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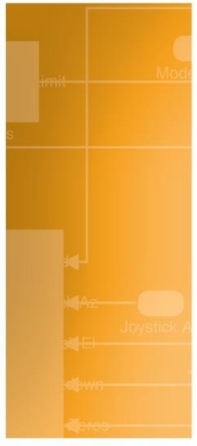
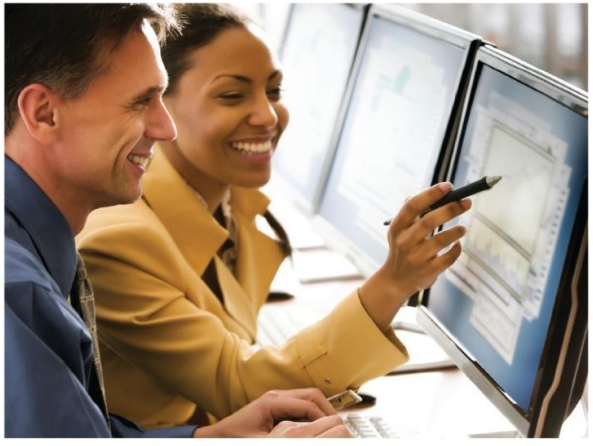
Exercises: Building Components

Physical Modeling for Formula Student





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Four-Bar Components

Try

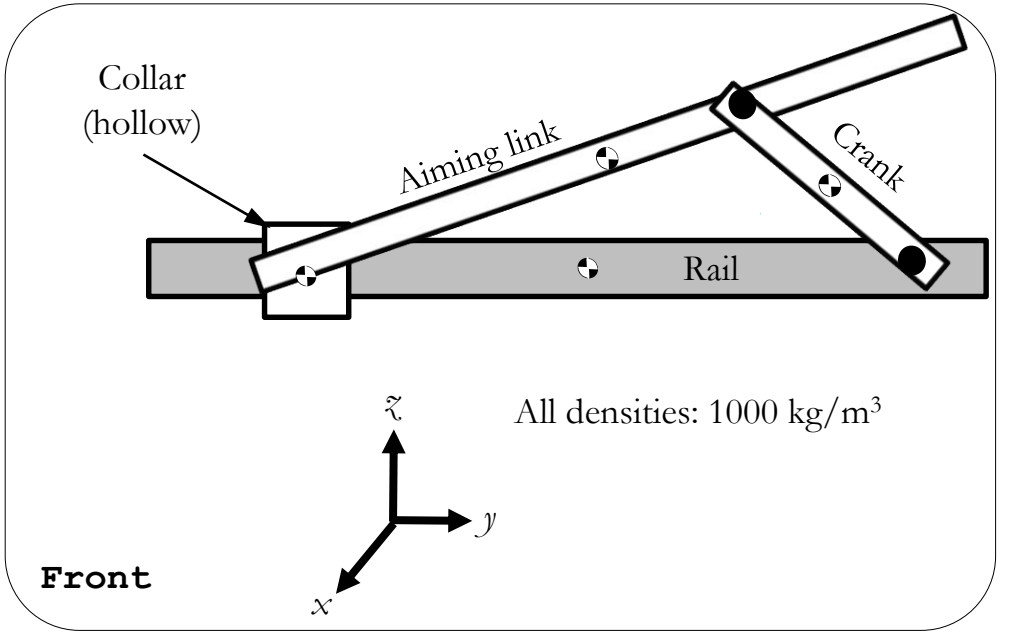
```
>> fourbarComp_start
```

Task: Model the components used in the four-bar linkage exercises (Building Mechanical Assemblies: Parts 1 and 2.)

Steps: Open the model `fourbarComp_start`. This model already contains the three basic blocks needed for any SimMechanics™ model.

1. **Create 3 components named Crank, Aiming Link, and Collar. (See next page for part dimensions)**
   - Add three Solid blocks to the model. This block is found in Body Elements library in SimMechanics.
   - Crank and Aiming Link are of `Brick` shape.
   - Collar is of `General Extrusion` shape.
     - Create a variable named `collarArea` to represent the collar cross-section in meters. This variable can be found in the `rectangularCollar.mat` file.

2. **Specify colors.**
   - Pick the color under **Graphic properties → Visual → Color** as follows.
     - Crank – Green
     - Aiming link – Red
     - Collar – Blue



Note This exercise covers only creating the components. Exercises for the "Building Mechanical Assemblies" sections will cover how to create an assembly out of these components.

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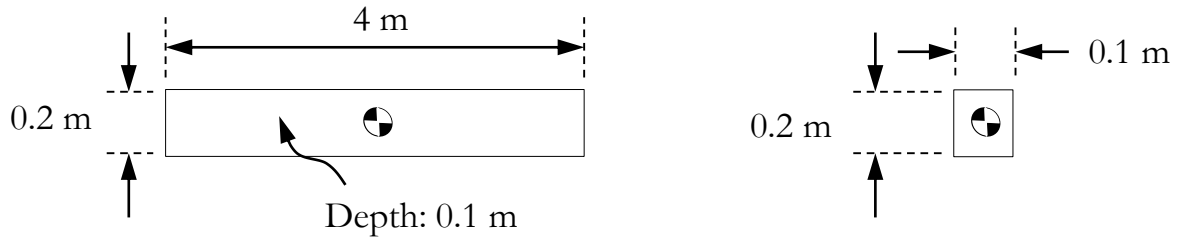
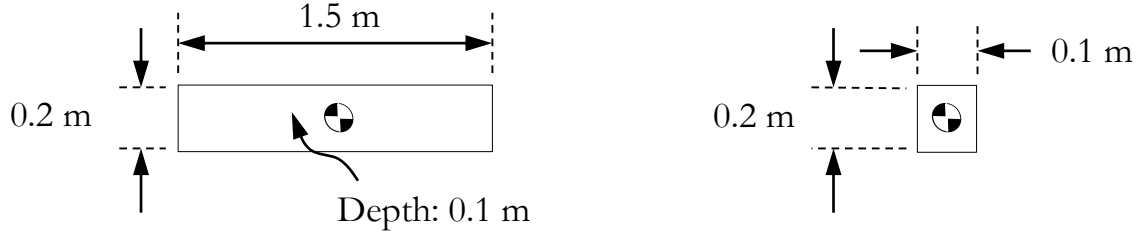
Four-Bar Components (Continued)

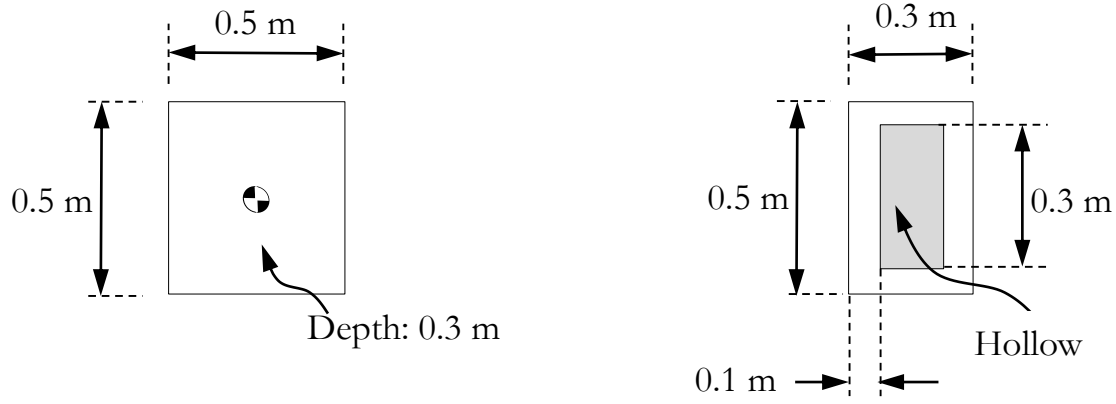
Aiming link



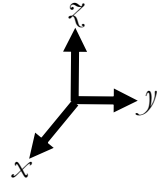
Crank



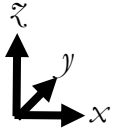
Collar



Right



Front



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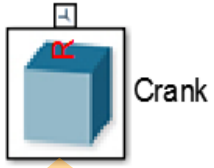
Solution: Four-Bar Components

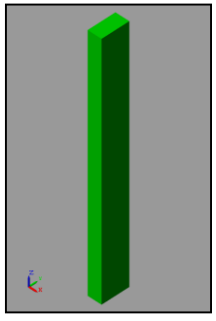
Try

```
>> fourbarComp_solution
```



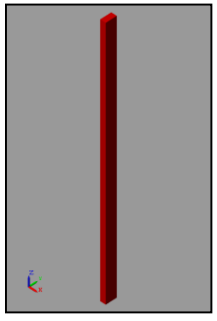
Crank

Geometry		
Shape	Brick	
Dimensions	[0.1 0.2 1.5]	m
Inertia		
Type	Calculate from Geometry	
Based on	Density	
Density	1000	kg/(m^3)
Graphic		
Type	From Geometry	
Visual Properti...	Simple	
Color	[0 1 0]	
Opacity	1.0	



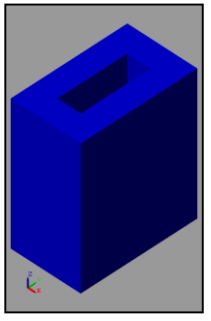
Aiming Link

Geometry		
Shape	Brick	
Dimensions	[0.1 0.2 4]	m
Inertia		
Type	Calculate from Geometry	
Based on	Density	
Density	1000	kg/(m^3)
Graphic		
Type	From Geometry	
Visual Properti...	Simple	
Color	[1 0 0]	
Opacity	1.0	



Collar

Geometry		
Shape	General Extrusion	
Cross-section	collarArea	m
Length	0.5	m
Inertia		
Type	Calculate from Geometry	
Based on	Density	
Density	1000	kg/(m^3)
Graphic		
Type	From Geometry	
Visual Properti...	Simple	
Color	[0 0 1]	
Opacity	1.0	



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Hollow Tube

Task: Model a hollow tube using extrusion and revolution.

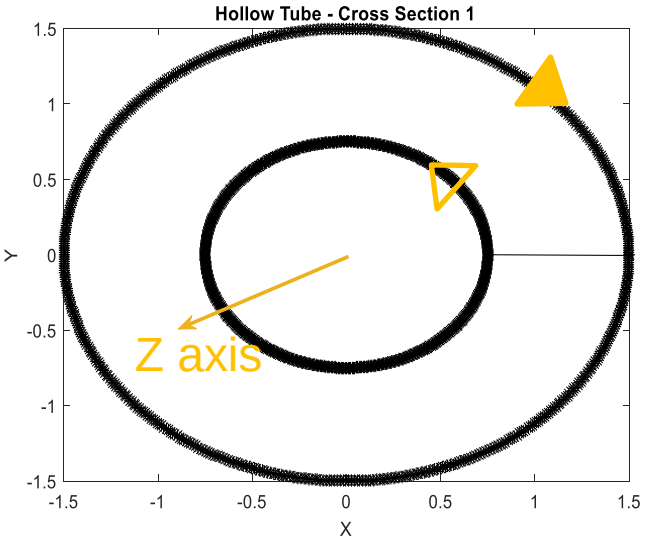
Steps: Open the model `hollowTube_start`. This model already contains the three basic blocks needed for any SimMechanics model. It also has two Solid blocks that will be used to model a hollow tube using extrusion and revolution, respectively.

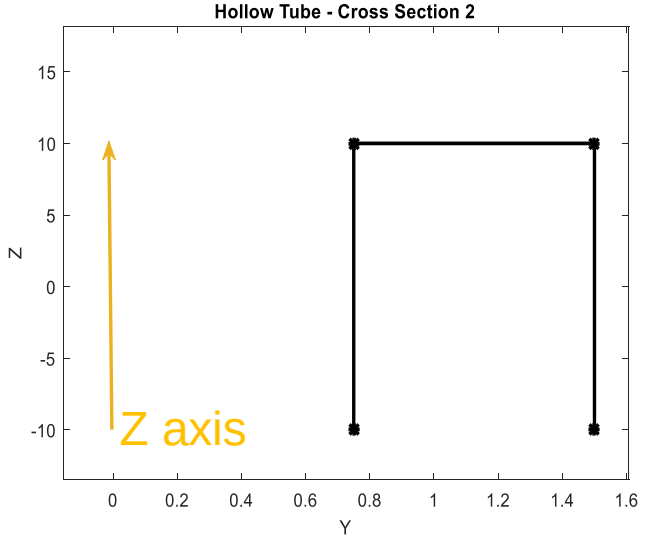
1. **Explore the `tube_1` and `tube_2` variables in the file `hollowTube.mat`.**
   - Plot the columns of the variables against each other (column 1 vs. column 2).
   - Determine which variable should be used for extrusion and which one for revolution (based on the cross-section shape).

2. **Create hollow tubes using extrusion and revolution.**
   - Under the respective Solid blocks, use the appropriate variable (`tube_1` or `tube_2`) to create hollow tubes.

Try

```
>> hollowTube_start
```





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Solution: Hollow Tube

Try

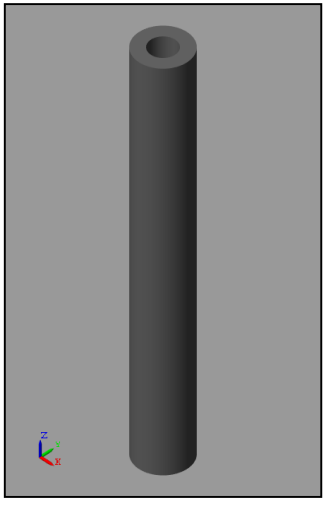
```
>> plot(tube_1(:,1),tube_1(:,2))
>> plot(tube_2(:,1),tube_2(:,2))
>> hollowTube_solution
```

Hollow Tube Extrusion

Hollow Tube Revolution

Geometry		
Shape	General Extrusion	
Cross-section	tube_1	cm
Length	20	cm

Geometry		
Shape	Revolution	
Cross-section	tube_2	cm
Extent of Revo...	Full	



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