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"

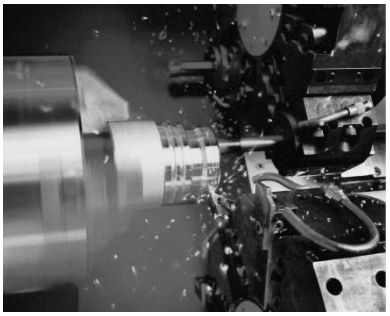
Wednesday, Oct. 14, 2015 (01/01/1437H)

HW 1 (MIDTERM 1)

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

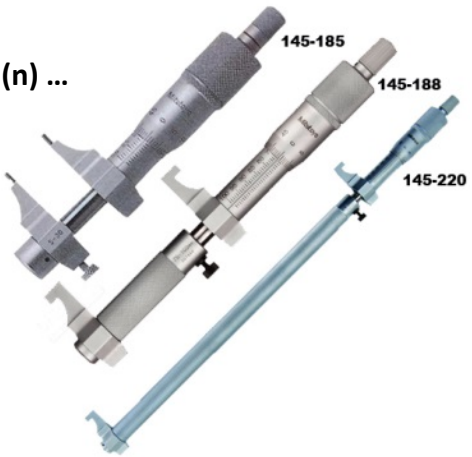
   B. deformation processes

   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 …**

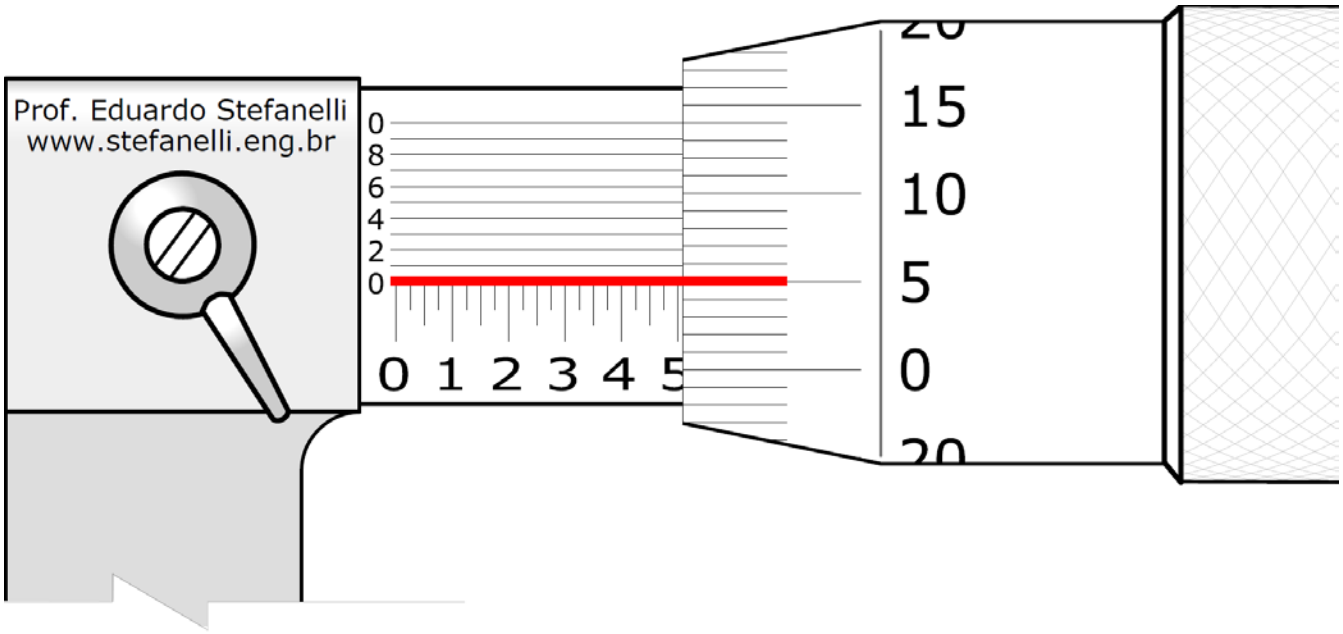
A. inside micrometer; $0.5050\ in$

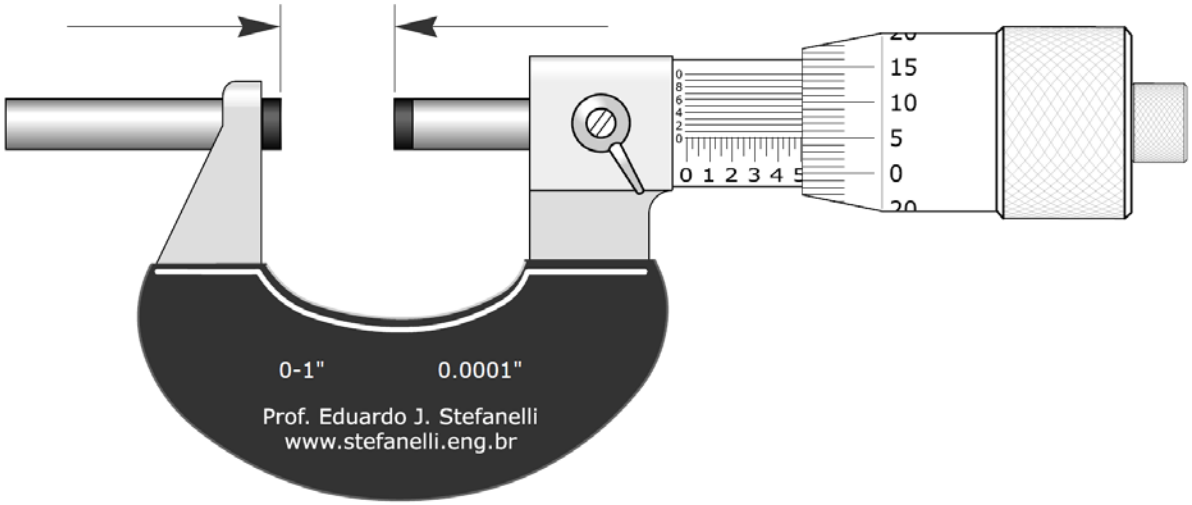
B. outside micrometer; $0.5050\ in$

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 …**

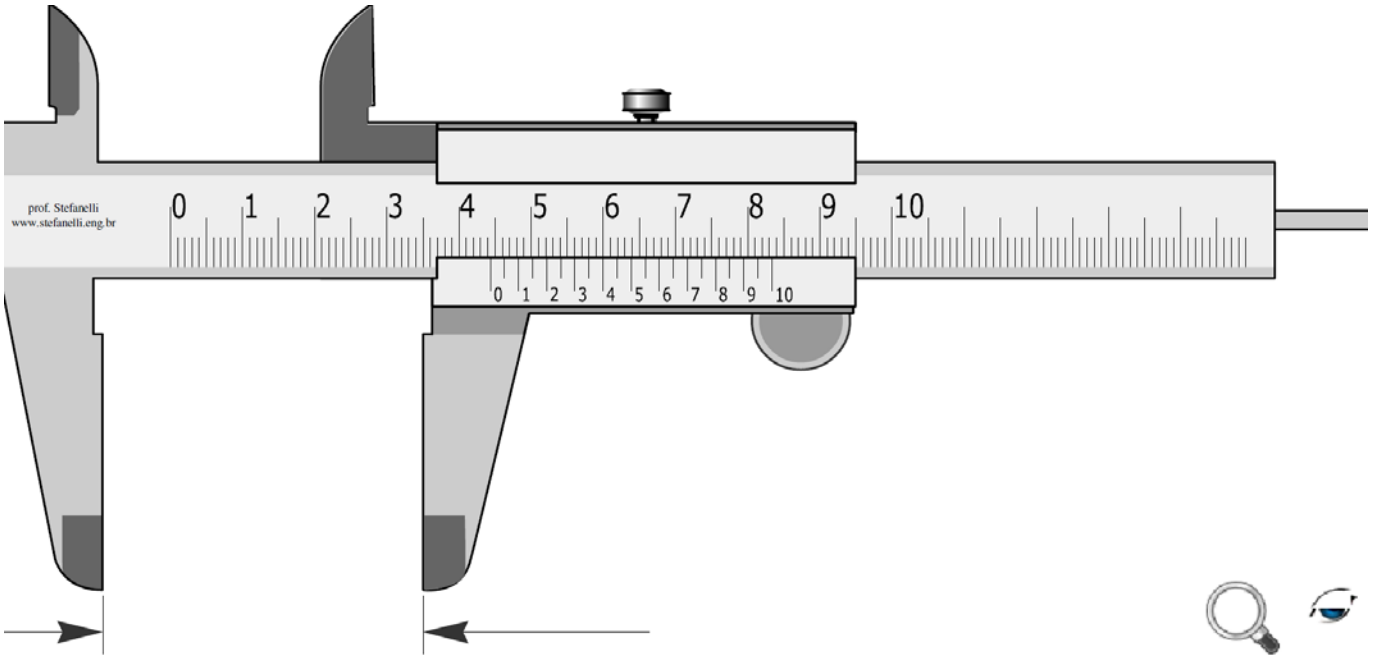
A. Vernier caliper; $4.435\ mm$

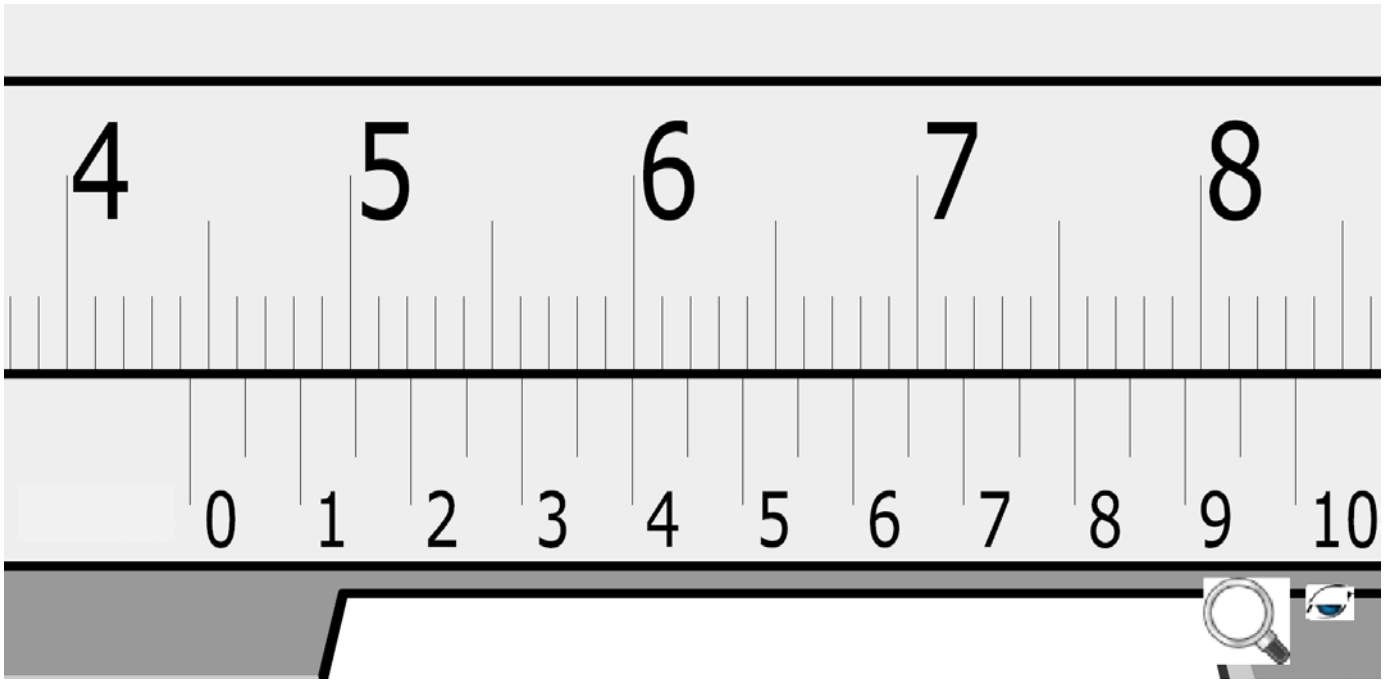
B. Vernier micometer; $44.35\ mm$

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 …**

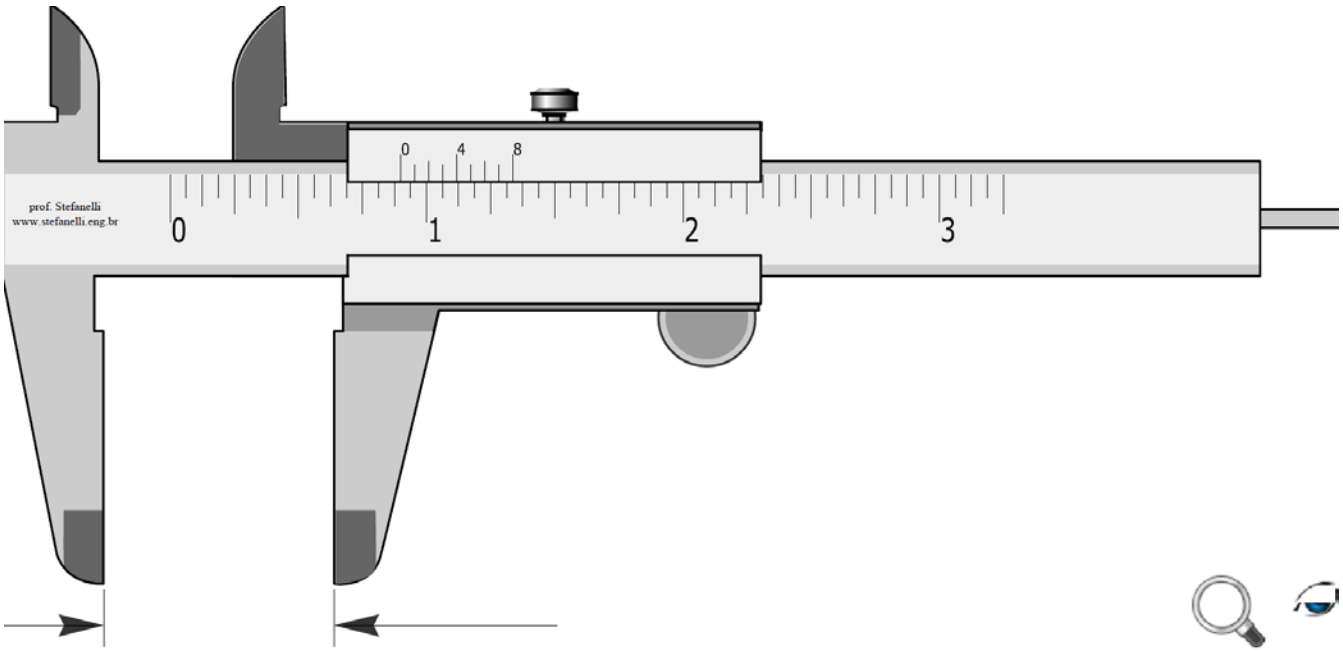
A. vernier caliper; $0.\frac{115}{128}\ in$

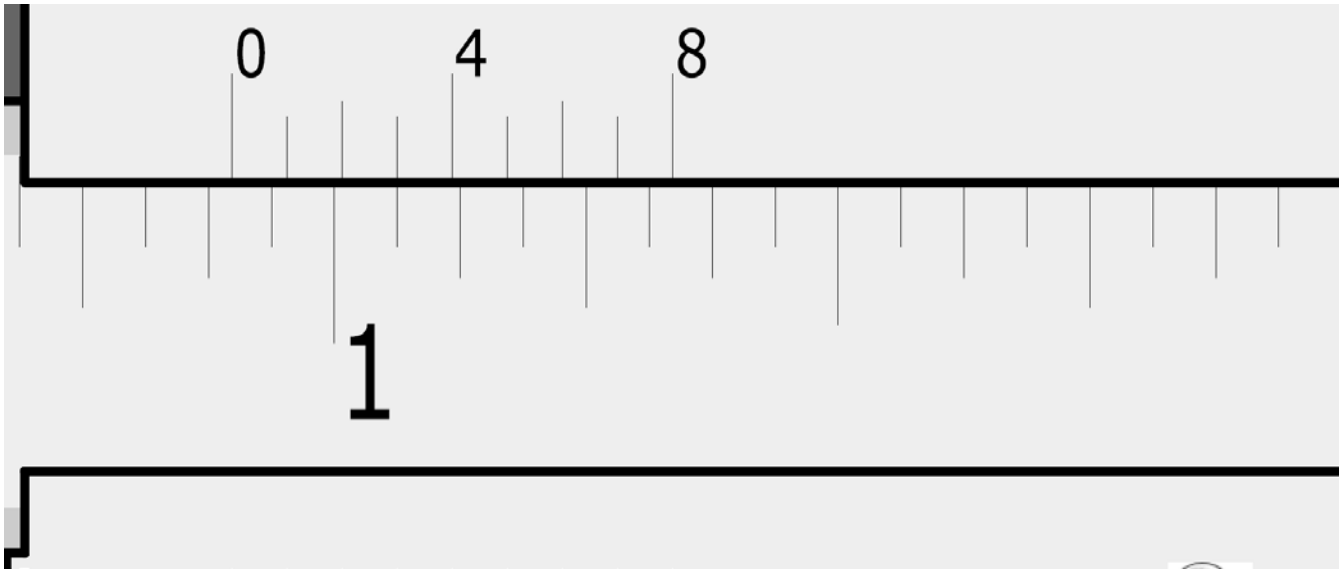
B. vernier caliper; $1.\frac{1}{16}\ in$

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 …**

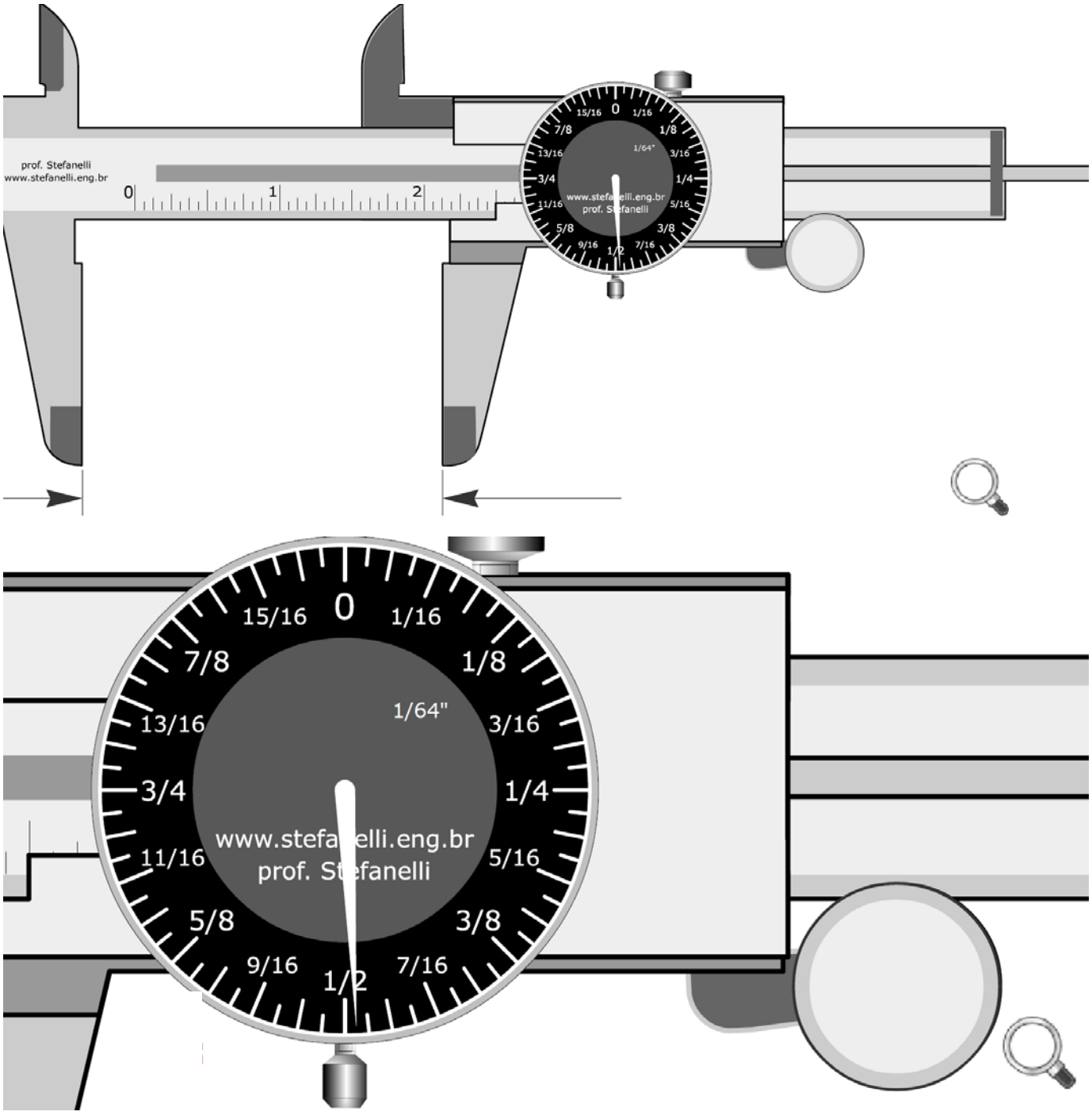
A. Vernier caliper; $2.\frac{63}{128}\ in$

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 …**

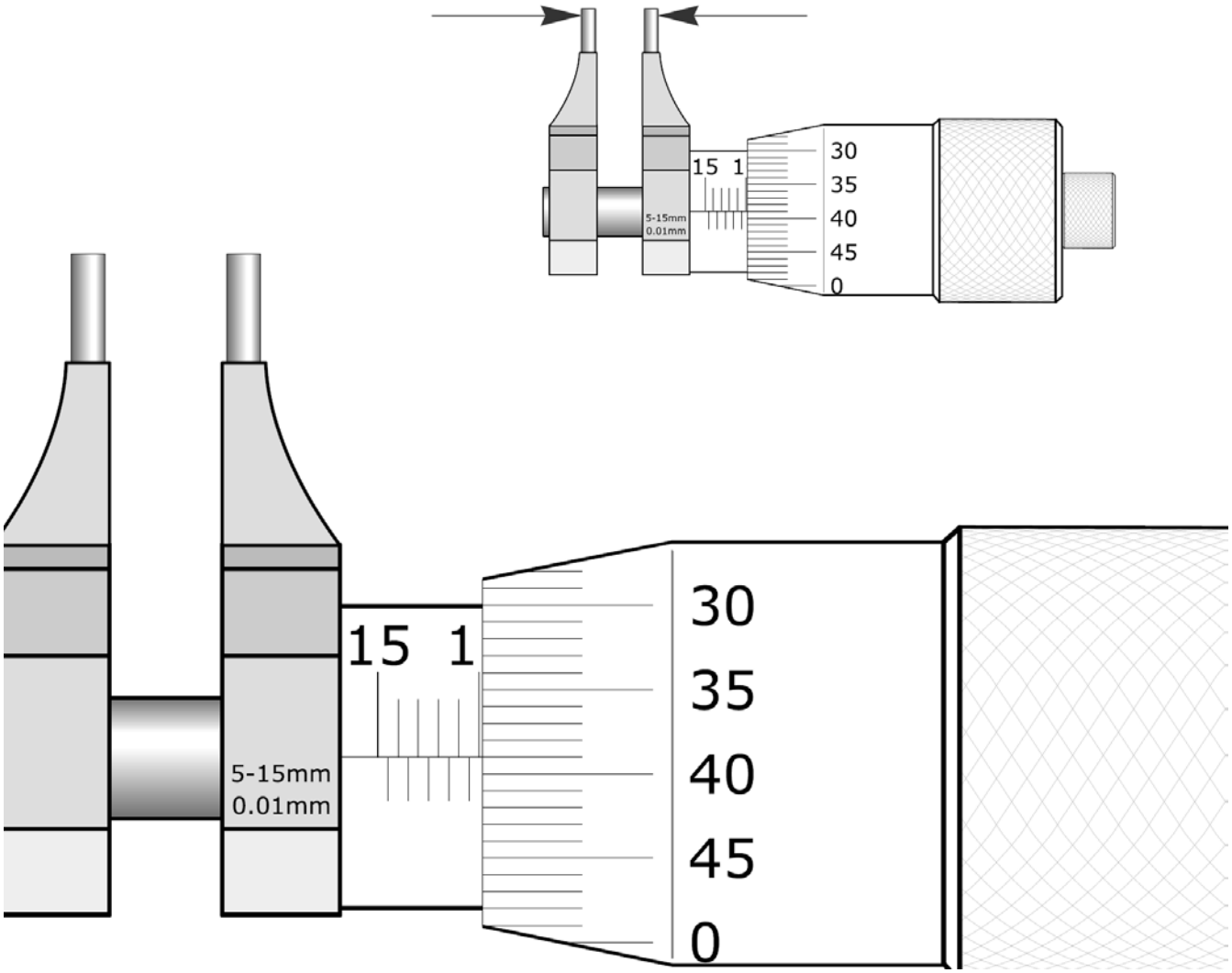
A. outside micrometer; 9.91 mm

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

Rules:

- You must prepare and submit the homework **individually**.
- Your work must be **neatly written** in pencil (or typed) and in **proper English** (where applicable).
- **You must show all work**.
- **BOX** your answer(s) and include the **units**.

Due date:

- **Thursday, October 22, 2015** (09/01/1437)