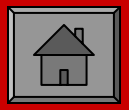
AUTOMOTIVE Youth Educational Systems YES!
The Passport to a Rewarding Automotive Career

ASE CERTIFIED

Modern Automotive Technology Chapter 6

Automotive Measurement and Math

North Montco Technical Career Center



Chapter 6

Automotive Measurement and Math

- Describe standard and metric measuring systems
- Identify basic measuring tools
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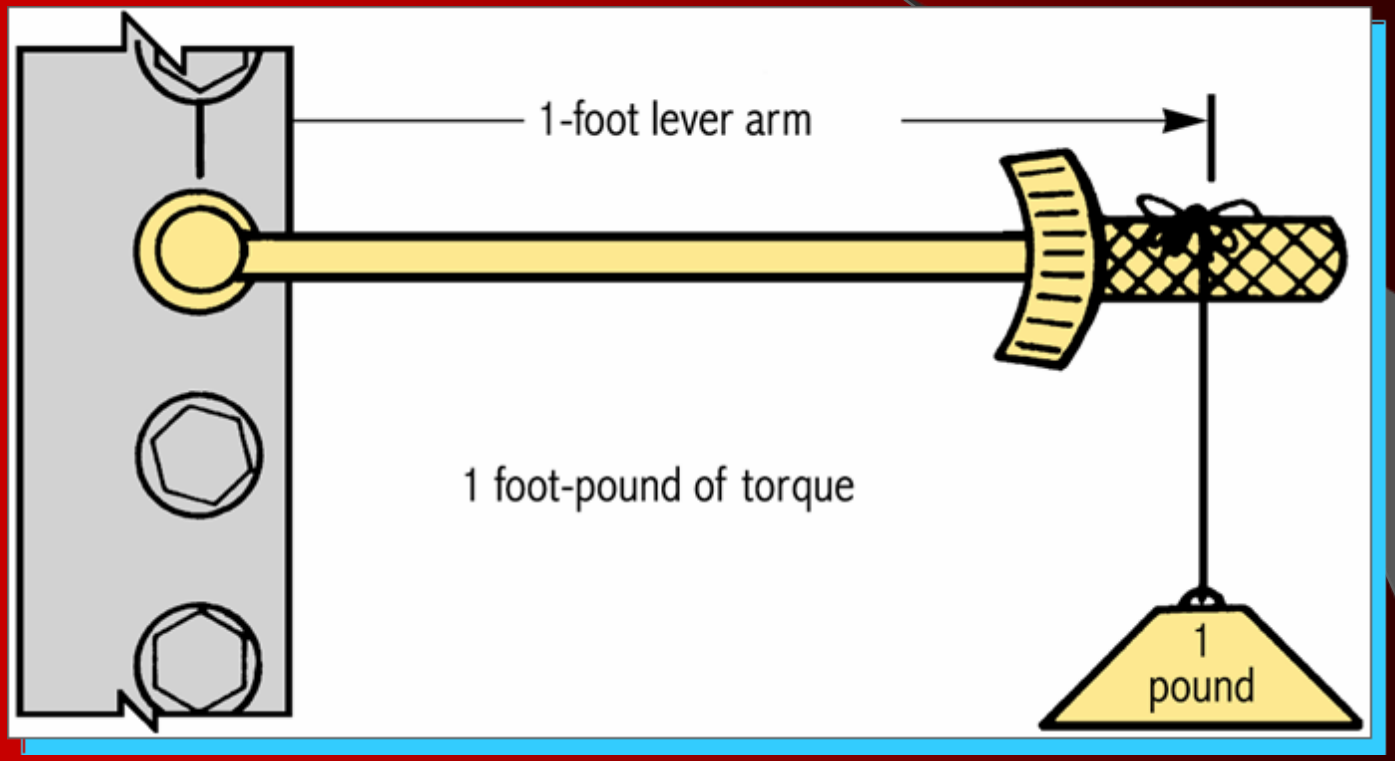
Automotive Measurement and Math

1. A TORQUE WRENCH is used to apply a specific amount of turning force to a fastener.

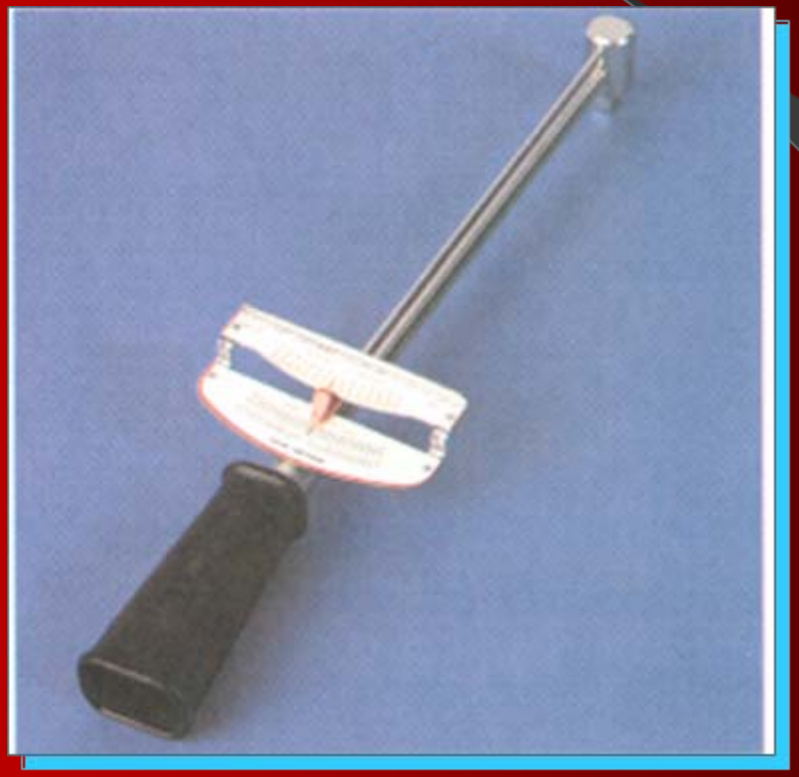
2. A VACUUM GAUGE is commonly used to measure negative pressure or suction.

Torque Wrench Theory



One foot-pound equals one pound of pull on a one-foot-long lever arm

Flex Bar Torque Wrench



Uses a bending metal beam to make the pointer read torque on the scale

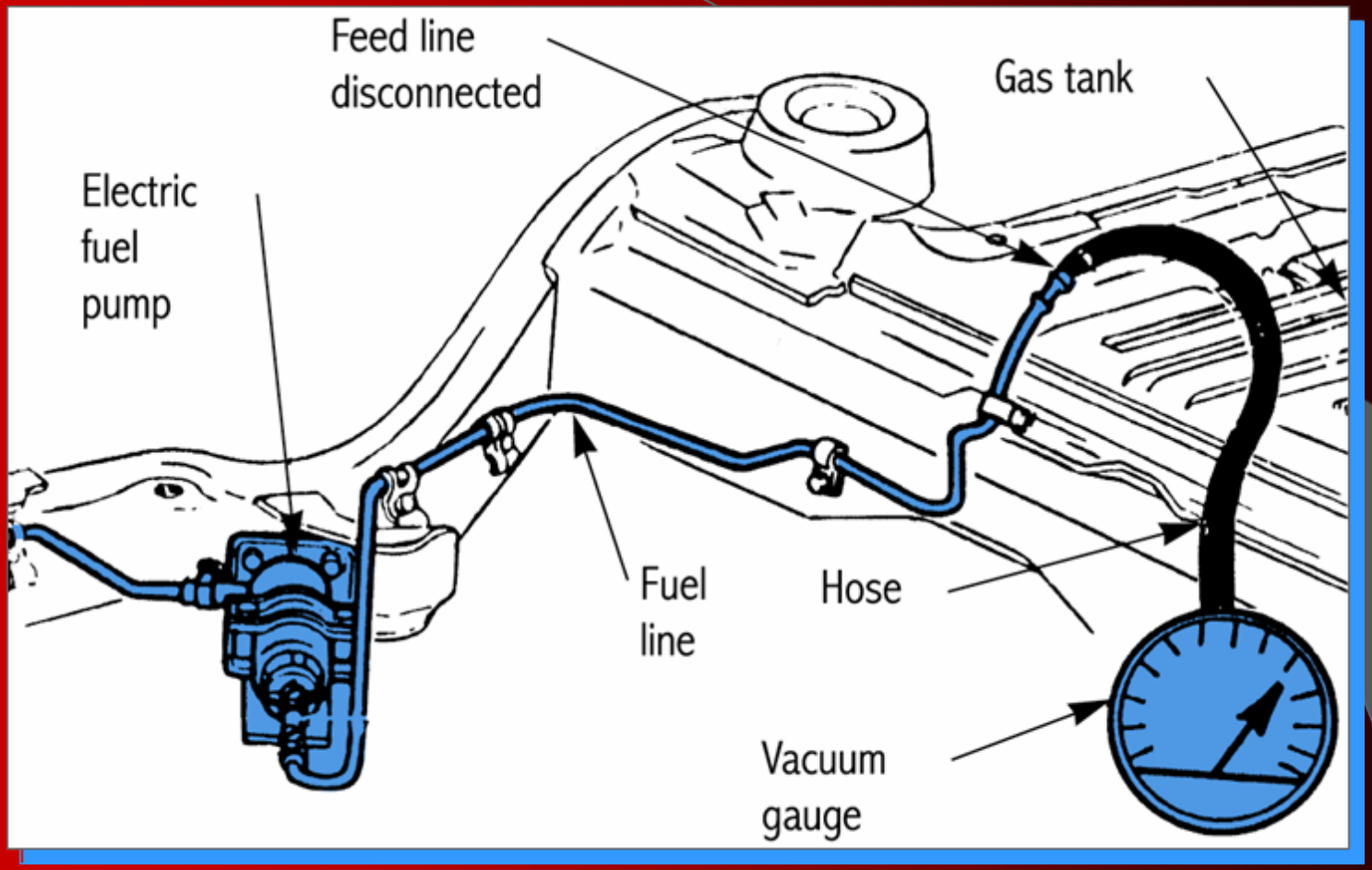
Dial Indicator Torque Wrench

Very accurate type of torque wrench

Ratcheting Torque Wrench

Torque value is set by turning the handle–fastener is tightened until it clicks

Vacuum Test



Connect a vacuum gauge to the inlet - the negative pressure side of the pump

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3. A MICROMETER can easily measure to one ten-thousandth of an inch.

4. A FEELER GAUGE is used to measure small clearances or gaps between parts.

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Parts of a Micrometer

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Each Blade of a Feeler Gauge is in .001 Increments

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5. A DIAL INDICATOR is used to measure part movement in thousandths of an inch.

6. The CONVENTIONAL MEASURING SYSTEM originated from sizes taken from the parts of the human body.

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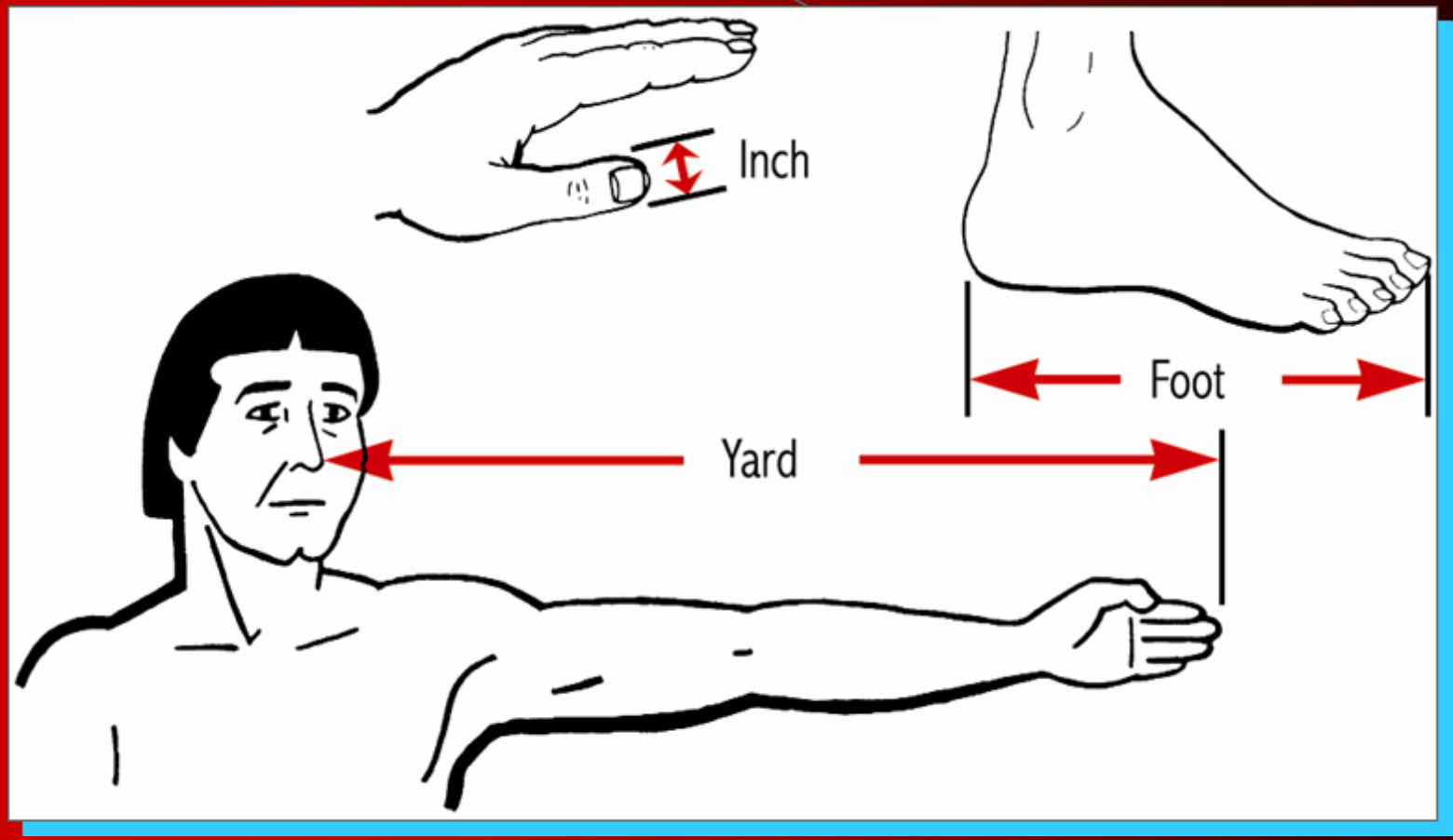
Dial Indicator Measures In .001 Increments

Customary Measuring System



Originated from sizes taken from parts of the human body

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7. A VERNIER CALIBER can make inside, outside, and at times, depth measurements with considerable accuracy.

8. The DECIMAL CONVERSION CHART is used to interchange and find equal values for fractions, decimals, and millimeters.

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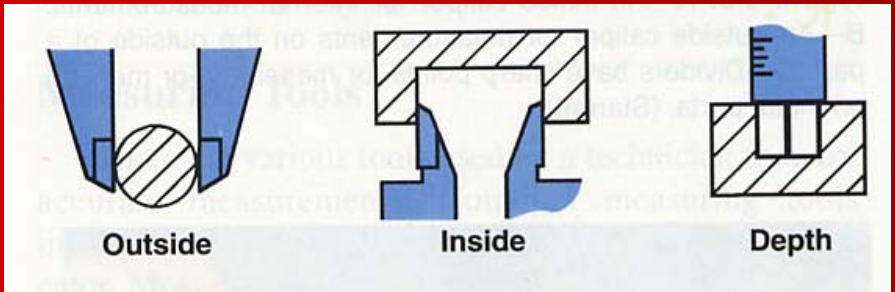
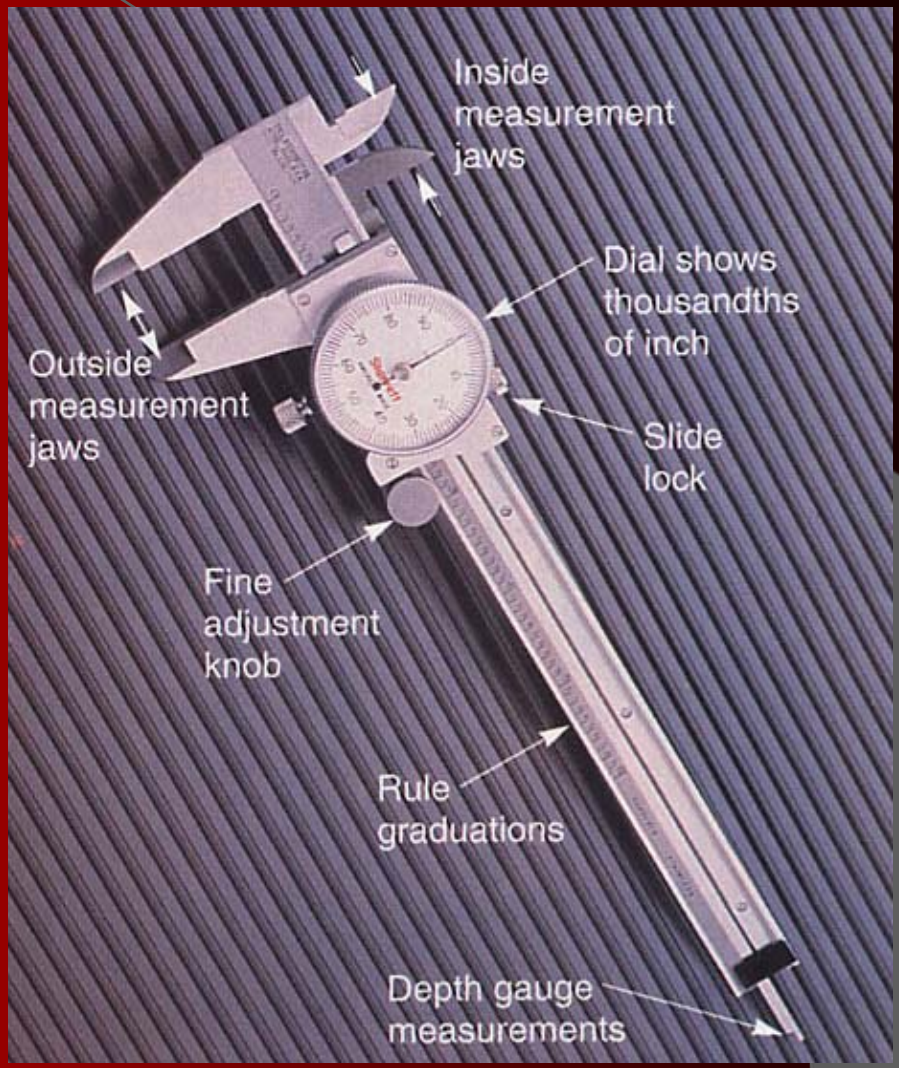
Vernier Calibers:

Can Measure Outside, Inside and Depth Measurements





Decimal Conversion Chart

Fraction				Inches	mm
			1/64	.01563	.397
		1/32		.03125	.794
			3/64	.04688	1.191
	1/16			.06250	1.588
			5/64	.07813	1.984
		3/32		.09375	2.381
			7/64	.10938	2.778
1/8				.12500	3.175
			9/64	.14063	3.572
		5/32		.15625	3.969
			11/64	.17188	4.366
	3/16			.18750	4.763
			13/64	.20313	5.159
		7/32		.21875	5.556
			15/64	.23438	5.953
1/4				.25000	6.350
			17/64	.26563	6.747
		9/32		.28125	7.144
			19/64	.29688	7.541
	5/16			.31250	7.938
			21/64	.32813	8.334
		11/32		.34375	8.731
			23/64	.35938	9.128
3/8				.37500	9.525
			25/64	.39063	9.922
		13/32		.40625	10.319
			27/64	.42188	10.716
	7/16			.43750	11.113
			29/64	.45313	11.509
		15/32		.46875	11.906
			31/64	.48438	12.303
1/2				.50000	12.700

Fraction				Inches	mm
			33/64	.51563	13.097
		17/32		.53125	13.494
			35/64	.54688	13.891
	9/16			.56250	14.288
			37/64	.57813	14.684
		19/32		.59375	15.081
			39/64	.60938	15.478
5/8				.62500	15.875
			41/64	.64063	16.272
		21/32		.65625	16.669
			43/64	.67188	17.066
	11/16			.68750	17.463
			45/64	.70313	17.859
		23/32		.71875	18.256
			47/64	.73438	18.653
3/4				.75000	19.050
			49/64	.76563	19.447
		25/32		.78125	19.844
			51/64	.79688	20.241
	13/16			.81250	20.638
			53/64	.82813	21.034
		27/32		.84375	21.431
			55/64	.85938	21.828
7/8				.87500	22.225
			57/64	.89063	22.622
		29/32		.90625	23.019
			59/64	.92188	23.416
	15/16			.93750	23.813
			61/64	.95313	24.209
		31/32		.96875	24.606
			63/64	.98438	25.003
1				1.00000	25.400

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9. The METRIC SYSTEM OF MEASURMENT uses a power of 10 for all basic units.

10. An OUTSIDE CALIBER can be used when making external measurements where 1/64" is sufficient.

Customary and Metric Values

Quantity	Customary (abbreviation)	Metric (abbreviation)
Length	Inch (in) Foot (ft) Mile (mi)	Meter (m)
Weight (mass)	Ounce (oz) Pound (lb)	Kilogram (kg)
Area	Square inch (sq-in)	Square meter (m^2)
Dry volume	Cubic inch (cu-in)	Cubic meter (m^3) Cubic centimeter (cc)
Liquid volume	Ounce (oz) Pint (pt) Quart (qt) Gallon (gal)	Liter (L) Cubic centimeter (cc)
Road speed	Miles per hour (mph)	Kilometer per hour (km/h)
Torque	Foot-pounds (ft-lb)	Newton meter (N·m)
Power	Horsepower (hp)	Kilowatt (kW)
Pressure	Pounds per square inch (psi)	Kilopascal (kPa)
Temperature	Degrees fahrenheit (°F)	Degrees celsius (°C)

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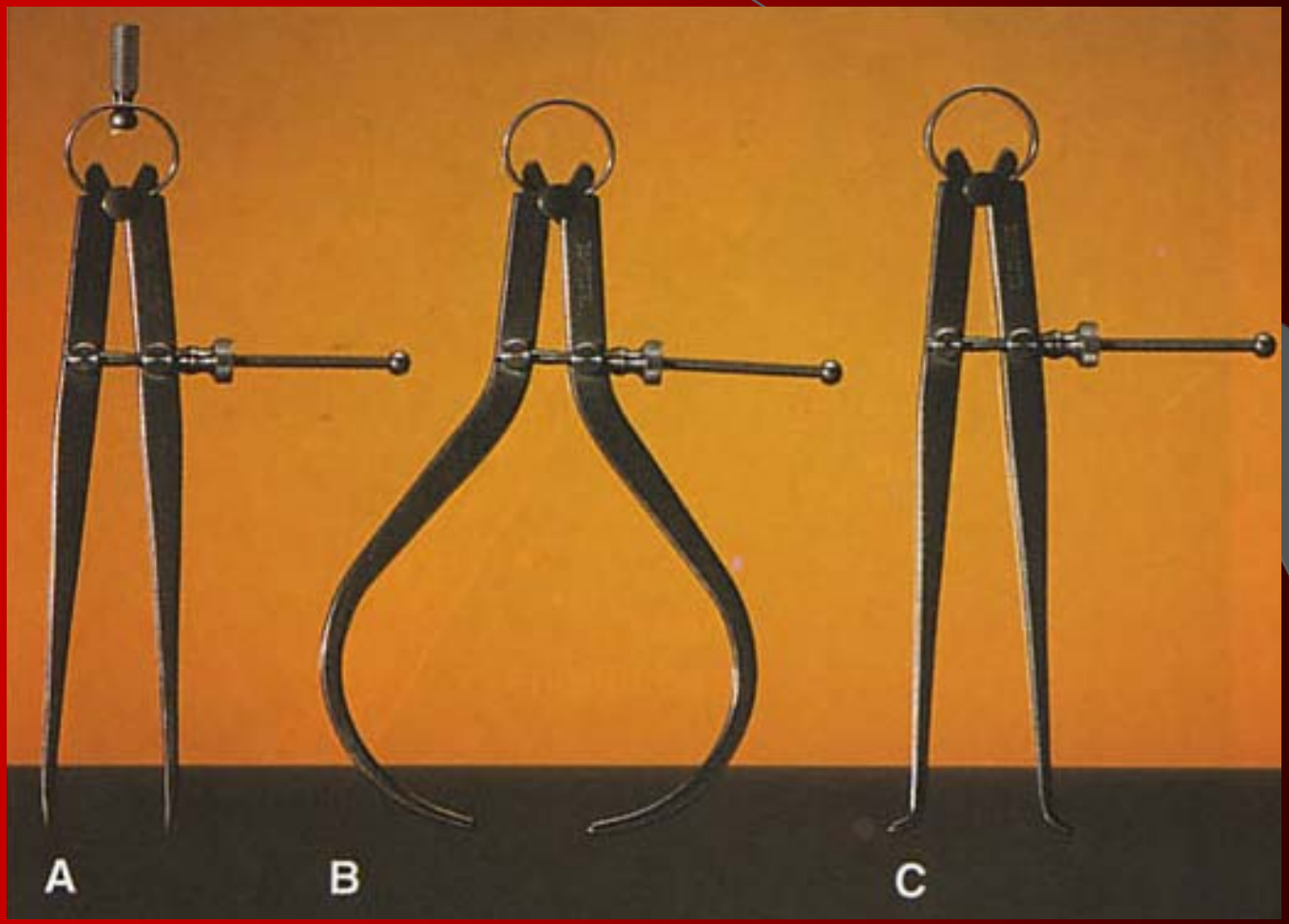

A. Dividers B. Outside Calibers C. Inside Calibers

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