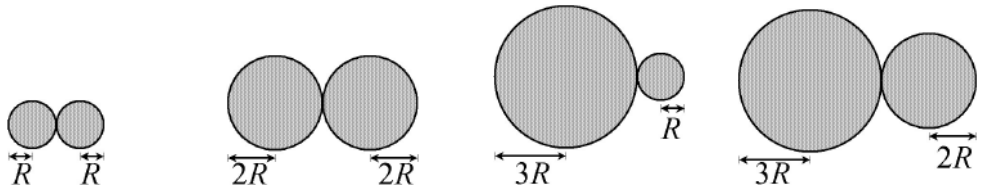
NAME _____ DATE _____

Scenario

In the four cases shown below, two spheres are in contact with each other somewhere in space far from the influence of other objects. The spheres have radii shown in each diagram. In each case, the two spheres exert a gravitational force on each other.



Case A ***Case B*** ***Case C*** ***Case D***

PART A: i. Consider all given cases and assume all of the spheres have the same mass M. Let the left sphere have a radius R_1 and the right sphere have a radius R_2. Write an equation for the gravitational force F that the two spheres exert on each other that could apply to any scenario above. Your equation should contain M_1, M_2, R_1, R_2, and physical constants as appropriate.

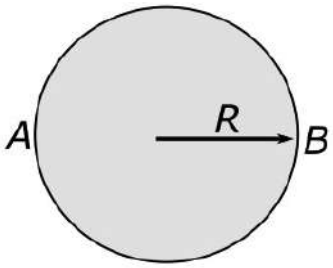
ii. Rank the cases by the gravitational force that the spheres exert on each other, assuming that all the spheres shown have the same mass. Include <, >, or = to clarify your ranking.

_____ _____ _____ _____

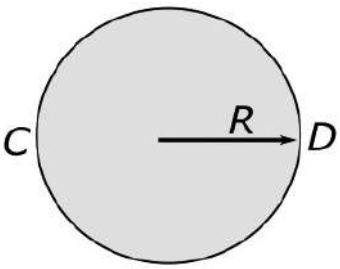
Strongest force Weakest force

Use your equation from Part A (i) to explain how you made your ranking.

PART B: The figure shows two identical planets with radius R. Their centers are separated by a distance of $4R$. They are near each other but are not colliding because they are orbiting each other. An astronaut stands at one of the labeled positions. Rank the magnitudes of net gravitational force on the astronaut at each of the four labeled positions from greatest to least. Include <, >, or = to clarify your ranking.



Planet 1



Planet 2

Greatest net force _____ Least net force

Justify your ranking: