1. Calculate the force of attraction between a 5.6×10^4 kg mass and a 3.4×10^5 kg mass if they are separated by 2.35 m.

[0.230 N]

2. Fill in the blanks:

F_G	m_1	m_2	R
2.3×10^{-5}	1000	[3103]	3
30	1.7×10^7	1.7×10^7	[25]
4×10^{-3}	2500	[8.63×10^{11}]	6000
[625]	5×10^6	7.5×10^8	20
1470	150	5.98×10^{24}	[6.38×10^6]

3. The force due to gravity between two objects is 400.0 N. Determine the force if:
   A. The distance between them is doubled
   B. The distance between them is decreased to ⅓ of the original distance?
   C. What will the force become if one of the masses is quadrupled?

A. [100.0 N]
B. [3600. N]
C. [1600. N]

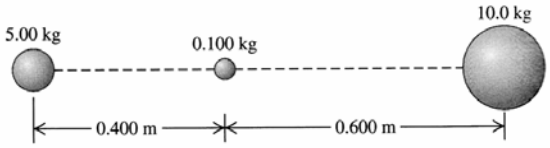
4. What force does the moon exert on Mr. McGeechan (m = 86.2 kg) if the mass of the moon is 7.35×10^{22} kg and it is orbiting 3.84×10^8 m away?

[0.00287 N]

5. Two masses, one 3 times the other, are placed 3.50 m apart. The experience a force of 1.50 N. What is the mass of each object?

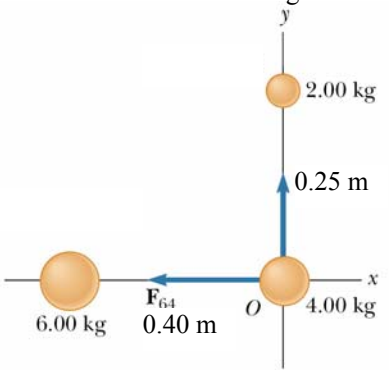
[$m_1 = 3.03 \times 10^5$ kg , $m_2 = 9.09 \times 10^5$ kg]

6. Determine the net force on the 0.100 kg mass.



[2.32×10^{-11} N to the left]

7. Determine the magnitude and direction of the net force on the 4.00 kg mass in the following:



[1.32×10^{-8} N @140° from x-axis]

8. The force of gravity between two bodies is 5 N. The mass of each body is 67,000 kg. How far apart are the two bodies?

[0.24 m]

9. The force of gravity between two bodies is 6.68×10^{3} N.

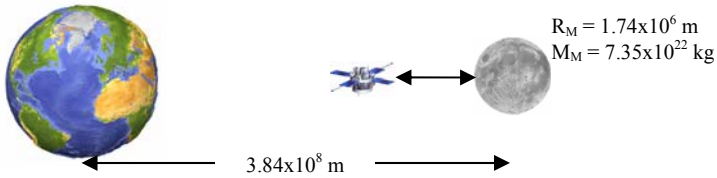
   a. What will the force become if the distance between them is tripled? [742 N]

   b. What will the force become if the mass of one body is halved? [3340 N]

10. Calculate the force between two bodies if the mass of one body is 250. kg, and the mass of the other body is 25.0 kg. The distance between the two bodies is 5.50×10^4 m.

[1.38×10^{-16} N]

11. How far from the surface of the Moon will a spacecraft experience a net gravitational force of zero?



[3.66×10^7 m]

Acceleration Due To Gravity "g"

12. What is the acceleration due to gravity (g) on Jupiter ($m_J = 1.90x10^{27}$ kg, $R_J = 6.91x10^7$ m)? How much would a 3.00 kg book weigh on Jupiter?

[26.5 m/s^2, 79.6 N]

13. Fill in the blanks:

g	m_P	R
4.9	[5.98x10^{24}]	$2.55x10^7$
12	$5x10^{20}$	[5.27x10^6]
3	[1.21x10^{22}]	$5.2x10^5$
[4x10^0]	$5.98x10^{24}$	10,000
19.6	$5.98x10^{24}$	[4.5x10^0]

13. What is the acceleration due to gravity (g) on a planet that has a mass of $3M_E$ and radius of ½ R_E?

[118 m/s^2]

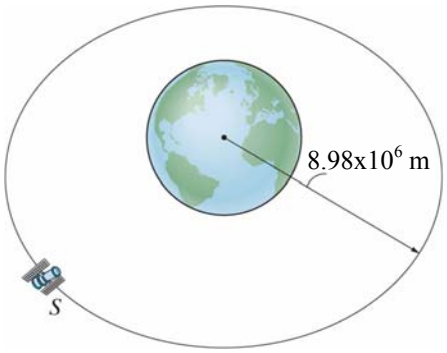
14. The g on a planet is 14.5 m/s^2. The planet has the same mass as the Earth. What is its radius?

[5.25x10^6 m]

Satellites

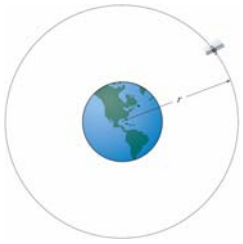
15. A satellite is in orbit around the Earth with a radius of 8.98×10^6 m from the Earth's center.

    A. What is the velocity of the satellite? [6664 m/s]
    B. What is the centripetal acceleration (a_C) of the satellite? [4.96 m/s^2]



16. A satellite is in orbit above the Earth at a distance of 4.23×10^7 m from the Earth's center.

    A. What is the velocity of the satellite?
    B. What is the satellite's period in days?

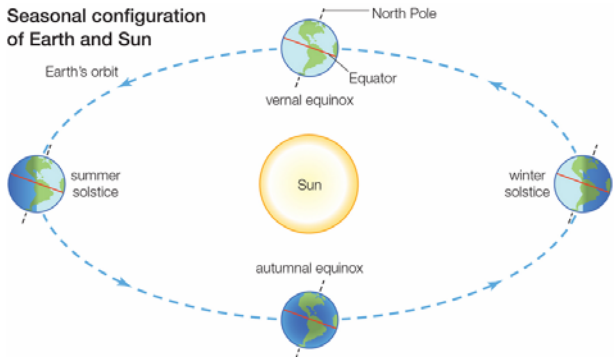


A. [3070. m/s]
B. [1.00 day, geosynchronous orbit!]

17. What must the velocity of a satellite be if it is in orbit 110. km *above* the Earth's surface?

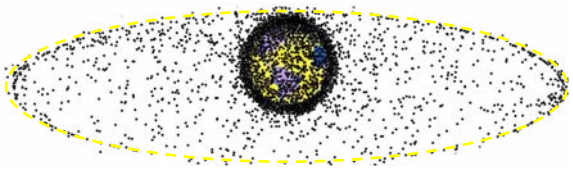
[7840 m/s]

18. The Earth orbits the Sun once every 365.25 days (3.16×10^7 seconds) at a radius of 1.50×10^{11} m.
    A. What is the velocity of the Earth?
    B. Use this information to calculate the mass of the Sun



A. [29,800 m/s]
B. [2.00×10^{30} kg]

19. What must the orbital height (above the surface) of a satellite that is in ***geosynchronous*** with a point on the Earth's equator?



[3.59×10^7 m]

20. A satellite is launched into an orbit that is 250. km <u>above the Earth's surface</u>.
    A. What velocity must the satellite have? [7756 m/s]]
    B. What must its period be? [5368 s]
    C. What is its centripetal acceleration? [9.11 m/s^2]