

Phy131 Sixth Homework Assignment
Due Friday, May 30

Figures for the questions can be found the the last page of the assignment

Question 1.

Major league baseball pitcher can throw a baseball toward home plate at 90 miles/hr with a spin of 1800 revolutions per minute. The distance from the pitcher's mound to home plate is approximately 60 feet. How many revolutions does the baseball make on its way to home plate?

Question 2

Ed spins a "cake-walk" wheel at a carnival. The wheel has 16 numbers, 1 – 16, equally spaced around it in numerical order clockwise. When the wheel stops, the number at the top is the winner and wins a cake. The initial angular velocity of the wheel is 30 radians/sec in the clockwise direction. The initial number at the top is 1. The wheel has an angular acceleration of -0.5 radians/sec². Find:

- a) The time it takes for the wheel to stop.
- b) What the winning number is.

Question 3

The length of a bicycle pedal arm is 6 inches. A downward force of 100 pounds is applied to the pedal arm. Find the torque about the axis (pivot point) when the arm makes an angle of: a) 30° , b) 90° , and c) 180° with the vertical.

Question 4

Weak Willie and Strong Sammy have to carry a heavy 200 pound rock. To do this, they will put the rock on a 20 pound plank and each lift at the ends of the plank. the plank is 6 feet long. Weak Willie can only lift a maximum of 50 pounds. Strong Sammy can lift a maximum of 180 pounds.

- a) How close to Weak Willie's end of the plank can the rock be placed so they can both lift it (plus the plank)?
- b) How far from Weak Willie's end of the plank can the rock be placed so they can

both lift it (plus the plank)?

Question 5

Sue owns a pick-up truck, which has a mass of 1000 kg. The front wheel and rear wheel are separated by a distance of 4 meters. The center of mass of the truck is 1 meter behind the front wheels. The truck has rear-wheel drive.

- a) How much weight in Newtons do the front tires push down on the road with?
- b) How much weight in Newtons do the back tires push down on the road with?
- c) What is the maximum acceleration that Sue's truck can have if the coefficient of static friction is $\mu = 0.6$.

Question 6

Timmy, Tommy, and Tammy are sitting on a teeter-totter as shown in the figure on the last page. Timmy (120 pounds) sits 6 feet to the left of the pivot point, Tommy (100 pounds) sits 3 feet to the left of the pivot point, and Tammy sits 6 feet to the left of the pivot point. The teeter-totter is in equilibrium. What is Tammy's weight?

Question 7

Doug, who weighs 200 pounds, takes a rest on top of a ladder as shown in the figure on the next page. There is no friction between the ladder and the floor. Each leg of the ladder weighs 40 pounds. Each leg of the ladder is 8 feet long, and a rope holds the two legs together. The legs make an angle of 30° at the top, and the hinge at the top is frictionless.

Find the tension in the rope (which keeps the legs from sliding apart).

See the next page for the figures

Figures for Homework 6

