



# Gravitational Force Worksheet

Name \_\_\_\_\_

Period \_\_\_\_\_

1. In 1874, a swarm of locusts descended on Nebraska. The swarm's mass was estimated to be  $2.5 \times 10^{10}$  kg. If this swarm were split in half and the halves separated by  $1.0 \times 10^8$  m, what would the magnitude of the gravitational force between the halves be?
2. Jupiter, the largest planet in the solar system, has a mass 318 times that of Earth and a volume that is 1323 times greater than Earth's. Calculate the magnitude of the gravitational force exerted on a 50.0 kg mass on Jupiter's surface.
3. A whale shark can have a mass of  $2.04 \times 10^4$  kg. A blue whale can have a mass of  $1.81 \times 10^5$  kg. If the distance between these two creatures is 1.50 m, how large is the gravitational force between them?

4. Jupiter's largest moon, Ganymede, is also the eighth largest known body in our solar system. The magnitude of the gravitational force between Ganymede and Jupiter is  $1.64 \times 10^{22}$  N. Given that Jupiter's mass is  $1.90 \times 10^{27}$  kg and the distance between Jupiter is  $1.07 \times 10^6$  km, calculate Ganymede's mass.
5. At the surface of the red super giant star Betelgeuse, the gravitational force between the star and a 1.00 kg mass of hot gas is only  $2.19 \times 10^{-3}$  N. This is because the mean radius of Betelgeuse is so large. Given that the mass of Betelgeuse is 20 times that of the sun, or  $3.98 \times 10^{31}$  kg, what is the mean radius of Betelgeuse?
6. In one hand you hold a 0.12 kg apple, in the other hand a 0.20 kg orange. The apple and orange are separated by 0.75 m.
- What is the force of gravity that the orange exerts on the apple?
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7. At a new Moon, the Earth, Moon, and Sun are all in a line.



Find the net gravitational force exerted on the Moon.