



Activity Overview:

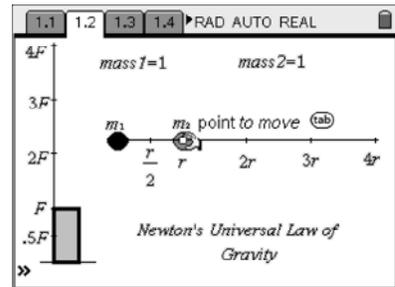
- There is a force F between any two masses (m_1 and m_2). This force F depends on the distance r between the centers of the two masses.
- Explore this relationship by moving the open point to change the distance.

Materials:

- TI-Nspire™ CAS handheld
- LawOfGravity_Physics.tns

Part 1 – Move the Planet

Advance to page 1.2, whose screen is shown at right. Press ctrl tab to grab the open point in $mass2$. Move this point and observe the relationship between the distance and the force.



1. As the distance between the two masses is decreased, what happens to the force?
2. True/False: If the distance is doubled, the force is cut in half.
3. Describe the relationship between the force and the distance between the masses. In your description, also discuss the direction of the force.

Part 2 – Change Distance and Mass

You can answer the self-check questions. Then advance to page 2.2. You can move the same point to adjust the distance. This time the distance will jump to the indicated values.

The mass can also be changed by clicking twice on $mass1$ or $mass2$ and entering a different number.

4. When m_1 and m_2 are separated by a distance r , the force of attraction between them is F . If the distance r between the two masses is cut in half, what is the force?
5. If the distance between the two masses is a third of r , what is the force? Show work to explain your answer. Use the formula on page 2.2 to show work.

Answer the following question on page 2.5. To toggle over to the calculator panel of page 2.5, press  . Give the decimal approximation for your answer.

6. What would the distance between the centers of the two masses need to be for the force to be reduced by a factor of 2? (In other words, what distance makes the force $0.5F$ or $F/2$?)

Use page 2.2 to help you answer the following questions and to help you explain your answers.

7. What happens to the force when the distance is doubled? Tripled? Quadrupled?

Move m_2 back to position r . Double-click on the text that says $mass2=1$. Arrow over to the end and use backspace () to remove the 1. Press 2 and then .

8. a) What happens to the force when one of the masses is doubled? Explain.
- b) What happens to the force when both masses are doubled? Explain.
9. Force F is exerted between m_1 and m_2 when they are separated by distance r .
- a) What is the force when m_2 is tripled and r is doubled?
- b) What is the force when m_1 , m_2 , and r are doubled?
- c) How could you get a force of $4/3F$?
10. a) Notice what happens to the size of the planet when the mass is increased. For example, change m_2 to 8 or 16. Does this affect the distance r between the two planets? Explain.
- b) Write about what you learned by doing this activity.