1. Running RecurDyn and Creating a New Model

- Double-click the RecurDyn icon on the Desktop to run RecurDyn.
- 2. Enter "Free_Falling_Ball" in the Name box and click **OK** to create a new model.



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2. Configuring the Modeling Environment and Creating a Ball

- 1. On the toolbar, click the Grid button to display the grid.
- 2. On the Professional tab, in the Body group, click **Ellipsoid**.
- 3. Click to select **Point**, **Distance** for the modeling option.
- 4. Click the point **(0, 1000, 0)** on the work pane utilizing the displayed grid.
- 5. Enter "100" for the distance of an ellipsoid.









3. Checking the Entity You Created and Changing the Name

- On the database pane to the right, right-click the Ellipsoid Body that you created, and then click Rename.
- 2. Change the name to **Falling_Ball**.



4. Changing the Mass of a Ball

- 1. Right-click the ball that you created, and then click Properties.
- 2. In the Properties of Falling_Ball dialog box, click the Body tab, and click to select User Input for the Material Input Type.
- 3. Enter "1" for the Mass.
- 4. Click **OK** to apply the changes and close the dialog box.

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5. Performing Dynamic Analysis

- On the Analysis tab, in the Simulation Type group, click Dyn/Kin (Dynamic/Kinematic Analysis).
- 2. In the dialog box, click the General tab, and enter "1" for the End Time.
- 3. Click Simulate.

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6. Creating a Scope and Checking the Results Graph on the Work Screen

1. On the Analysis tab, in the Scope group, click **Entity**.

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- 2. In the Scope Entity dialog box, enter "Distance" in the Name box.
- 3. Click the **Et** button next to the Entity Name box to select the created ellipsoid.
- 4. Click to select Pos TY for Component (the ball position in the y-direction).
- 5. Click to select Ground.InertiaMarker for Reference Frame.
- 6. Select the Display check box and click **OK** to apply the changes.

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7. Checking the Results Graph in Plot - Position

- 1. On the Analysis tab, in the Plot group, click Plot.
- 2. On the Plot database pane to the right, click Bodies, click Falling_Ball, and then double-click Pos_TY.
- 3. Click the **Data Editor** button.
- 4. Scroll the data sheet that appears below to the right and check the ball position on the y-axis when time is 1 second.





8. Checking the Results Graph in Plot - Velocity, Acceleration

- 1. Click Add.
- 2. For the added chart, on the Plot database pane to the right, click Bodies, click Falling_Ball, and then double-click Vel_TY.
- 3. Double-click Acc_TY as in step 2.
- 4. Click the Data Editor button.
- 5. Check the results on the data sheet below when time is 1 second.



9. Analytical Solution

- Refer to the analysis results of RecurDyn and calculate kinetic energy when time is 1 second.
 - s=Distance
 - ► a=Acceleration
 - ► t=Time
 - v=Velocity
 - ▶ m=mass

RecurDyn Results

```
Distance traveled after 1 second : 2903.32 mm
Velocity after 1 second : -9806.6 mm/s
Acceleration after 1 second : -9806.6 mm/s^2
```

Analytical Solution $s = \frac{1}{2}(at^{2}) = 2903.32$ $v = at = 9806.6 \ mm/s$ $a = g = 9806.6 \ mm/s^{2}$ $KE = \frac{1}{2}mv^{2} = \frac{1}{2} \times 1kg \times (9806.6 \ mm/s)^{2} = 4.8085e7(kg \cdot mm^{2}/s^{2})$ Conversion to N: $1N = 1(kg \cdot m/s^{2})$ $KE = 4.8085e7 \times [\left(kg \cdot \frac{mm^{2}}{s^{2}}\right)(\frac{1m}{100\text{ mm}})] \times mm = 48085.2 \ N \cdot mm$