Look up → $r_{Earth} = 6.37 \cdot 10^6$ m $G = 6.67 \cdot 10^{-11}$ N kg²/m²

$m_{Earth} = 5.98 \times 10^{24}$ kg $m_{Moon} = 7.35 \times 10^{22}$ kg

Key

Worksheet 5.3

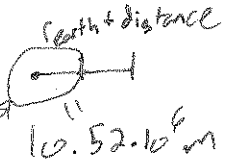
1) Two students are sitting 1.50 m apart. One student has a mass of 70.0 kg and the other has a mass of 52.0 kg. What is the gravitational force between them? $F_g = \frac{52.70}{1.5\,m^2} \cdot 6.67 \cdot 10^{-11}\ N \cdot kg^2/m^2 =$ (1.08x10-7 N)

2) What gravitational force does the moon produce on the Earth if their centers are 3.84×10^8 m apart? $F_g = 6.67 \cdot 10^{-11} \cdot \frac{5.98 \cdot 10^{24}\,kg \cdot 7.35 \cdot 10^{22}\,kg}{(3.84 \cdot 10^8\,m)^3}$ (1.99×10^{20} N)

3) if the gravitational force between two objects of equal mass is 2.30x10-8 N when the objects are 10.0 m apart what is the mass of each object? $2.3 \cdot 10^{-8} N = \frac{6.67 \cdot 10^{-11} \cdot m^2}{(10.0\,m)^2} \rightarrow m =$ (186 kg)

4) Calculate the gravitational force on a 6.50×10^2 kg spacecraft that is 4.15×10^6 m above the surface of the Earth. (2.34×10^3 N)

$6.37 \cdot 10^6$ m + $F_g = 6.67 \cdot 10^{-11} \cdot \frac{5.98 \cdot 10^{24}\,kg \cdot 6.5 \cdot 10^2\,kg}{(10.52 \cdot 10^6\,m)^2} =$



5) The gravitational force between two objects that are 2.1×10^{-1} m apart is 3.2×10^{-6} N. If the mass of one object is 55 kg, what is the mass of the other object? $3.2 \cdot 10^{-6} N = \frac{6.67 \cdot 10^{-11} \cdot 55 \cdot m_2}{(2.1 \cdot 10^{-1}\,m)^2} \rightarrow m_2 =$ (38 kg)

6) If two objects, each with a mass of 200 kg, produce a gravitational force of 3.7×10^{-6} N, what is the distance between them? (0.85 m)

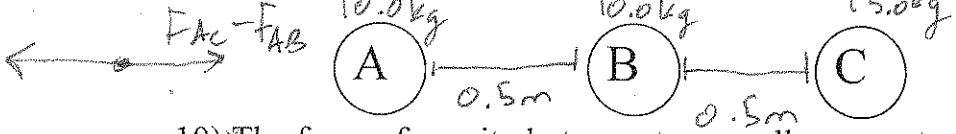
$3.7 \cdot 10^{-6} N = \frac{6.67 \cdot 10^{-11} \cdot (200\,kg)^2}{r^2} \rightarrow r = ?$

7) What is the gravitational force on a 70.0 kg object standing on the Earth's surface? $F_g = \frac{6.67 \cdot 10^{-11} \cdot 70.0\,kg \cdot 5.98 \cdot 10^{24}}{6.37 \cdot 10^6\,m}$ (686 N)

8) Three 10.0 kg objects are placed in a straight line 5.00x10-1 m apart. What is the net gravitational force on the center object due to the other two objects? Net = 0N since it is balanced (0N)

9) Three objects A, B, and C are placed 0.50 m apart along a straight line. A and B have masses of 10.0 kg and C has a mass of 15.0 kg, what is the net gravitational force on B due to A and C? (1.33×10^{-8} N)

$F_{gAB} = \frac{6.67 \cdot 10^{-11} \cdot 10^2}{(0.5\,m)^2} = 2.668 E^{-9}$



$F_{gBC} = \frac{6.67 \cdot 10^{-11} \cdot 10kg \cdot 15kg}{(0.5m)^2} = 4.00 E^{-8}$

$4.00 - 2.668 = 1.332 \cdot 10^{-8}$ N

10) The force of gravity between two small masses A and B when placed very near each other is 3.24×10^{-7} N. What will the force between these objects be if both of their masses are doubled and the distance between them is tripled? (1.44x10-7 N)

$\frac{4}{9} \cdot 3.24 \cdot 10^{-7} N = \frac{6 \cdot (2x) \cdot (2x)}{(3r)^2} = \frac{4}{9}$

$F_A = 1.44 \cdot 10^{-7}$ N