Working Model 2D: Tutorial 7

Example 13-9

Wheel A with a mass of 22 kg has a diameter of 240 mm. The mass of B is 10 kg. If the system starts from rest and has no bearing friction, determine the angular acceleration of A and the tension in the rope.

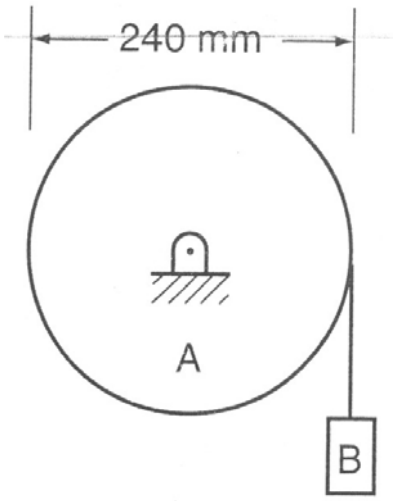

Figure 1

Initial Setup:

1. Set the Unites to SI(Radians) on Numbers and Unites… sub menu and click on the More Choices. Set the distance to Millimeters on the Distance pull-down menu.
2. Select the View Size menu from View and set the Window Width to 1000 mm.
3. Change the accuracy to 0.0001
4. Set the Pause Control to pause when t > 0

Creating Geometry

1. Draw the circle at (0, 0) with a diameter of 240 mm.
2. Select the Pin Joint  from the drawing tool bar and bring the mouse pointer to the center of the circle to make a pin joint between the wheel and the background.
3. Double click on the wheel and get the properties window. Change the mass of the wheel to 22 kg as shown in Figure 2.

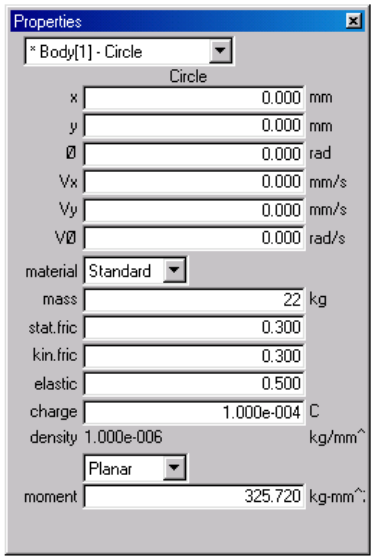

Figure 2

4. Draw a rectangle in the vicinity of mass B and change the X coordinate of the center of the box to 120. The resultant workspace should look like Figure 3.

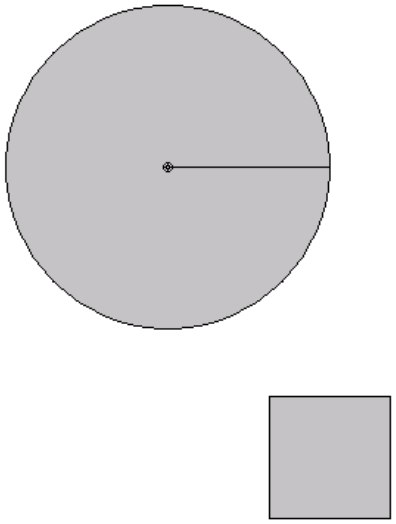

Figure 3

5. Double-click on the box and change the mass of the object B to 10 kg.
6. It is necessary to connect mass B to wheel A using a rope. Select the rope button from the drawing tools menu and click on points PT1 and PT2 in Figure 4 to draw the rope. It is essential to exactly pick the PT1 and PT2, which are on the left-most periphery of the circle and the middle of the top-edge of the mass B.

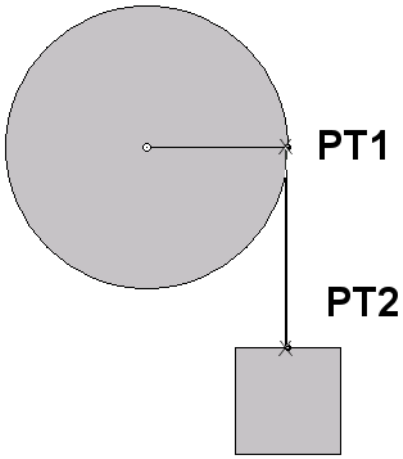

Figure 4

7. Use the rotational acceleration graph to measure the acceleration of the wheel A.
8. Click on the rope and select the Tension from Measure menu
9. Now, the model is ready for simulation. Run the simulation to get the results similar to Figure 5.

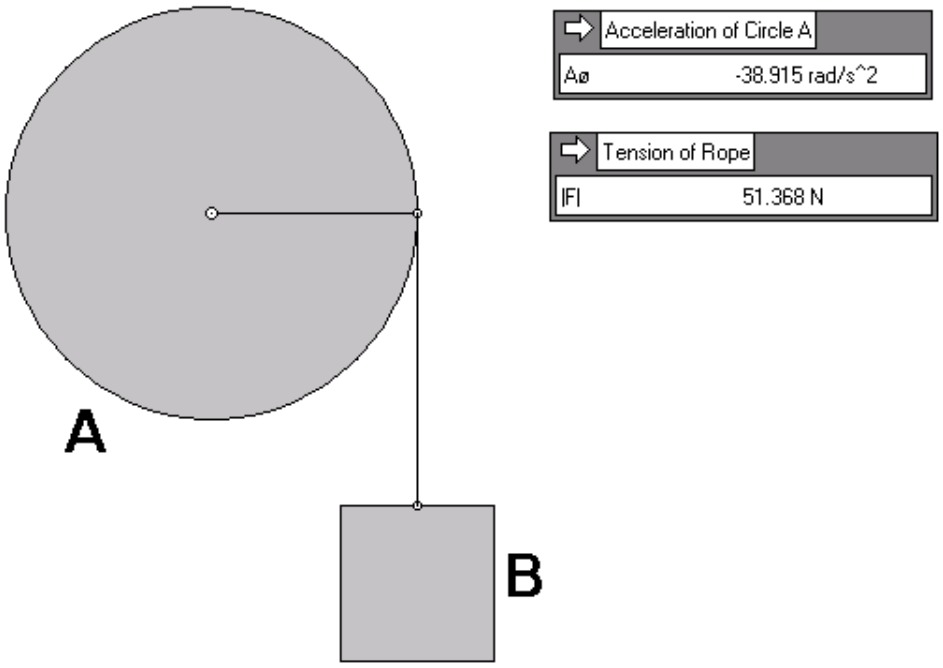

Figure 5