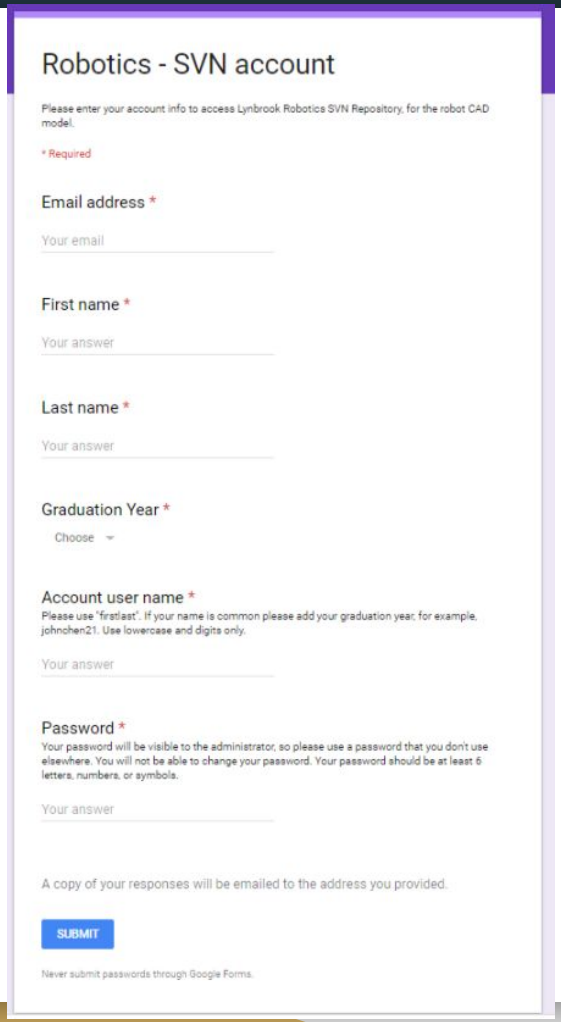
Robot Design Workshops

Week 1

SVN Setup

- Install Tortoise SVN
  - tortoisesvn.net/downloads.html
- Google Form:
  - https://goo.gl/ifMbMM



Robotics - SVN account

Please enter your account info to access Lynbrook Robotics SVN Repository, for the robot CAD model.

* Required

Email address *

Your email

First name *

Your answer

Last name *

Your answer

Graduation Year *

Choose

Account user name *

Please use "firstlast". If your name is common please add your graduation year, for example, johnchen21. Use lowercase and digits only.

Your answer

Password *

Your password will be visible to the administrator, so please use a password that you don't use elsewhere. You will not be able to change your password. Your password should be at least 6 letters, numbers, or symbols.

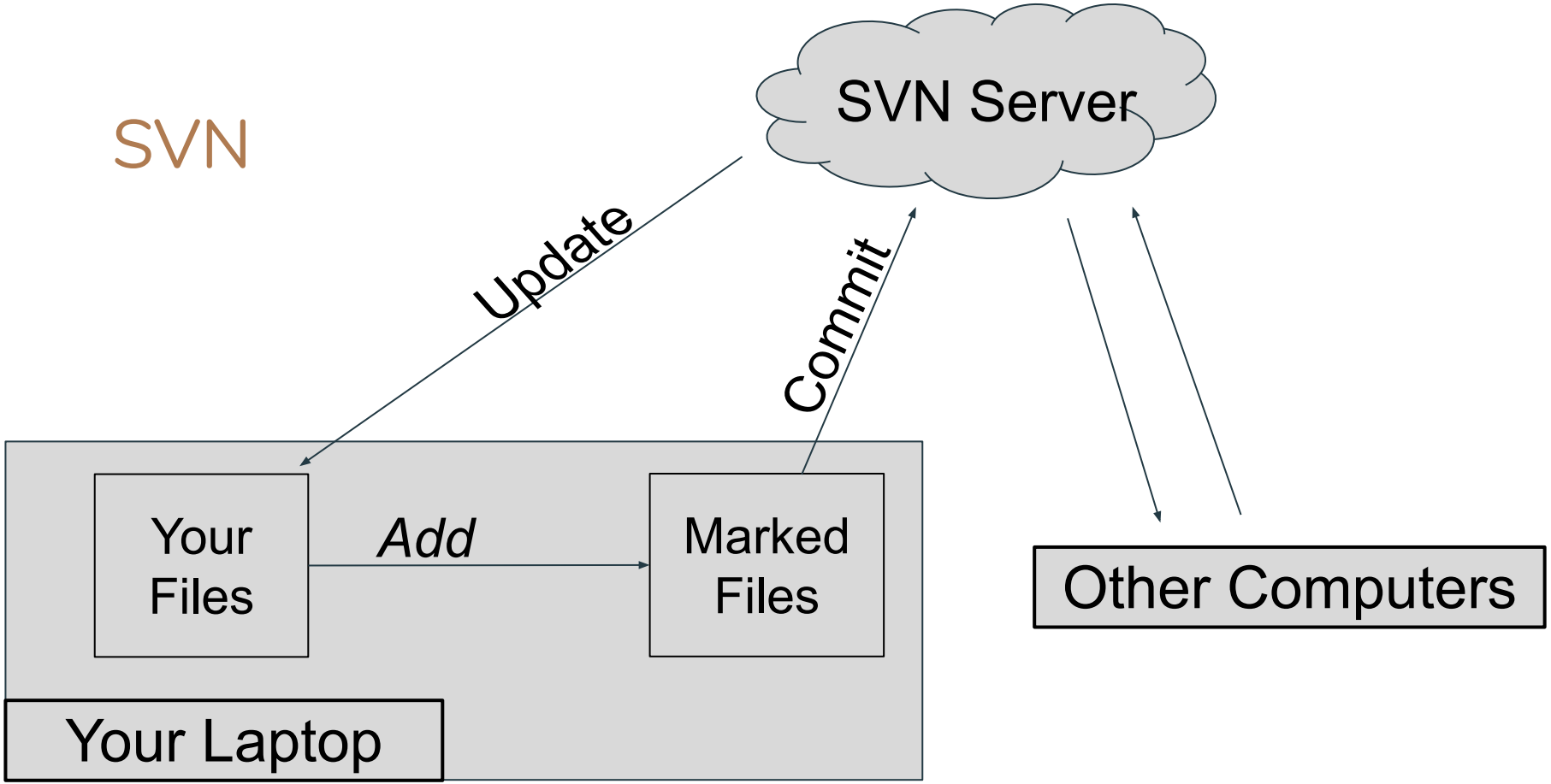
Your answer

A copy of your responses will be emailed to the address you provided.

SUBMIT

Never submit passwords through Google Forms.

SVN


SVN Server
Update
Commit
Your Files
Add
Marked Files
Your Laptop
Other Computers

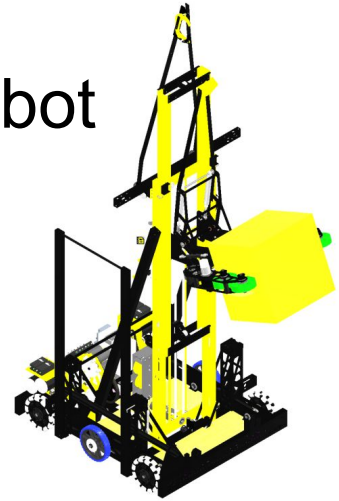
SVN Practice!

Tips

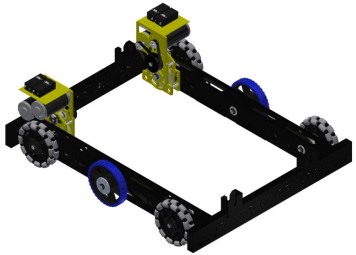
- Close Inventor before updating
- Look through what you are committing

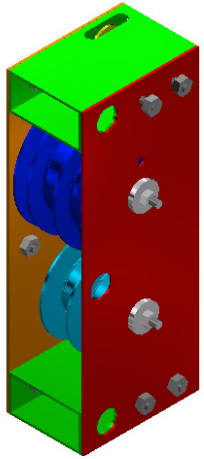
Inventor Basics

Robot

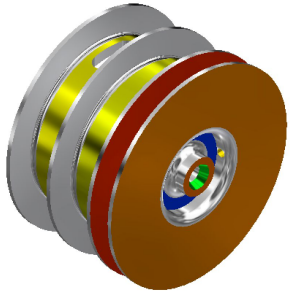


Subsystems





Subassemblies



Parts

Assemblies

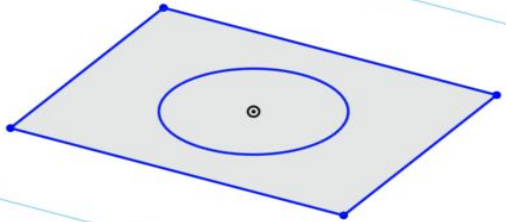
Inventor Assemblies

Setup

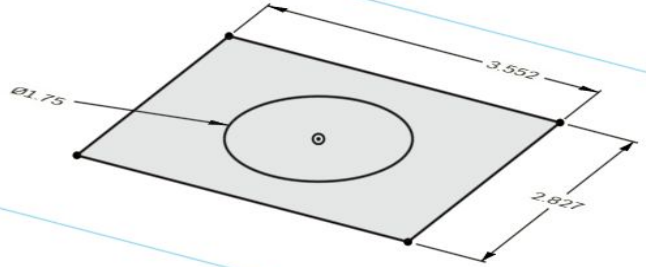
- Project Files
  - include
- Application Options
  - Add name
- Assemblies
- TUTORIALS

Design Workshop: Sketches and Parts

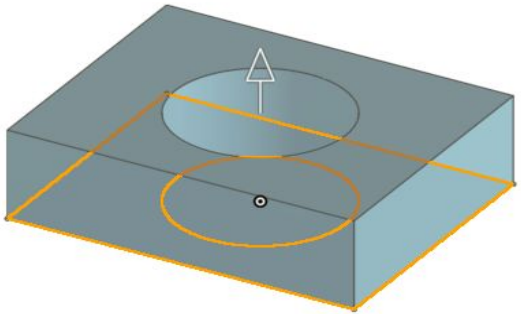
1 Sketch



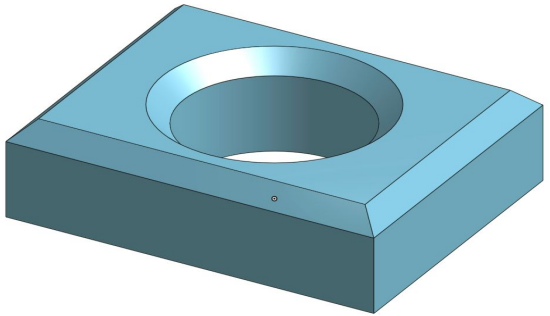
2 Dimension



3 Extrude



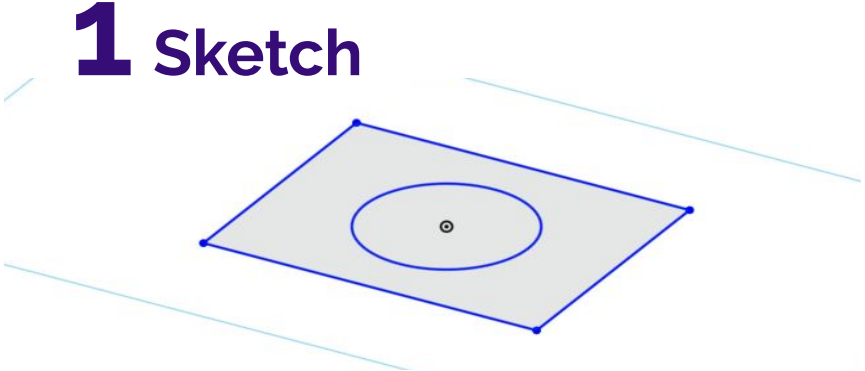
4 Finish



Sketches

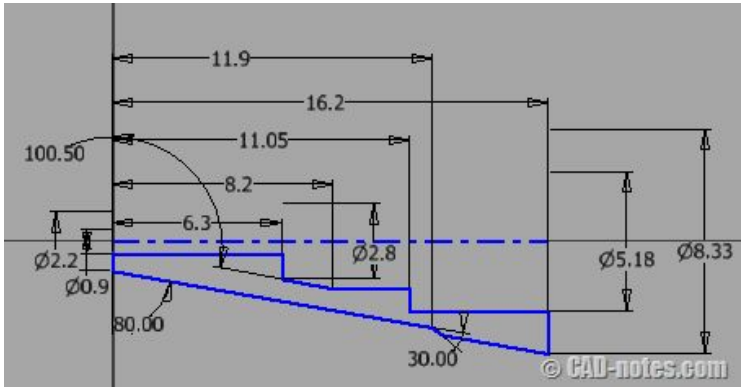
A 2D Drawing on a plane

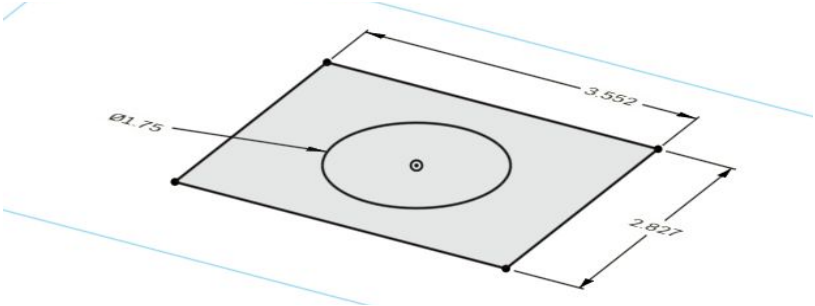
- Basic plane: XY YZ and XZ
- You can create your own pl



Dimension

Definition of length, angle, radius, etc





2 Dimension

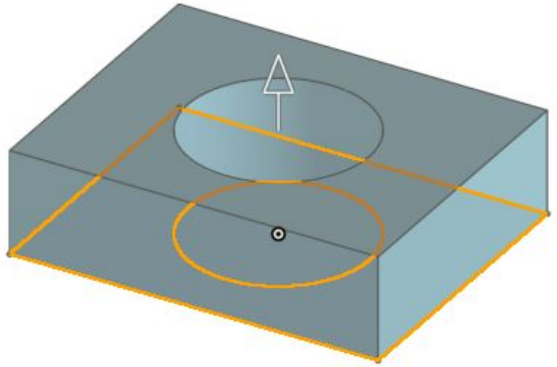
Parameters

Think Algebra. When there is a variable x=3. In Inventor, you “x” is your variable name, and “3” is your value. When the value is changed, it will automatically change all the “x”.

Extrusion

A process that creates a 3D object from a 2D sketch

3 Extrude



Finishing Steps
(Different for each project)

Basic Finishing:

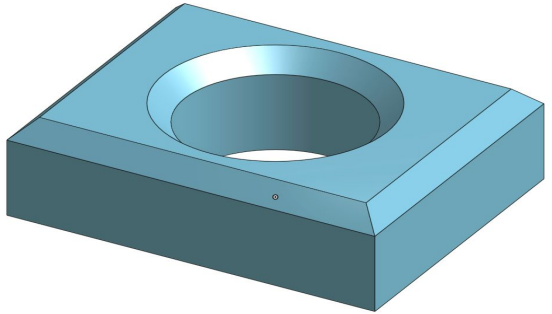
Fillets

Chamfers

Access Holes

Etc.

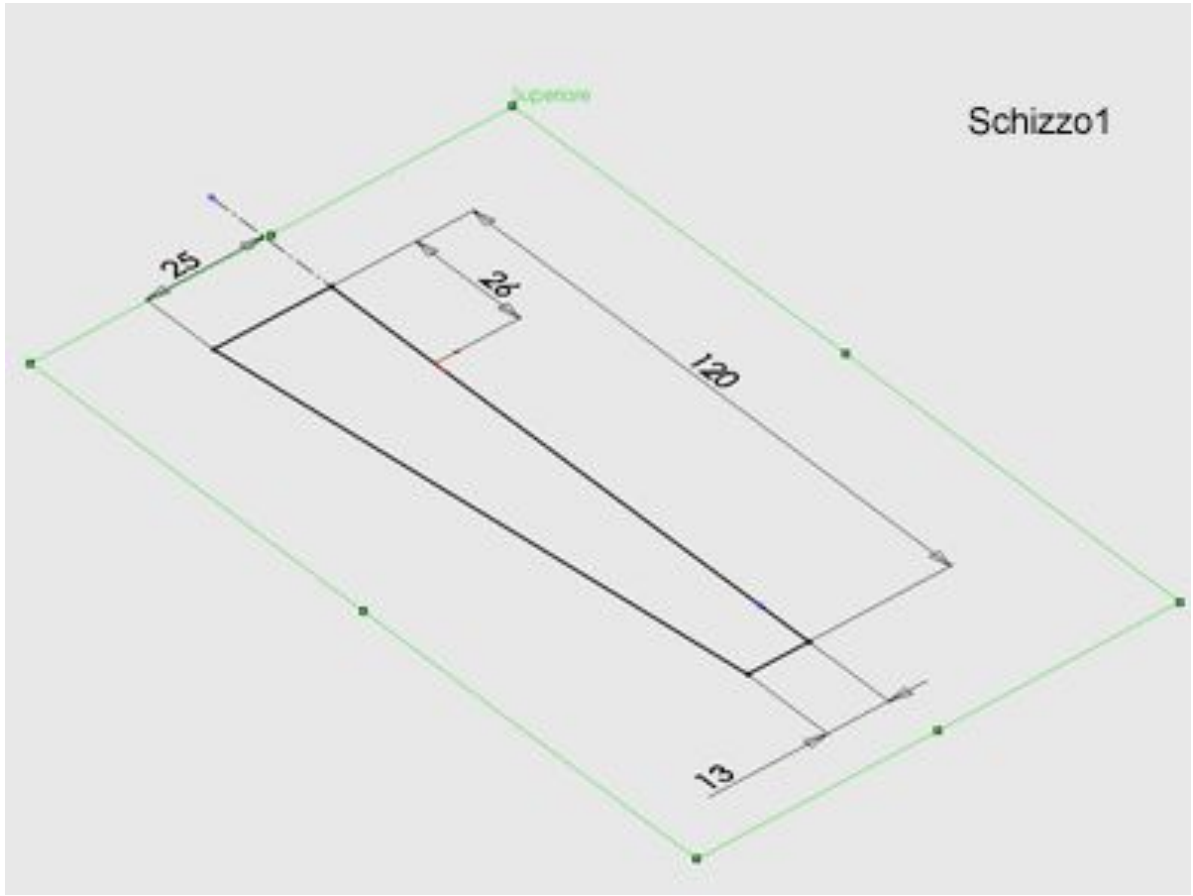
4 Finish



Part vs Assemble

Part: One or multiple solid body

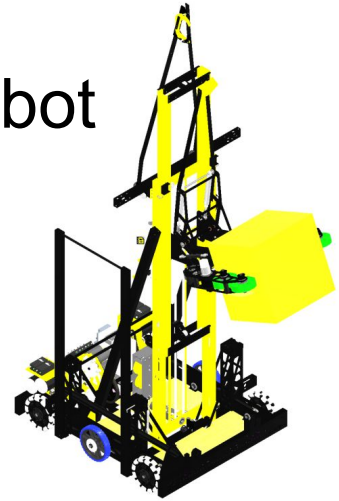
Assemble: One or multiple part with relationship specified


Schizzo1
25
26
120
13

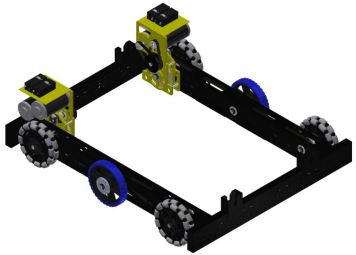
Robot Design Workshops

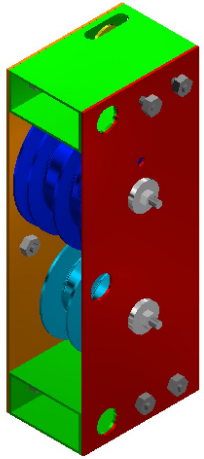
Week 2

Robot

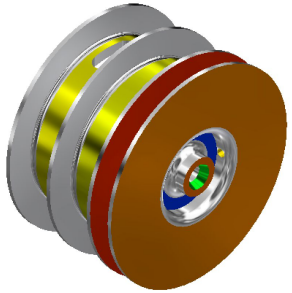


Subsystems



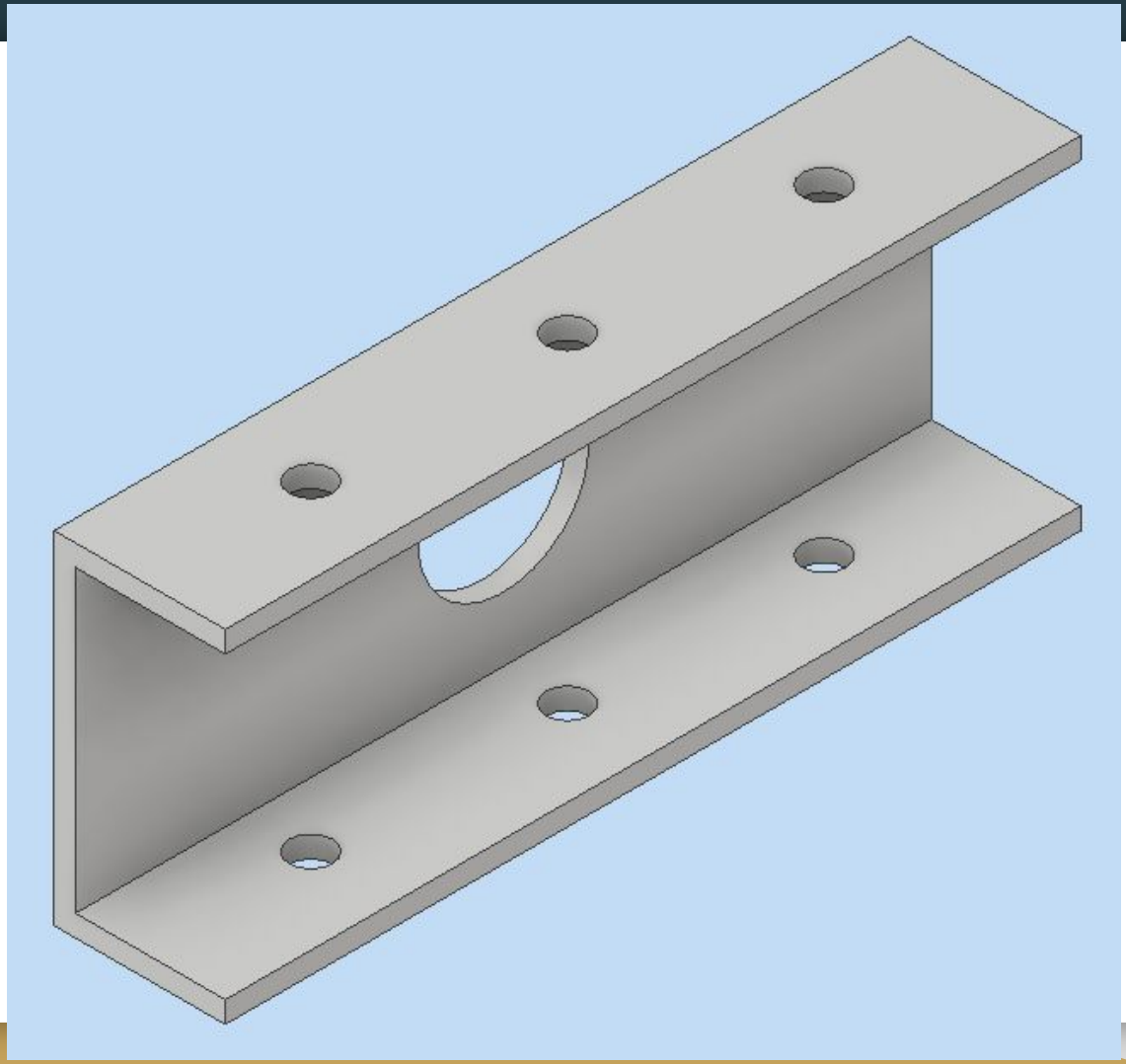


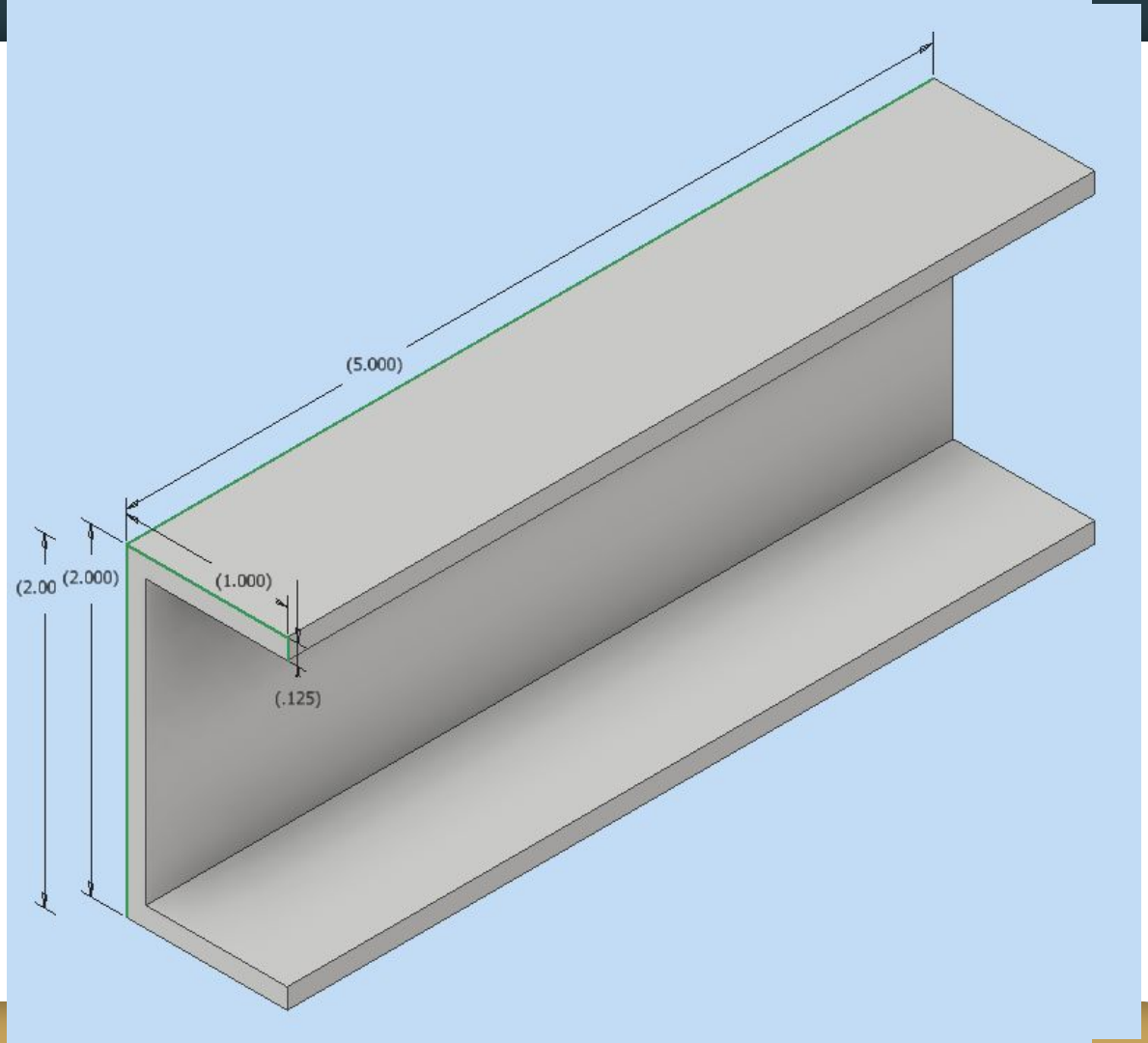
Subassemblies



Parts

Assemblies

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(2.00
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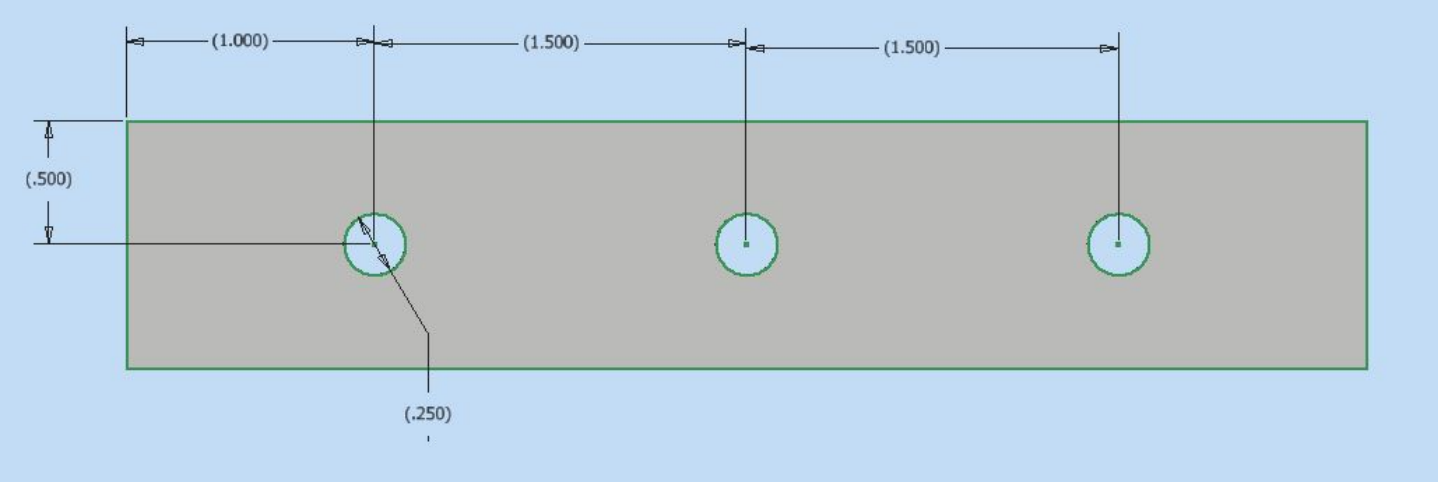
(.125)


(1.000)
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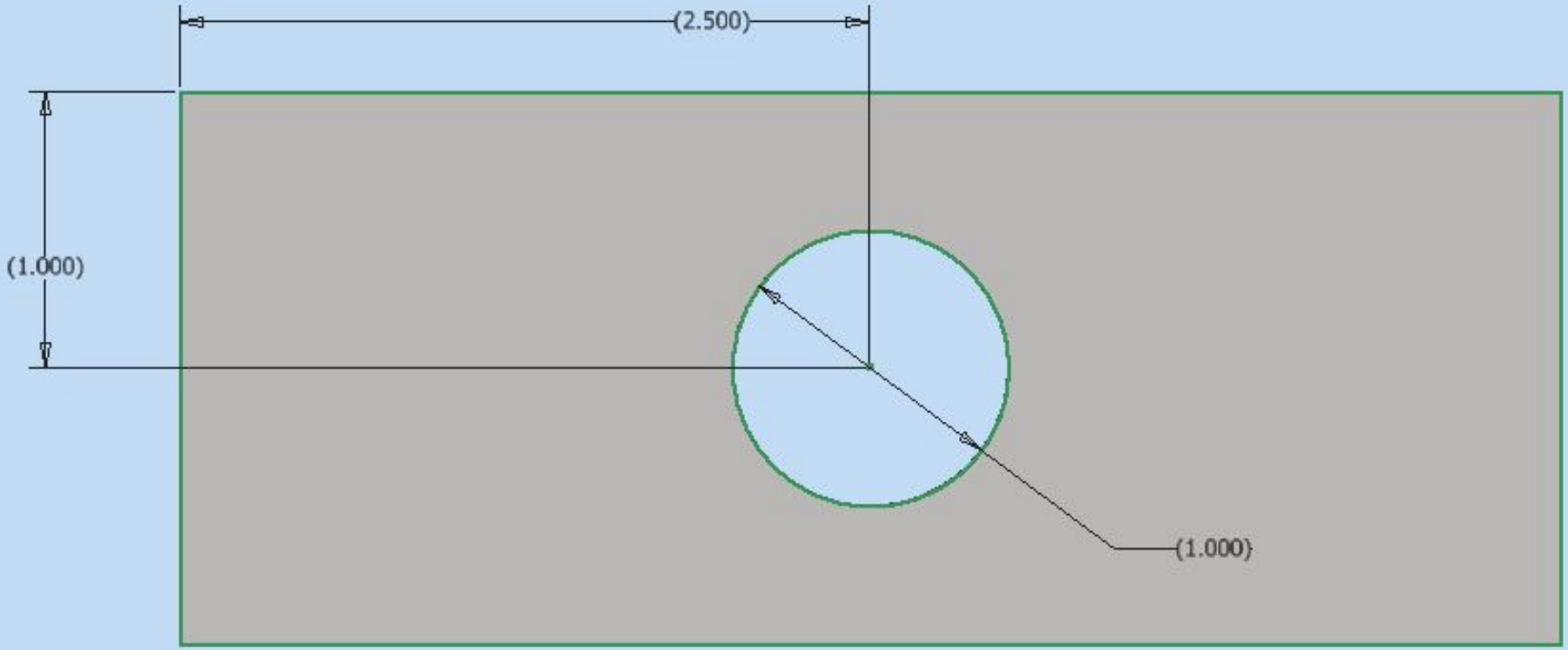
(1.500)
(.500)
(.250)


(2.500)
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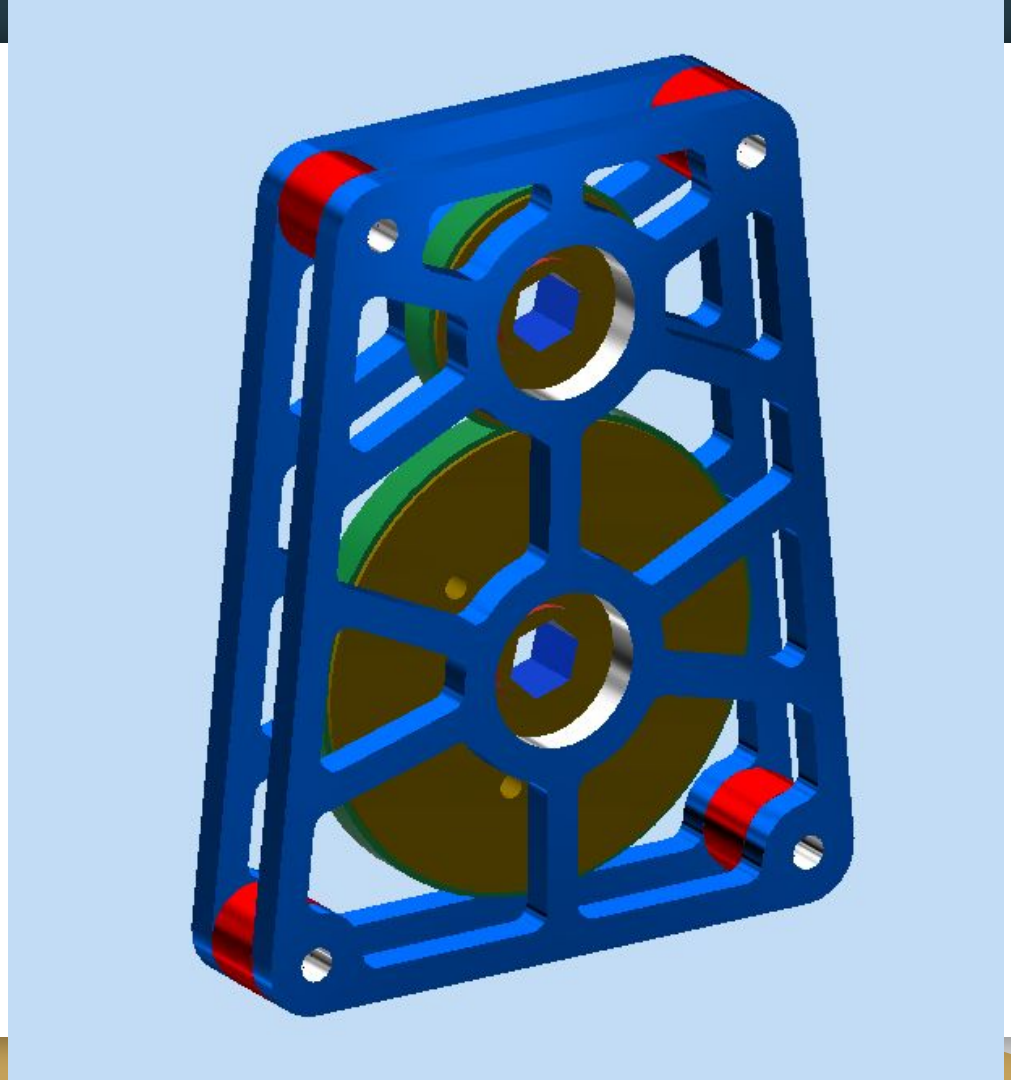
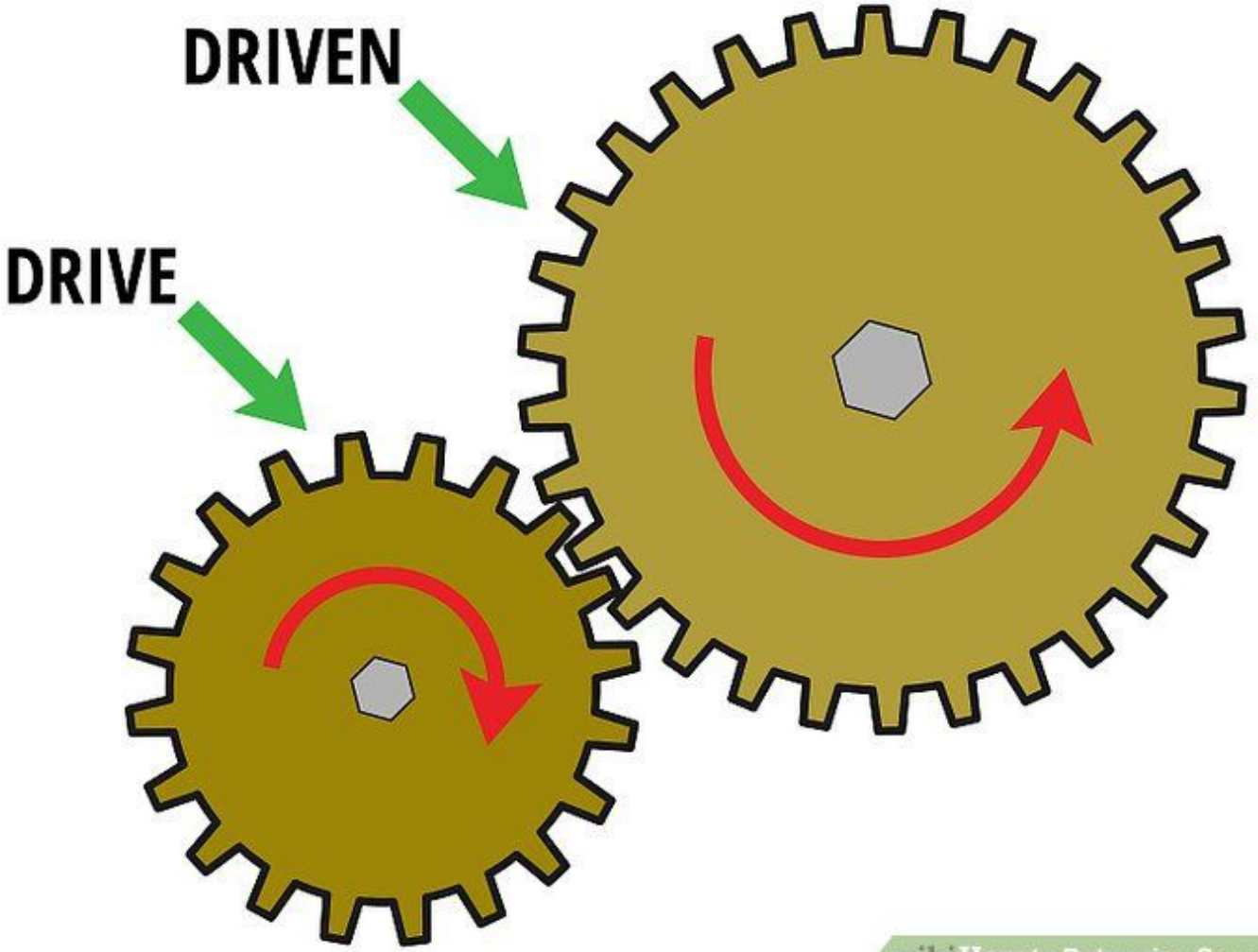
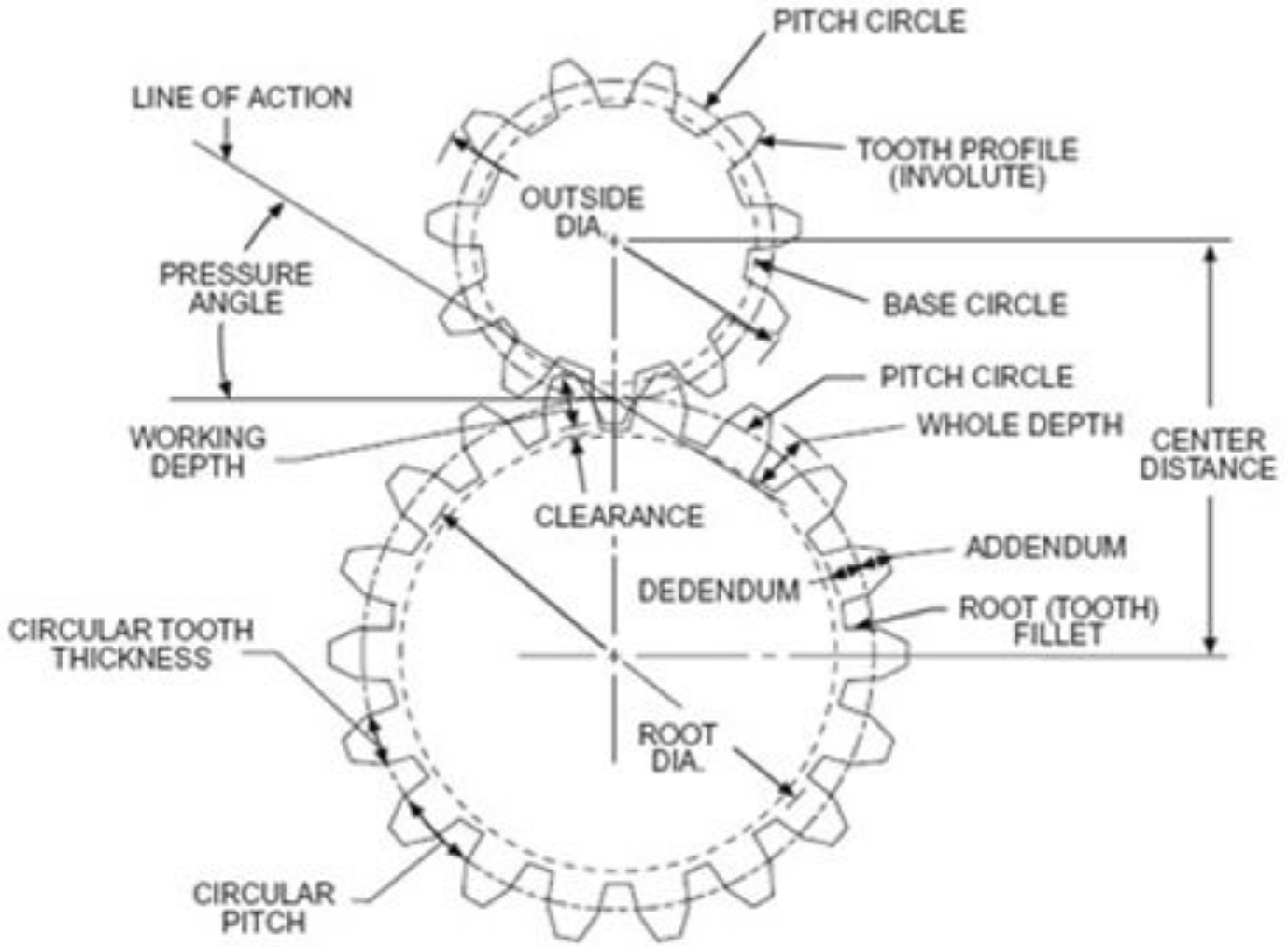
(1.000)

Robot Design Workshops

Week 4






PITCH CIRCLE
LINE OF ACTION
TOOTH PROFILE
(INVOLUTE)
OUTSIDE
DIA.
PRESSURE
ANGLE
BASE CIRCLE
PITCH CIRCLE
WHOLE DEPTH
CENTER
DISTANCE
WORKING
DEPTH
CLEARANCE
ADDENDUM
DEDENDUM
ROOT (TOOTH)
FILLET
CIRCULAR TOOTH
THICKNESS
ROOT
DIA.
CIRCULAR
PITCH

Pneumatics 101

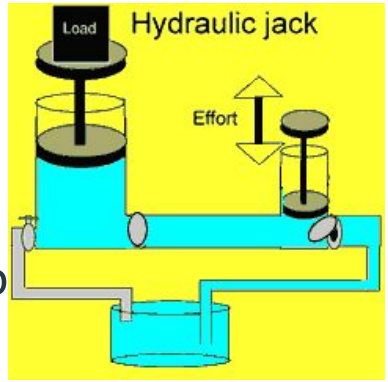
Introduction - Units

- PSI
  - Pounds per Square Inch
  - Lb / (in^2)
- Questions
  - A force of 3 pounds in applied uniformly on a 3 inch by 2 inch piece of sheet metal, calculate the pressure?
  - A force of 10 pounds is applied to a side of a cube, measuring 0.5 square inches in area. What is the average pressure on the side of the cube?

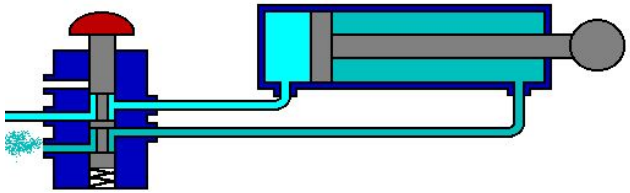
Introduction - Formulas

- Area of Circle
  - A = π*r^2
- Question
  - What is the area of a circle with radius of 1.784124116152771114538966372565082590394202920571953471859273845845530779530430775259849251073107333821940941170827299487877497849194206859913399055524056108918749086508920785120360690973659067421480429995879189702713812908768046100815… inches?

Concepts (Hydraulics)

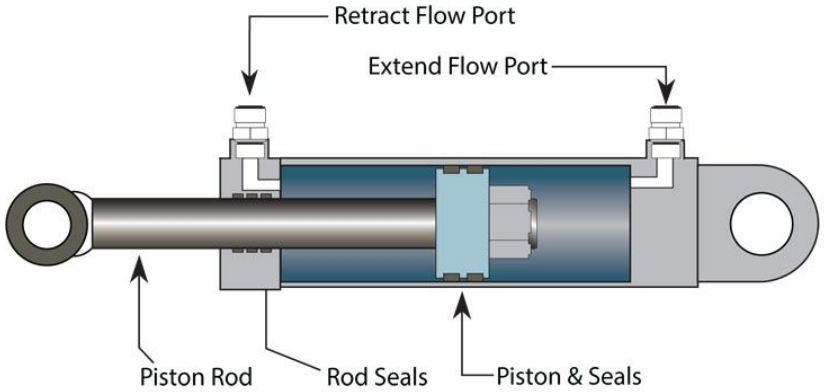


- A small force applied to a piston
  - Compresses fluid in larger chamber, large force
- Example
  - A powered piston pushed on fluid with 5 lb of force o a 1 in^2 area
  - Creates 5 lb/in^2
  - That “compressed” fluid pushes with 5 psi on a second piston of 3 in^2 in area
  - Output of 15 lb of force
- Works the same with pneumatics
  - No first pison, air compressor does that job



Pneumatic Terminology and Functionality

- Retracted Length
- Extended Length
- Stroke Length
- Bore (Diameter)



Pneumatic Force Calculation

- Practice
  - Air Tanks at 60 psi, pneumatic bore of ⅝”

Pneumatics in Design

- Pros:
  - Simple Code (not that that's our concern lol :))
  - Powerful yet small
    - Many differed bores/strokes available
  - Can provide slow motion
    - motors can be at 18000 rotations per minute, requiring complex gearboxes to slow them down to a useable speed
- Cons:
  - Only 2 positions (out and in)
  - Limited Motion
  - Require compressor and other heavy pneumatic components

Pneumatic Damping

- When extending have full bore to push against
- When retracting have full bore - area of piston rod
  - ~10% less force when retracting
- Practice:
  - 60 psi air tank, ¾” bore, ¼” diameter piston Rod
  - Calculate % of damping.