IE-352
Section 1, CRN: 5022
Section 2, CRN: 32997
Second Semester 1432-33 H (Spring-2012) – 4(4,1,1)
MANUFACTURING PROCESSES - 2

Thursday, Mar 15, 2012 (22/04/1433H)

MIDTERM 1 ANSWERS [10 POINTS]

Name: Ahmed M. El-Sherbeeny, PhD	Student Number: 4	Section: Su-8:00 / Su-10:00

Place the correct letter in the box at the right of each question [$\frac{1}{2}$ Point Each]

1. **Which of the following does not directly "touch the product" at any point?** B

   a. quality control system

   b. production planning and control (see slides 1-54, 53)

   c. manufacturing systems

   d. production facilities

   e. flow line production

2. **Clay (such as the one shown below) is an example of …** E

   a. thermoplastic polymer

   b. nonferrous metal

   c. ferrous metal

   d. glass ceramic

   e. crystalline ceramic (see slide 1-24)

3. **Which of the following is an example of a *material removal process*?** A

   a. milling (see slide 1-38)

   b. forging

   c. sintering

   d. metal casting

   e. sand blasting

4. **Symbols ⌭ , // , —, respectively, refer to which geometric tolerances?** **D**

   a. cylindricity, symmetry, straightness

   b. circularity, parallelism, straightness

   c. cylindricity, parallelism, flatness

   d. cylindricity, parallelism, straightness (see slides 4-6,7)

   e. circularity, symmetry, flatness

5. **How do you read the feature control frame shown below?** **C**

   a. feature plane must lie at specified angle to datum **A**, and within 0.006 tolerance **between any two planes parallel** to the angled face

   b. feature plane must lie at specified angle to datum **T**, and within 0.006 tolerance **below** the plane tangent to **high points** on the surface of the feature plane

   c. feature plane must lie at specified angle to datum A, and within 0.006 tolerance below the plane tangent to high points on the surface of the feature plane (see slide 4-29)

   d. feature plane must lie at specified angle to datum **T**, and within 0.006 tolerance **between any two planes parallel** to the angled face

   e. feature plane must lie at specified angle to datum **A**, and within 0.006 tolerance **above** the plane tangent to **low points** on the surface of the feature plane

6. **Classify the following geometric tolerances: *concentricity*; *cylindricity*; *position*:** **B**

   a. form tolerance; location tolerance; form tolerance

   b. location tolerance; form tolerance; location tolerance (slide 4-7)

   c. location tolerance; orientation tolerance; location tolerance

   d. orientation tolerance; form tolerance; orientation tolerance

   e. location tolerance; form tolerance; orientation tolerance

7. **According to the *ANSI Y14.5M Rule #1* (describing material condition),** **E**

   a. a hole is a perfect cylinder when it is at its largest permissible diameter

   b. feature must have perfect form regardless of feature size

   c. feature must have perfect form at its least material condition

   d. a shaft is a perfect cylinder when it is at its smallest permissible diameter

   e. planes must be perfectly parallel when at their maximum distance apart (slide 4-14)

Questions 8-9. **Examine the figure below and answer the following questions.**

8. **Feature size at V_C =** **A**

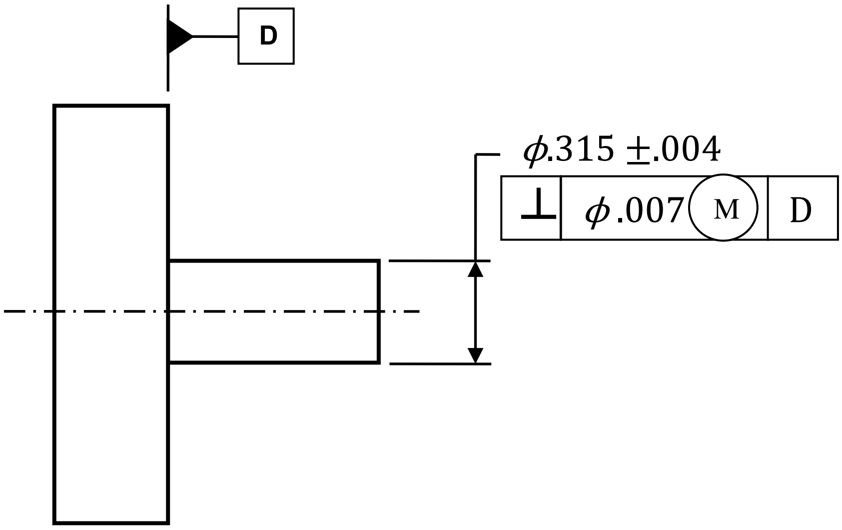
a. 0.326

b. 0.319

c. 0.322

d. 0.311

e. 0.304



$V_c = MMC + 0.007 = (0.315 + 0.004) + 0.007 = \mathbf{0.326}$

9. **At shaft size 0.318, geometric tolerance =** **D**

a. 0.007

b. 0.001

c. 0.014

d. 0.008

e. 0.010

$GT_{0.318} = V_c - size = 0.326 - 0.318 = \mathbf{0.008}$

10. **What is true below about any $FN2$ fit?** **A**

a. $shaft_{MMC} > hole_{MMC}$; $shaft_{LMC} > hole_{LMC}$ (slide 3-26)

b. $shaft_{MMC} < hole_{MMC}$; $shaft_{LMC} \geq hole_{LMC}$

c. $shaft_{MMC} < hole_{MMC}$; $shaft_{LMC} < hole_{LMC}$

d. $shaft_{MMC} \geq hole_{MMC}$; $shaft_{LMC} \leq hole_{LMC}$

e. $shaft_{MMC} \leq hole_{MMC}$; $shaft_{LMC} \geq hole_{LMC}$

11. **The *limits of clearance* in ANY shaft-hole system are: $min_{cl} = \cdots$; $max_{cl} = \cdots$** **C**

a. $max.hole\ size - min.shaft\ size$; $min.hole\ size - max.shaft\ size$

b. $max.shaft\ size - min.hole\ size$; $min.shaft\ size - max.hole\ size$

c. $min.hole\ size - max.shaft\ size$; $max.hole\ size - min\ shaft\ size$ (slides 3-38, 39)

d. $min. shaft\ size - max. hole\ size; max. shaft\ size - min. hole\ size$

e. $max. hole\ size - basic\ size; min. hole\ size - basic\ size$

Questions 12-15. Consider a $1\text{–}\frac{3}{16}$" nominal diameter, LN 3 fit between a shaft and a hole.

VALUES SHOWN BELOW ARE IN THOUSANDTHS OF AN INCH

Nominal Size Range (Inches)		Class LN1			Class LN2			Class LN3		
		Interference Limits	Standard Tolerance Limits		Interference Limits	Standard Tolerance Limits		Interference Limits	Standard Tolerance Limits	
Over	To		Hole H6	Shaft n5		Hole H7	Shaft p6		Hole H7	Shaft r6
0	0.12	0 0.45	+0.25 0	+0.45 +0.25	0 0.65	+0.4 0	+0.65 +0.4	0.1 0.75	+0.4 0	+0.75 +0.5
0.12	0.24	0 0.5	+0.3 0	+0.5 +0.3	0 0.8	+0.5 0	+0.8 +0.5	0.1 0.9	+0.5 0	+0.9 +0.6
0.24	0.40	0 0.65	+0.4 0	+0.65 +0.4	0 1.0	+0.6 0	+1.0 +0.6	0.2 1.2	+0.6 0	+1.2 +0.8
0.40	0.71	0 0.8	+0.4 0	+0.8 +0.4	0 1.1	+0.7 0	+1.1 +0.7	0.3 1.4	+0.7 0	+1.4 +1.0
0.71	1.19	0 1.0	+0.5 0	+1.0 +0.5	0 1.3	+0.8 0	+1.3 +0.8	0.4 1.7	+0.8 0	+1.7 +1.2
1.19	1.97	0 1.1	+0.6 0	+1.1 +0.6	0 1.6	+1.0 0	+1.6 +1.0	0.4 2.0	+1.0 0	+2.0 +1.4
1.97	3.15	0.1 1.3	+0.7 0	+1.3 +0.8	0.2 2.1	+1.2 0	+2.1 +1.4	0.4 2.3	+1.2 0	+3.2 +1.6
3.15	4.73	0.1 1.6	+0.9 0	+1.6 +1.0	0.2 2.5	+1.4 0	+2.5 +1.6	0.6 2.9	+1.4 0	+2.9 +2.0
4.73	7.09	0.2 1.9	+1.0 0	+1.9 +1.2	0.2 2.8	+1.6 0	+2.8 +1.8	0.9 3.5	+1.6 0	+3.5 +2.5
7.09	9.85	0.2 2.2	+1.2 0	+2.2 +1.4	0.2 3.2	+1.8 0	+3.2 +2.0	1.2 4.2	+1.8 0	+4.2 +3.0
9.85	12.41	0.2 2.3	+1.2 0	+2.3 +1.4	0.2 3.4	+2.0 0	+3.4 +2.2	1.5 4.7	+2.0 0	+4.7 +3.5

12. **The basic size (BS) is …** $\mathbf{1\text{–}\frac{3}{16}" = 1 + \frac{3}{16} = 1 + 0.1875 = 1.1875}$ **E**

a. 0.1875 in

b. 0.8125 in

c. 1.1250 in

d. 1.19 in

e. 1.1875 in

13. **Respectively,** $shaft_{MMC}$ =; $shaft_{LMC}$ =… **C**

a. 1.1892 in; 1.1875 in

b. 1.1883 in; 1.1875 in

c. $\mathbf{1.1892\ in; 1.1887\ in}$

d. $1.1875\ in; 1.1883\ in$

e. $1.1887\ in; 1.1892\ in$

$shaft_{MMC} = 1.1875 + 0.0017 = \mathbf{1.1892};\ shaft_{LMC} = 1.1875 + 0.0012 = \mathbf{1.1887}$

D

14. **Respectively,** $hole_{MMC}$ **=;** $hole_{LMC}$ **=…**

a. $1.1892\ in; 1.1875\ in$

b. $1.1883\ in; 1.1875\ in$

c. $1.1892\ in; 1.1887\ in$

d. $\mathbf{1.1875\ in; 1.1883\ in}$

e. $1.1887\ in; 1.1892\ in$

$hole_{MMC} = 1.1875 + 0 = basic\ size = \mathbf{1.1875};$

$hole_{LMC} = 1.1875 + 0.0008 = \mathbf{1.1883}$

C

15. $\boldsymbol{Maximum\ interference}$ **=…;** $\boldsymbol{Minimum\ interference}$ **=**

a. $0.0004\ in;\ 0.0017\ in$

b. $0.0008\ in;\ 0.0005\ in$

c. $\mathbf{0.0017\ in;\ 0.0004\ in}$

d. $0.0017\ in;\ 0.0005\ in$

e. $0.017\ in;\ 0.004\ in$

$Max.interference = hole_{MMC} - shaft_{MMC} = 1.1875 - 1.1892 = -0.0017\ clearance$

$= \mathbf{0.0017}\ \boldsymbol{interference}$

$Min.interference = hole_{LMC} - shaft_{LMC} = 1.1883 - 1.1887 = -0.0004\ clearance$

$= \mathbf{0.0004}\ \boldsymbol{interference}$

- Note, how you can confirm these two values from the “interference limits” column
- Also note how *LN* fits are described as location (i.e. small) interference (i.e. all shafts ≥ holes) fits

B

16. **The correct reading in the … shown below is …**

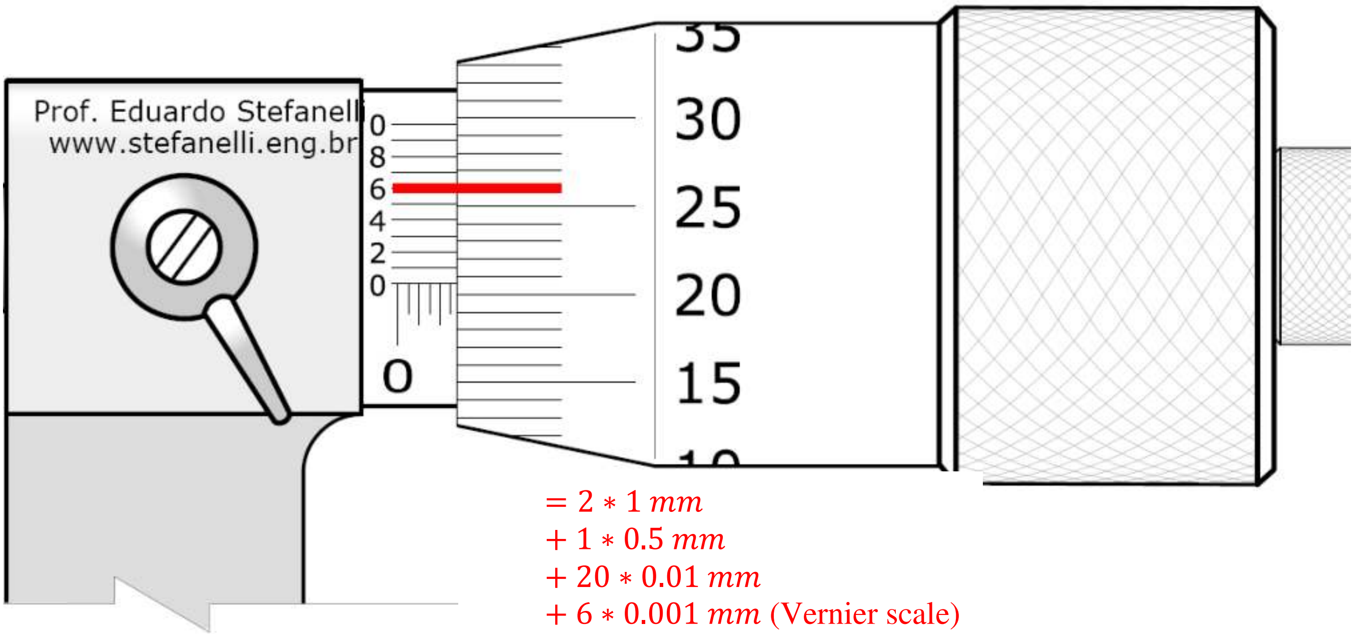
a. Vernier caliper; 2.206 mm

b. Vernier micrometer; 2.706 mm

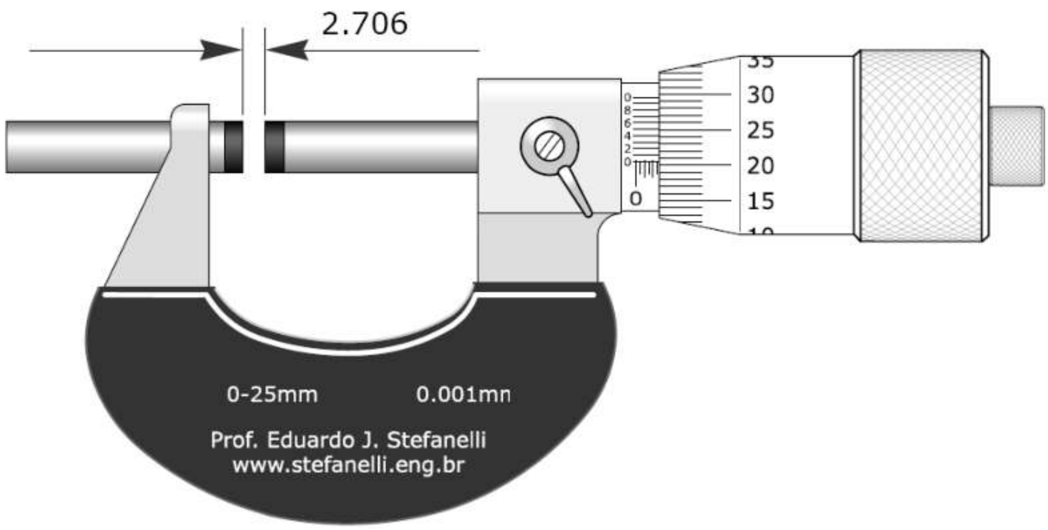
c. Vernier micrometer; 2.206 mm

d. micrometer; 2.706 mm

e. Vernier micrometer; 2.206 mm



$= 2 * 1\ mm$
$+ 1 * 0.5\ mm$
$+ 20 * 0.01\ mm$
$+ 6 * 0.001\ mm$ (Vernier scale)
$= \mathbf{2.706\ mm}$



D

17. **The correct reading in the … shown below is …**

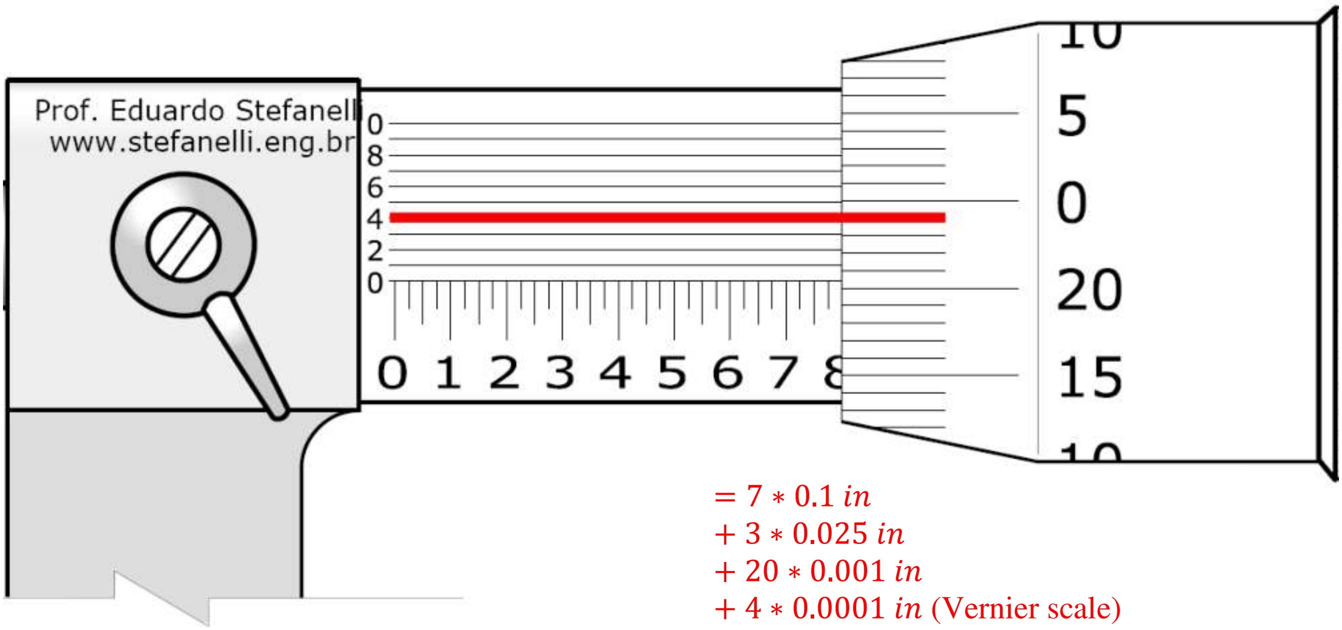
a. Vernier caliper; 0.7754 *in*

b. Vernier micrometer; 7.954 *in*

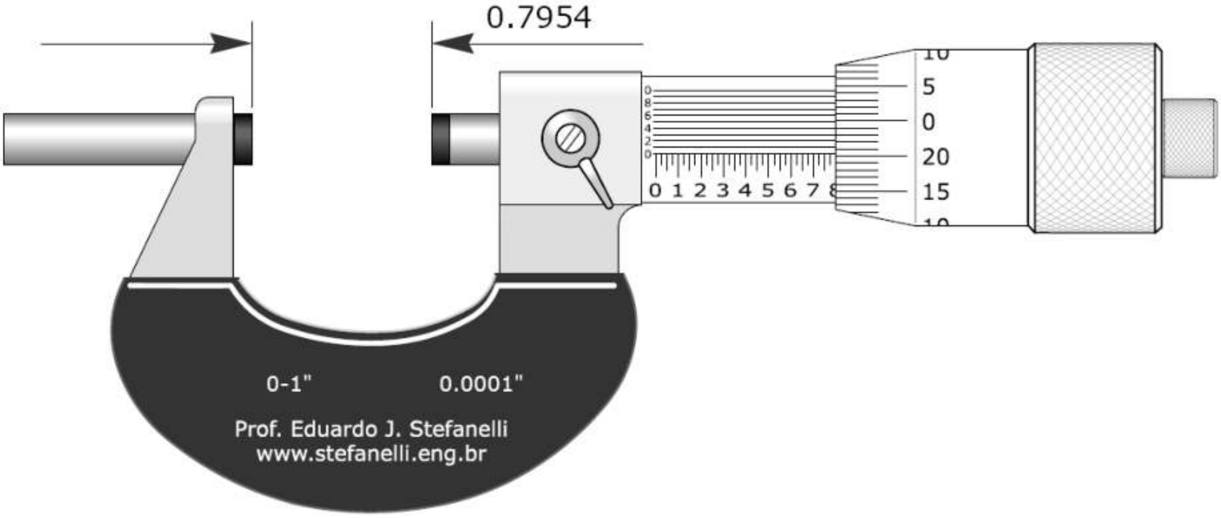
c. micrometer; 0.7204 *in*

d. Vernier micrometer; 0. 7954 in

e. Vernier micrometer; 0.7204 *in*



$= 7 * 0.1\ in$
$+ 3 * 0.025\ in$
$+ 20 * 0.001\ in$
$+ 4 * 0.0001\ in$ (Vernier scale)
$= \mathbf{0.7954\ in}$



18. **The correct reading in the … shown below is …**

A

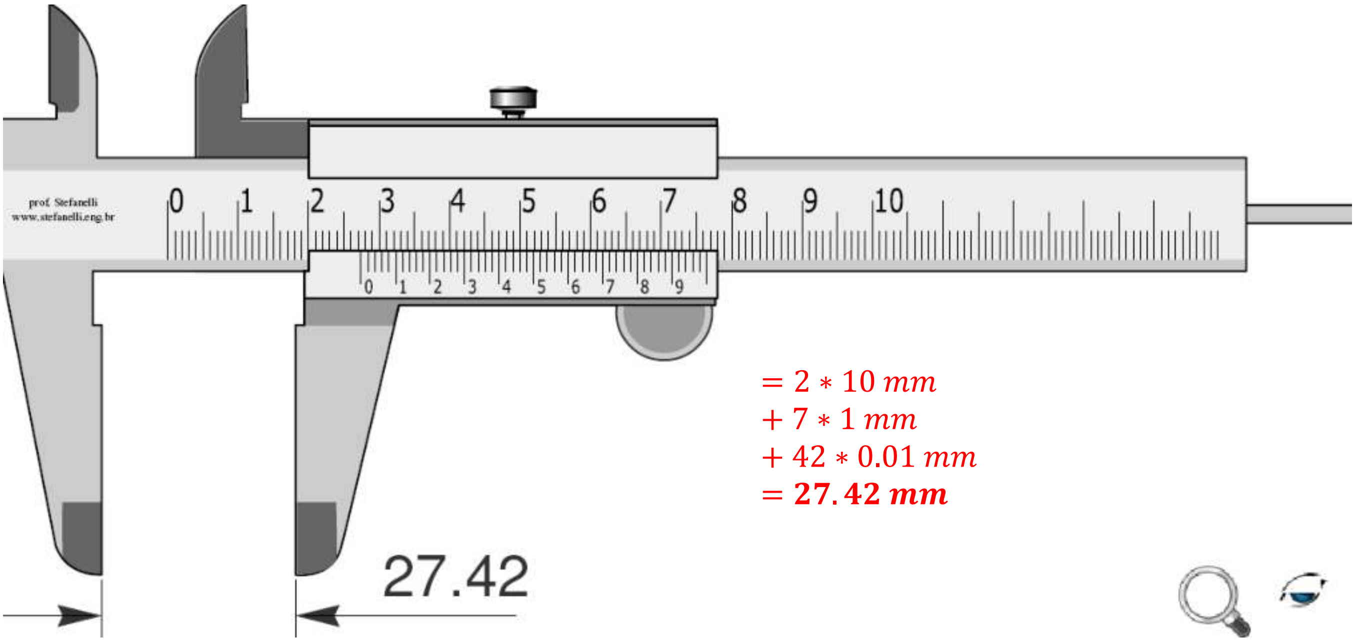
a. Vernier caliper; 27.42 mm

b. Vernier caliper; 27.42 *cm*

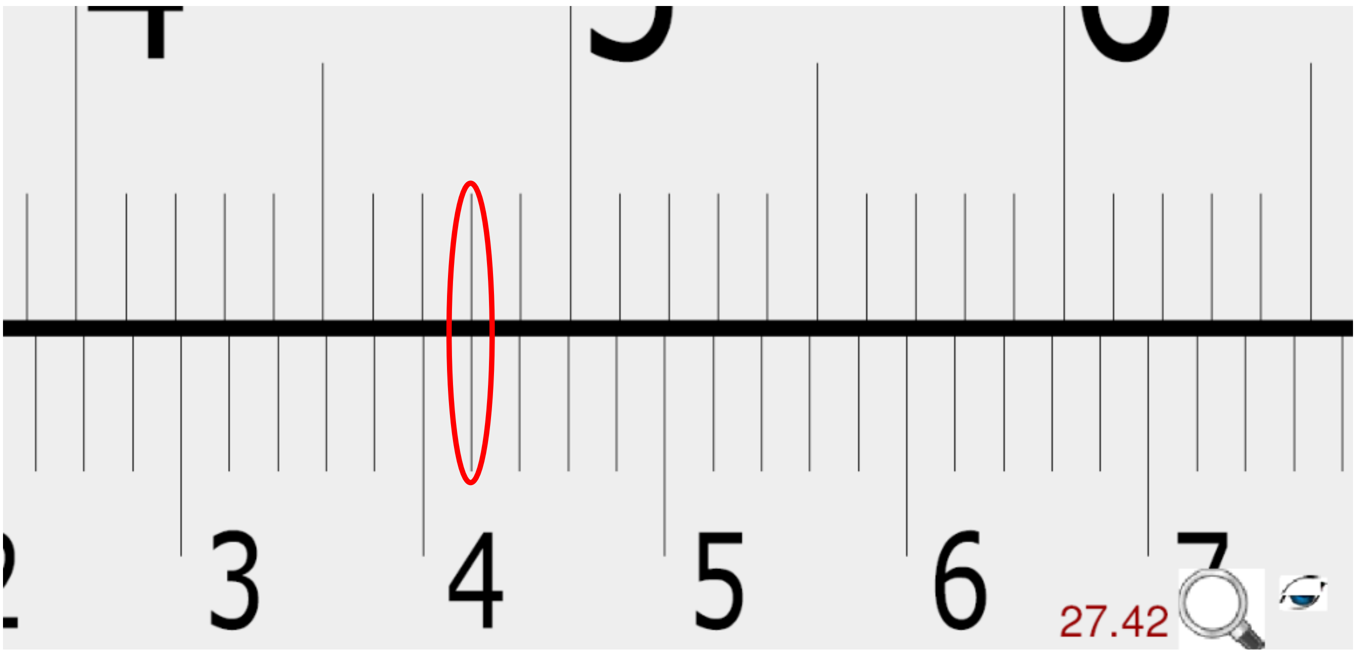
c. Vernier micometer; 2.742 *mm*

d. Vernier caliper; 27.48 *mm*

e. Vernier caliper; 27.48 *cm*



$$= 2 * 10\ mm$$
$$+ 7 * 1\ mm$$
$$+ 42 * 0.01\ mm$$
$$= \mathbf{27.42\ mm}$$



E

19. **The correct reading in the … shown below is …**

a. Vernier micometer; $0\frac{195}{256}\ in$

b. Vernier caliper; $0\frac{9}{512}\ in$

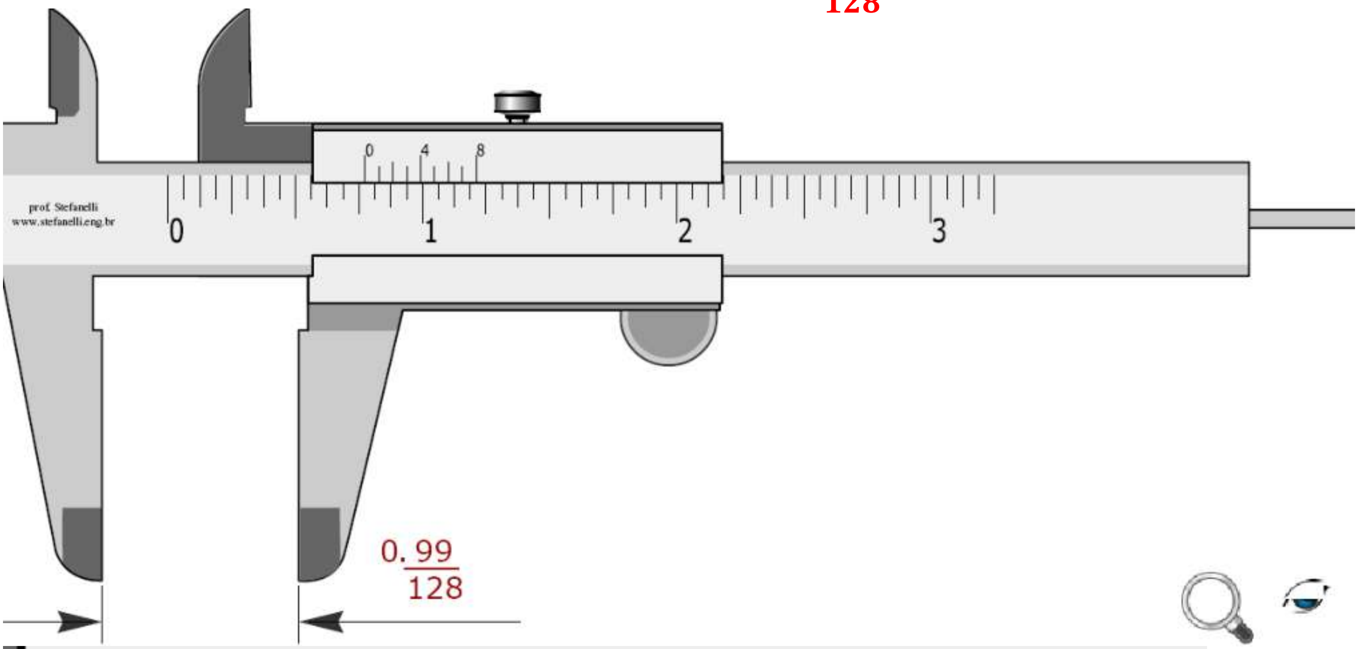
c. Vernier micometer; $0\frac{93}{128}\ in$

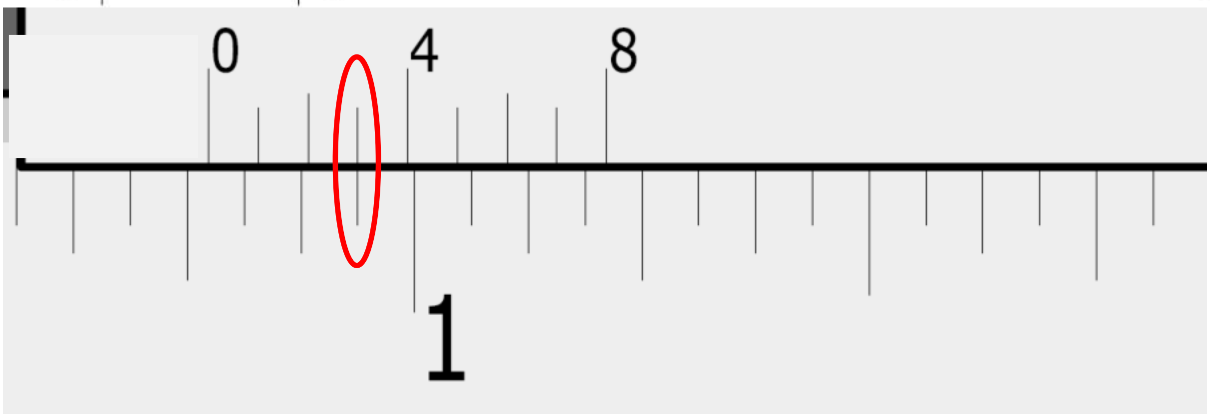
d. Vernier caliper; $0\frac{3}{8}\ in$

e. Vernier caliper; $0\frac{99}{128}$ in

$$= \frac{3}{4} * 1\ in + \frac{3}{8} * \frac{1}{16}\ in = \frac{3}{4} + \frac{3}{128}\ in = \frac{96+3}{128}\ in$$

$$\mathbf{0\frac{99}{128}\ in}$$





B

20. **Choose the labeling that correctly matches the diagram below:**

a. **L**: outer-dimension jaws; **M**: inner-dimension jaws; **P**: main scale; **Q**: Vernier scale

b. L: inner-dimension jaws; M: outer-dimension jaws; P: main scale; Q: Vernier scale (slide 2-32)

c. **L**: inner-dimension jaws; **M**: outer-dimension jaws; **P**: Vernier scale; **Q**: main scale

d. **L**: outer-dimension jaws; **M**: inner-dimension jaws; **P**: Vernier scale; **Q**: main scale

e. **L**: outer-dimension jaws; **M**: inner-dimension jaws; **P**: Depth scale; **Q**: main scale