Name _____ Hour _____

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Gravity and Circular Motion Book Assignment

p. 159-163

1. *Reminder: Vectors have both _____ and _____
2. Can you accelerate if your speed is constant? **Explain!**

3. Define centripetal acceleration:

4. Centripetal also is called _____ -seeking acceleration.
5. The acceleration will be directed toward the _____ of the circle.

Centripetal Acceleration $(a_c) = \frac{v^2}{r}$ v = _____ in _____ (units)

r = _____ in _____

6. You are on the swings at MOA moving at constant speed in a circle. If your swing is 48.2 m from the center and has a centripetal acceleration of 4.05 m/s^2, what is your speed? (13.97 m/s)

Period of revolution:

7. Define **period** and include the letter of its abbreviation:

Objects moving in a circle at constant speed: $v = \frac{2 \pi r}{T}$

8. A ball is swung from a cord with a radius of 0.58 m at a constant speed of 2.4 m/s. What is the period of the ball? (1.52 sec)

Centripetal Force (force directed toward the center of the object's circular path)

$F_c = m \times a_c$ F_c = _____ in _____

a_c = _____ in _____

9. What is the centripetal force keeping Earth circling the sun? _____
10. A pilot is flying a small plane at 30 m/s in a circular path with a radius of 150 m. If a force of 655 N is needed to maintain the pilot's circular motion, what is the pilot's mass? (Find a_c first, then mass) (109 kg)

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11. Explain why **inertia, not a centrifugal force**, causes you to slide to the right when you make a sharp left turn in your car.

Name _____ Hour _____

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12. Isaac Newton determined that the force of _____ would act between any 2 objects in the universe and is known as the _____ force.
13. The gravitational force depends on the _____ of the objects and the _____ between them.

Newton's law of Universal Gravitation: yellow box on p. 182 and p. 184 for G

$F_g = \frac{G(m_1 m_2)}{r^2}$ G = (a constant) =_____ Units = _____

m_1=_____ in _____ m_2= _____ in _____

r = _____ units = _____

14. All objects attract one another. Why do we not observe the attraction between 2 objects on Earth? (p. 185)

Problems: No book needed:

15. Mars has a mass of 6.4×10^{23} kg, and its moon Phobos has a mass of 9.6×10^{15} kg. If the gravitational force between them is 4.6×10^{15} N, how far apart are they? (9.44×10^{6} m)

16. A 90 kg person stands 1.0 m from a 60 kg person. What is the gravitational force between them? (3.6×10^{-7} N)

17. Tom is twirling his huge set of keys (1.5 kg) for the building in a circle at the end of a cord at a constant speed.
    a. If the keys have a centripetal acceleration of 145 m/s^2 and the cord has a length of 0.34 m, what is the speed of the keys? (7.02 m/s)

    b. What force is needed to maintain the circular motion? (217.5 N)

    c. How long will it take to make 1 revolution using this equation: $v = \frac{2\pi r}{T}$
    (T = the time for one revolution) (0.30 sec)