

WORKSHEET – Law of Universal Gravitation

mass of:

Earth → 5.98×10^{24} kg
Jupiter → 1.91×10^{27} kg
Mars → 6.43×10^{23} kg
Mercury → 3.32×10^{23} kg
Moon → 7.36×10^{22} kg
Neptune → 1.03×10^{26} kg
Saturn → 5.68×10^{26} kg
Sun → 1.99×10^{30} kg
Uranus → 8.74×10^{25} kg
Venus → 4.89×10^{24} kg

radius of:

Earth → 6.38×10^6 m
Jupiter → 7.14×10^7 m
Mars → 3.40×10^6 m
Mercury → 2.44×10^6 m
Neptune → 2.43×10^7 m
sun → 7.00×10^8 m
Uranus → 2.61×10^7 m
Venus → 6.05×10^6 m

distance from Earth to the sun → 1.50×10^{11} m
distance from Earth to the moon → 3.84×10^8 m

distance from Saturn to the sun → 1.43×10^{12} m

1 pound = 4.545 newtons

1 meter = 3.28 feet

1 mile = 1609 meters

- 1) How much would a 70.0-kg person weigh on Mercury?
- 2) How much would your 20.0-kg dog weigh on Neptune?
- 3) If Pete (mass = 90.0 kg) weighs himself and finds that he weighs 30.0 pounds, how far away from the surface of the earth is he?
- 4) Captain Kirk (80.0 kg) beams down to a planet that is the same size as Uranus and finds that he weighs 1250 N. What is the mass of that planet?

- 5) Which is greater, the force exerted by Saturn on the sun, or the force exerted by the earth on the Sun? How much greater?
- 6) A distance of 2.00 mm separates two objects of equal mass. If the gravitational force between them is 0.0104 N, find the mass of each object.
- 7) Calculate the gravitational field strength (g) on the surface of Jupiter.
- 8) If the gravitational field strength at the top of Mount Everest is 9.772 N/kg, approximately how tall (in feet) is the mountain?
- 9) If you dropped a ball while standing on the surface of Mars, at what rate would it accelerate toward the ground?
- 10) A space probe lands on the surface of a spherical asteroid 250 miles in diameter and measures the strength of its gravitational field at that point to be 4.95×10^{-11} N/kg. What is the mass of the asteroid?