

7.3 Quizlette - Gravity and Orbit

Name _____

Gravity - Use $G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$.

1. What is the force of gravity between a 3.50×10^{13} kg asteroid and a 29,300 kg spaceship if their centers are 1,720 m distant? (23.1 N)

2. What is the force of gravity between a 2.50×10^{14} kg asteroid and a 48,420 kg spaceship if their centers are 5,580 m distant? (25.9 N)

3. The centers of two lead spheres are separated by 2.70 m. If one sphere has a mass of 32.0 kg, and there is an attractive force of 1.70×10^{-9} N, what is the mass of the other sphere? (5.81 kg)

4. The centers of two lead spheres are separated by 1.55 m. If one sphere has a mass of 223 kg, and there is an attractive force of 1.90×10^{-8} N, what is the mass of the other sphere? (3.07 kg)




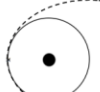







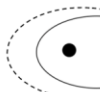
5. What distance separates the centers of two lead spheres if one has a mass of 502 kg, the other a mass of 56.0 kg and there is an attractive force of 2.60×10^{-12} N? (849 m)

6. What distance separates the centers of two lead spheres if one has a mass of 215 kg, the other a mass of 197 kg and there is an attractive force of 2.40×10^{-8} N? (10.8 m)

Orbital Trajectories:

Questions:

Answers:

 Slow down at the x:	 Speed up at the x:	 Slow down at the x:	 Speed up at the x:
 Slow down at the x:	 Speed up at the x:	 Slow down at the x:	 Speed up at the x:
 Slow down at the x:	 Speed up at the x:	 Slow down at the x:	 Speed up at the x:

In general, speeding up brings the far side out, slowing down brings the far side in. Speeding up brings the entire trajectory outside the old one, and slowing down brings entire trajectory inside the old one.

Orbit:

Useful things to know:

Mass of the Earth 5.97×10^{24} kg

Mass of the Moon 7.35×10^{22} kg

Mass of the Sun 1.99×10^{30} kg

$G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$

Radius of the Moon

Radius of the Earth

Earth-Moon Distance

Earth-Sun Distance

1.738×10^6 m

6.38×10^6 m

3.84×10^8 m

1.496×10^{11} m

1. What is the orbital velocity 3400 m from the center of a 5.6×10^{18} kg asteroid? ($331.4 \approx 330$ m/s)
2. You find that you can orbit at 516 m/s 12,150 m from the center of a small moon. What is its mass? (4.85×10^{19} kg)
3. A satellite orbits a planet at a distance of 7.5×10^6 m from the center every 8900 seconds. What is the mass of the planet?
(3.2×10^{24} kg)
4. What distance from the center of Earth's moon is your orbital velocity 120 m/s? (3.4×10^8 m)
5. What is the period of orbit of a satellite that orbits 1.95×10^6 m from the center of Earth's moon? (7730 s)
6. What is the radius of an orbit with a period of 3.16×10^7 s around the sun? (1.50×10^{11} m – yep – it's the earth)