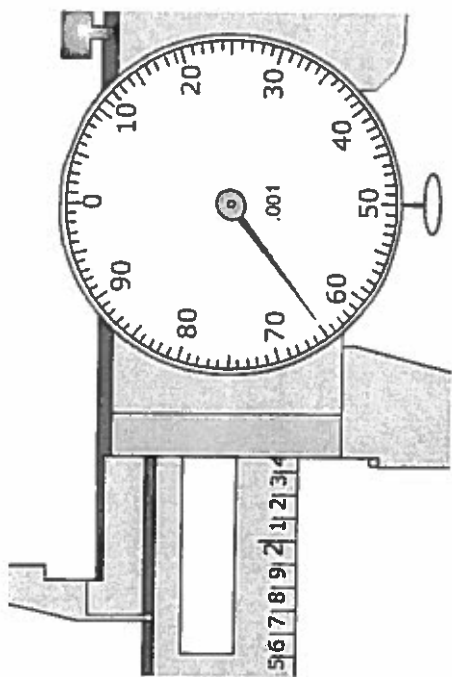
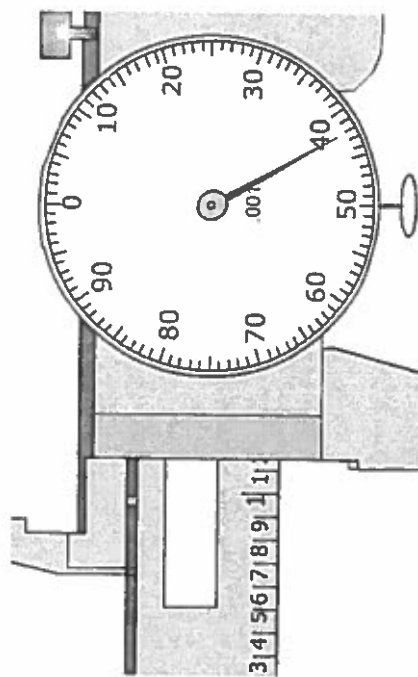
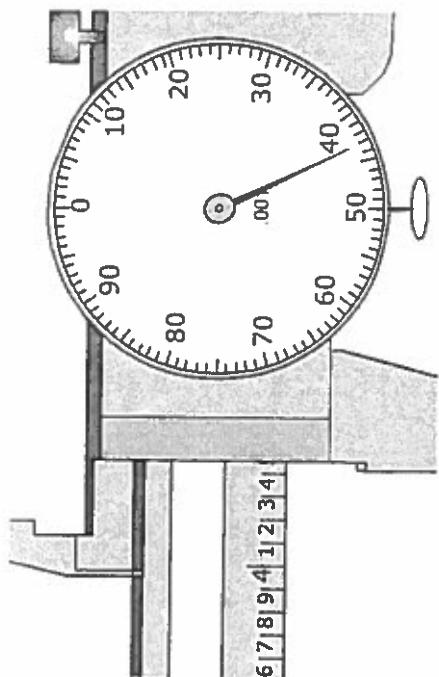
Using the Dial Caliper

1. For outside dimensions, place the outside measuring contacts around the object to be measured. Close the moveable jaw around the object. You should apply just enough pressure that the contacts can hold the object, but do not squeeze the jaws too tightly. This can give false measurement. For inside dimensions, place the inside measuring contacts inside the object to be measured. Once again, light pressure must be applied so that the inside measuring contacts are placed firmly in the object. See the illustration on the previous page.
2. To read the measurement of the caliper, the bar must be read first and the dial. The bar is divided into inches and those inches are divided into tenths. The dial is divided into thousandths. The reading on the bar is added to the reading on the dial. For example, if a part is measured 1.531, the bar would read 1.5 and the dial would read .031. These numbers are added together. A picture of dial caliper illustrates this on the next page.

Name: _____ Date: _____ Period: _____

Calipers Worksheet





PRECISION MEASUREMENT WORKSHEET – DIAL CALIPERS

NAME:

NAME:

DATE:

PERIOD:

What are the dimensions of the CD that you got when using the STANDARD/METRIC SCALE)?
Write your answers below (in inches):

Dimension A:

Dimension B:

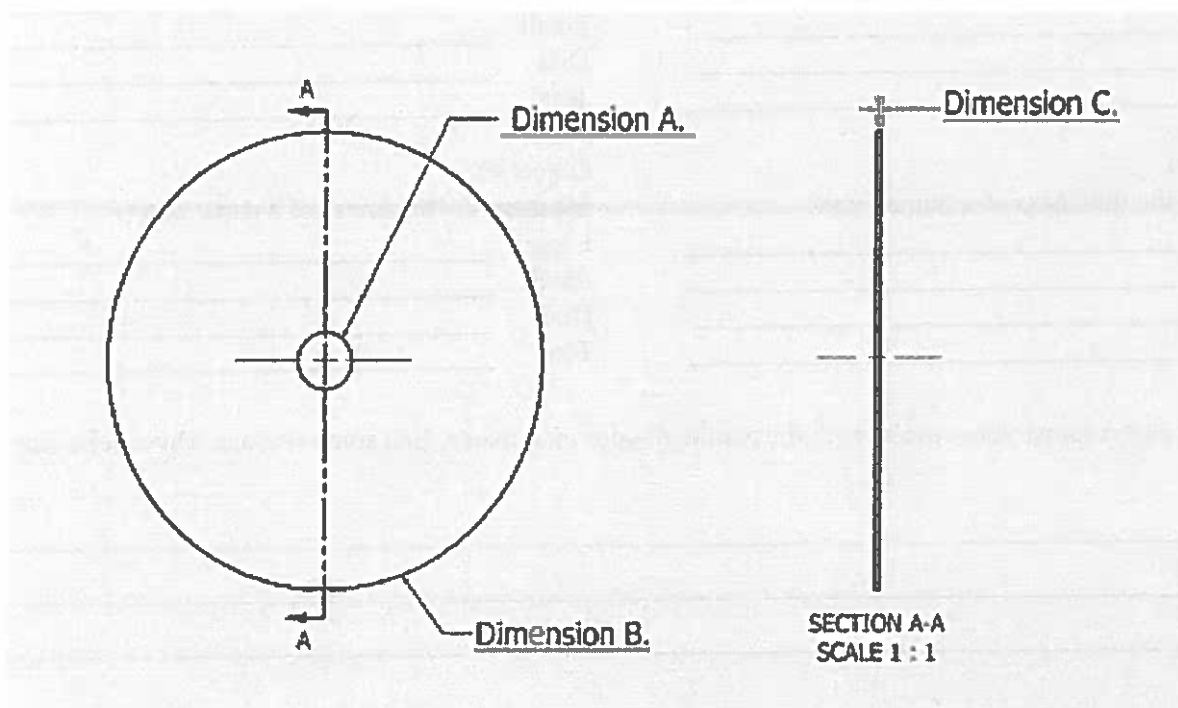
Dimension C:

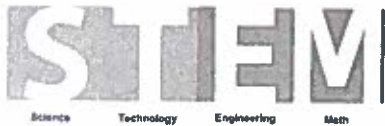
What are the dimensions of the CD that you got when using the DIAL CALIPERS? Write your answers below (in inches):

Dimension A:

Dimension B:

Dimension C:





Activity Sheet 7

■ ■ MEASURING WITH A DIAL CALIPER ■ ■

The manufacturing industry requires precision in its production of parts. Numerous precision measuring instruments are used to maintain quality. Practice using a dial caliper by measuring the following common objects.

Object #1

Measure the thickness of a pencil.

Large _____
Small _____
Dial _____
Total _____

Object #5

Measure the thickness of a pen cap.

Large _____
Small _____
Dial _____
Total _____

Object #2

Measure the width of a penny.

Large _____
Small _____
Dial _____
Total _____

Object #6

Measure the thickness of a textbook cover.

Large _____
Small _____
Dial _____
Total _____

Object #3

Measure the thickness of a sheet of paper.

Large _____
Small _____
Dial _____
Total _____

Object #7

Measure the thickness of a dime.

Large _____
Small _____
Dial _____
Total _____

Object #4

Measure the thickness of a human hair.

Large _____
Small _____
Dial _____
Total _____

Object #8

Measure the thickness of a paper clip

Large _____
Small _____
Dial _____
Total _____

Compare and contrast your results with the results of your classmates. List some reasons why results may vary.
