

# EN1740 Computer Aided Visualization and Design

Spring 2012

3/8/2012

Brian C. P. Burke

# Brown University

### Last Time:

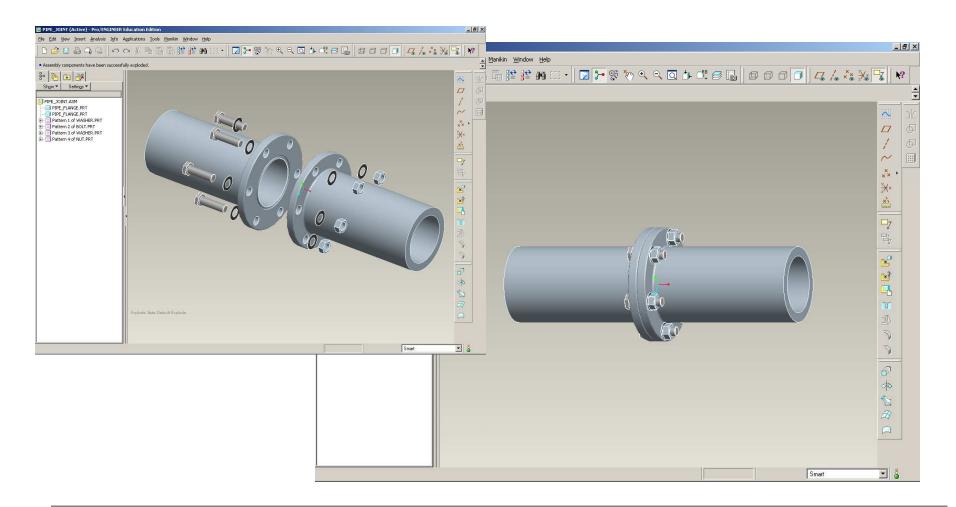
- Finish Surface from Boundary Curve
- Free-form (Style features)

### Tonight:

- Introduction to Assemblies
- Exploded Views
- Assembly drawings
  - X-sec
  - Exploded
  - Tables
    - BOM
    - Inclusions

### Assemblies

#### Assembly represent how components interact with each other

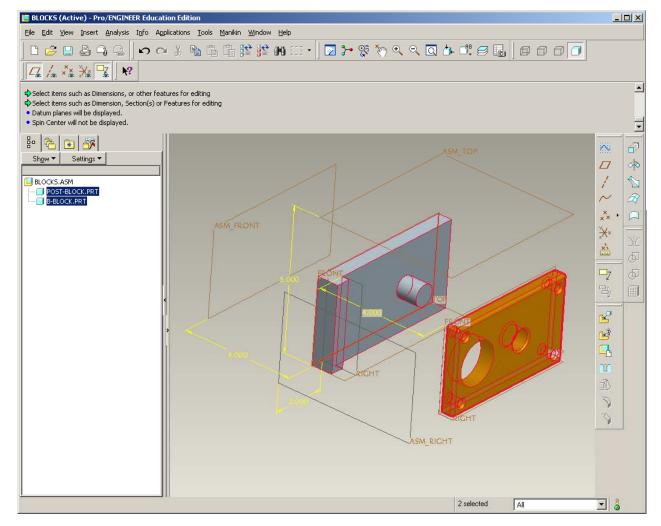


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### Assemblies

#### In assembly files components are constrained, either to other

parts or to datums

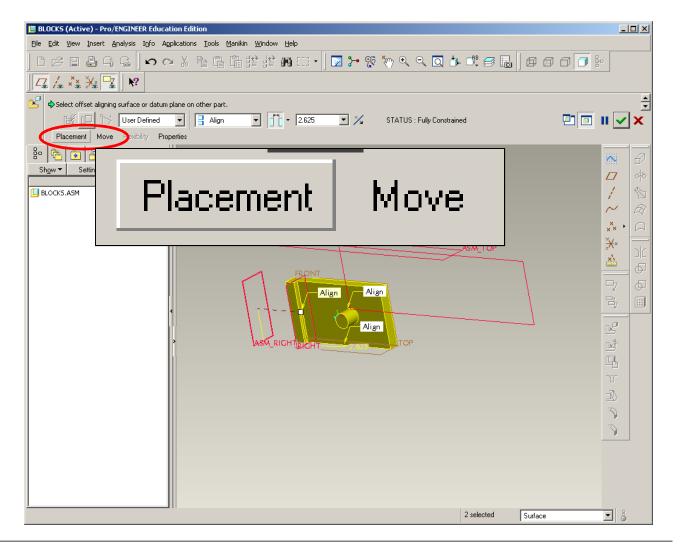


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### Assemblies

#### Assembly Dashboard

- There are wide variety of options available
- We really only need
  the Placement and
  Move tab for 95% of
  operations



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### Assemblies

### Assembly Dashboard – Placement Tab

- Constraints are applied in Placement
  - References are selected from
     Assembly and Component being
     placed
  - Variety of Placements:
    - Align Equal surface normals
    - Mate Opposite surface normals
    - Insert
    - Tangent
  - Constraints can be applied as
  - Coincident, Offset or Oriented

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Select offset aligning surface or datun	n plane on other part.
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Placement Move Flexibility Pr	operties
Bo I Sho Sho BLC BLC Align Align Align New Constraint	Constraint Enabled Constraint Type Align Flip Offset 2.625 ASM_TRONT
New Set	Fully Constrained
	Align Align

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### Assemblies

#### Assembly Dashboard – Move Tab

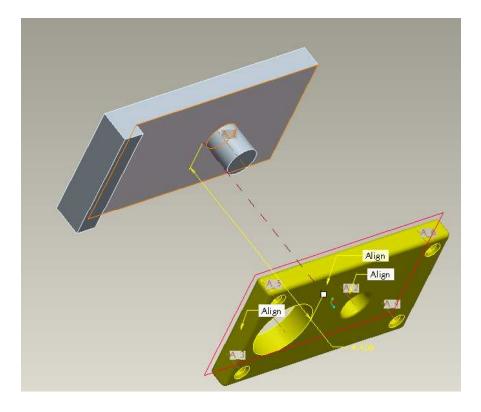
- Allows user to position component in space prior to applying constraints
  - Sometimes necessary when components are dropped in amongst many components
    DOES NOT TAKE THE PLACE OF CONSTRAINTS

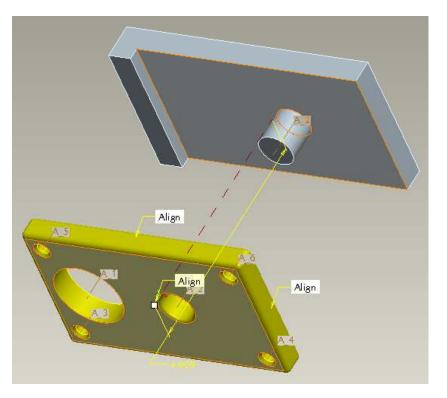
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Click left but	tton in model window to drag component being assembled.
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Placement	Move Flexibility Properties
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BLOCKS.ASM	
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### Assemblies

#### DESIGN INTENT is as important in modeling Assemblies as in Components



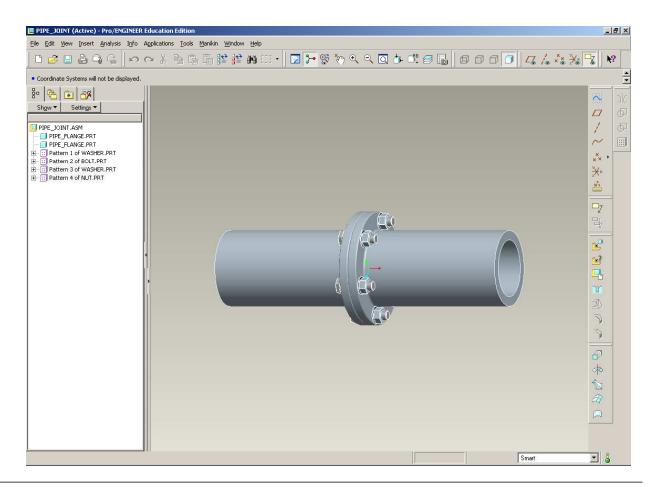






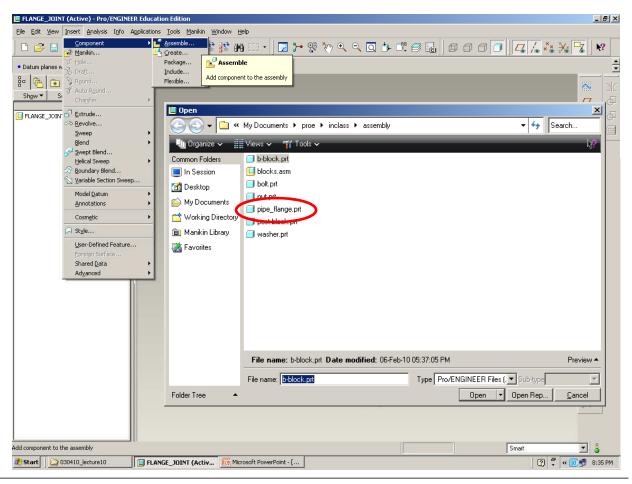
#### Assemble the flanged pipe joint as shown below

- Download flange\_connection.zip from the
- supporting materials page
- Set Working Directory
- Extract file to working
- directory
- File > New > Assembly
  - pipe\_joint.asm





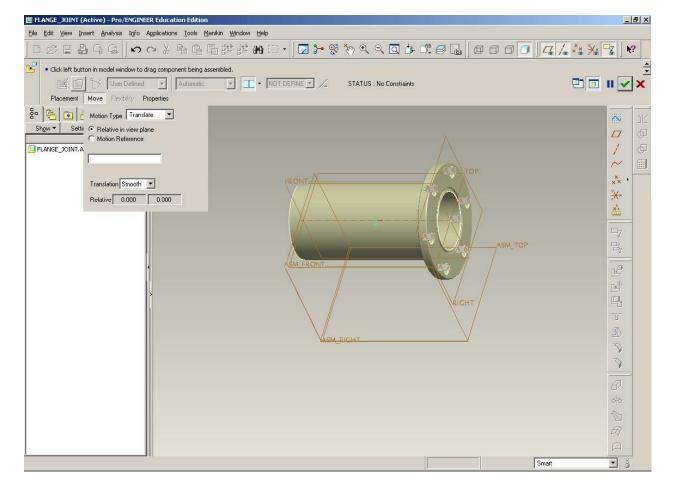
- Insert > Component > Assemble
- Select pipe\_flange.prt



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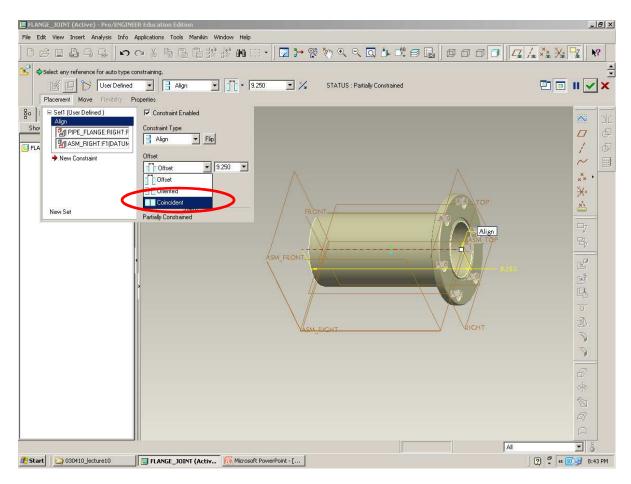
- Click on the Move tab
- LMB in graphics window
- Translate part
- LMB again to drop part
- You don't have to do this everytime you place a part, but its nice to know when you need it



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# EXERCISE – Assemblies

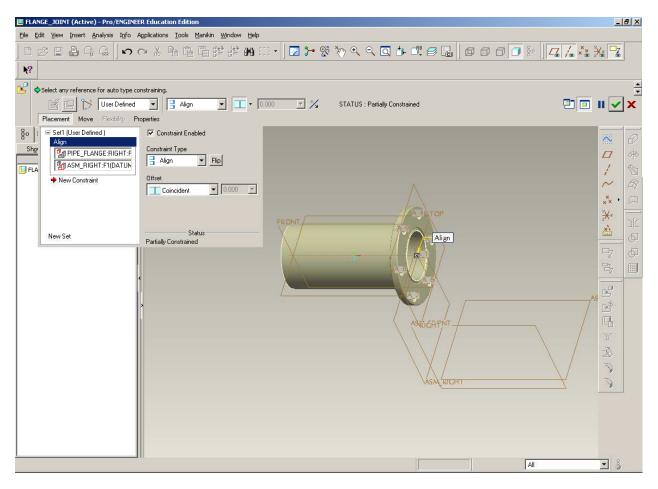
- Click on the Placement tab
- Select the RIGHT plane on
- the component
- Select ASM\_RIGHT plane
- Select Coincident from the
- Offset drop-down





- •Select the FRONT plane on
- the component
- Select ASM\_FRONT plane
- Select Coincident from the

Offset drop-down

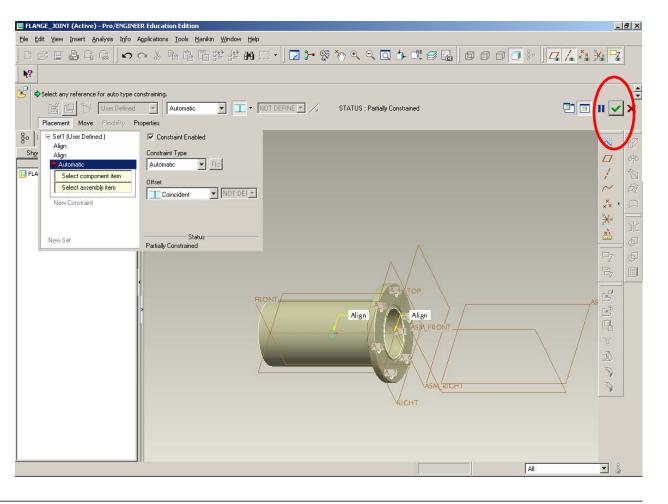




•Select the TOP plane on the

component

- Select ASM\_TOP plane
- Select Coincident from the Offset drop-down
- Click the Done check



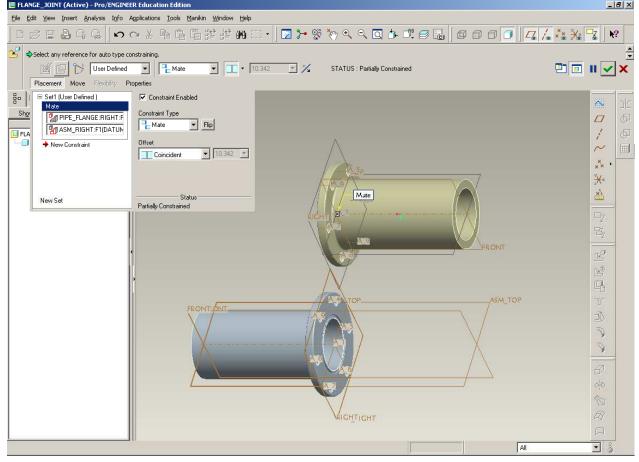


- Insert > Component > Assemble
- Select pipe\_flange.prt again
- Select the RIGHT plane on

the component

- Select ASM\_RIGHT plane
- From Constraint drop down

box select Mate

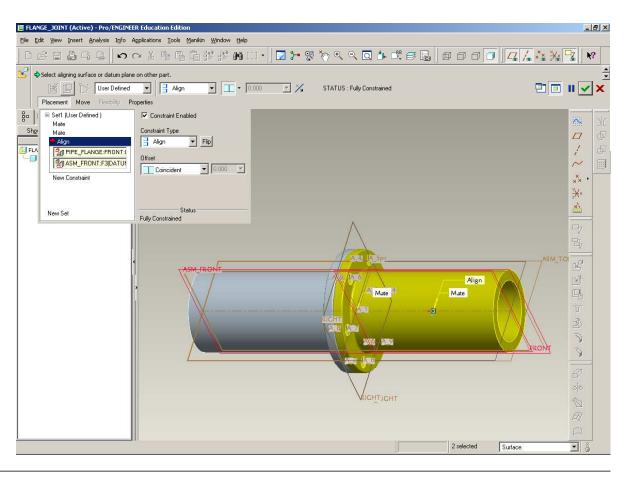




- Define additional constraints
- between FRONT and ASM FRONT

as well as TOP and ASM TOP

Click Done



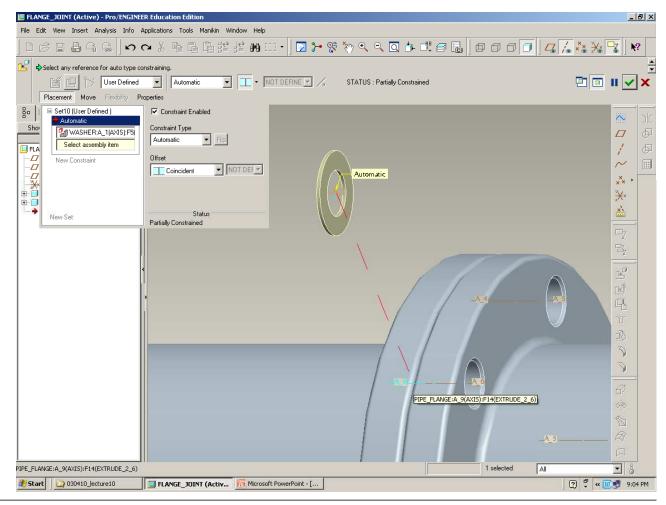


- Insert > Component > Assemble
- Open washer.prt
- Select the axis (A2) on

the part

Select an axis of one of

the through holes



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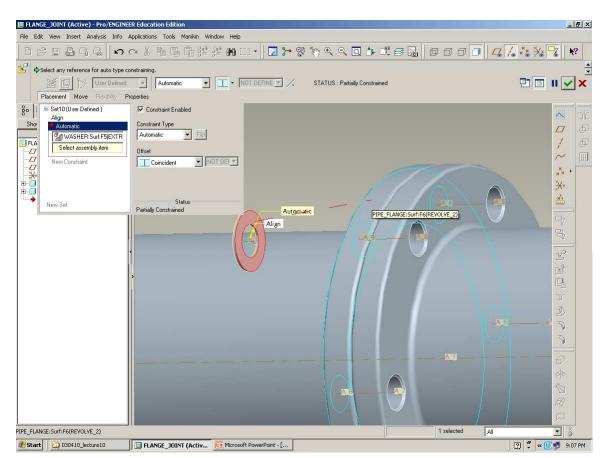
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# **EXERCISE** – Assemblies

- Move the component (if necessary) to find it again
- Select the face of the washer
- Select the face of the flange (Design Intent!!)
- Select Mate from drop-down
- Select Coincident from drop-

down

• Click Done





IOINT (Active) - Pro/ENGINEER Education Edition

Insert Analysis Info Applications Tools Manikin Window Help

 Note after these two constraints are applied
 Pro/E has enough to Fully
 Constrain the parts

Select mating surface or datum plane on other part. 🔄 🔲 II 🗸 🗙 - .... User Defined Mate STATUS : Fully Constrained 図 回 Placement Move Flexibility Properties 🖃 Set10 (User Defined ) Constraint Enabled 8-Alian Constraint Type Sho  $\square$ ▼ Flip Hate 🗧 WASHER:Surf:F5(EXTR 🗐 FLA PIPE\_FLANGE:Surf:F6(F Offset ▼ 0.000 ▼ New Constraint Coincident ×× Placement Move Flexibility Properties × Set10 (User Defined ) Constraint Enabled New Set Align Constraint Type Mate 💾 Mate Ŧ P Flip MASHER:Surf:F5(EXTR đ PIPE\_FLANGE:Surf:F6(F 4 Offset ▼ 0.000 -New Constraint Coincident 3 3 Status Allow Assumptions New Set Fully Constrained PIPE\_FLANGE:Surf:F5(REVOLVE\_1) 2 selected Surface - 8

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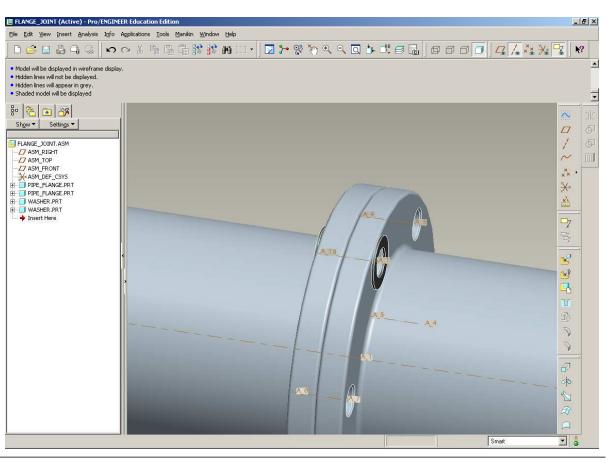
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Assemble a second washer

in the same way on the other

side of the flange

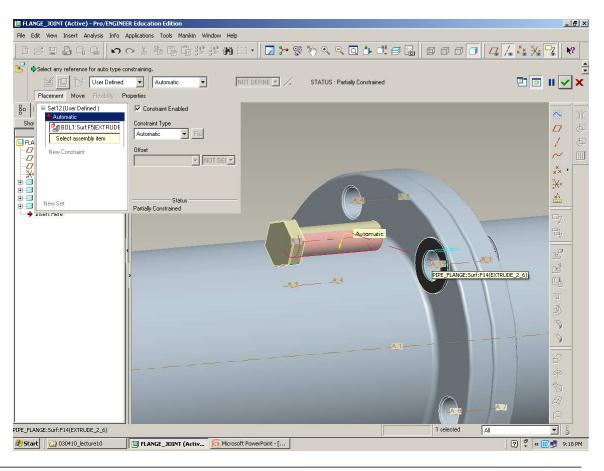




Insert > Component >

#### Assemble

- Assemble bolt.prt
- Select the outside cylinder surface of the bolt
- Select the surface of the through hole
  - NOTE: this will create an
    - Insert constraint
- Mate the head of the bolt to the washer
- Click Done





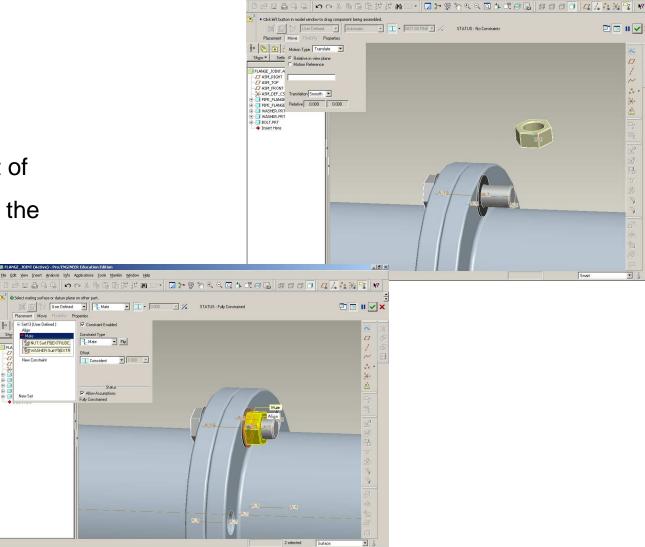
Insert > Component >

#### Assemble

- Assemble nut.prt
- Use an appropriate set of constraints to put nut on the

bolt

Click Done



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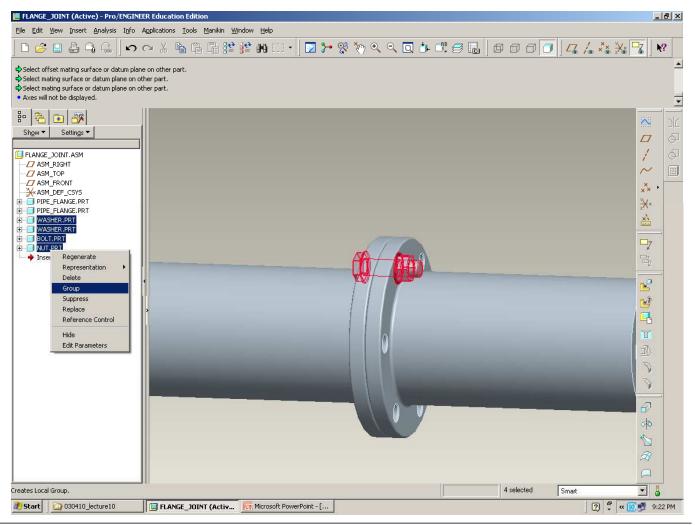


• In the Model Tree,

# select the two

washers, bolt and nut

• RMB, Group



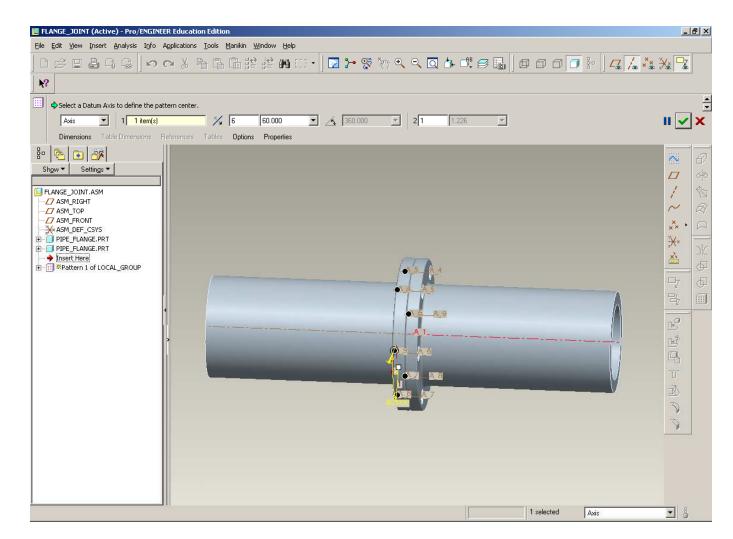
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- RMB on the Group
  - Pattern
- Select Axis Pattern
- Select 6 entities
- Select 60deg

separation

Click Done



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# EXERCISE – Assemblies

NOTE: If we had assembled washers, nut and bolt to first feature in part model, we could have used a Reference Pattern

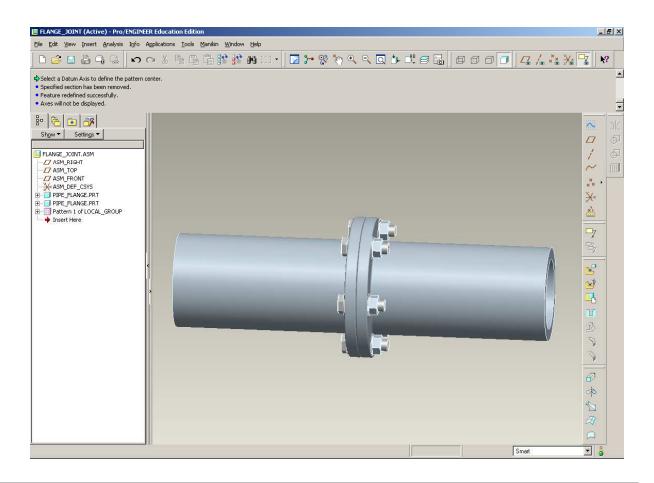
• Try this.

- Delete Pattern
- Redefine

component

placement

• RMB > Pattern



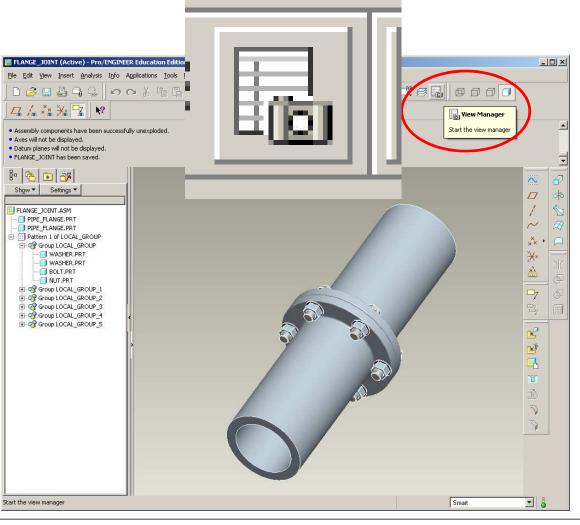


• Create a general view that effectively displays

components

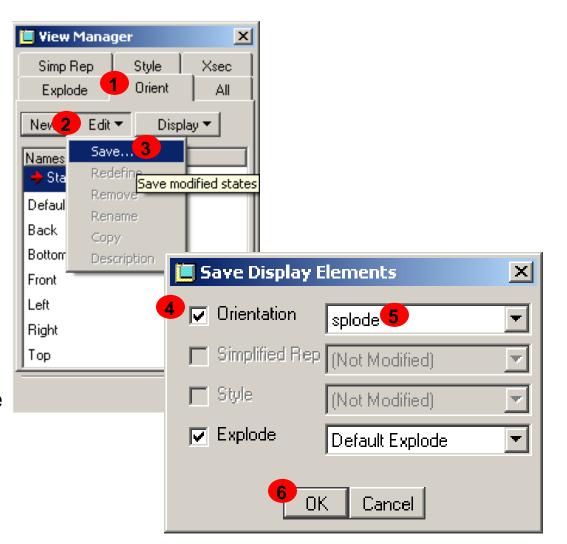
 Once you're happy with the orientation, open View

Manager



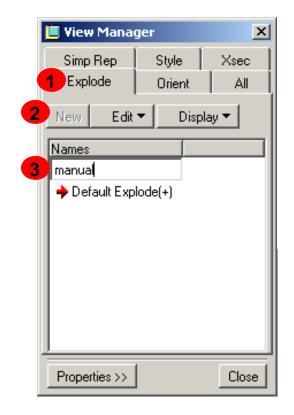


- To Save the Orientation...
- **1** Select the Orient tab
- 2 Select Edit
- Click Save...
- 4 Check to save orientation
- 5 Name the orientation
- 6 Click OK
- Toggle between another orientation and this one to make sure it's saved



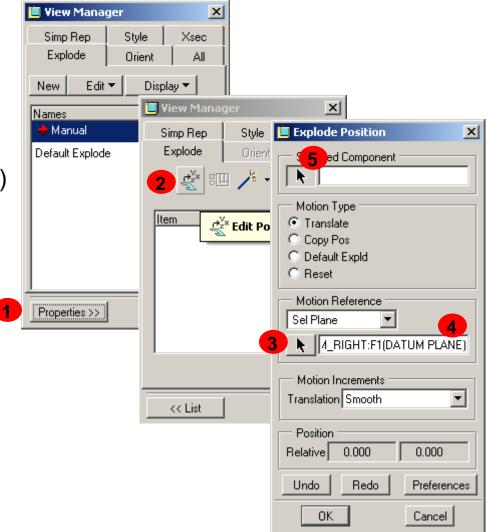


- Create an Explode Display
- **1** Select the Explode tab
- Select New
- 3 Click Return





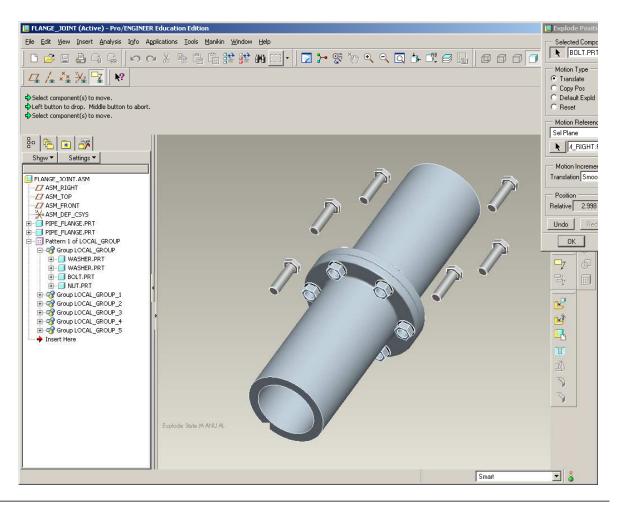
- Create an Explode Display (cont.)
- **1** Select the Properties tab
- 2 Select Edit Position
- **3** Select a Motion Reference (Sel Plane)
- 4 Select the ASM RIGHT plane
- 5 Select a component to move







• Move all 6 bolts off the flange parts

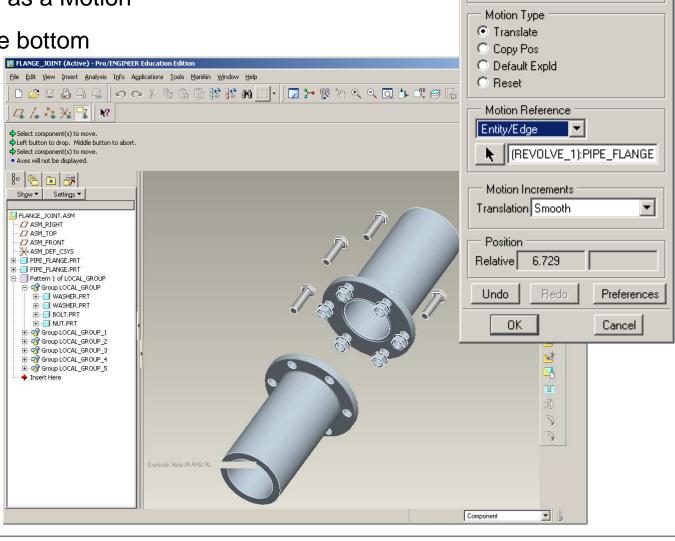




• Select the center axis as a Motion

Reference and slide the bottom

flange back



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Explode Position

Selected Component

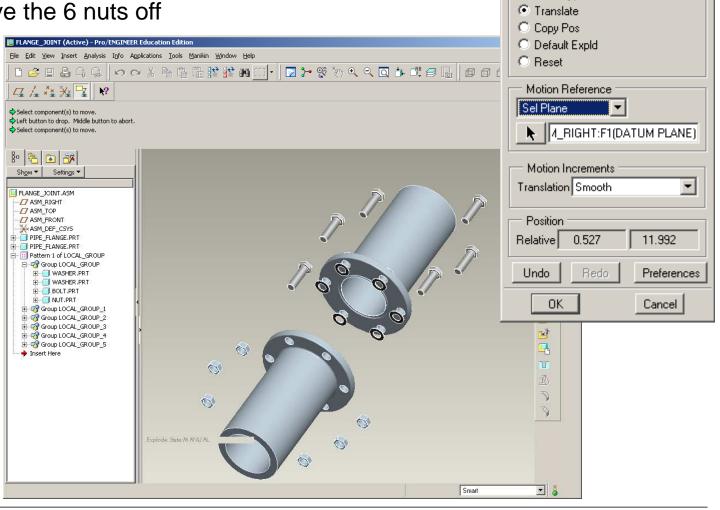
X



• Select the ASM\_RIGHT datum

plane again and move the 6 nuts off

the pipe flange



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X

Explode Position

NUT.PRT

Motion Type

Selected Component



Move washers back

#### on to corresponding

parts

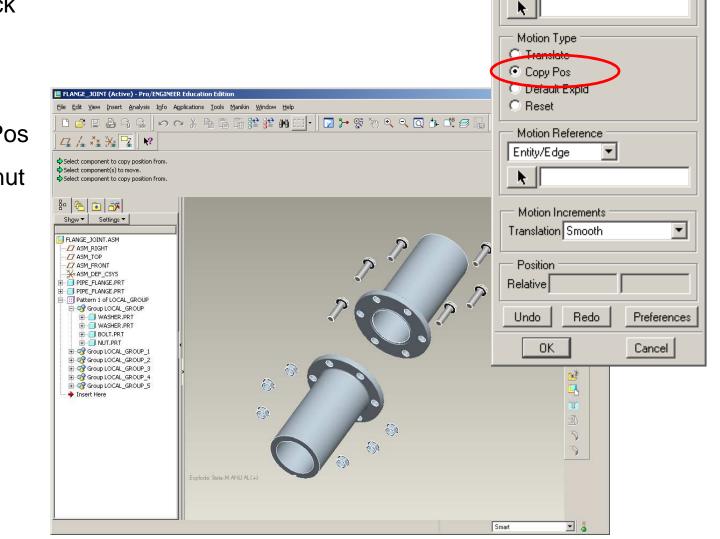
- Select Copy Pos
- Select either nut

or bolt

Select

corresponding

washer



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**Explode** Position

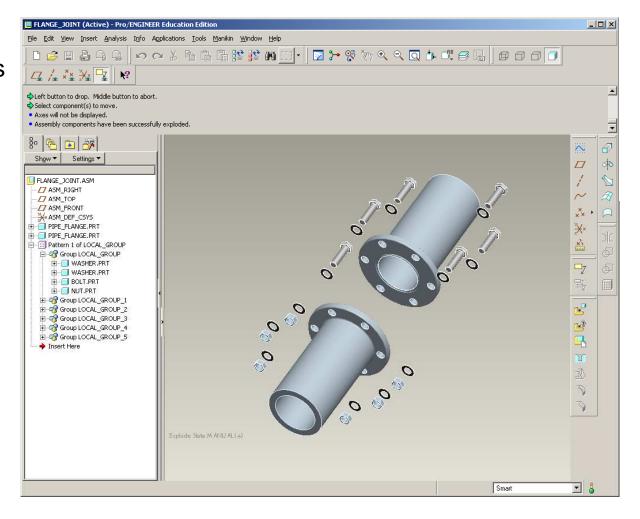
Selected Component

X



• Select center axis again

and move washers so they are off all other components



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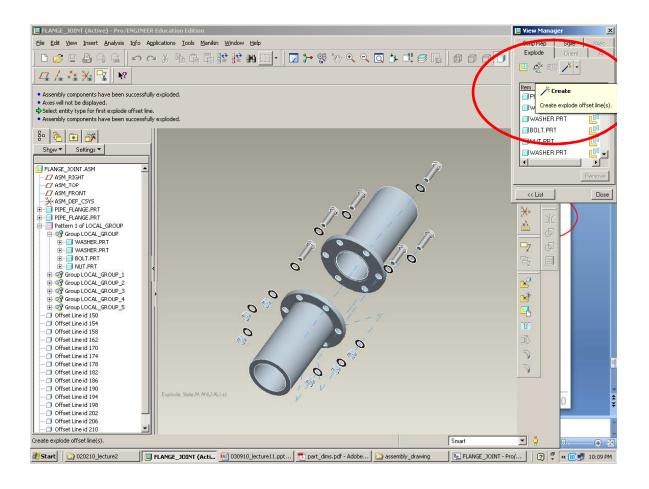
• Create Offset Lines

#### connecting

- Click Create
- Select Axis of one

#### part

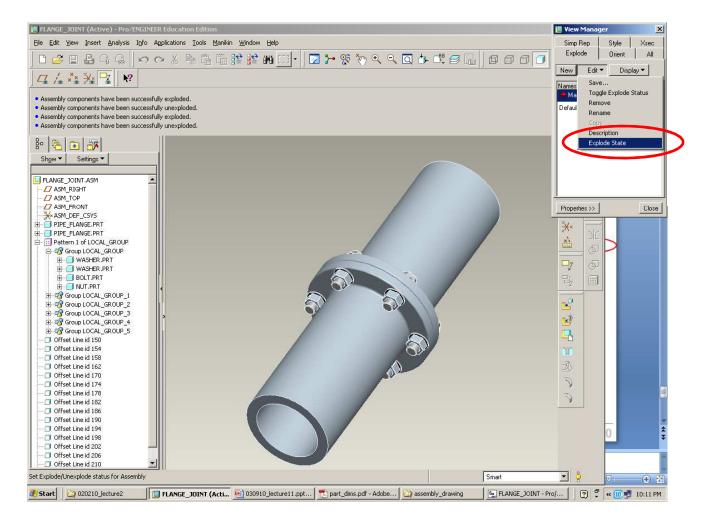
- Select Axis of another
- Connect
  - Nut to Washer
  - Washer to Flange
  - Flange to Flange
  - Flange to Washer
  - Washer to Bolt





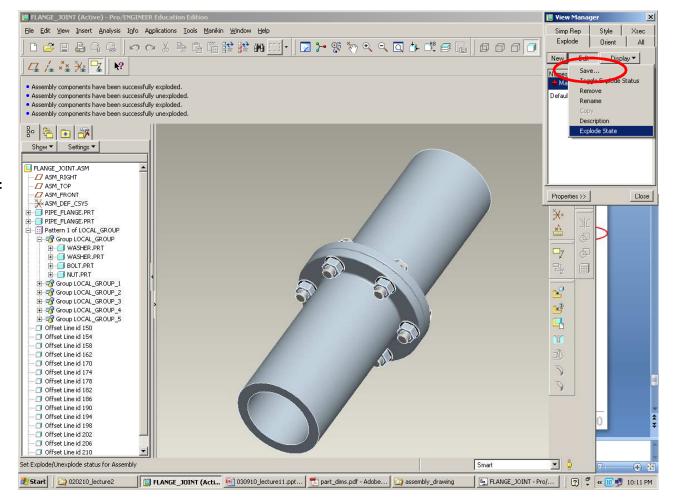
• Return and toggle off

exploded display





- SAVE, SAVE, SAVE
  - Exploded View details must be saved from View Manager
- Return and toggle off
   exploded display





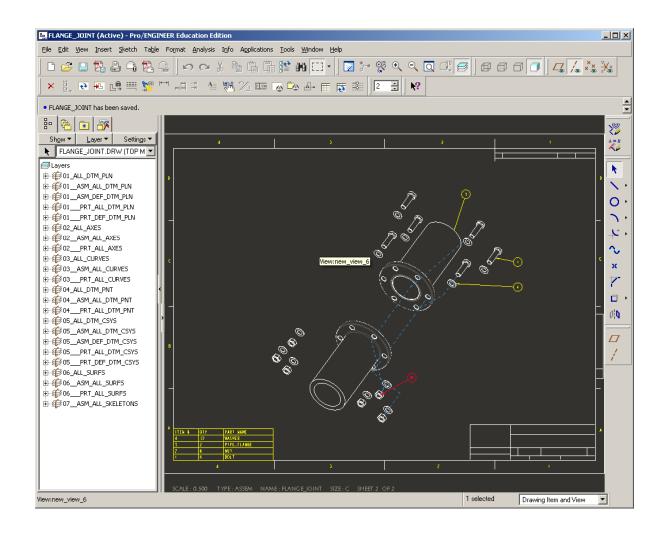
• While we're at it....create

a cross section (A-A) through ASM\_FRONT datum just as we did for components

FLANGE_JOINT (Active) - Pro/ENGIN		_0
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### Assembly Drawing



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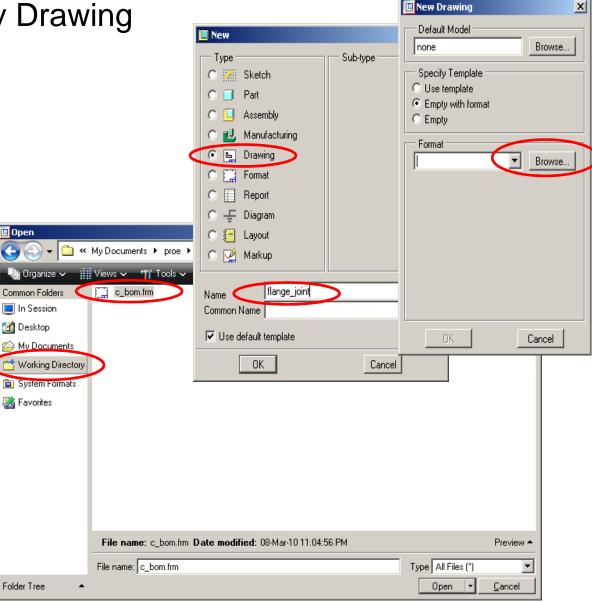
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# EXERCISE - Assembly Drawing

Create an assembly

drawing or the pipe flange

- assembly
  - Begins in same way as for components
  - Be sure to use same name as Assembly
- For Format, use
- c\_bom.frm that came with
  the files for tonight's lecture
  (should be in working
  directory)





• When prompted select No

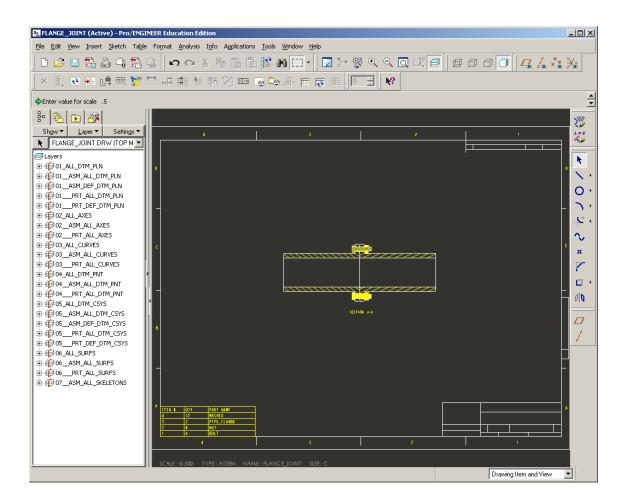
#### **Combined State**



- Use FRONT orientation
- Set View Display to No

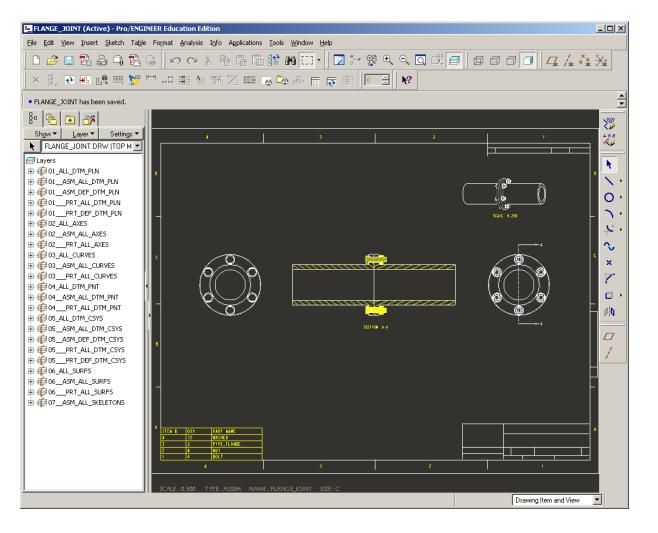
Hidden, Tan-Dimmed

- Turn on Section A-A
- Change default scale to .5





- Add two projection views
- Add section arrow to one of them
- Add a general view to aid in visualization in upper right



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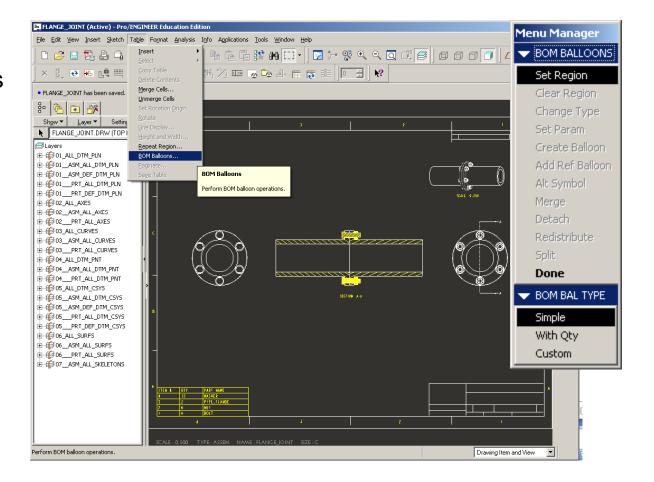


Add Bill of Materials

#### balloons

- Table > BOM Balloons
- Click on BOM table in

lower left



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# EXERCISE - Assembly Drawing

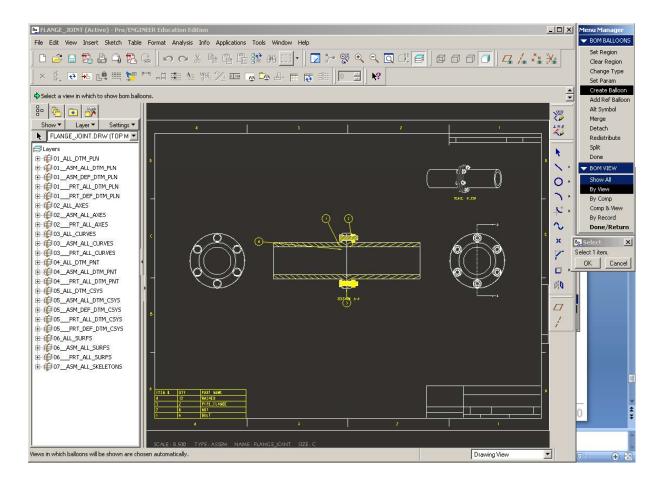
Add Bill of Materials

### balloons (cont.)

- Create Balloons
- Show All
- Arrange balloons so they

make sense

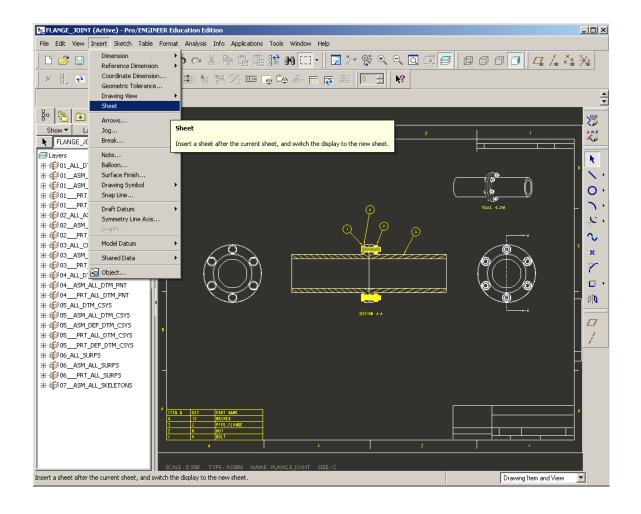
- Edit Attachment
- Re-arrange



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# EXERCISE - Assembly Drawing

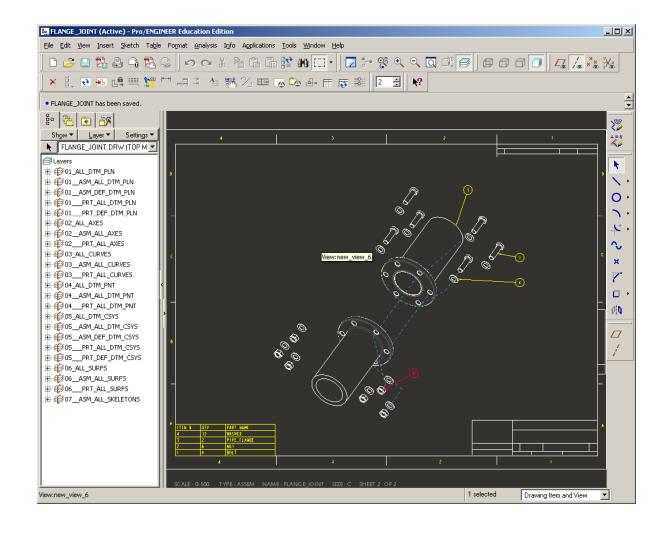
- Create a second sheet
- for the exploded view
  - Insert > Sheet





• Set View Display and

show BOM balloons



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