# Warm Up Question 1

Two objects are initially $10\,\mathrm{m}$ apart. The distance between them doubles. How many times larger or smaller does the gravitational force (exerted by one on the other) become after the change? Explain your answer.

1. Half as much. Distance is doubled.

2. One quarter (four times smaller). Distance must be squared.

3. Same. Gravity is constant.

Question 1

Two asteroids are in outer space. Asteroid B has mass three times that of asteroid A. Let $F_{\text{A on B}}$ be the magnitude of the force exerted by A on B and $F_{\text{B on A}}$ be the magnitude of the force exerted by B on A.

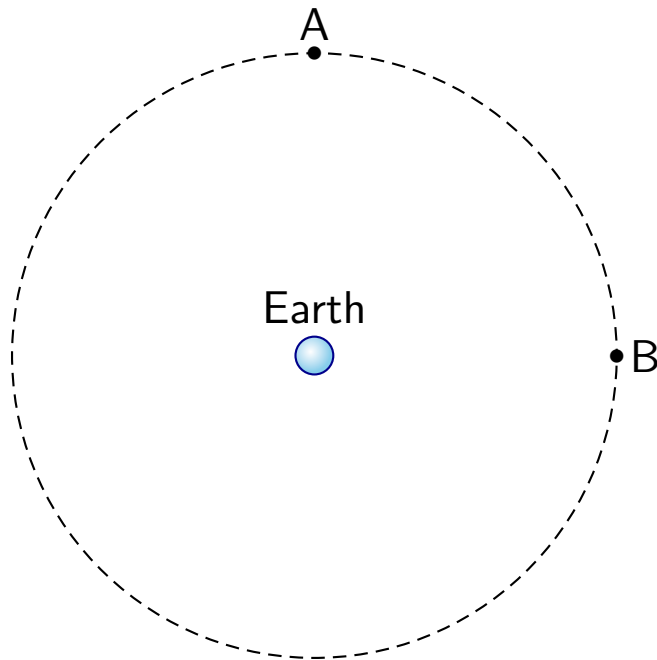Asteroid B

Asteroid A
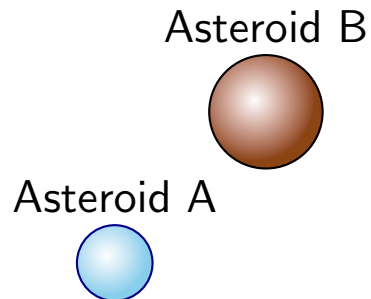
Which of the following is true?

1. $F_{\text{A on B}} = F_{\text{B on A}}$

2. $F_{\text{A on B}} = \dfrac{1}{3} \, F_{\text{B on A}}$

3. $F_{\text{A on B}} = \dfrac{1}{9} \, F_{\text{B on A}}$

4. $F_{\text{A on B}} = 3 \, F_{\text{B on A}}$

5. $F_{\text{A on B}} = 9 \, F_{\text{B on A}}$

Question 2

Two satellites, A and B, move around the Earth in the same circular orbit. The mass of A is twice the mass of B.

A

Earth

• B

Let a_A be the acceleration of A and a_B be the acceleration of B. Which of the following is true?

1. $a_A = \dfrac{1}{4} a_B$

2. $a_A = \dfrac{1}{2} a_B$

3. $a_A = a_B$

4. $a_A = 2a_B$

5. $a_A = 4a_B$

Warm Up Question 2

Europa and Ganymede are two of Jupiter's larger Moons. Ganymede's orbital radius is larger than Europa's. How does the orbital speed of Ganymede compare (larger, smaller, same) to that of Europa? Explain your answer.

1. Ganymede larger. Larger distance to travel.

2. Ganymede smaller. Smaller distance to travel.

3. Ganymede smaller. $v = \sqrt{GM/r}$.

4. Depends on their masses. $v = \sqrt{GM/r}$.