

Name \_\_\_\_\_ Hour \_\_\_\_\_

# Level 1: Circular Motion and Gravity

## Circular Motion at constant speed:

1. What is T? \_\_\_\_\_
2. What unit is T measured in? \_\_\_\_\_
3. What unit is centripetal force measured in? \_\_\_\_\_
4. What unit is centripetal acceleration measured in? \_\_\_\_\_
5. Can you accelerate if your velocity is constant? Explain!
  
6. Your pig (mass=450 grams) is flying in a circle with a radius of 2.45 m.
  - a. If he goes around 5 times in 22.5 sec, what is his velocity? (3.42 m/s)
  
  - b. What is the centripetal force acting on him? (2.15 N)
  
7. The world's highest swing ride (TX) turns at **35 mph**, 400 feet above the ground!
  - a. If the radius is 23.4 m, how many seconds does it take to spin around once? (9.4 s)
  
  - b. If you were to drop your keys from the ride, what velocity would they be traveling at when they hit the ground 400 **feet** below? (Use 1 in = 2.54 cm) (48.9 m/s)
  
8. The Earth travels around the sun in an almost perfect circle. It takes  $\approx 365$  days to complete the orbit. The average radius of the earth's orbit is 1 Astronomical Unit (1 AU), or  $1.5 \times 10^{11}$  meters. Find the **velocity (in mph)** of the Earth as it moves around the sun. (Assume constant speed,  **$\Delta t$  has to be in sec**) (over 66,000 mph!)

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**Gravitation:**

9. What is  $F_g$ ? What unit is it measured in?
  
10. What is  $G$ ? \_\_\_\_\_ What are the units of  $G$ ? \_\_\_\_\_
11. What 2 things does the force of gravity depend on? \_\_\_\_\_
12. Newton believed all things \_\_\_\_\_ each other.
13. What is  $r$ ? \_\_\_\_\_ What unit is  $r$  measured in? \_\_\_\_\_
14.
  - a. What would the gravitational force be on Phredricka Physics if she lived on Mars and her mass was 53 kg? The mass of Mars is  $6.37 \times 10^{23}$  kg and the radius of Mars is  $3.43 \times 10^6$  m. (ans. 191.4 N)
  
  - b. What is the acceleration due to gravity on the surface of Mars? (3.61 m/s<sup>2</sup>)
  
  - c. Would she weigh more or less on earth? Explain your answer relating to the equation for weight!
  
15. Find the acceleration due to gravity on the surface of the moon. (1.61 m/sec<sup>2</sup>)
  
16. A satellite for Sprint is orbiting at **650,000 m above the surface** of the Earth. (Need to add to Earth's radius!)
  - a. What is the acceleration due to gravity at that location? (8.09 m/s<sup>2</sup>)
  
  - b. What velocity would it need to maintain to stay in orbit? ( $\approx 7536$  m/s)