1) What is the weight of a 25.0 kg object near the surface of the earth?
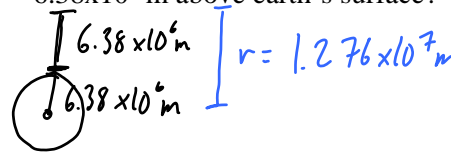
$$F_g = mg$$
$$= (25.0\,kg)(9.80\,m/s^2)$$
$$= \boxed{245\,N}$$

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

$$F_g = mg$$
$$m = \frac{F_g}{g} = \frac{80.0\,N}{9.80\,m/s^2}$$
$$= \boxed{8.16\,kg}$$

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?

$$F_g = mg \qquad g = \frac{F_g}{m} = \frac{36.0\,N}{22.0\,kg}$$
$$= \boxed{1.64\,m/s^2}$$

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

$$F_g = mg = (72.0\,kg)(1.64\,m/s^2)$$
$$= \boxed{118\,N}$$

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

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

6) What is the gravitational field strength at a point 6.38×10^6 m above earth's surface?

$6.38 \times 10^6\,m$ $6.38 \times 10^6\,m$ $r = 1.276 \times 10^7\,m$

$$g = \frac{GM}{r^2} = \frac{(6.67 \times 10^{-11})(5.98 \times 10^{24})}{(1.276 \times 10^7)^2}$$
$$= 2.45\,m/s^2$$

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

$r_{sun} = 6.96 \times 10^8$ m
$m_{sun} = 1.99 \times 10^{30}$ kg

$$g = \frac{GM}{r^2} = \frac{(6.67 \times 10^{-11})(1.99 \times 10^{30})}{(6.96 \times 10^8)^2}$$
$$= \boxed{274\,m/s^2}$$

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

$$g = \frac{GM}{r^2} = \frac{(6.67 \times 10^{-11})(1.99 \times 10^{30})}{(1.46 \times 10^{10})^2}$$
$$= \boxed{0.622\,m/s^2}$$

1) 245 N 2) 8.16 kg 3) 1.64 m/s² 4) 118 N 5) 13.0 kg 6) 2.45 m/s² 7) 274 m/s² 8) 0.622 m/s²