Fundamentals of Engineering Drawing

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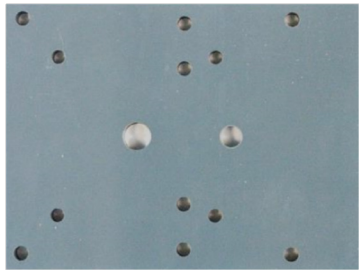
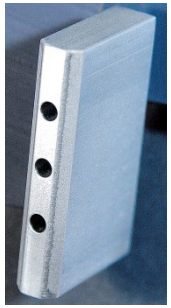
http://saliterman.umn.edu/

Parts & Assemblies

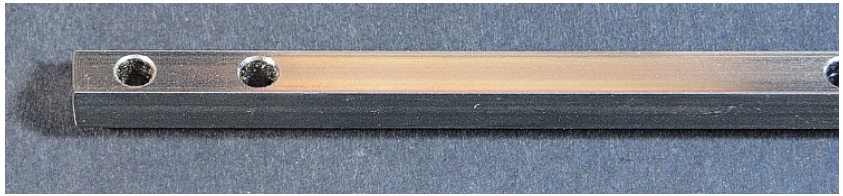


Base Plate

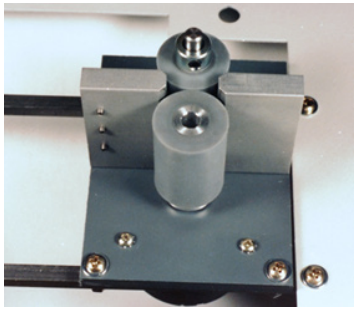
Roller

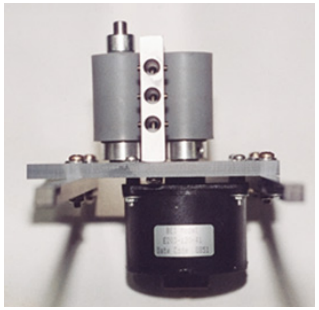


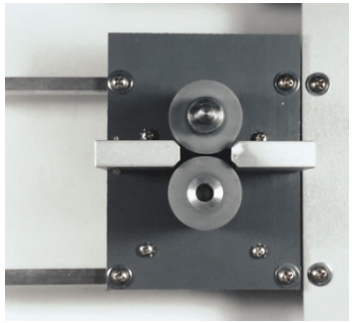
Clamp

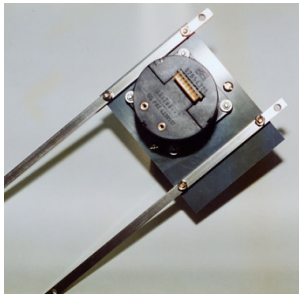


Support Bar



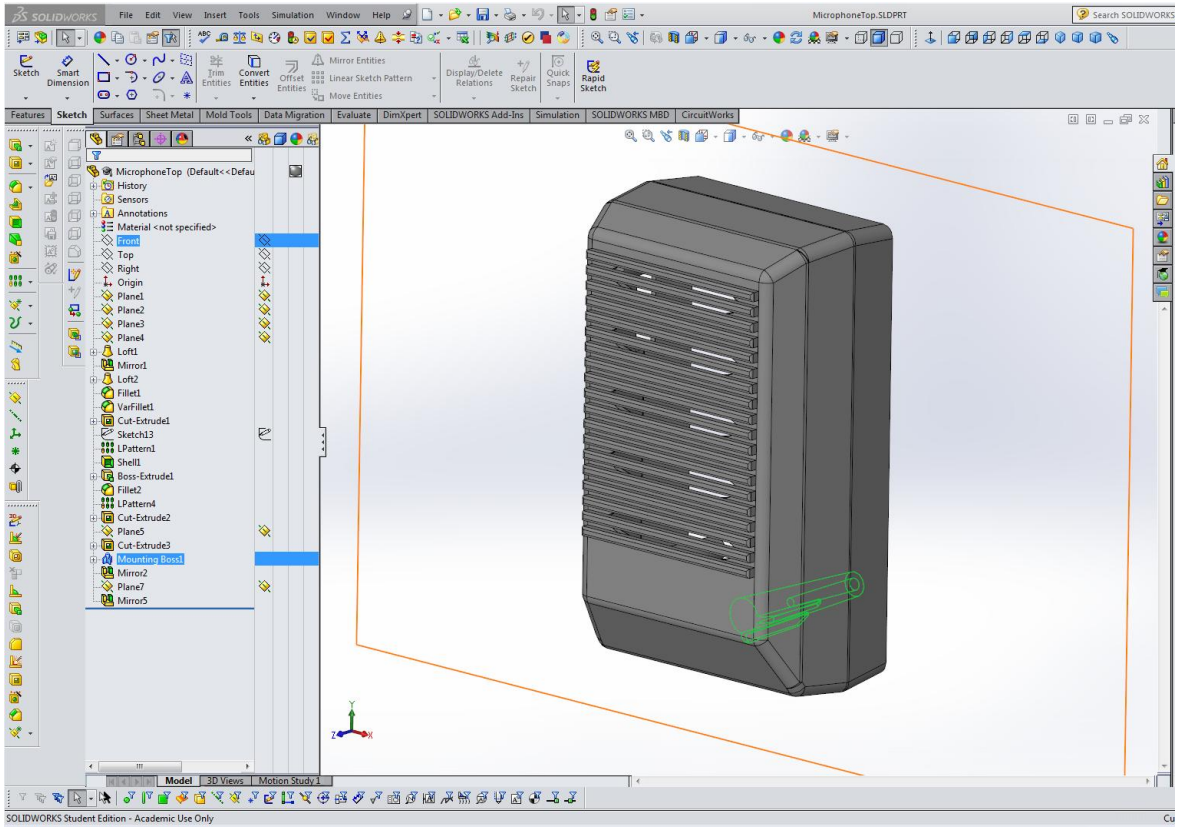






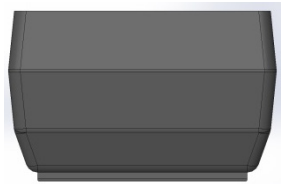
Assembly of Parts in Various Views

Computer Aided Design & Drafting (CADD)

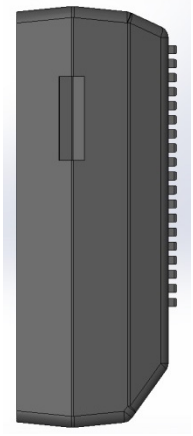


SolidWorks software and an example part.

Views…

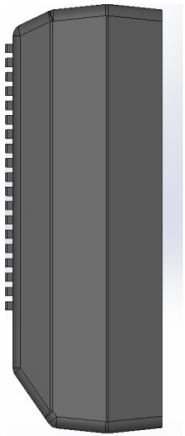


Top



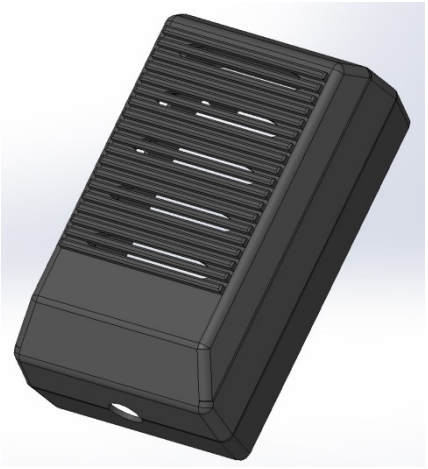
Left Side

Front

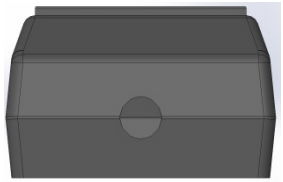


Right Side

Back



Trimetric Projection



Bottom

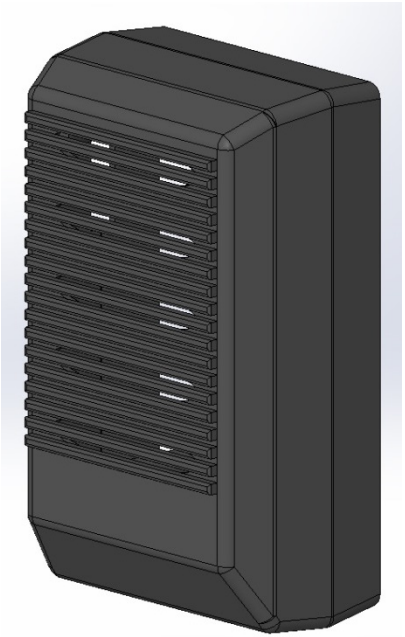
Geometric Projections…

Isometric

The 3-axes appear equally foreshortened and the angle between any two of them is 120 degrees.

Trimetric

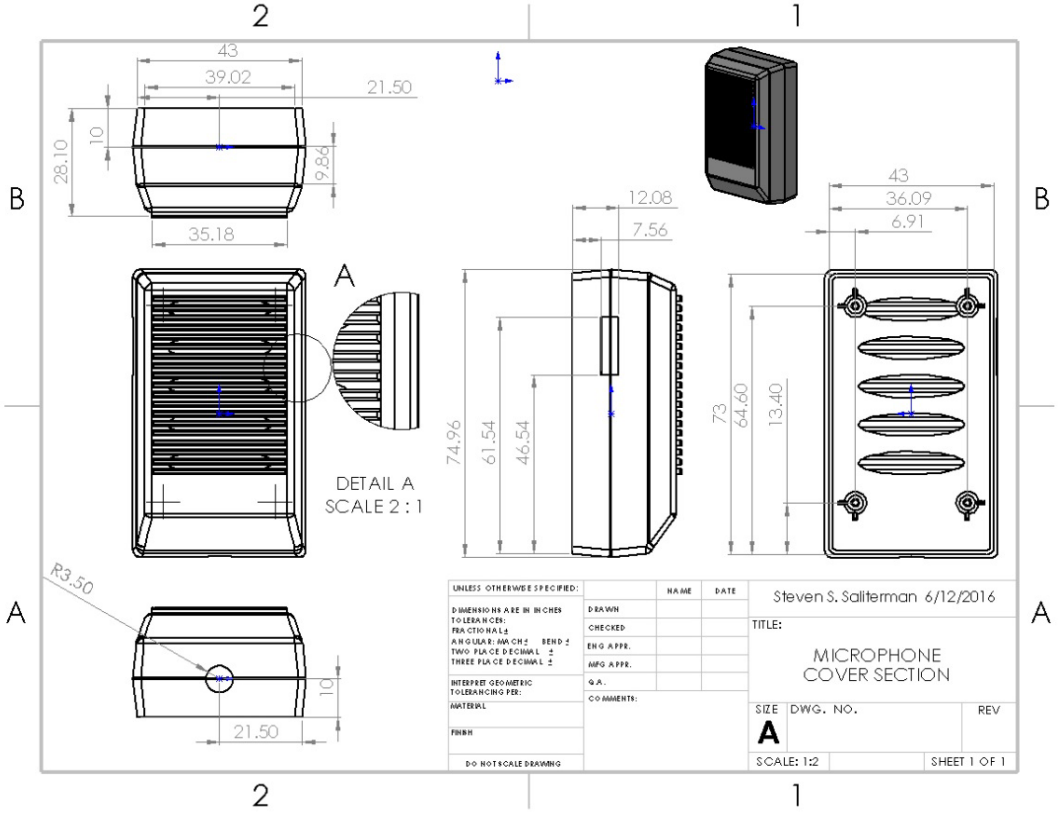
The 3-axes are at arbitrary angles.



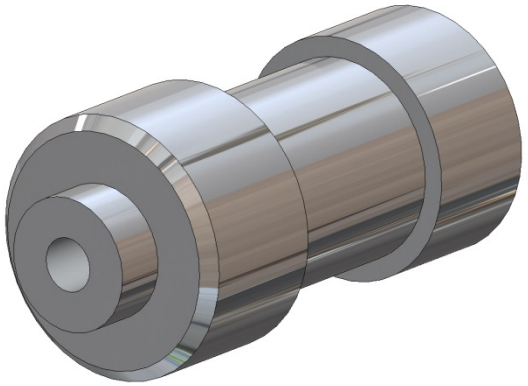
Dimetric

One axis has a different scale than the other two axis in the drawing.

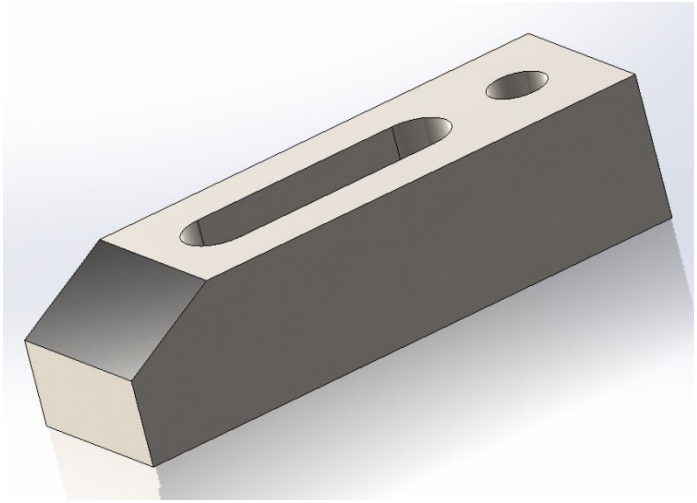
Drawing & 3D Printed Prototype…



Parts for Lathe and Mill Exercise…

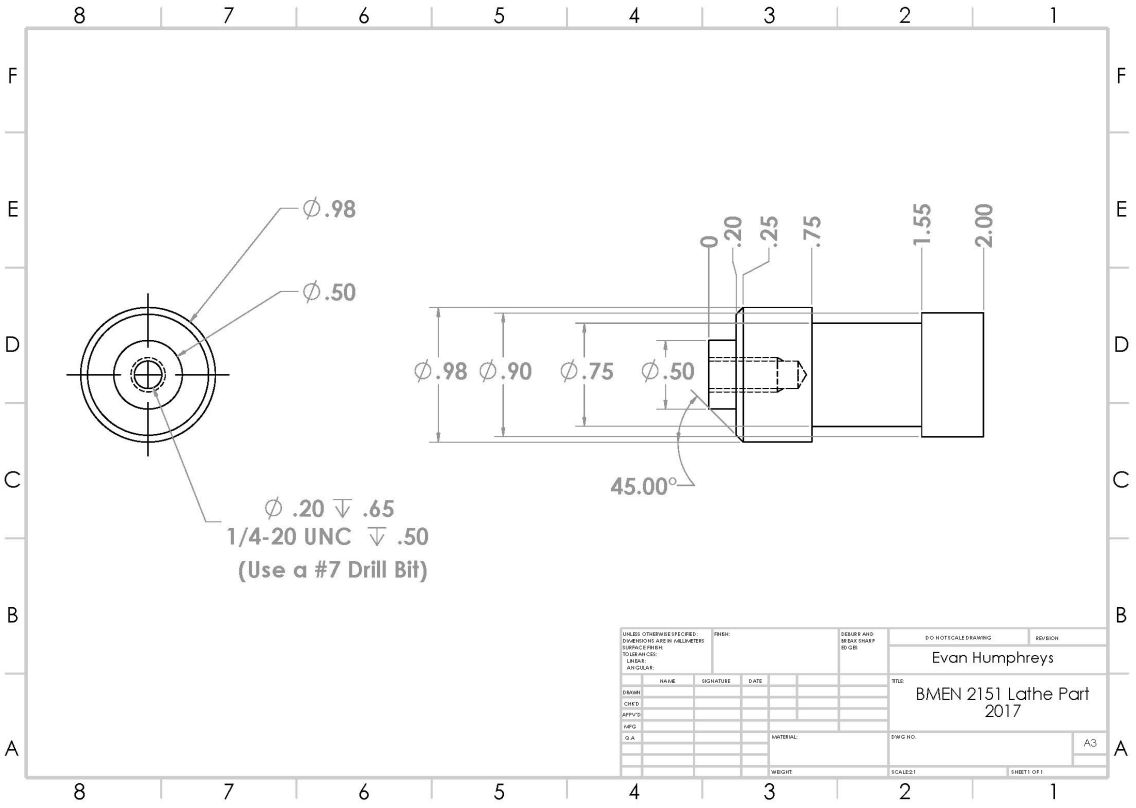


Aluminum Part Made on Lathe



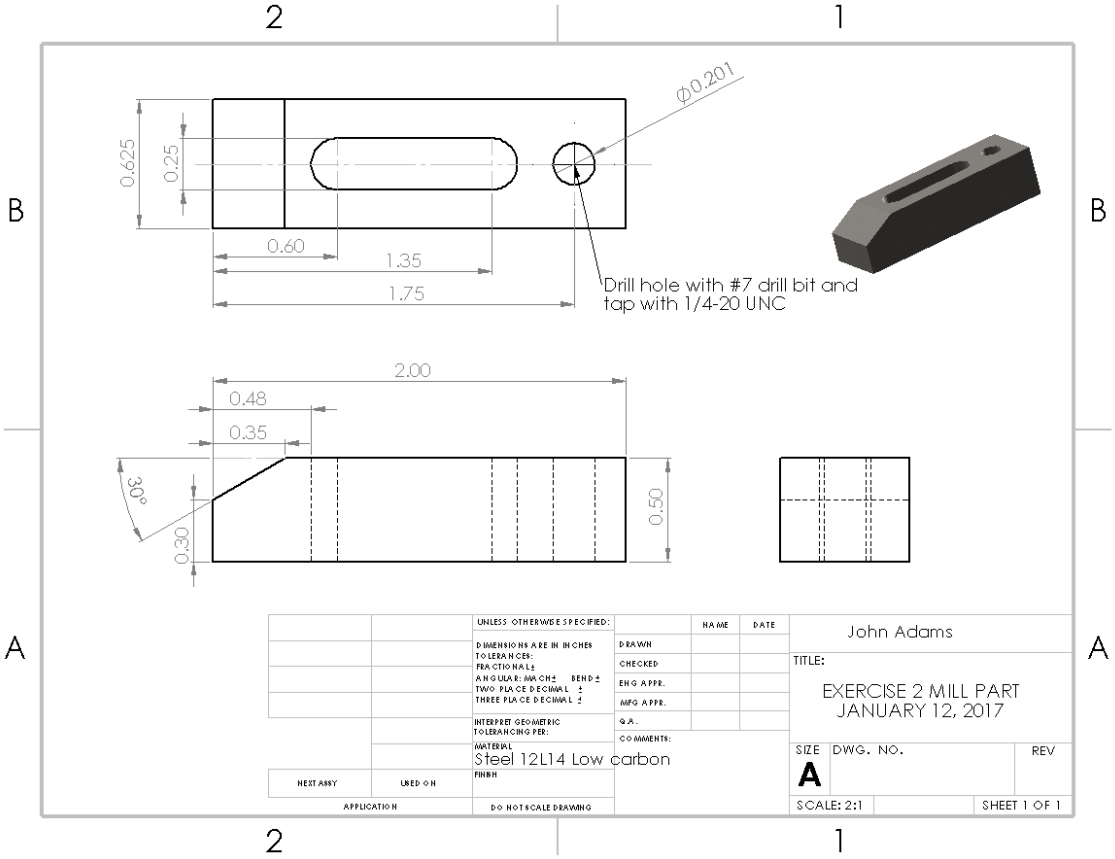
Steel Mini-Toe Clamp Made on Mill

Lathe Part Drawing…

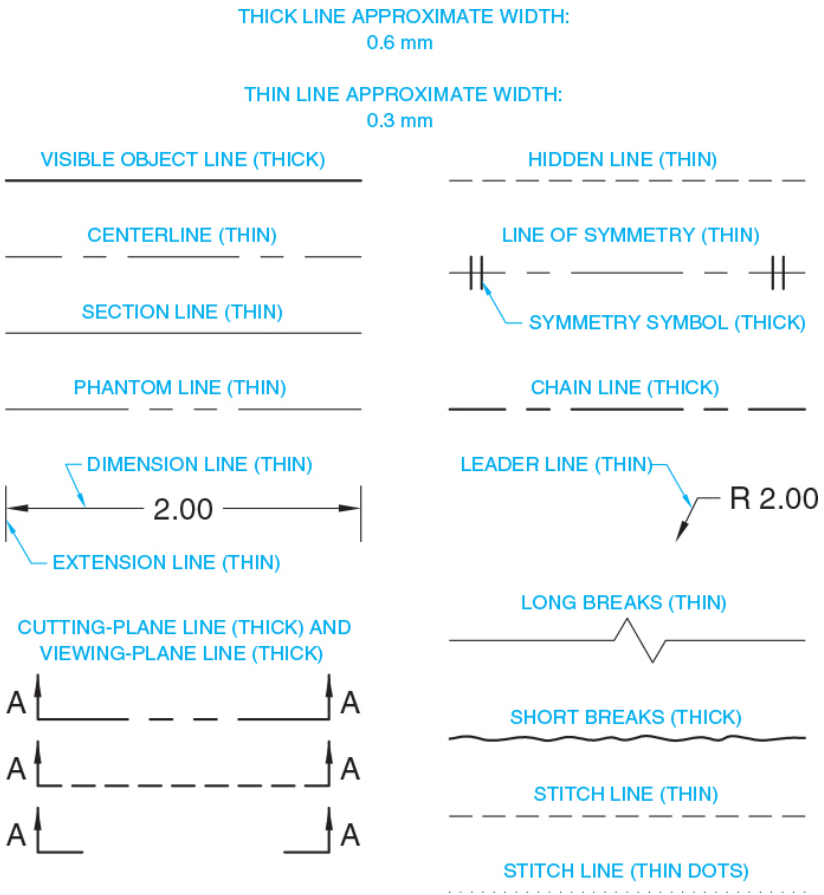


SOLIDWORKS Educational Product. For Instructional Use Only.

Mill Part Drawing…

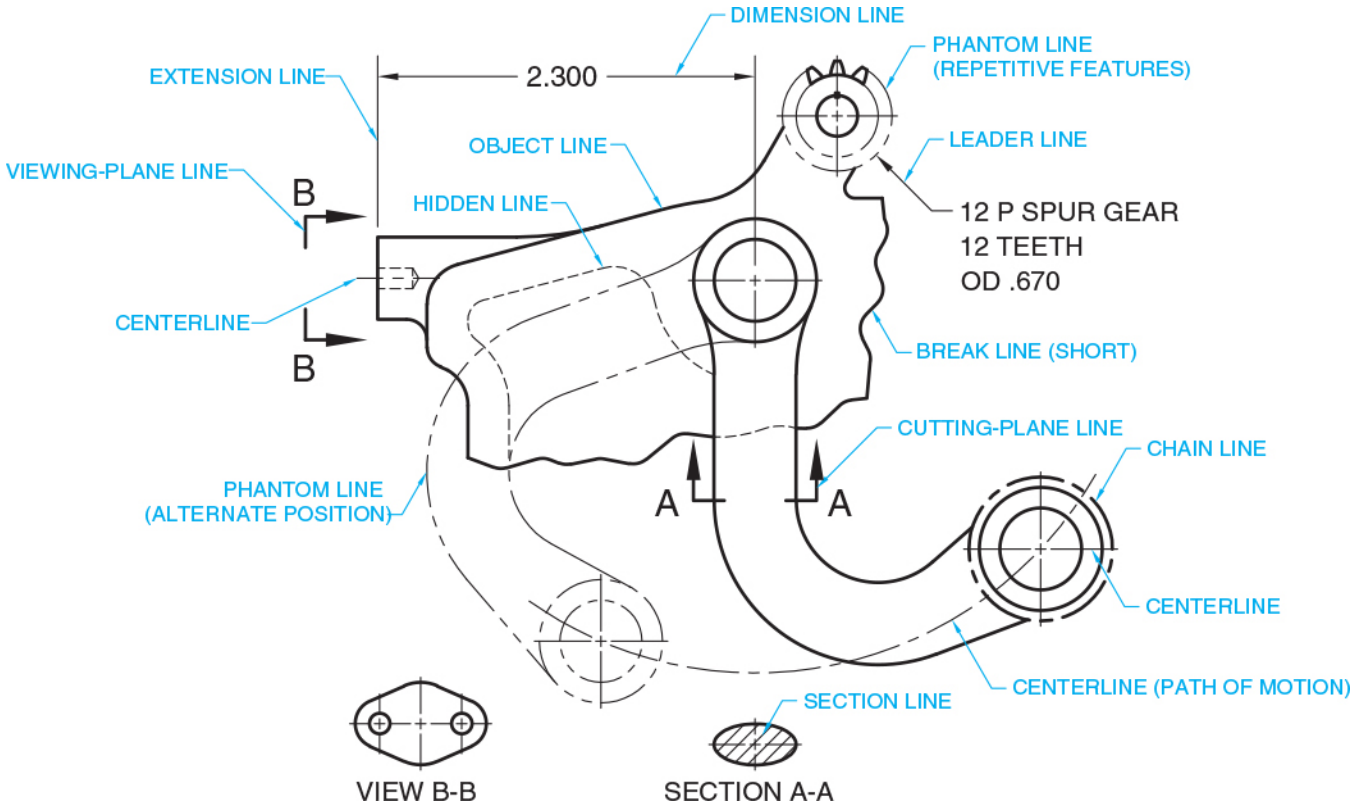


Drawing Concepts – *Line Types…*



Madsen, D.A. and D.P. Madsen. *Engineering Drawing & Design*, 5th ed. Delmar Cengage Learning. Clifton Park, NY, (2012).

Example of Drawing Lines...



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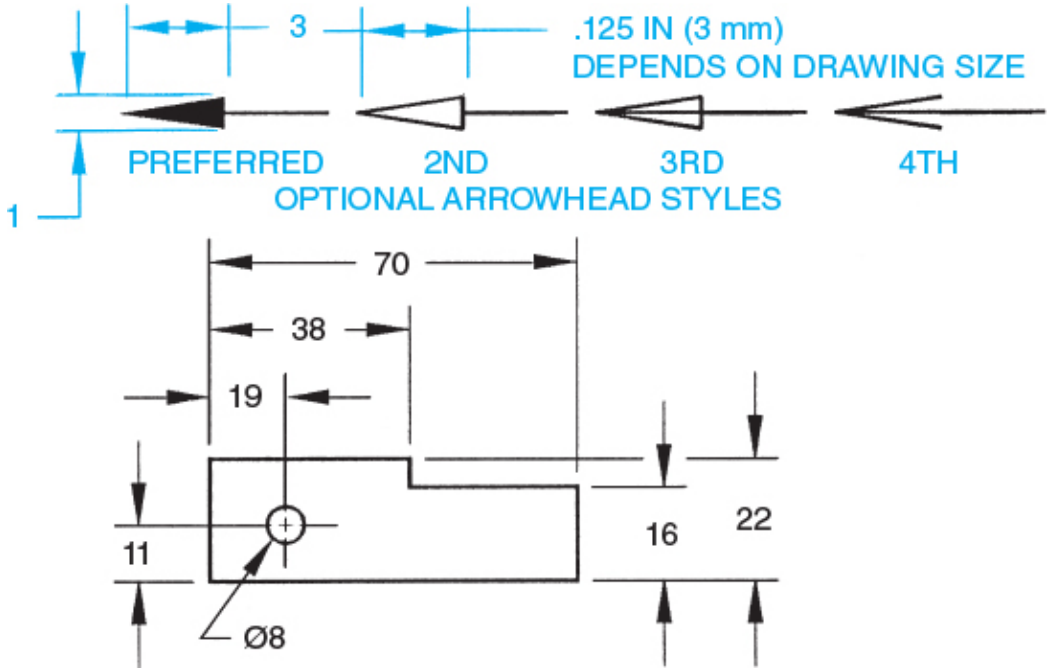
Dimension Arrowhead Styles…



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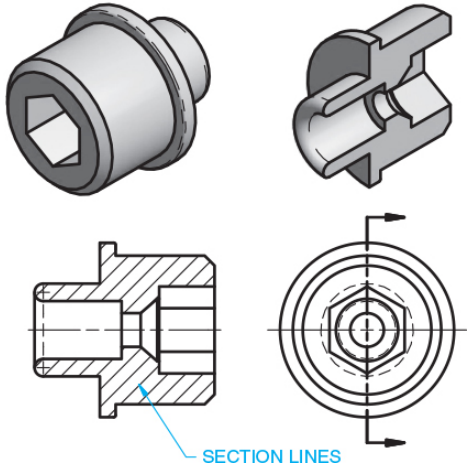
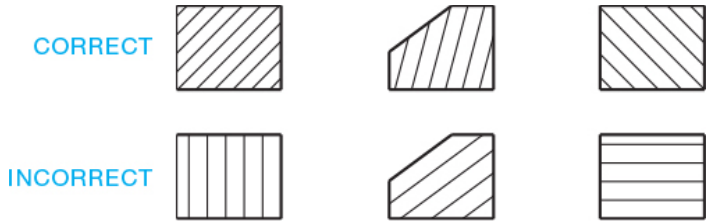
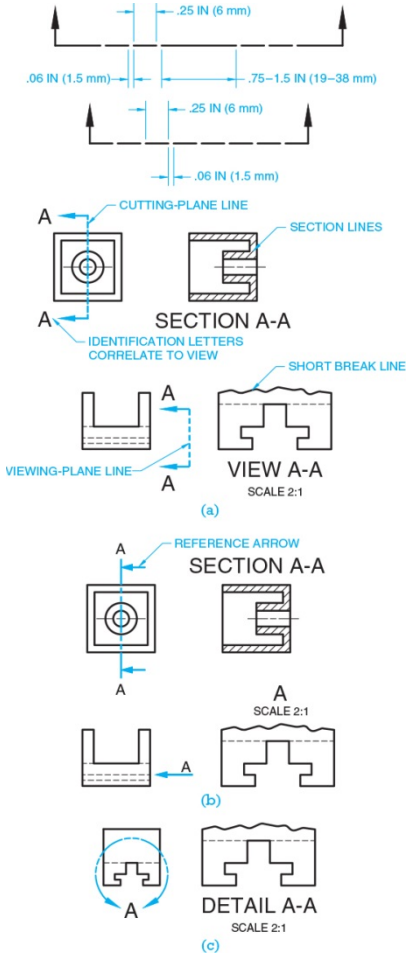
Section Lines & Detail...







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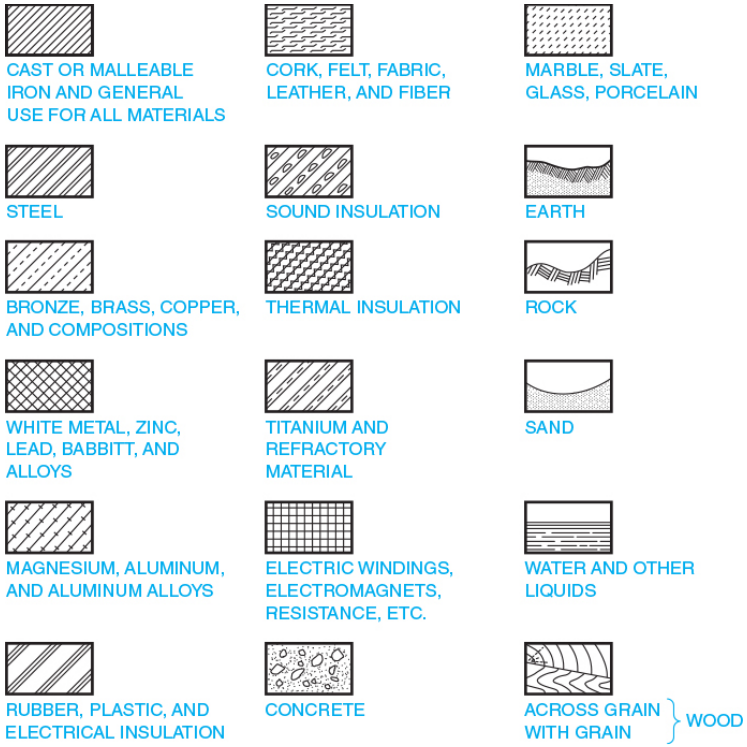
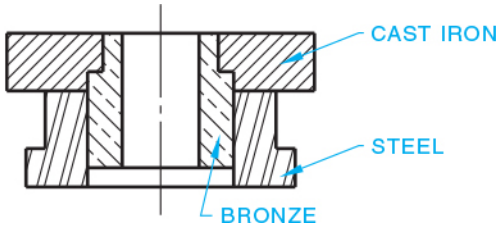
Material Representation...





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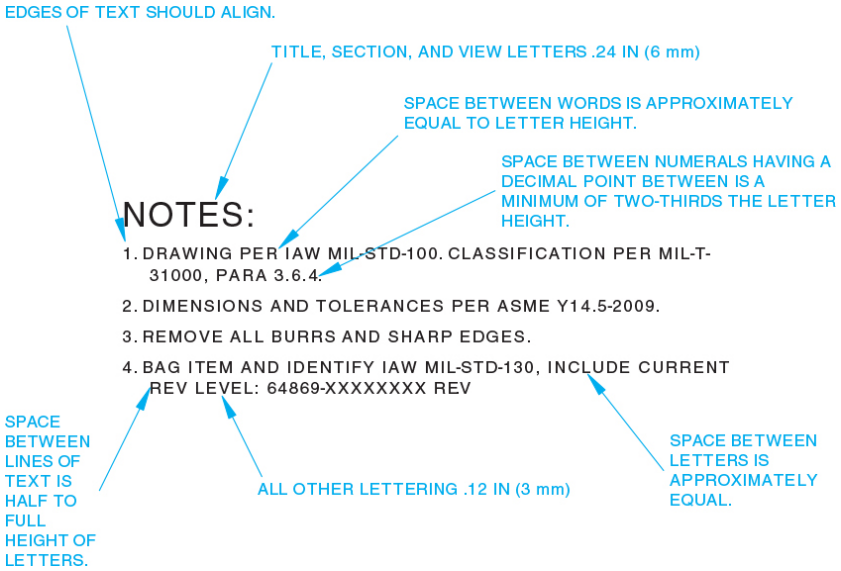
Notes



DIMENSIONS AND TOLERANCES PER ASME Y14.5–2009.
ASME Y14.2 standard: vertical UPPERCASE, Romans font

BEND DOWN 90° R.50
ASME Y14.2 standard: vertical UPPERCASE, Arial font

REMOVE ALL BURRS AND SHARP EDGES.
ASME Y14.2 standard: vertical UPPERCASE, Century Gothic font

SIMPSON LCC5.25-3.5 TYP
United States National CAD Standard: vertical UPPERCASE, SanSarif font

HOOD W/ FAN, VENT TO OUTSIDE AIR
Traditional architectural format: vertical UPPERCASE, Stylus BT font

ALL FRAMING LUMBER TO BE DFL #2 OR BETTER
Traditional architectural format: vertical UPPERCASE, CountryBlueprint font

TYP EACH END TWO FLANGES
ASME Y14.2 standard variation: inclined UPPERCASE, Arial font

Mississippi River
River identification on a map: inclined lowercase, SanSarif font

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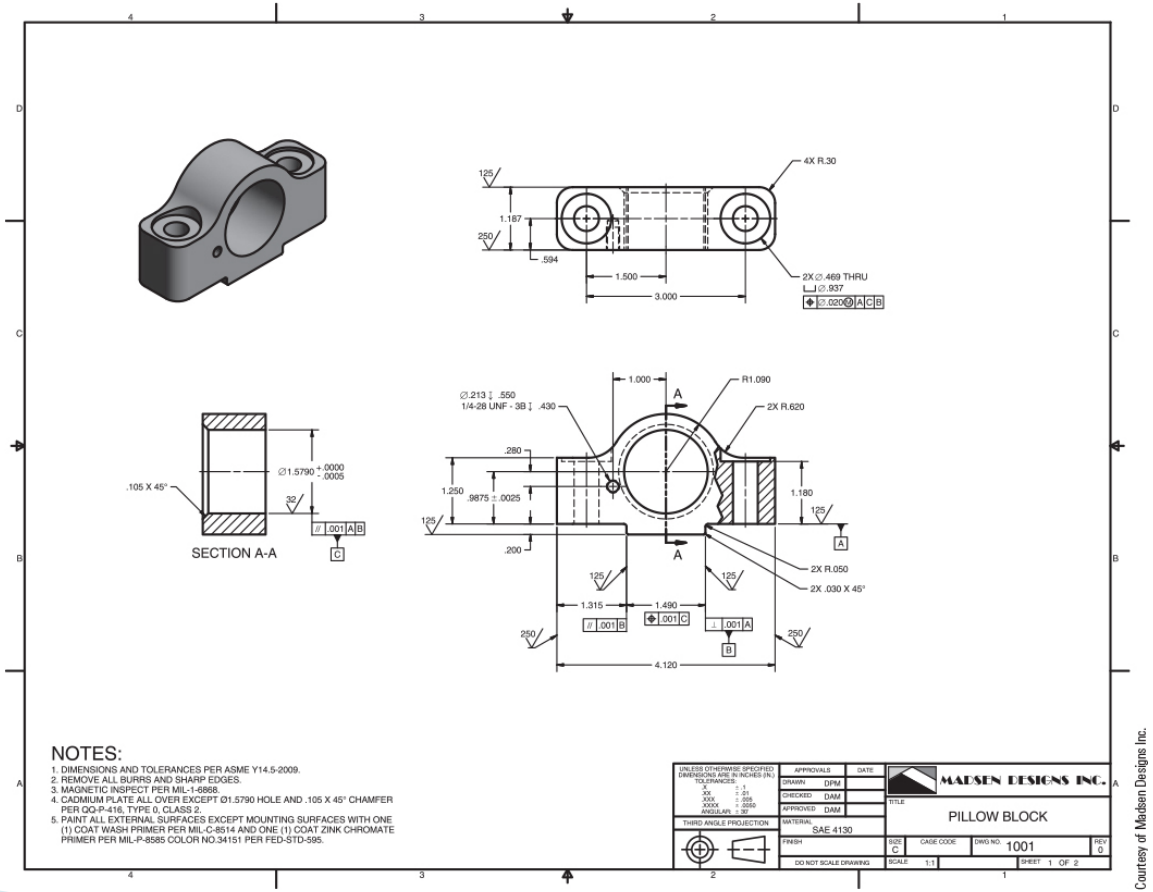
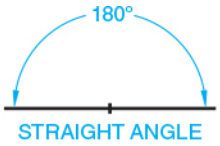
Example…

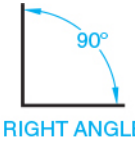


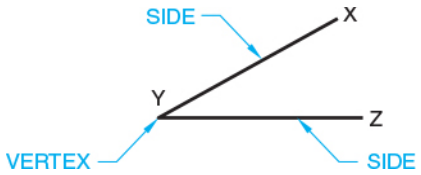
Courtesy of Madsen Designs Inc.

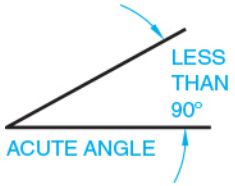
Madsen, D.A. and D.P. Madsen. *Engineering Drawing & Design*, 5th ed. Delmar Cengage Learning. Clifton Park, NY, (2012).

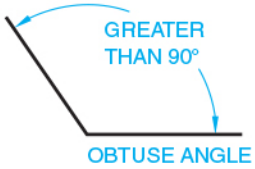
Angles and Triangles

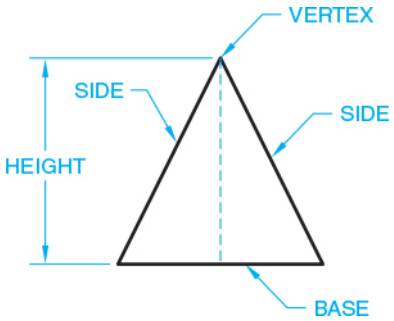


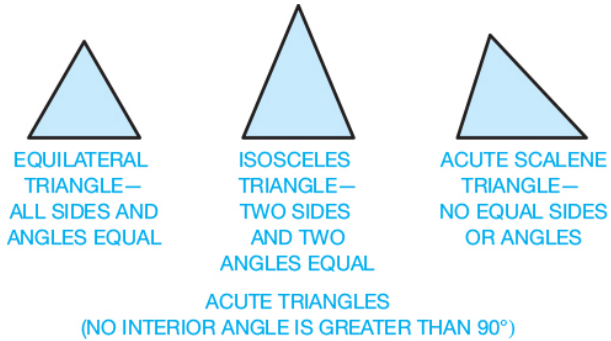


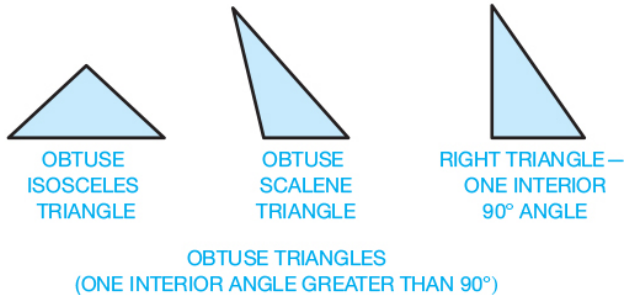












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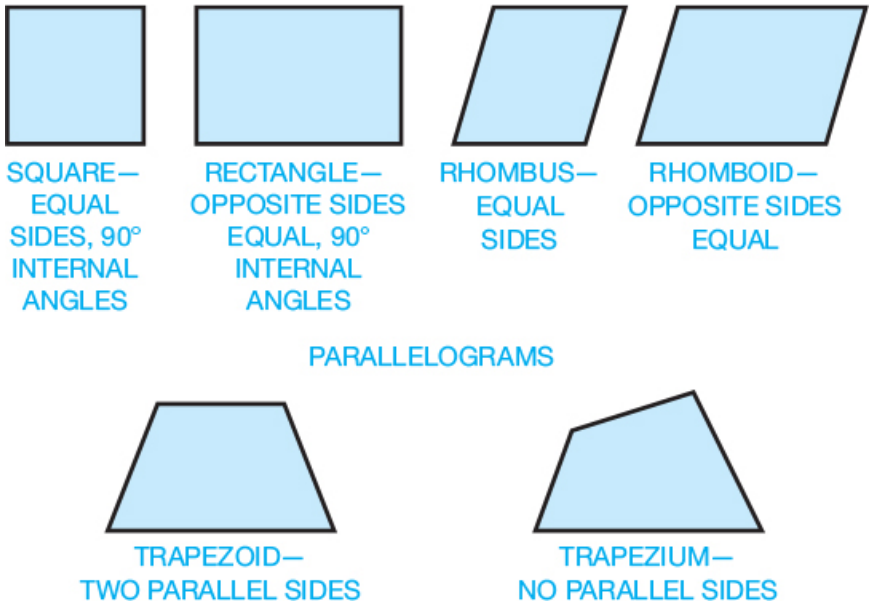
Parallelograms…



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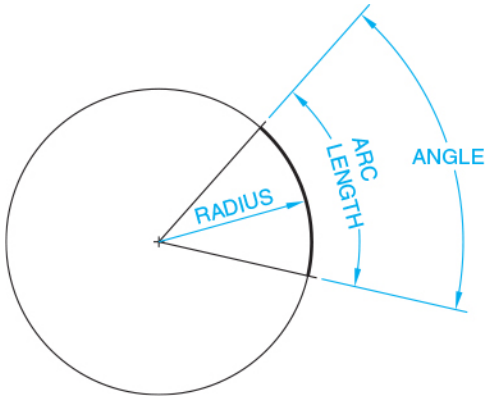
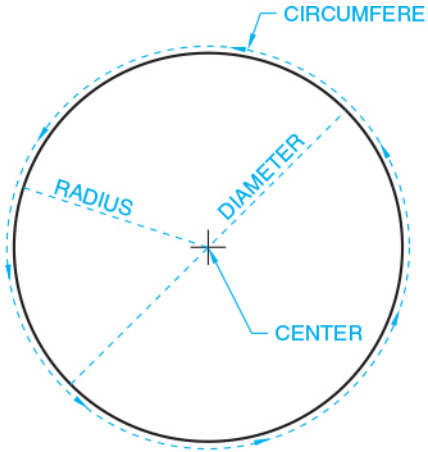
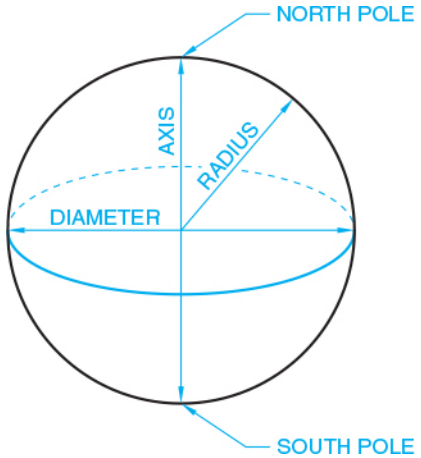
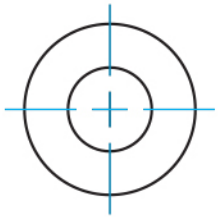
Arcs, Radius, & Diameter…

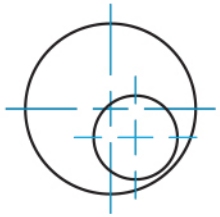








CONCENTRIC CIRCLES (SAME CENTERS)



ECCENTRIC CIRCLES (DIFFERENT CENTERS)

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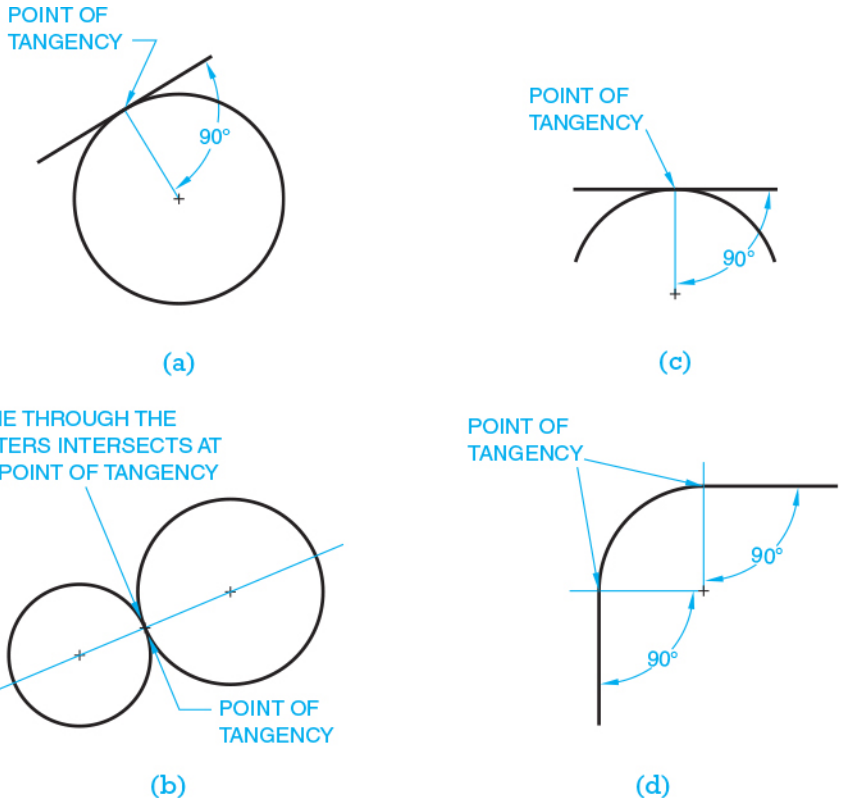
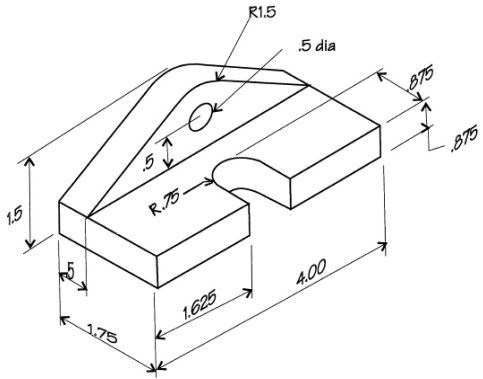
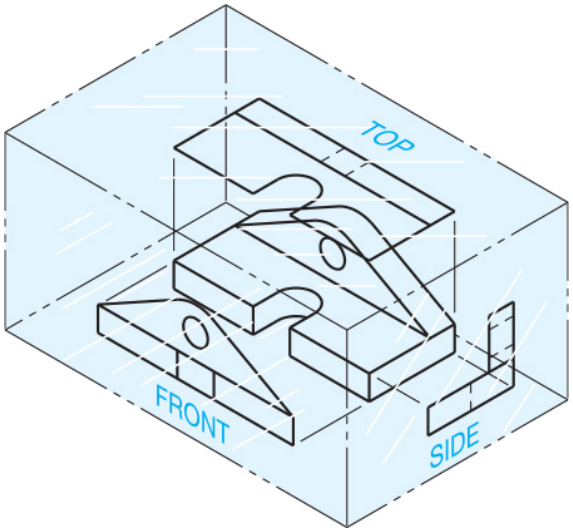
Tangents...


POINT OF
TANGENCY
90°
(a)
POINT OF
TANGENCY
90°
(c)
A LINE THROUGH THE
CENTERS INTERSECTS AT
THE POINT OF TANGENCY
POINT OF
TANGENCY
(b)
POINT OF
TANGENCY
90°
90°
(d)

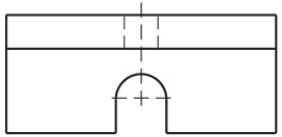
Views



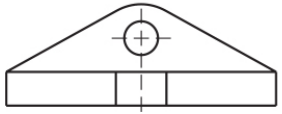
Part



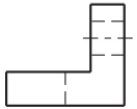
Projections



Top



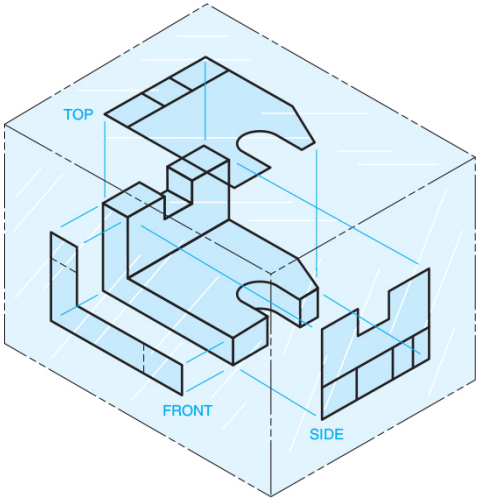
Front



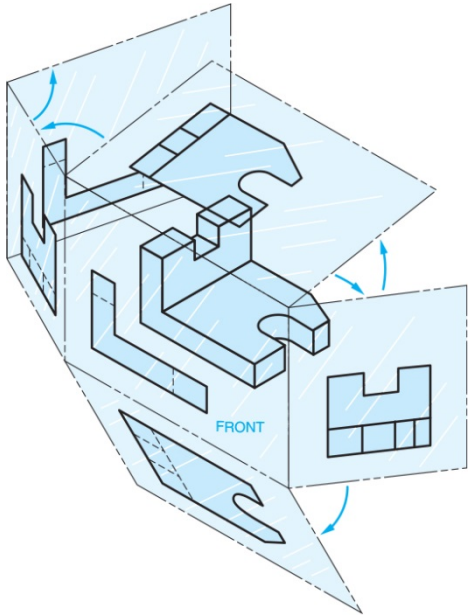
Right Side

Views

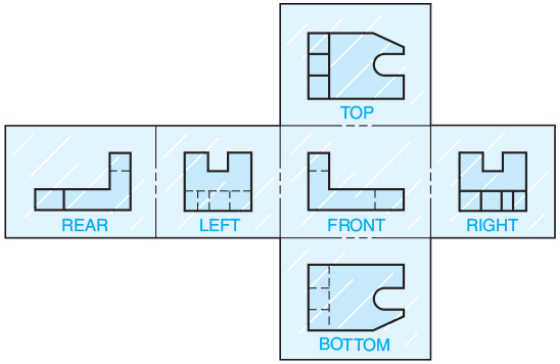
Example…



Projections

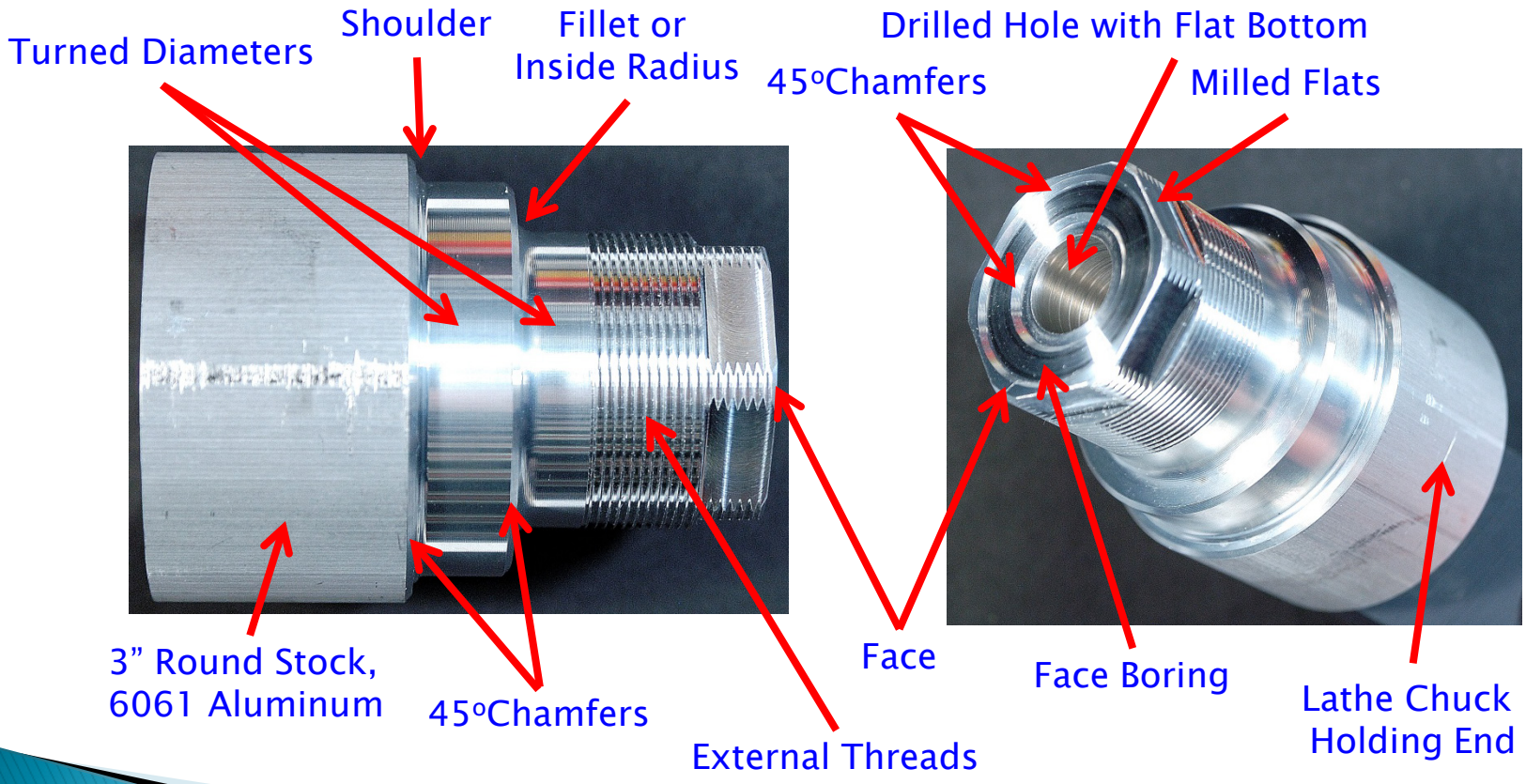


"Unfolded Box"



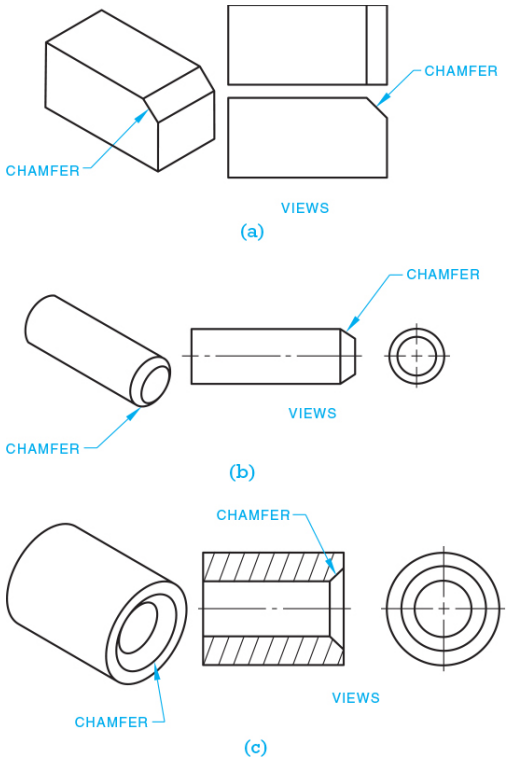
Drawing

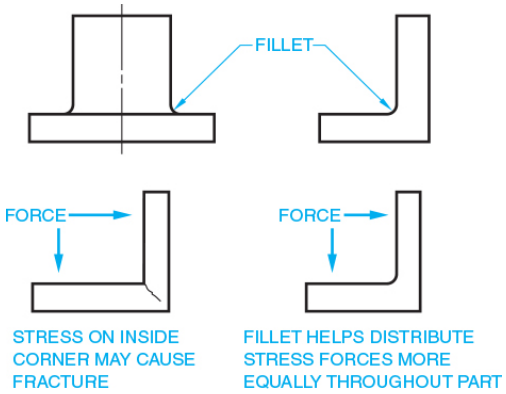
Part Features



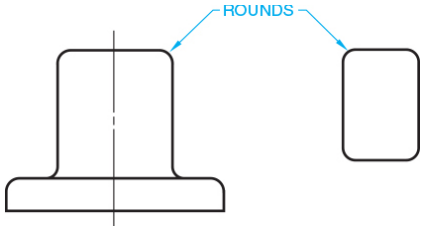
Part Courtesy of Craig Kruse, Productivity, Haas ST-20, X, Z, Y Lathe

Chamfer, Fillets and Round…





Internal Radius



External Radius

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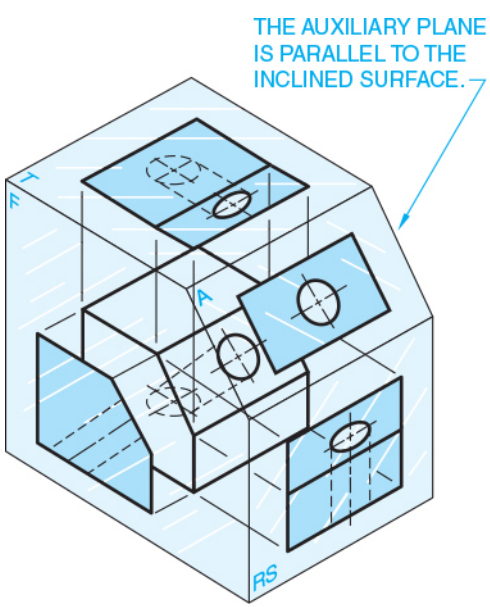
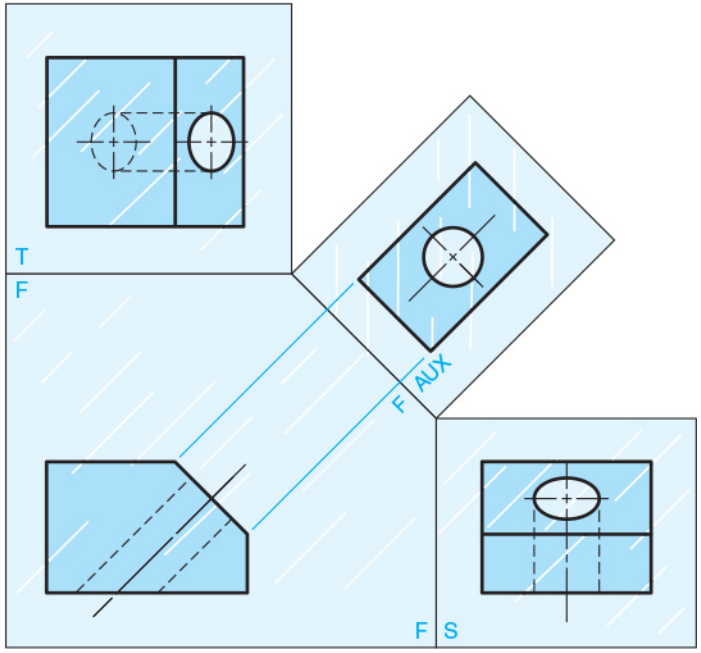
Auxiliary Plane





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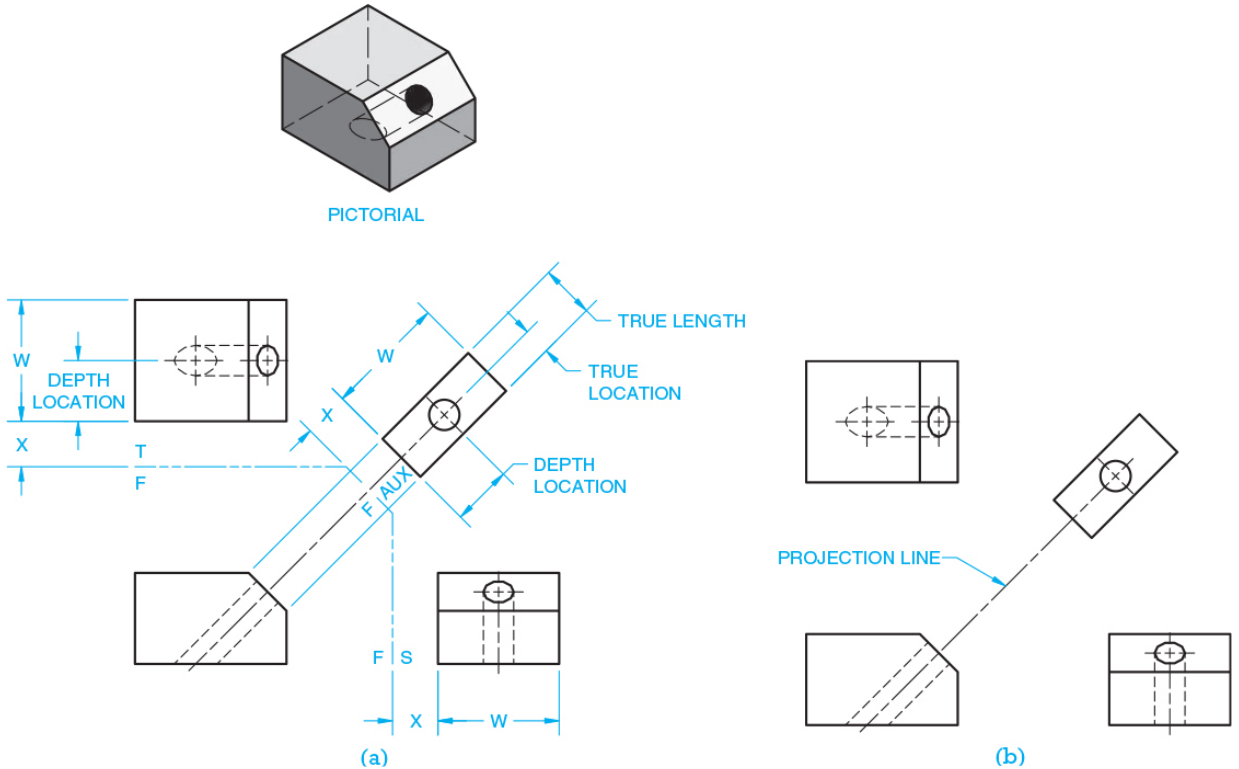
Including the Auxiliary Plane...



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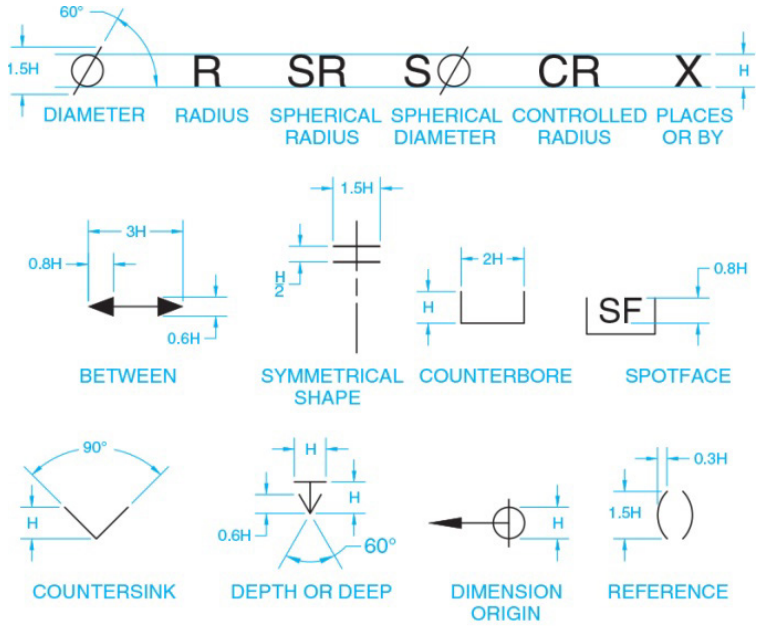
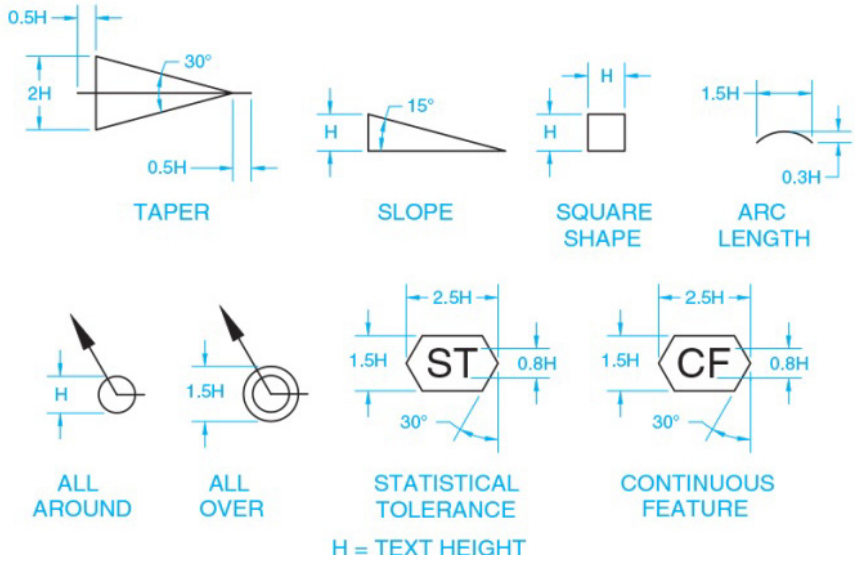
Symbols





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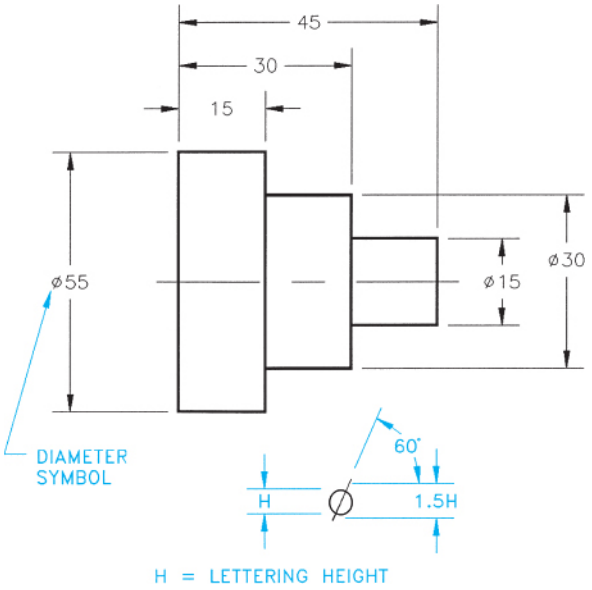
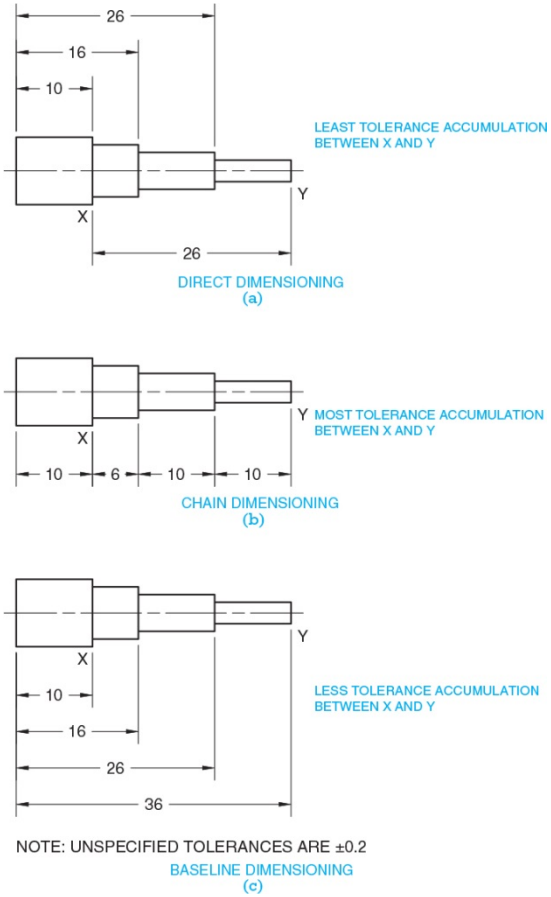
Dimensioning





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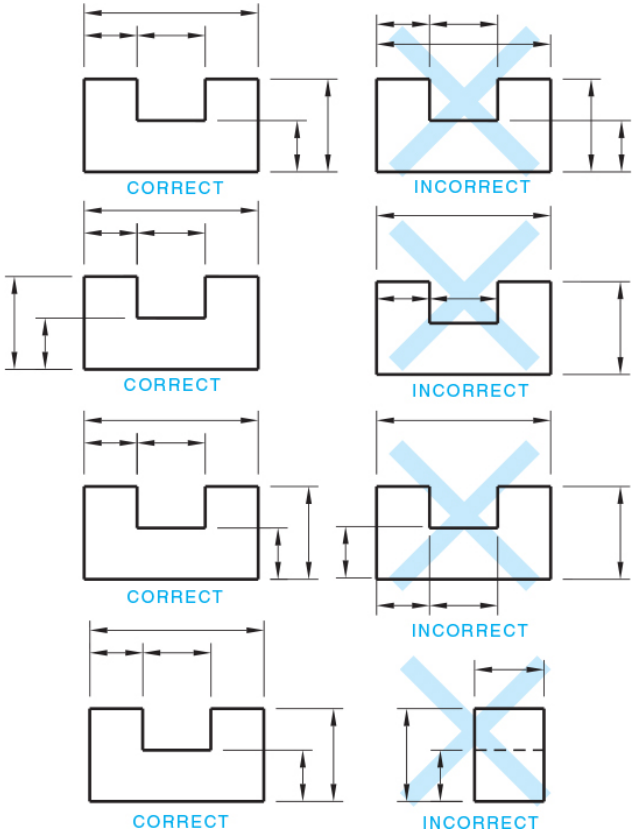
Correct Dimensioning Methods...



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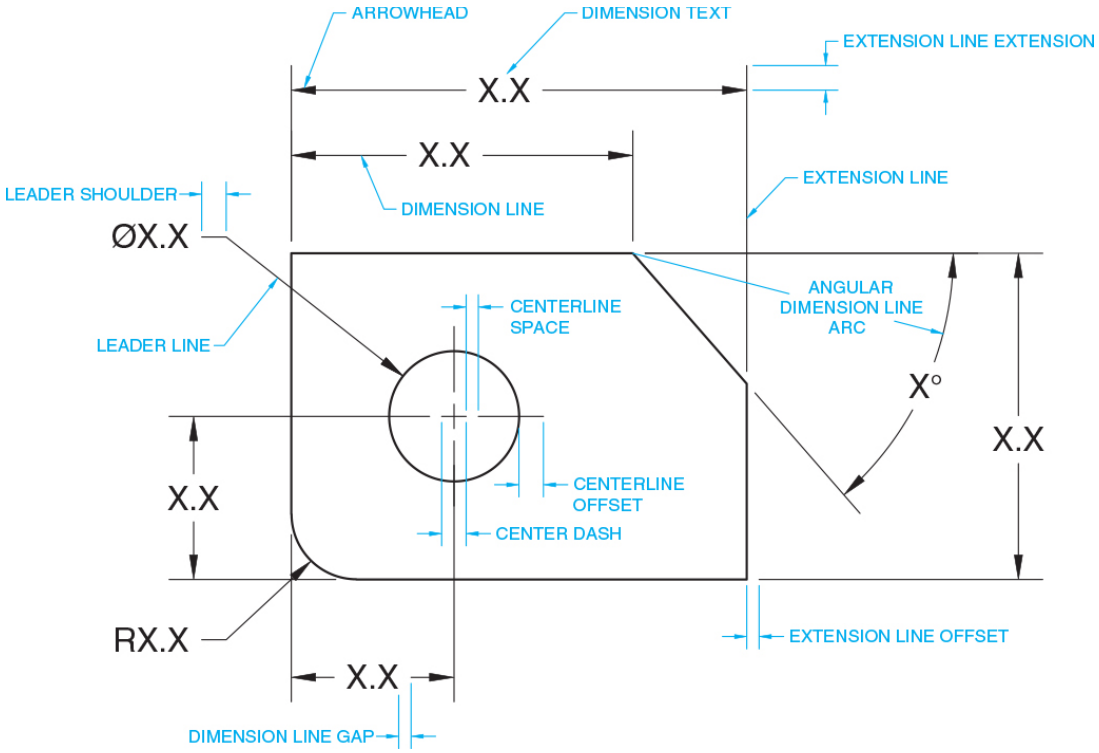
Dimensioning Nomenclature…



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Holes

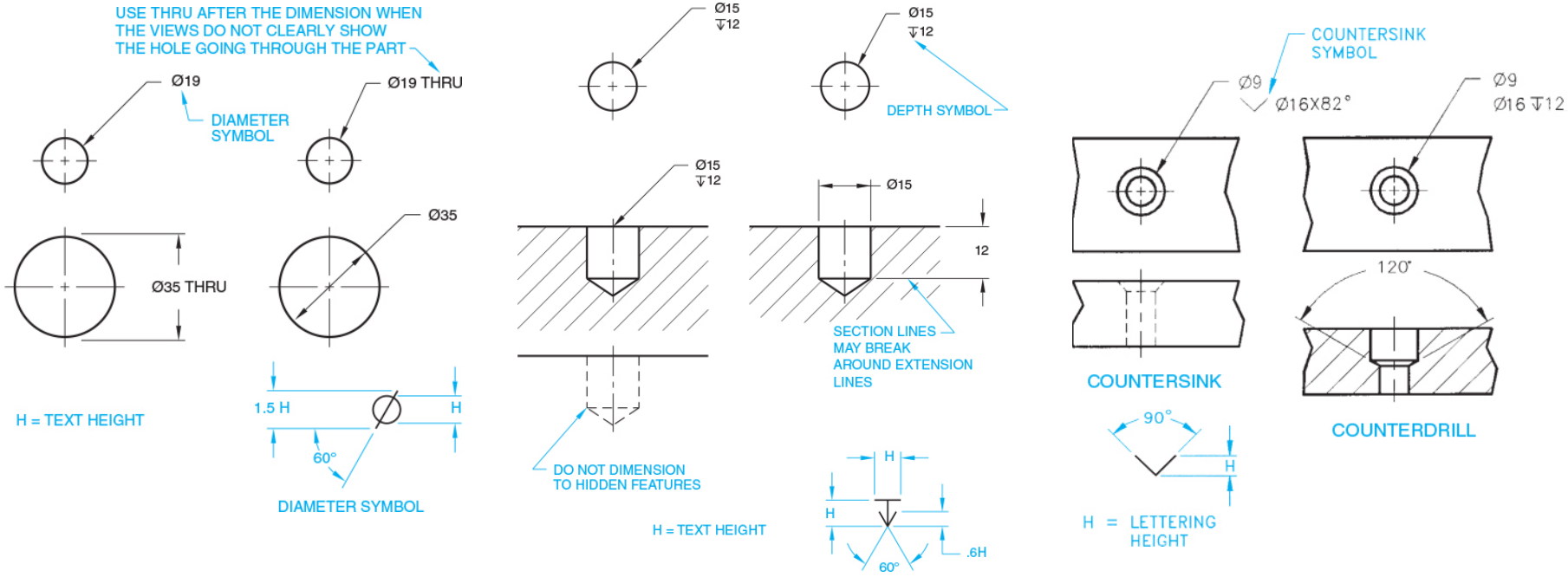

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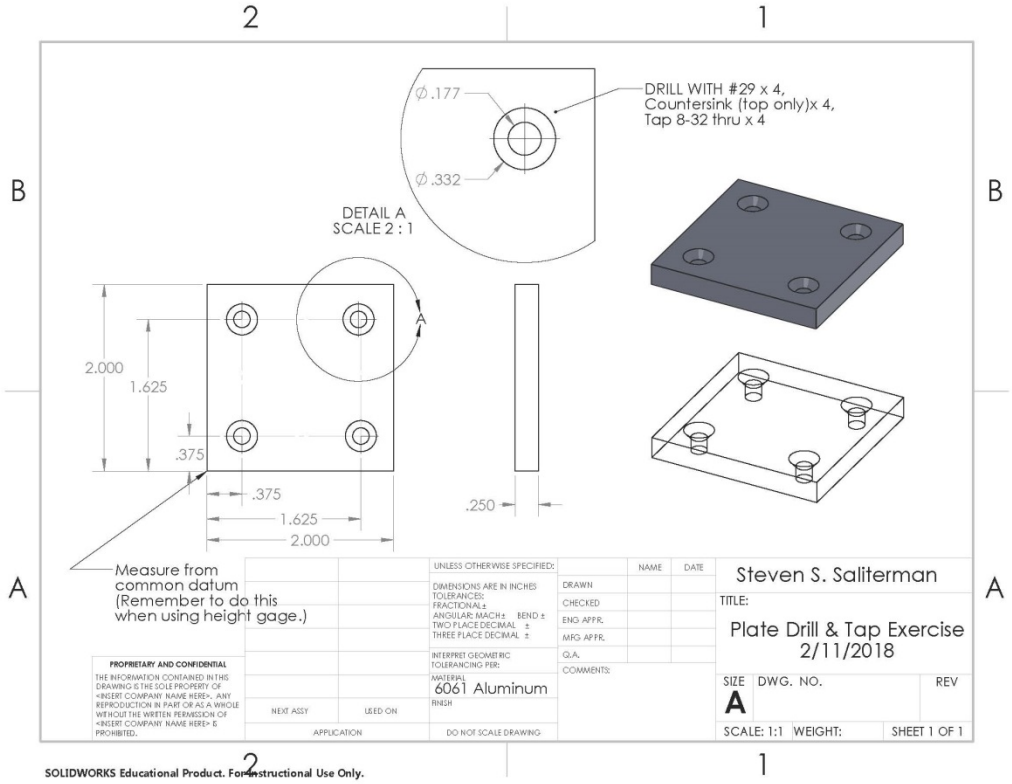
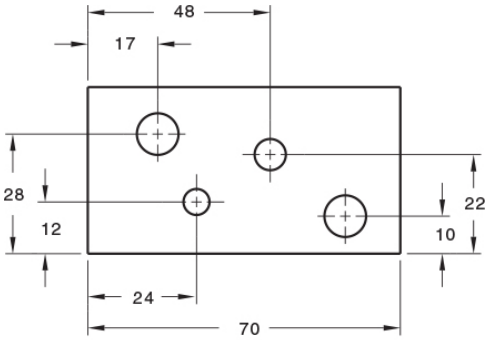
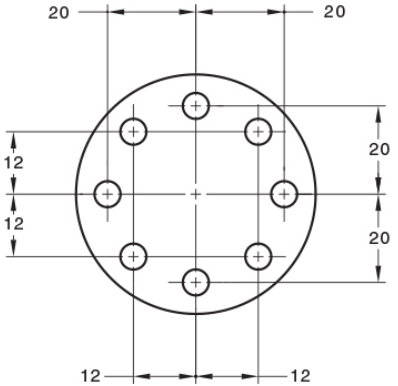
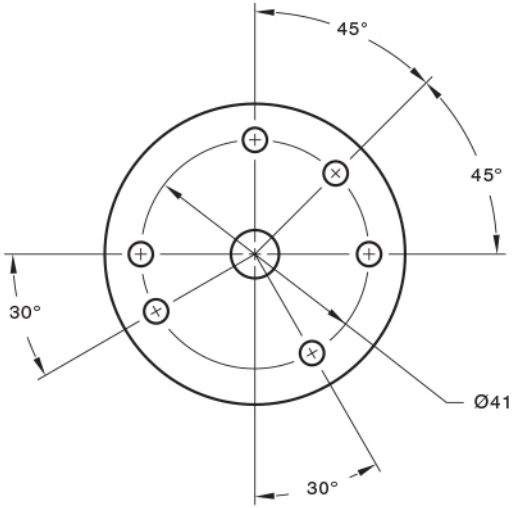
Plate Drill & Tap Exercise...

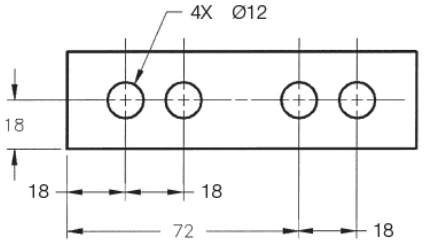


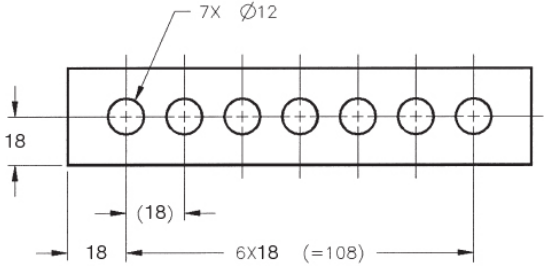
Hole Patterns…

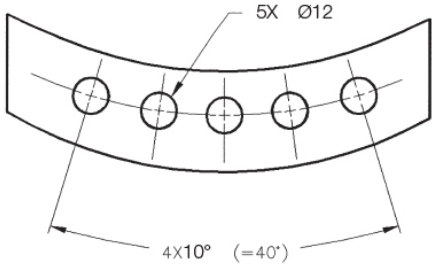












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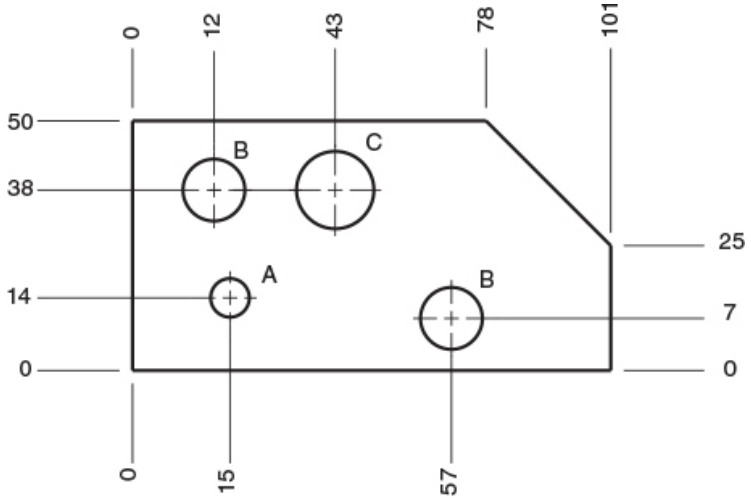
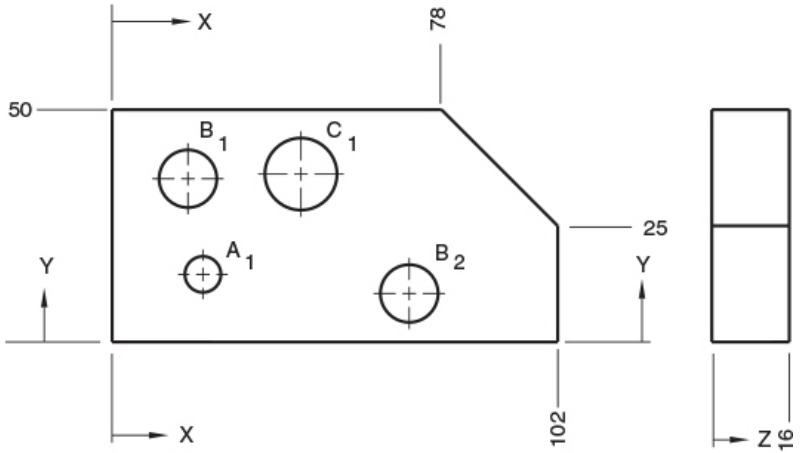
Hole Tables...



HOLE SYMBOL	HOLE DIA	QTY
A	6	1
B	9	2
C	12	1



HOLE SYMBOL	HOLE DIA	LOCATION X	LOCATION Y	DEPTH Z
A_1	6	15	14	THRU
B_1	9	12	38	9
B_2	9	57	7	12
C_1	12	43	38	THRU

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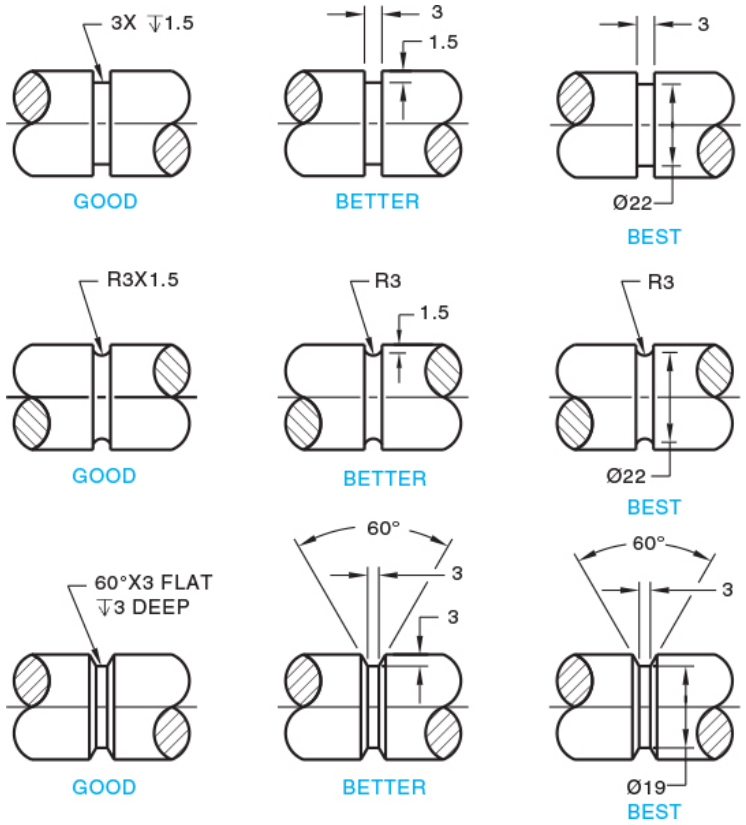
Grooves



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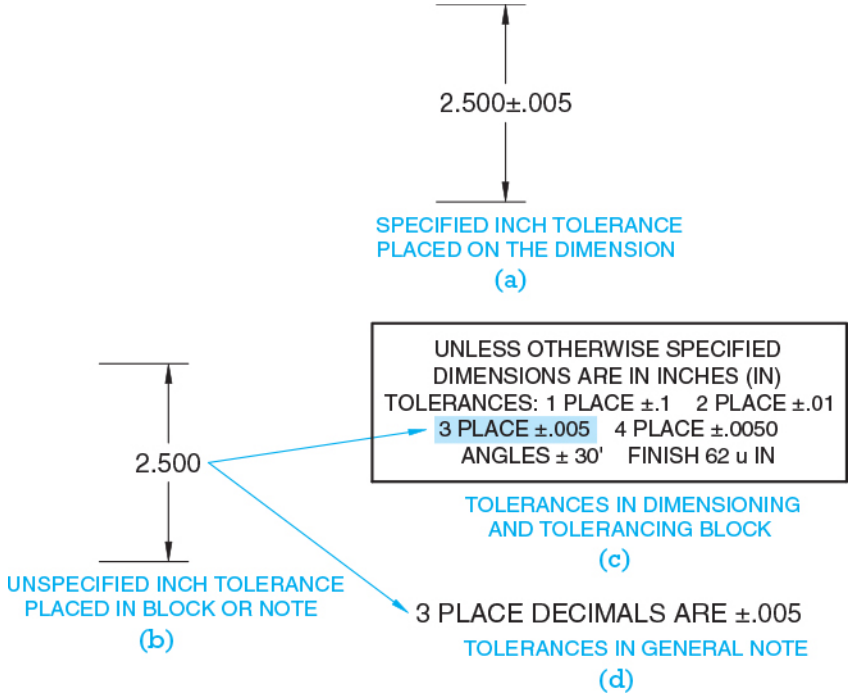
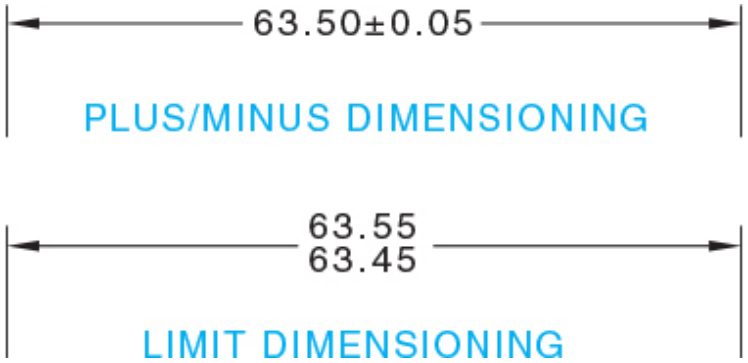
Tolerances





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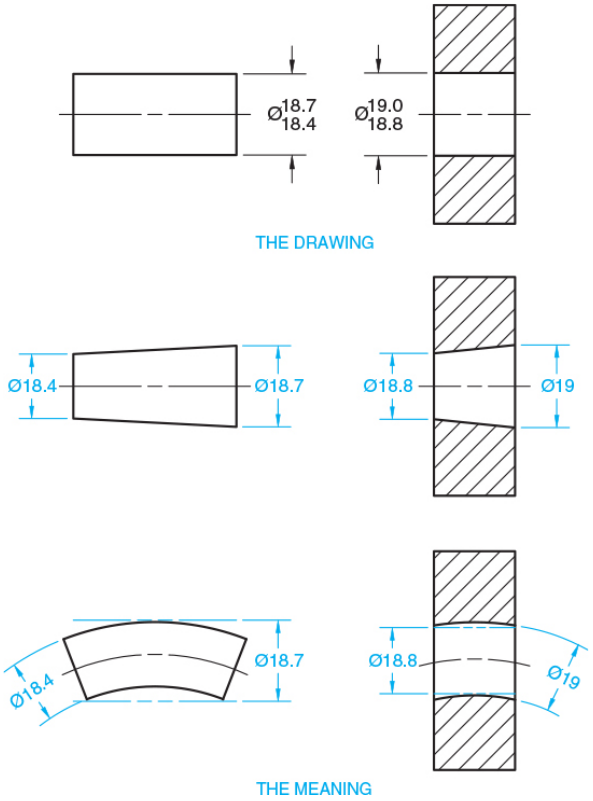
Geometric Tolerancing…



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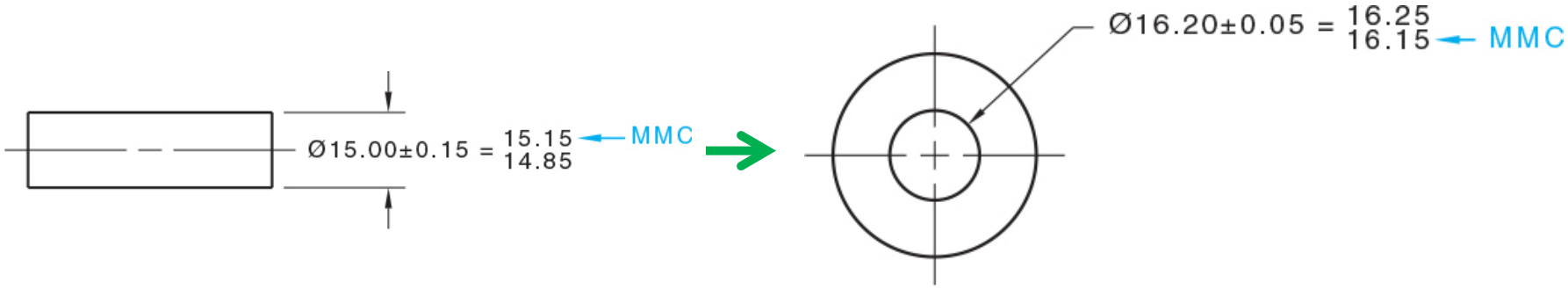
MMC – Maximum Material Condition…



For the shaft, maximum material is the largest diameter allowed.

For the hole, maximum material is the smallest hole allowed.

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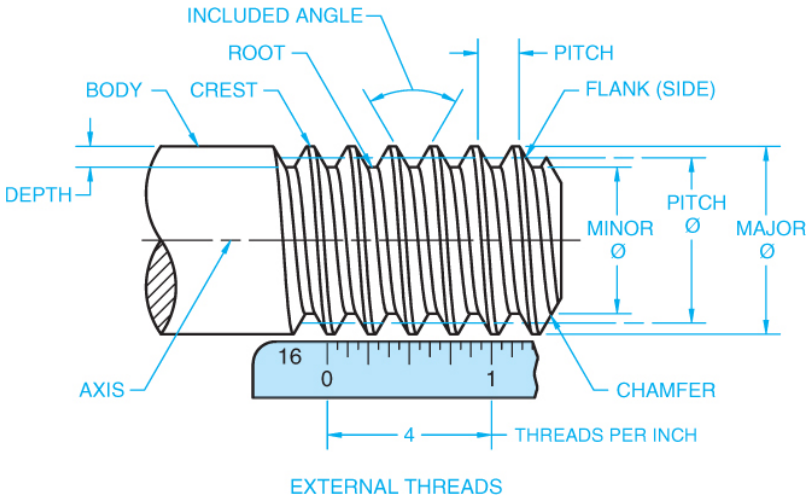
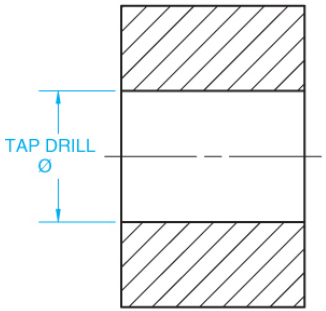
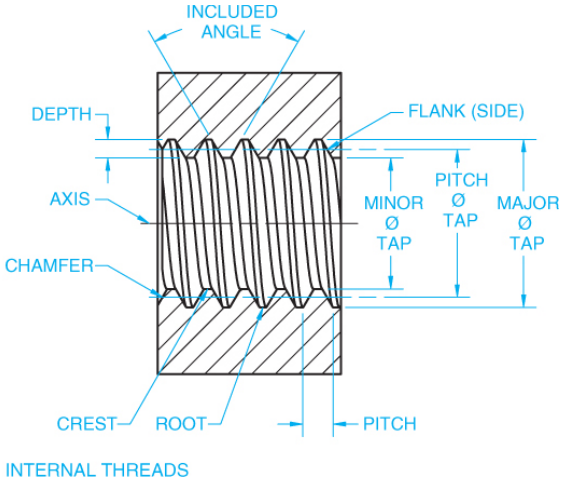
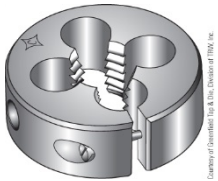
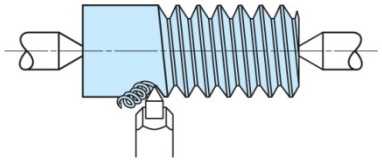
Threads

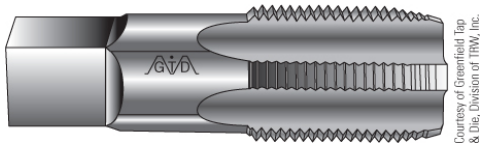












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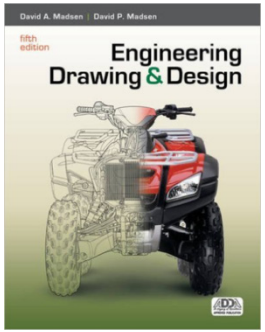
Summary

- Computer Aided Design and Drafting (CADD)
- Parts & assemblies
- Drawing projections, views, sections and details.
- Geometry:
  - Angles and triangle; parallelograms; arcs, radius and diameter; and tangents
- Part features:
  - Chamfers, rounds, fillets and grooves
- Tolerances



Recommended Reading