

Worksheet 5.2 - Gravitational Field Strength

- 1) What is the weight of a 25.0 kg object near the surface of the earth?

$$F_g = mg$$

$$= (25.0 \text{ kg})(9.80 \text{ m/s}^2)$$

$$= \boxed{245 \text{ N}}$$

- 5) What is the mass of an object if it has a weight of 127 N near the earth's surface?

$$F_g = mg$$

$$m = \frac{F_g}{g} = \frac{127 \text{ N}}{9.80 \text{ N/kg}} = \boxed{13.0 \text{ kg}}$$

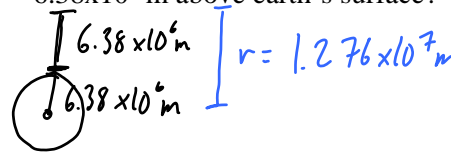
- 2) What is the mass of an object if it has a weight of 80.0 N near the earth's surface?

$$F_g = mg$$

$$m = \frac{F_g}{g} = \frac{80.0 \text{ N}}{9.80 \text{ m/s}^2}$$

$$= \boxed{8.16 \text{ kg}}$$

- 6) What is the gravitational field strength at a point $6.38 \times 10^6 \text{ m}$ above earth's surface?



$$g = \frac{GM}{r^2} = \frac{(6.67 \times 10^{-11})(5.98 \times 10^{24})}{(1.276 \times 10^7)^2}$$

$$= \boxed{2.45 \text{ m/s}^2}$$

- 3) What is the acceleration due to gravity near the surface of the moon if an object that has a mass of 22.0 kg has a weight of 36.0 N near the moon's surface?

$$F_g = mg \quad g = \frac{F_g}{m} = \frac{36.0 \text{ N}}{22.0 \text{ kg}}$$

$$= \boxed{1.64 \text{ m/s}^2}$$

- 7) What is the acceleration due to gravity on the surface of the sun?

$$r_{\text{sun}} = 6.96 \times 10^8 \text{ m}$$

$$m_{\text{sun}} = 1.99 \times 10^{30} \text{ kg}$$

$$g = \frac{GM}{r^2} = \frac{(6.67 \times 10^{-11})(1.99 \times 10^{30})}{(6.96 \times 10^8)^2}$$

$$= \boxed{274 \text{ m/s}^2}$$

- 4) What is the weight of a 72.0 kg object near the surface of the Moon?

$$F_g = mg = (72.0 \text{ kg})(1.64 \text{ m/s}^2)$$

$$= \boxed{118 \text{ N}}$$

- 8) The Earth orbits the Sun at a distance of $1.46 \times 10^{10} \text{ m}$ from center to center. What is the strength of the Sun's gravitational field at this distance?

$$g = \frac{GM}{r^2} = \frac{(6.67 \times 10^{-11})(1.99 \times 10^{30})}{(1.46 \times 10^{10})^2}$$

$$= \boxed{0.622 \text{ m/s}^2}$$