Name _____Answer Key_____ **A** Date _____

Honors Physics Gravity/Circles/Kepler WS #5H

Period _____ Mrs. Nadworny

Torque

Directions – Read textbook pages 278 – 282. Solve the following problems using the GUESS method and correct significant figures. Be sure to show ALL work!

1. Which of the following are means of maximizing the torque of a force applied to a rotating object?

   I. Maximize the magnitude of the applied force.
   II. Apply the force as close as possible to the axis of rotation.
   III. Apply the force perpendicular to the displacement vector between the axis of rotation and the point of applied force.

   (A) I only (B) II only (C) I and II only (D) I and III only (E) I, II, and III

2. A force of 20 N is applied perpendicular to the end of a bar of length 50 cm Calculate the magnitude of the torque produced by the force.

$$\tau = F \cdot r = (20N)(0.5m) = 10Nm$$

3. A child of mass 20. kg is located 2.5 m from the pivot point of a seesaw. Where must a child of mass 30. kg sit on the seesaw in order to provide balance?

$$\tau_1 = \tau_2$$
$$F_1 \cdot r_1 = F_2 \cdot r_2$$
$$m_1 \cancel{g} \cdot r_1 = m_2 \cancel{g} \cdot r_2$$
$$r_1 = \frac{m_2 r_2}{m_1} = \frac{(20.kg)(2.5m)}{30.kg} = 1.7m$$

4. Three people wish to teeter totter at the park. The first person has a mass of 40.0 kilograms and sits 2.20 meters to the left of the pivot. The second person has a mass of 55.0 kilograms and sits 3.30 meters to the right of the pivot. The third person sits 2.70 meters to the left of the pivot. If the teeter totter balances perfectly, what is the mass of the third person?

$$\tau_1 + \tau_3 = \tau_2$$
$$F_1 \cdot r_1 + F_3 \cdot r_3 = F_2 \cdot r_2$$
$$m_1 \cancel{g} \cdot r_1 + m_3 \cancel{g} \cdot r_3 = m_2 \cancel{g} \cdot r_2$$
$$m_3 = \frac{m_2 r_2 - m_1 r_1}{r_3} = \frac{(55.0kg)(3.30m) - (40.0\,\text{kg})(2.20\,\text{m})}{2.70m} = 34.6kg$$

Answers in size order: 1.7, 10, 34.6