IE-352
Section 1, CRN: 48703/4/5
Section 2, CRN: 48706/7/8
First Semester 1436-37 H (Fall-2015) – 4(4,1,2)
"MANUFACTURING PROCESSES – 2"

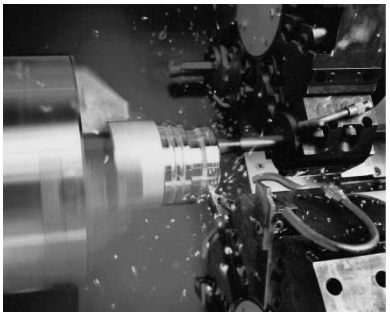
Wednesday, Oct. 14, 2015 (01/01/1437H)

MIDTERM 1 [10 POINTS]

Name:	Student Number: 4	Section: Darwish / Sherb.

Place the correct letter in the box at the right of each question [0.5 Pt. Each]

1. **The figure below displays what type of manufacturing process/operation?** ☐



   A. surface processing operation
   B. permanent joining, assembly operation
   C. shaping, material removal process
   D. mechanical fastening operation
   E. heat treatment, property enhancing process

2. **The building blocks of modern manufacturing are …** ☐

   A. people, materials, processes, and products
   B. people, equipment, machines, and systems
   C. people, materials, machines, and products
   D. people, equipment, processes, and systems
   E. people, materials, processes, and systems

3. **The maximum quantity produced in a given time period in a plant is called …** ☐

   A. physical product limitations
   B. production capacity
   C. technological processing capability
   D. production quantity
   E. manufacturing industry

4. **A material that consists of a rigid, structure that cannot be reheated is …**

   A. thermosetting polymers

   B. elastomers

   C. thermoplastic polymers

   D. crystalline ceramics

   E. nonferrous metals

5. **In the following processes, the starting material is a ductile or brittle solid:**

   A. surface processing operations

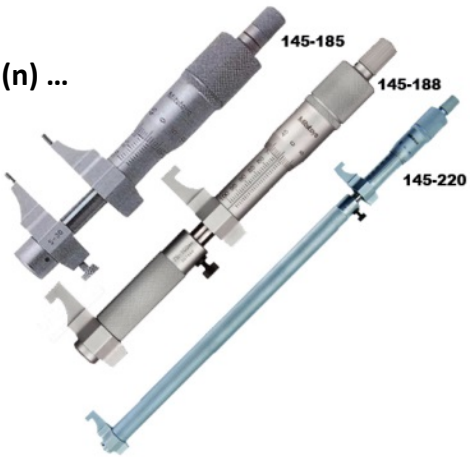
   B. deformation processes

   C. particulate processing

   D. solidification processes

   E. material removal processes

6. **The devices shown below are all examples of a(n) …**



   A. micrometer depth gage

   B. Vernier height gage

   C. inside Vernier gage

   D. inside micrometer gage

   E. micrometer height gage

7. **A dial caliper…**

   A. looks similar to a Vernier micrometer

   B. is used to provide angular measurements using a Vernier scale

   C. is used to provide direct readings of linear measurements

   D. is used to provide direct readings of angular measurements

   E. is used to provide angular measurements using a degree-minute system

8. **The figure below shows an example of a … gage.**

   A. dial indicator snap gage

   B. ring gage

   C. plug gage

   D. non-adjustable snap gage

   E. thread gage

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

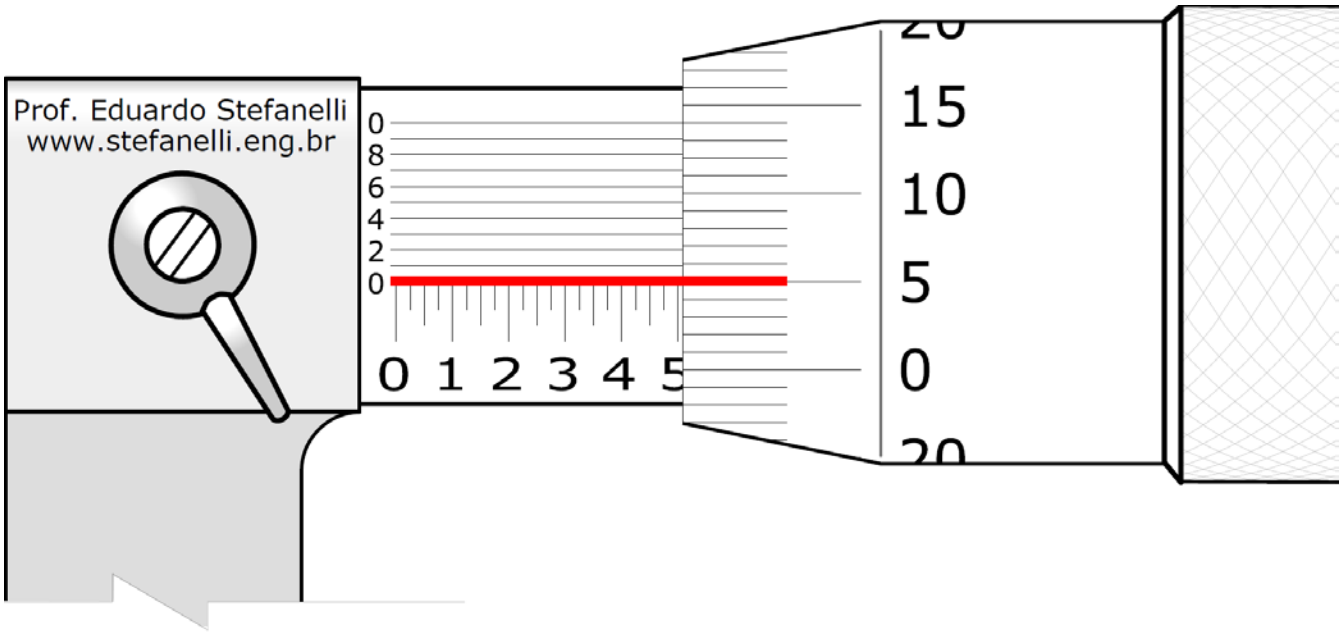
A. inside micrometer; $0.5050\ in$

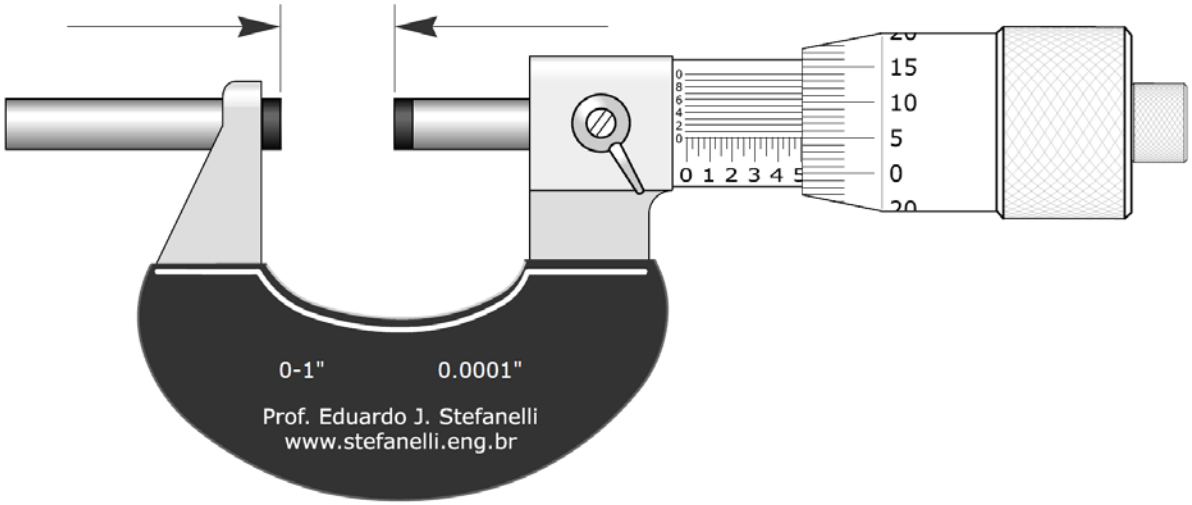
B. outside micrometer; $0.5050\ in$

C. inside micrometer; $0.505\ in$

D. outside micrometer; $0.505\ in$

E. inside micrometer; $0.550\ in$





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

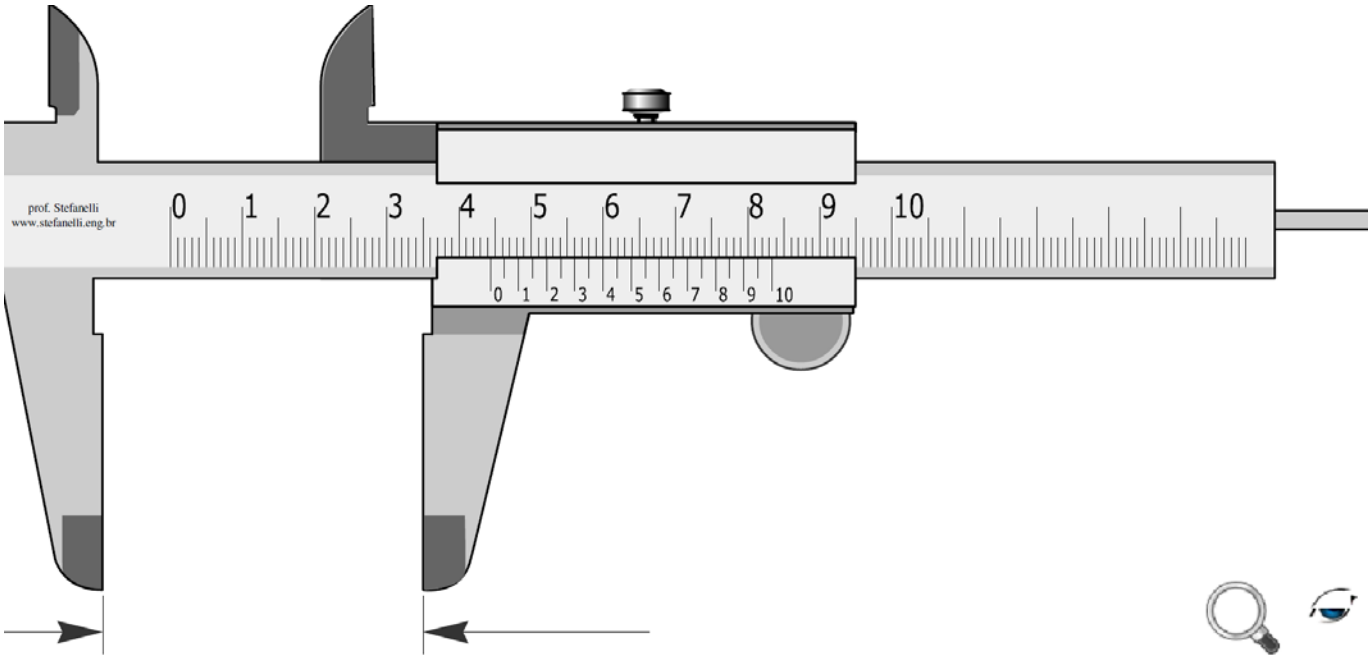
A. Vernier caliper; $4.435\ mm$

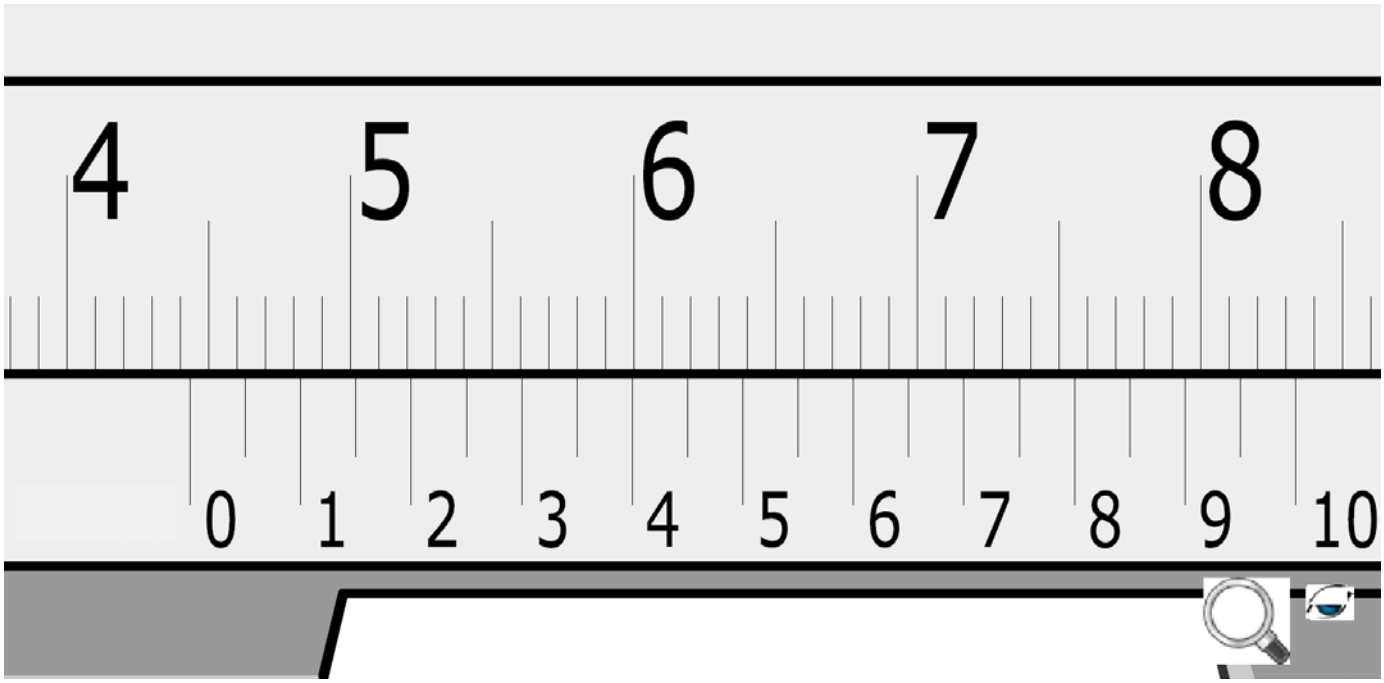
B. Vernier micometer; $44.35\ mm$

C. Vernier caliper; $44.35\ in$

D. Vernier caliper; $44.70\ mm$

E. Vernier caliper; $44.35\ mm$





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

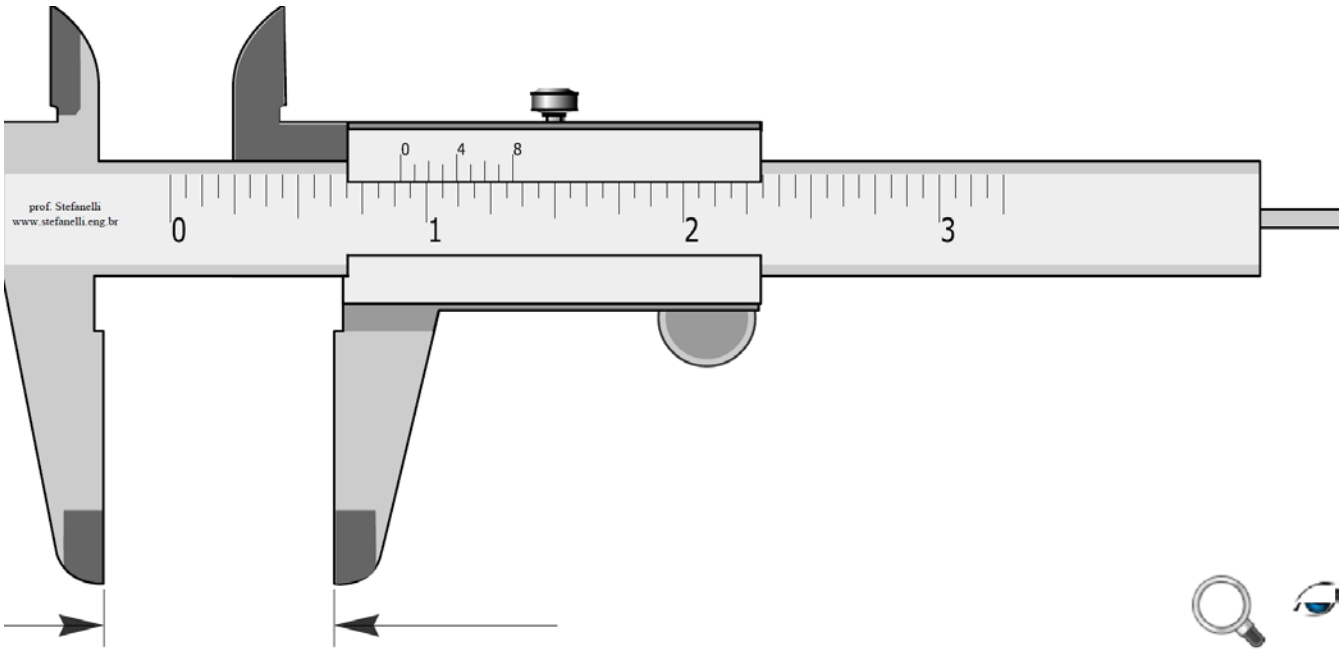
A. vernier caliper; $0.\frac{115}{128}\ in$

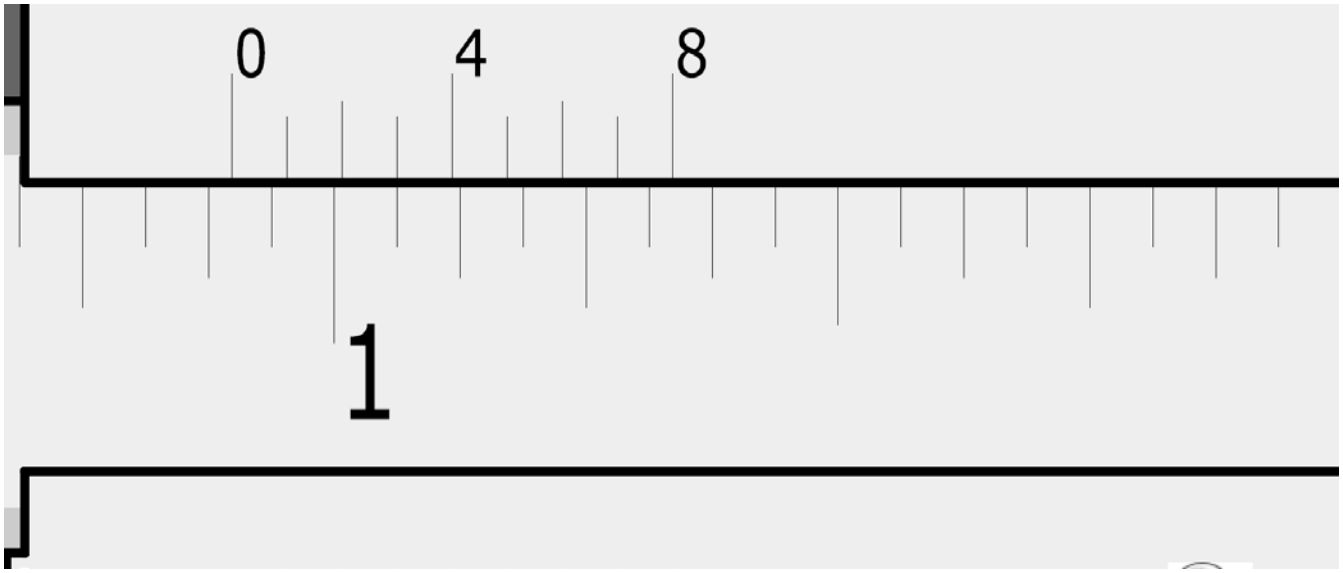
B. vernier caliper; $1.\frac{1}{16}\ in$

C. dial caliper; $0.\frac{115}{128}\ in$

D. dial caliper; $1.\frac{1}{16}\ in$

E. dial caliper; $1.\frac{3}{128}\ in$





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

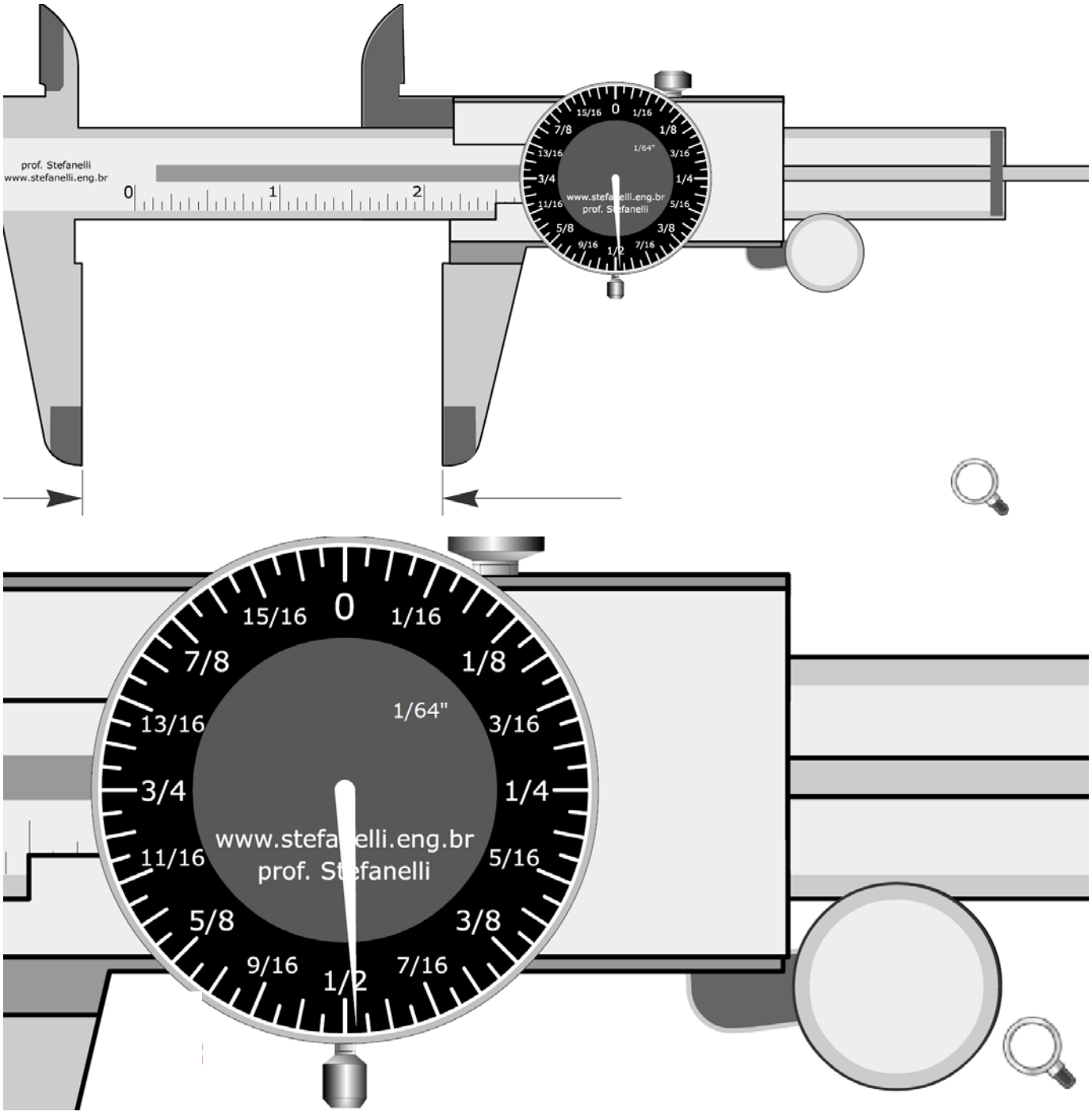
A. Vernier caliper; $2.\frac{63}{128}\ in$

B. Dial caliper; $2.\frac{119}{128}\ in$

C. Dial caliper; $2.\frac{63}{128}\ in$

D. Universal Bevel Protractor; $2.\frac{63}{128}\ in$

E. Vernier micrometer; $2.\frac{119}{128}\ in$



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

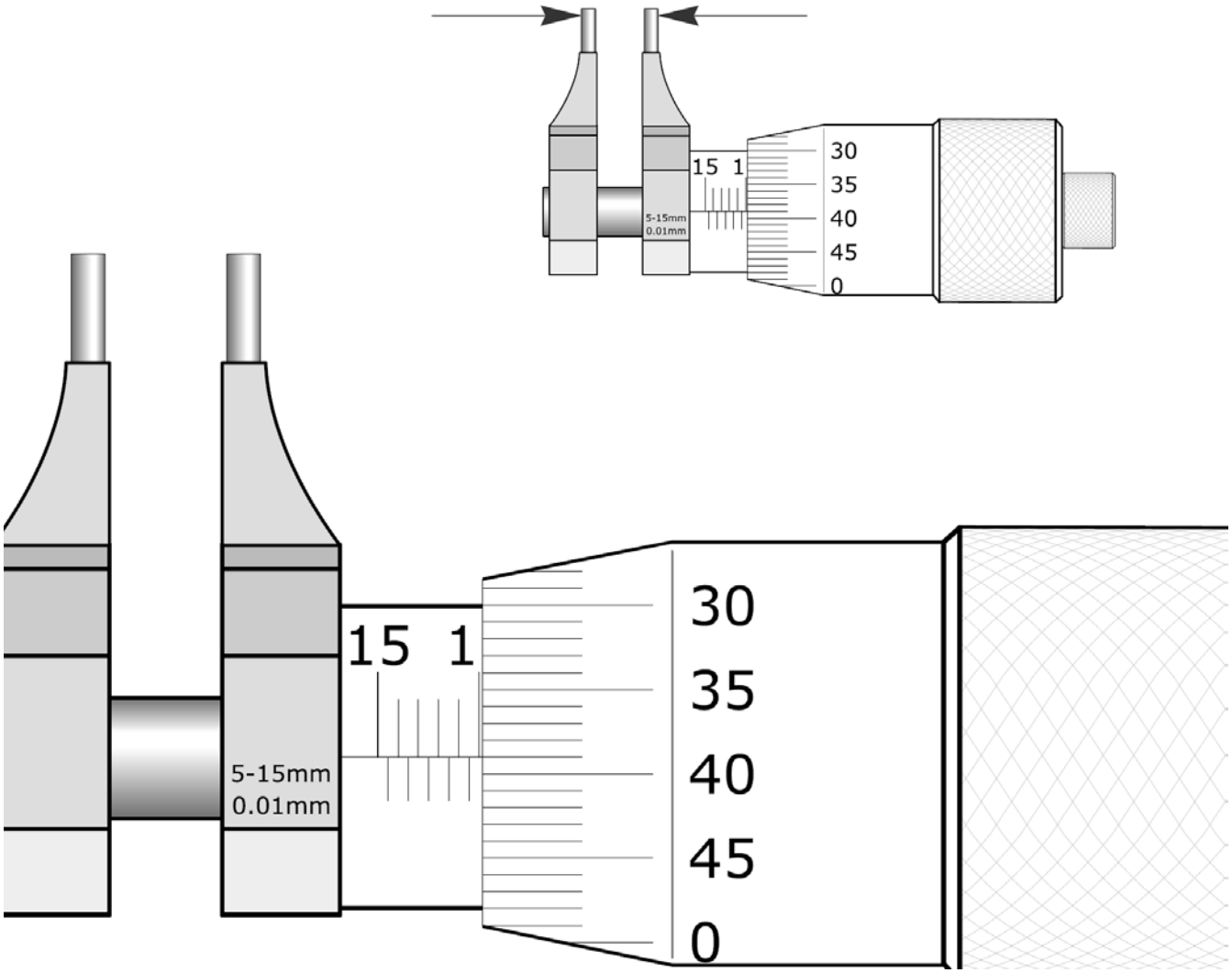
A. outside micrometer; 9.91 mm

B. outside micrometer; 9.89 mm

C. inside micrometer; 9.91 mm

D. inside micrometer; 9.89 mm

E. inside micrometer; 16.41 mm



Questions 14-16. Consider a 15" nominal diameter, $RC7$ fit between a shaft and hole.

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

A. $15.006\ in;\ 15.000\ in$

B. $14.987\ in; 14.990\ in$

C. $15.000\ in;\ 15.006\ in$

D. $14.990\ in;\ 14.987\ in$

E. $14.990\ in;\ 15.006\ in$

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

A. $15.006\ in;\ 15.000\ in$

B. $15.000\ in;\ 15.006\ in$

C. $14.987\ in; 14.990\ in$

D. $14.990\ in;\ 14.987\ in$

E. $14.990\ in;\ 15.006\ in$

16. **Respectively,** $min.clearance$ **=;** $max.clearance$ **= …** ☐

A. $0\ in;\ 0.020\ in$

B. $0.008\ in;\ 0.016\ in$

C. $0\ in; 0.006\ in$

D. $0.010\ in;\ 0.020\ in$

E. $0.020\ in;\ 0.010\ in$

Questions 17-20. Consider a 20 mm nominal diameter, $N7/h6$ fit.

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

A. 20.000 mm; 19.987 mm

B. 19.987 mm; 20.000 mm

C. 20.000 mm; 19.993 mm

D. 19.993 mm; 19.972 mm

E. 19.972 mm; 19.993 mm

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

A. 20.000 mm; 19.987 mm

B. 19.987 mm; 20.000 mm

C. 20.000 mm; 19.993 mm

D. 19.993 mm; 19.972 mm

E. 19.972 mm; 19.993 mm

19. **Respectively,** $max.clearance$ =; $max.interference$ = …

A. 0; 0.028 mm

B. 0; 0

C. 0.006 mm; 0.028 mm

D. 0.028 mm; 0.006 mm

E. 0; 0.006 mm

20. **Respectively,** $min.clearance$ =; $min.interference$ = …

A. 0; 0.028 mm

B. 0; 0

C. 0.006 mm; 0.028 mm

D. 0.028 mm; 0.006 mm

E. 0; 0.006 mm

Table 4. American National Standard Running and Sliding Fits *ANSI B4.1-1967 (R1987)*

Nominal Size Range, Inches		Class RC 5			Class RC 6			Class RC 7			Class RC 8			Class RC 9		
		Clearance[a]	Standard Tolerance Limits		Clearance[a]	Standard Tolerance Limits		Clearance[a]	Standard Tolerance Limits		Clearance[a]	Standard Tolerance Limits		Clearance[a]	Standard Tolerance Limits	
Over	To		Hole H8	Shaft e7		Hole H9	Shaft e8		Hole H9	Shaft d8		Hole H10	Shaft c9		Hole H11	Shaft
		Values shown below are in thousandths of an inch														
0 –	0.12	0.6	+0.6	– 0.6	0.6	+1.0	– 0.6	1.0	+1.0	– 1.0	2.5	+1.6	– 2.5	4.0	+2.5	– 4.0
		1.6	0	– 1.0	2.2	0	– 1.2	2.6	0	– 1.6	5.1	0	– 3.5	8.1	0	– 5.6
0.12 –	0.24	0.8	+0.7	– 0.8	0.8	+1.2	– 0.8	1.2	+1.2	– 1.2	2.8	+1.8	– 2.8	4.5	+3.0	– 4.5
		2.0	0	– 1.3	2.7	0	– 1.5	3.1	0	– 1.9	5.8	0	– 4.0	9.0	0	– 6.0
0.24 –	0.40	1.0	+0.9	– 1.0	1.0	+1.4	– 1.0	1.6	+1.4	– 1.6	3.0	+2.2	– 3.0	5.0	+3.5	– 5.0
		2.5	0	– 1.6	3.3	0	– 1.9	3.9	0	– 2.5	6.6	0	– 4.4	10.7	0	– 7.2
0.40 –	0.71	1.2	+1.0	– 1.2	1.2	+1.6	– 1.2	2.0	+1.6	– 2.0	3.5	+2.8	– 3.5	6.0	+4.0	– 6.0
		2.9	0	– 1.9	3.8	0	– 2.2	4.6	0	– 3.0	7.9	0	– 5.1	12.8	0	– 8.8
0.71 –	1.19	1.6	+1.2	– 1.6	1.6	+2.0	– 1.6	2.5	+2.0	– 2.5	4.5	+3.5	– 4.5	7.0	+5.0	– 7.0
		3.6	0	– 2.4	4.8	0	– 2.8	5.7	0	– 3.7	10.0	0	– 6.5	15.5	0	–10.5
1.19 –	1.97	2.0	+1.6	– 2.0	2.0	+2.5	– 2.0	3.0	+2.5	– 3.0	5.0	+4.0	– 5.0	8.0	+6.0	– 8.0
		4.6	0	– 3.0	6.1	0	– 3.6	7.1	0	– 4.6	11.5	0	– 7.5	18.0	0	–12.0
1.97 –	3.15	2.5	+1.8	– 2.5	2.5	+3.0	– 2.5	4.0	+3.0	– 4.0	6.0	+4.5	– 6.0	9.0	+7.0	– 9.0
		5.5	0	– 3.7	7.3	0	– 4.3	8.8	0	– 5.8	13.5	0	– 9.0	20.5	0	–13.5
3.15 –	4.73	3.0	+2.2	– 3.0	3.0	+3.5	– 3.0	5.0	+3.5	– 5.0	7.0	+5.0	– 7.0	10.0	+9.0	–10.0
		6.6	0	– 4.4	8.7	0	– 5.2	10.7	0	– 7.2	15.5	0	–10.5	24.0	0	–15.0
4.73 –	7.09	3.5	+2.5	– 3.5	3.5	+4.0	– 3.5	6.0	+4.0	– 6.0	8.0	+6.0	– 8.0	12.0	+10.0	–12.0
		7.6	0	– 5.1	10.0	0	– 6.0	12.5	0	– 8.5	18.0	0	–12.0	28.0	0	–18.0
7.09 –	9.85	4.0	+2.8	– 4.0	4.0	+4.5	– 4.0	7.0	+4.5	– 7.0	10.0	+7.0	–10.0	15.0	+12.0	–15.0
		8.6	0	– 5.8	11.3	0	– 6.8	14.3	0	– 9.8	21.5	0	–14.5	34.0	0	–22.0
9.85 –	12.41	5.0	+3.0	– 5.0	5.0	+5.0	– 5.0	8.0	+5.0	– 8.0	12.0	+8.0	–12.0	18.0	+12.0	–18.0
		10.0	0	– 7.0	13.0	0	– 8.0	16.0	0	–11.0	25.0	0	–17.0	38.0	0	–26.0
12.41 –	15.75	6.0	+3.5	– 6.0	6.0	+6.0	– 6.0	10.0	+6.0	–10.0	14.0	+9.0	–14.0	22.0	+14.0	–22.0
		11.7	0	– 8.2	15.5	0	– 9.5	19.5	0	–13.5	29.0	0	–20.0	45.0	0	–31.0
15.75 –	19.69	8.0	+4.0	– 8.0	8.0	+6.0	– 8.0	12.0	+6.0	–12.0	16.0	+10.0	–16.0	25.0	+16.0	–25.0
		14.5	0	–10.5	18.0	0	–12.0	22.0	0	–16.0	32.0	0	–22.0	51.0	0	–35.0

Table 15. American National Standard Preferred Shaft Basis Metric Transition and Interference Fits *ANSI B4.2-1978 (R1994)*

Basic Size[a]		Locational Transition			Locational Transition			Locational Interference			Medium Drive			Force		
		Hole K7	Shaft h6	Fit[b]	Hole N7	Shaft h6	Fit[b]	Hole P7	Shaft h6	Fit[b]	Hole S7	Shaft h6	Fit[b]	Hole U7	Shaft h6	Fit[b]
1	Max	1.000	1.000	+0.006	0.996	1.000	+0.002	0.994	1.000	0.000	0.986	1.000	−0.008	0.982	1.000	−0.012
	Min	0.990	0.994	−0.010	0.986	0.954	−0.014	0.984	0.994	−0.016	0.976	0.994	−0.024	0.972	0.994	−0.028
1.2	Max	1.200	1.200	+0.006	1.196	1.200	+0.002	1.194	1.200	0.000	1.186	1.200	−0.008	1.182	1.200	−0.012
	Min	1.190	1.194	−0.010	1.186	1.194	−0.014	1.184	1.194	−0.016	1.176	1.194	−0.024	1.172	1.194	−0.028
1.6	Max	1.600	1.600	+0.006	1.596	1.600	+0.002	1.594	1.600	0.000	1.586	1.600	−0.008	1.582	1.600	−0.012
	Min	1.590	1.594	−0.010	1.586	1.594	−0.014	1.584	1.594	−0.016	1.576	1.594	−0.024	1.572	1.594	−0.028
2	Max	2.000	2.000	+0.006	1.996	2.000	+0.002	1.994	2.000	0.000	1.986	2.000	−0.008	1.982	2.000	−0.012
	Min	1.990	1.994	−0.010	1.986	1.994	−0.014	1.984	1.994	−0.016	1.976	1.994	−0.024	1.972	1.994	−0.028
2.5	Max	2.500	2.500	+0.006	2.496	2.500	+0.002	2.494	2.500	0.000	2.486	2.500	−0.008	2.482	2.500	−0.012
	Min	2.490	2.494	−0.010	2.486	2.494	−0.014	2.484	2.494	−0.016	2.476	2.494	−0.024	2.472	2.494	−0.028
3	Max	3.000	3.000	+0.006	2.996	3.000	+0.002	2.994	3.000	0.000	2.986	3.000	−0.008	2.982	3.000	−0.012
	Min	2.990	2.994	−0.010	2.986	2.994	−0.014	2.984	2.994	−0.016	2.976	2.994	−0.024	2.972	2.994	−0.028
4	Max	4.003	4.000	+0.011	3.996	4.000	+0.004	3.992	4.000	0.000	3.985	4.000	−0.007	3.981	4.000	−0.011
	Min	3.991	3.992	−0.009	3.984	3.992	−0.016	3.980	3.992	−0.020	3.973	3.992	−0.027	3.969	3.992	−0.031
5	Max	5.003	5.000	+0.011	4.996	5.000	+0.004	4.992	5.000	0.000	4.985	5.000	−0.007	4.981	5.000	−0.011
	Min	4.991	4.992	−0.009	4.984	4.992	−0.016	4.980	4.992	−0.020	4.973	4.992	−0.027	4.969	4.992	−0.031
6	Max	6.003	6.000	+0.011	5.996	6.000	+0.004	5.992	6.000	0.000	5.985	6.000	−0.007	5.981	6.000	−0.011
	Min	5.991	5.992	−0.009	5.984	5.992	−0.016	5.980	5.992	−0.020	5.973	5.992	−0.027	5.969	5.992	−0.031
8	Max	8.005	8.000	+0.014	7.996	8.000	+0.005	7.991	8.000	0.000	7.983	8.000	−0.008	7.978	8.000	−0.013
	Min	7.990	7.991	−0.010	7.981	7.991	−0.019	7.976	7.991	−0.024	7.968	7.991	−0.032	7.963	7.991	−0.037
10	Max	10.005	10.000	+0.014	9.996	10.000	+0.005	9.991	10.000	0.000	9.983	10.000	−0.008	9.978	10.000	−0.013
	Min	9.990	9.991	−0.010	9.981	9.991	−0.019	9.976	9.991	−0.024	9.968	9.991	−0.032	9.963	9.991	−0.037
12	Max	12.006	12.000	+0.017	11.995	12.000	+0.006	11.989	12.000	0.000	11.979	12.000	−0.010	11.974	12.000	−0.015
	Min	11.988	11.989	−0.012	11.977	11.989	−0.023	11.971	11.989	−0.029	11.961	11.989	−0.039	11.956	11.989	−0.044
16	Max	16.006	16.000	+0.017	15.995	16.000	+0.006	15.989	16.000	0.000	15.979	16.000	−0.010	15.974	16.000	−0.015
	Min	15.988	15.989	−0.012	15.977	15.989	−0.023	15.971	15.989	−0.029	15.961	15.989	−0.039	15.956	15.989	−0.044
20	Max	20.006	20.000	+0.019	19.993	20.000	+0.006	19.986	20.000	−0.001	19.973	20.000	−0.014	19.967	20.000	−0.020
	Min	19.985	19.987	−0.015	19.972	19.987	−0.028	19.965	19.987	−0.035	19.952	19.987	−0.048	19.946	19.987	−0.054
25	Max	25.006	25.000	+0.019	24.993	25.000	+0.006	24.986	25.000	−0.001	24.973	25.000	−0.014	24.960	25.000	−0.027
	Min	24.985	24.987	−0.015	24.972	24.987	−0.028	24.965	24.987	−0.035	24.952	24.987	−0.048	24.939	24.987	−0.061