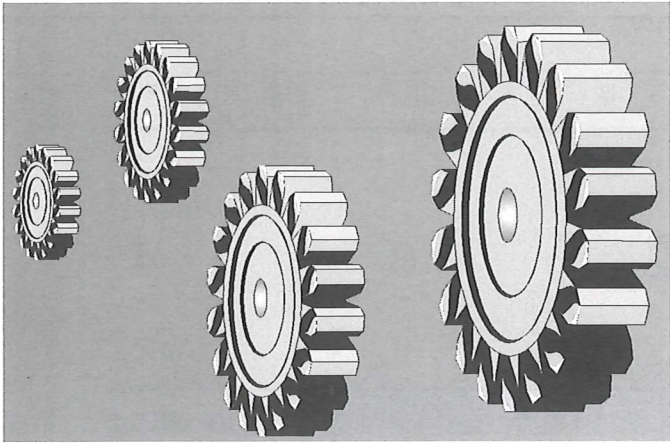


Chapter 4

Measurement



Name: _____ Date: _____

Score: _____ Text pages 55–80

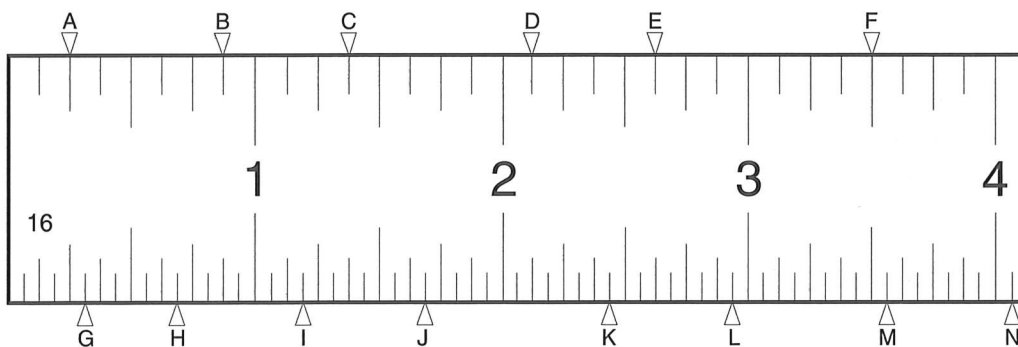
LEARNING OBJECTIVES

After studying this chapter, you will be able to:

- Measure to $1/64''$ (0.5 mm) with a steel rule.
- Measure to $0.0001''$ (0.002 mm) using a Vernier micrometer caliper.
- Measure to $0.001''$ (0.02 mm) using Vernier measuring tools.
- Measure angles to $0^{\circ}5'$ using a universal Vernier bevel.
- Identify and use various types of gages found in a machine shop.
- Use a dial indicator.
- Employ the various helper measuring tools found in a machine shop.

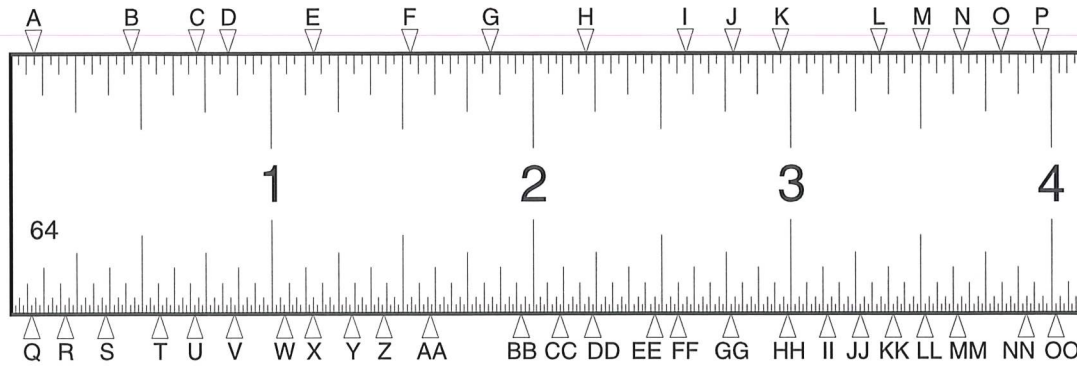
■ Carefully study the chapter, then answer the following questions in the space provided.

1. Make readings from the ruler shown below.



- | | |
|----------|----------|
| A. _____ | H. _____ |
| B. _____ | I. _____ |
| C. _____ | J. _____ |
| D. _____ | K. _____ |
| E. _____ | L. _____ |
| F. _____ | M. _____ |
| G. _____ | N. _____ |

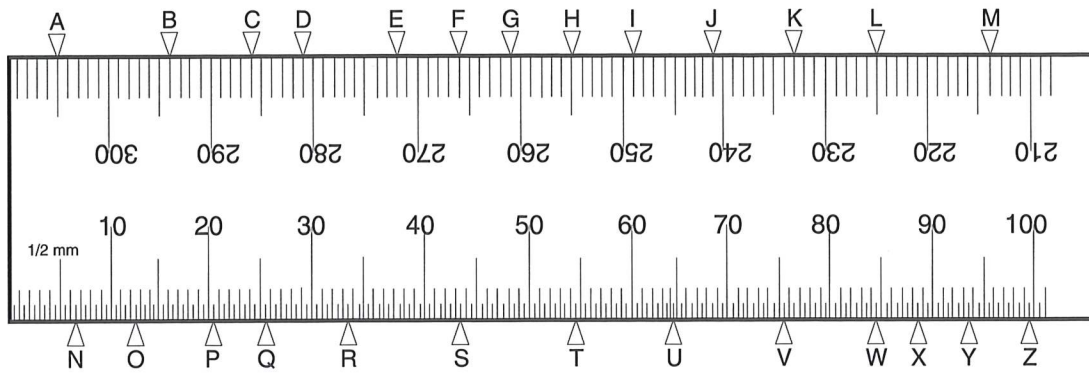
2. Make readings from the ruler shown below.



- A. _____
- B. _____
- C. _____
- D. _____
- E. _____
- F. _____
- G. _____
- H. _____
- I. _____
- J. _____
- K. _____
- L. _____
- M. _____
- N. _____
- O. _____
- P. _____
- Q. _____
- R. _____
- S. _____
- T. _____
- U. _____

- V. _____
- W. _____
- X. _____
- Y. _____
- Z. _____
- AA. _____
- BB. _____
- CC. _____
- DD. _____
- EE. _____
- FF. _____
- GG. _____
- HH. _____
- II. _____
- JJ. _____
- KK. _____
- LL. _____
- MM. _____
- NN. _____
- OO. _____

3. Make the readings from the metric ruler shown below.



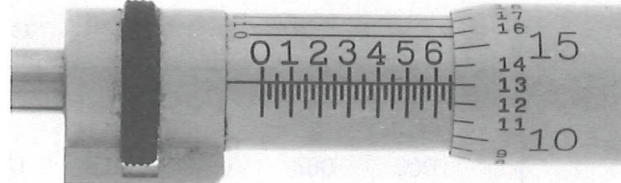
- A. _____
- B. _____
- C. _____
- D. _____
- E. _____
- F. _____
- G. _____
- H. _____
- I. _____
- J. _____
- K. _____
- L. _____
- M. _____

- N. _____
- O. _____
- P. _____
- Q. _____
- R. _____
- S. _____
- T. _____
- U. _____
- V. _____
- W. _____
- X. _____
- Y. _____
- Z. _____

4. Make readings from the micrometers shown below.



A. _____

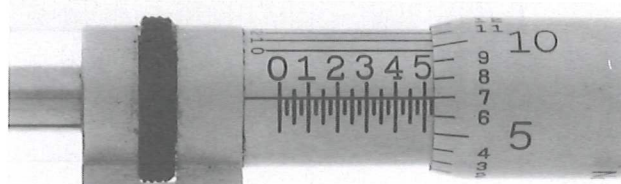


B. _____

5. Make readings from the micrometers shown below.

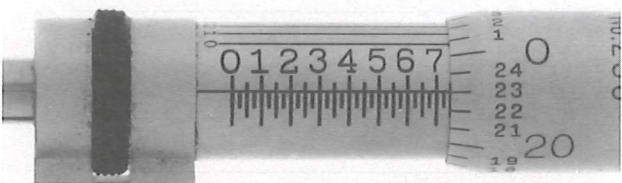


A. _____

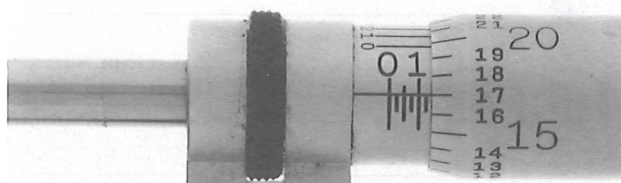


B. _____

6. Make readings from the micrometers shown below.

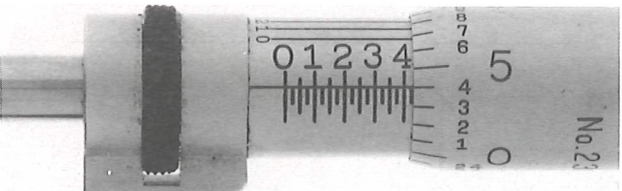


A. _____

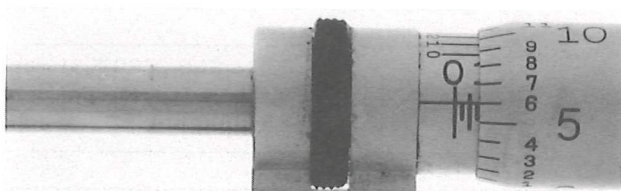


B. _____

7. Make readings from the micrometers shown below.

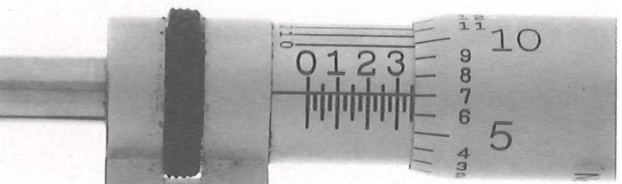


A. _____

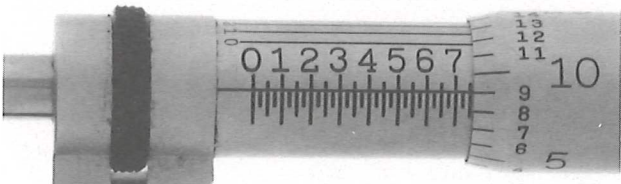


B. _____

8. Make readings from the micrometers shown below.

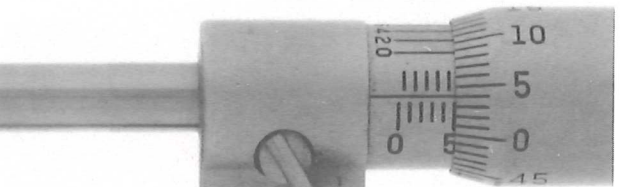


A. _____

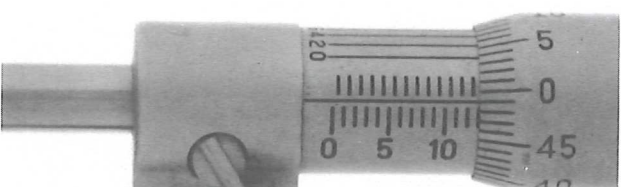


B. _____

9. Make readings from the micrometers shown below.

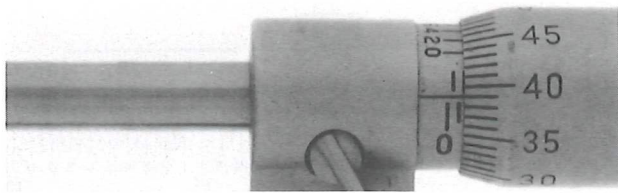


A. _____

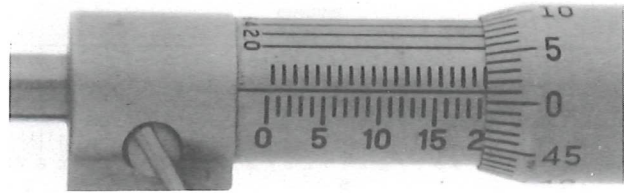


B. _____

10. Make readings from the micrometers shown below.

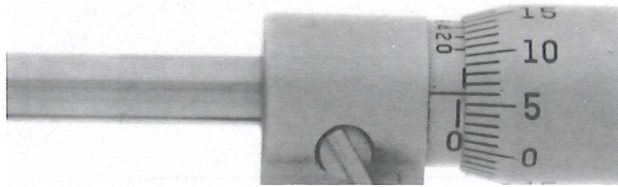


A. _____

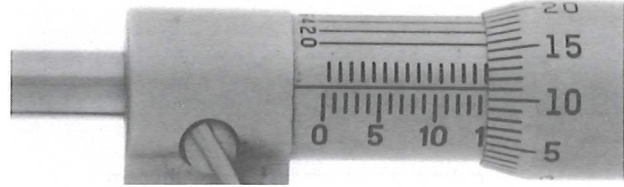


B. _____

11. Make readings from the micrometers shown below.

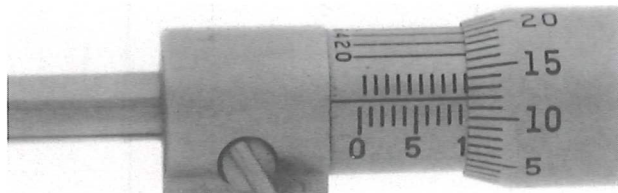


A. _____

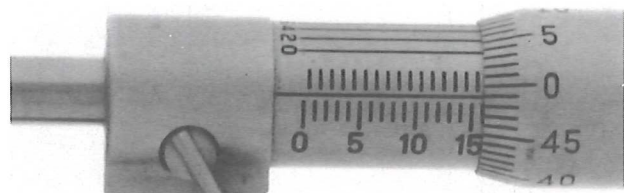


B. _____

12. Make readings from the micrometers shown below.

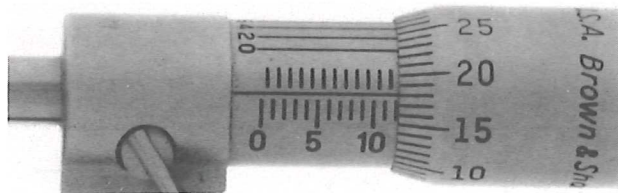


A. _____

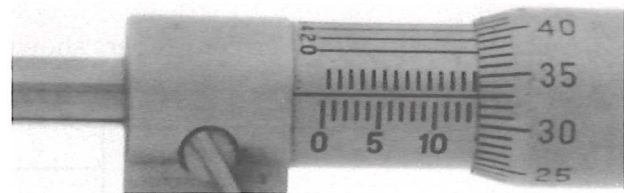


B. _____

13. Make readings from the micrometers shown below.

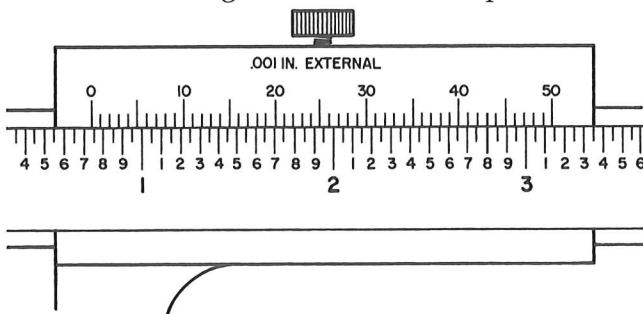


A. _____

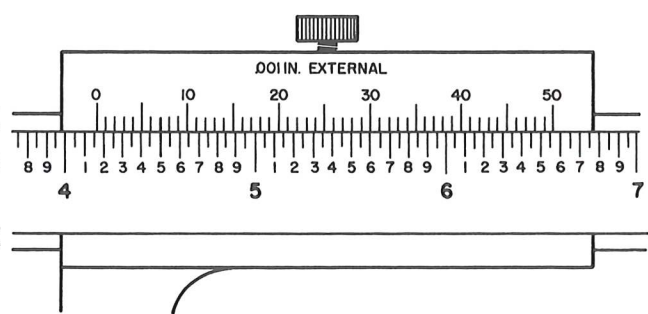


B. _____

14. Make readings of the Vernier calipers shown below.

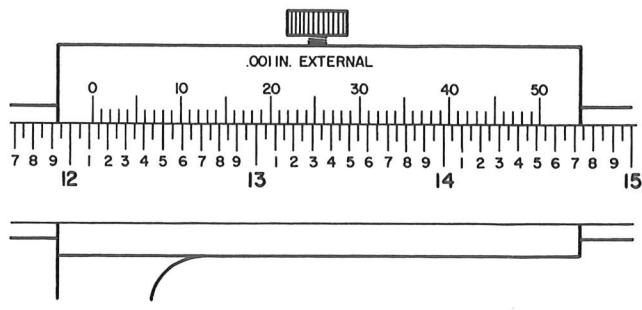
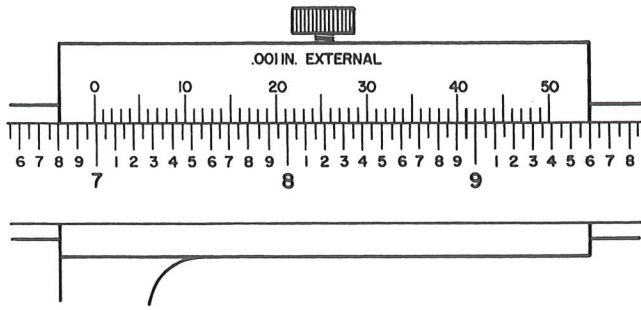


A. _____



B. _____

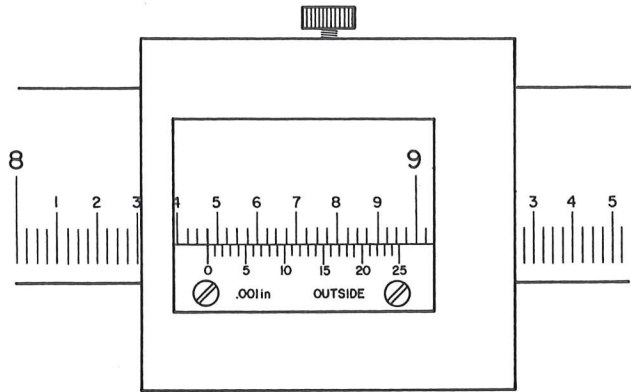
15. Make readings of the Vernier calipers shown below.



A. _____

B. _____

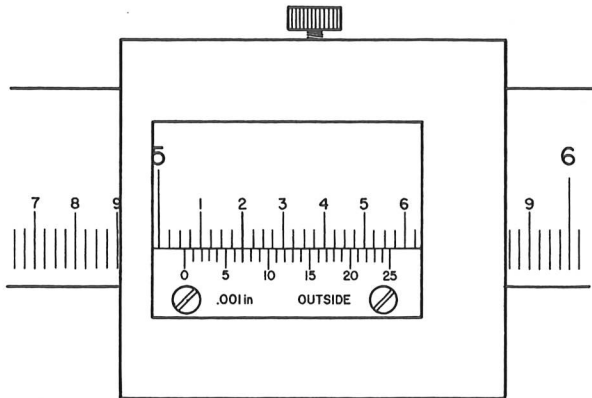
16. Make readings of the Vernier calipers shown below.



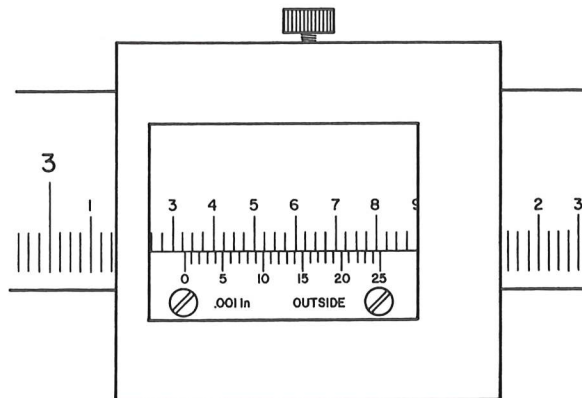
A. _____

B. _____

17. Make readings of the Vernier calipers shown below.

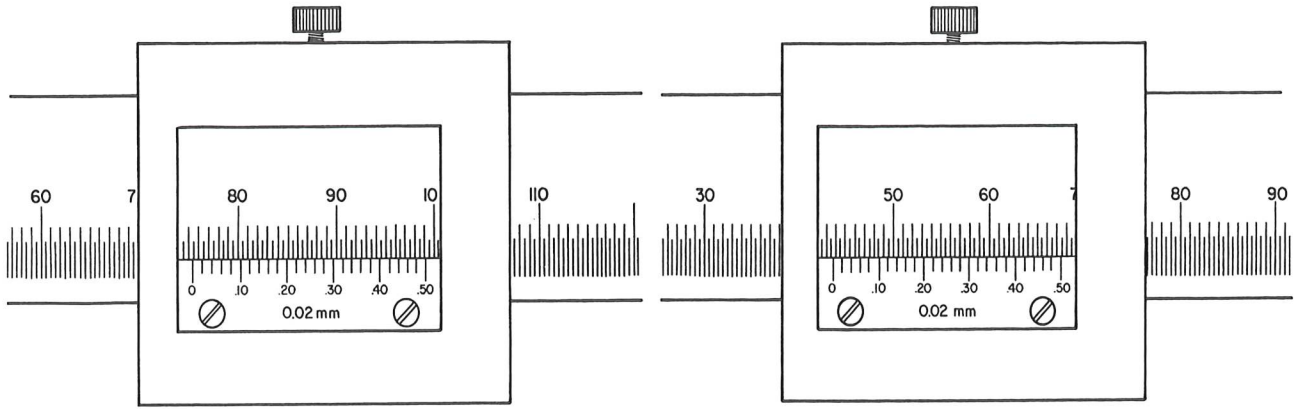


A. _____



B. _____

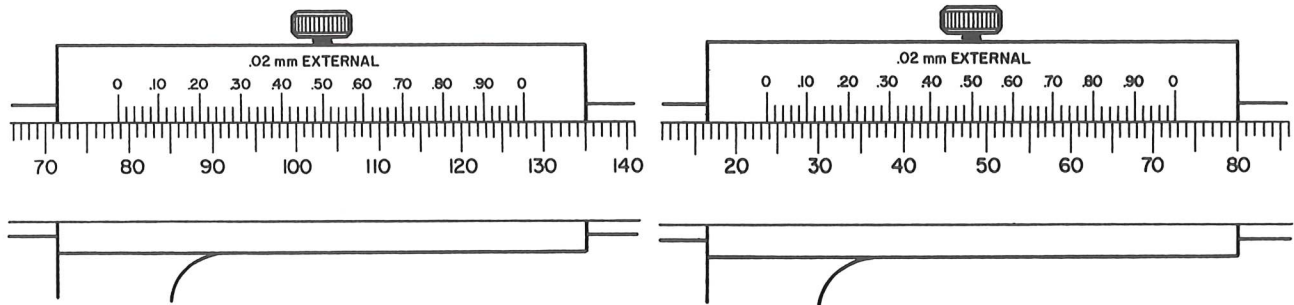
18. Make readings of the Vernier calipers shown below.



A. _____

B. _____

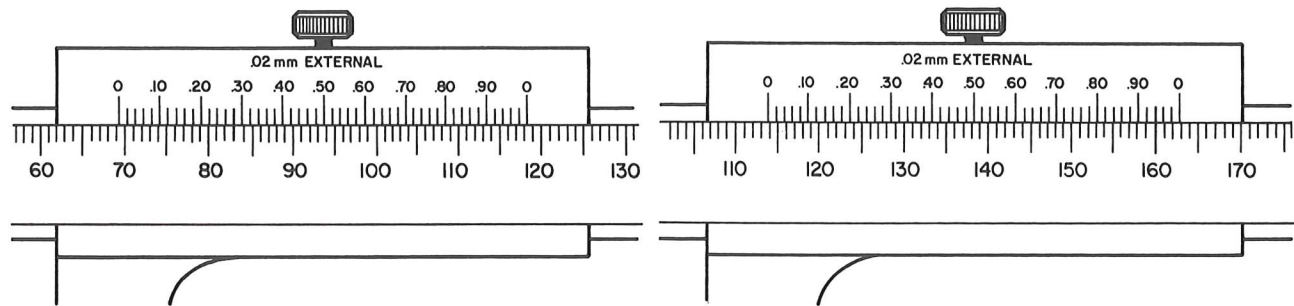
19. Make readings of the Vernier calipers shown below.



A. _____

B. _____

20. Make readings of the Vernier calipers shown below.



A. _____

B. _____

21. A Vernier caliper has which of the following advantages over a micrometer?

- a. Easier to use.
- b. It can be used to make both inside and outside measurements over a range of sizes.
- c. Permits a range of measurements that would require several sizes of micrometers.
- d. Both b and c.
- e. None of the above.

21. _____

22. The micrometer caliper, known as a mike, is a precision measuring tool capable of reading to _____ of an inch, and when fitted with a Vernier scale to _____ of an inch. 22. _____

23. A metric micrometer caliper is capable of reading to the _____ part of a millimeter, and to _____ when fitted with a Vernier scale. 23. _____

24. How does a Vernier caliper differ from a dial caliper? _____

25. The micrometer caliper and Vernier caliper are precision measuring tools that require care in use if they are to retain their accuracy. List five precautions that must be observed when using them.

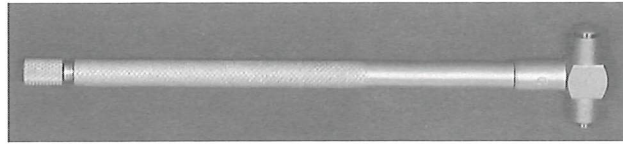
26. The universal Vernier protractor can measure angles accurately to _____ of a degree or _____ minutes. 26. _____

27. The double end cylindrical plug gage is also known as a(n) _____ gage. 27. _____
28. A progressive plug gage is able to check _____

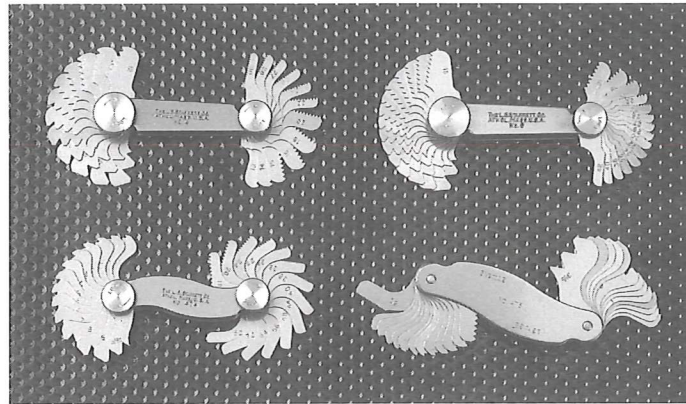
29. An air gage measuring tool employs air pressure to measure internal diameters. It is especially useful for measuring deep internal bores. It operates on the principle of _____

30. Dial indicators can be used for _____. 30. _____
 a. centering and aligning work on machine tools
 b. checking for eccentricity
 c. visual inspection
 d. All of the above.
 e. None of the above.
31. Optical flats employ _____ _____ as a standard to make measurements. 30. _____
32. What is an *optical comparator*? _____

33. The _____ illustrated below is a tool that can be employed to make accurate internal measurements but it must be used with a micrometer or Vernier caliper. 33. _____



34. The screw pitch gages illustrated below can be used to determine _____



35. Of what use is the fillet and radius gage? _____

36. What are helper measuring tools? _____

37. List four helper type measuring tools.

38. Dial indicators would be classified as _____. 38. _____
 a. helper type measuring tools
 b. direct measuring tools
 c. a combination of both types
 d. All of the above.
 e. None of the above.

39. Drill rods are steel rods used to inspect hole _____.
a. diameter
b. location
c. alignment
d. All of the above.
e. None of the above.
39. _____
40. A small hole gage is used to measure _____.
a. concave and convex radii on corners
b. openings that are too large for a telescoping gage
c. openings that are too small for a telescoping gage
d. All of the above.
e. None of the above.
40. _____