

## The Inverse Square Law of Universal Gravitation

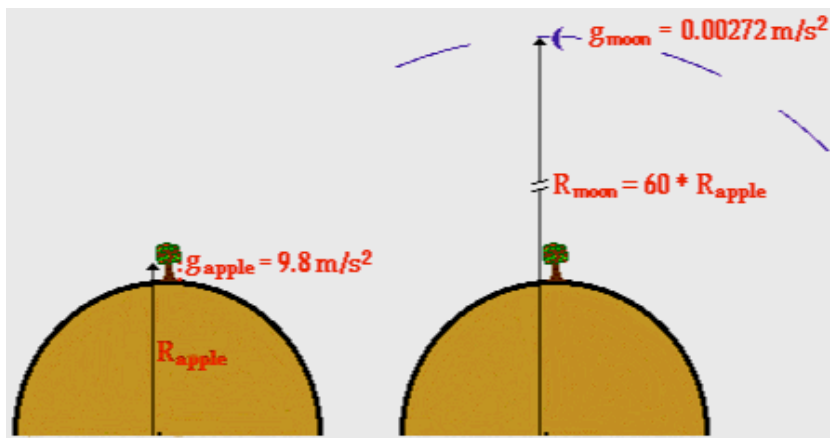
Read from **Lesson 3** of the **Circular and Satellite Motion** chapter at **The Physics Classroom**:

<http://www.physicsclassroom.com/Class/circles/u6l3b.html>

<http://www.physicsclassroom.com/Class/circles/u6l3c.html>

**MOP Connection:** Circular Motion and Gravitation: sublevels 6 and 7

- Isaac Newton compared the acceleration of a falling apple to the acceleration of the *falling* moon. In his comparison, he proved that the moon accelerates at a rate that is 1/3600-th of the apple's rate; he also showed that the separation distance (center to center) between the moon and the Earth was 60 times the separation distance between the apple and the Earth. This is evidence



that the acceleration caused by gravity is \_\_\_\_\_ (directly, inversely) dependent upon the \_\_\_\_\_ (square, square root, cube, cubed root, etc.) of the separation distance.

Use Newton's gravitational law in a conceptual manner in order to fill in the following blanks.

- Two objects gravitationally attract with a force of 18 N. If the distance between the two objects' centers is doubled, then the new force of attraction is \_\_\_\_\_ N.
- Two objects gravitationally attract with a force of 18 N. If the distance between the two objects' centers is tripled, then the new force of attraction is \_\_\_\_\_ N.
- Two objects gravitationally attract with a force of 18 N. If the distance between the two objects' centers is halved, then the new force of attraction is \_\_\_\_\_ N.
- Two objects gravitationally attract with a force of 18 N. If the distance between the two objects' centers is decreased by a factor of three, then the new force of attraction is \_\_\_\_\_ N.
- Two objects gravitationally attract with a force of 18 N. If the distance between their centers is decreased by a factor of four, then the new force of attraction is \_\_\_\_\_ N.
- Two objects gravitationally attract with a force of 18 N. If the **mass** of one of the objects is doubled and the **distance** between their centers is doubled, then the new force of attraction is \_\_\_\_\_ N.
- Two objects gravitationally attract with a force of 18 N. If the **masses** of both of the objects are doubled and the **distance** between their centers is doubled, then the new force of attraction is \_\_\_\_\_ N.
- Two objects gravitationally attract with a force of 18 N. If the **masses** of both of the objects are tripled and the **distance** between the two objects' centers is doubled, then the new force of attraction is \_\_\_\_\_ N.

