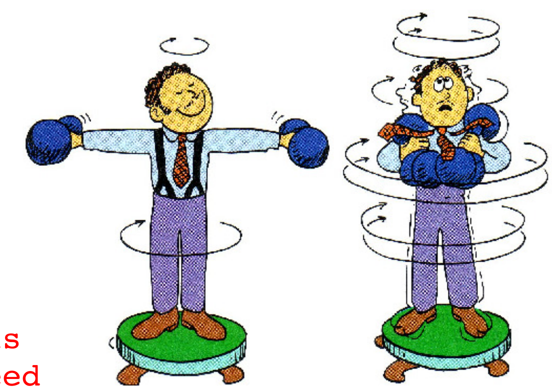
Chapter 11: Reading Guide and Problems Name Key-Mr. Sudbury Block___

Ch 11 (p 150-163)

1. What is another word for "turning force"? Torque
2. When is a torque produced? A torque is produced when a force is applied with "leverage."
3. What kind of wrench will give you greater torque? Long or short?
   A longer handle on a wrench will give you more torque because the radius of the circular motion.
4. According to rotational inertia, rotating objects tend to keep Rotating while nonrotating objects tend to stay linear.
5. Rotational inertia is sometimes called the Moment of inertia.
6. What is rotational inertia? Rotational inertia is the inertia of rotation. Objects that are rotating will continue rotating and objects that are not rotating will continue not rotating.
7. Like regular inertia, rotational inertia depends on the mass but it also depends on the Distribution of the mass.
8. What type of cylinder would roll with the greatest acceleration, if they had the same mass: a hollow one or solid one? (Circle one) and why?
   Pg 158. These solid stone would have the greatest acceleration because its mass is most evenly distributed and begins to roll sooner because it has less rotational inertia. The stone with all the mass at the edges begins to roll a little later because it has more rotational inertia.
9. Which one of your body axis's (there are 3) has the least rotational inertia?
   Pg 159. Your longitudinal axis. It has the least rotational inertia because most of the inertia is concentrated around the axis.
10. What is the "inertia of rotation"? Angular momentum.
11. There are 2 equations for angular momentum, list them below:
    Angular momentum = $I \times \omega$ angular momentum = mvr
12. Angular momentum is always Conserved for systems in rotation.
13. Why are galaxies spiral shaped?
    Conservation of angular momentum. Read pg 163.
14. What does the law of conservation of angular momentum state?
    If no unbalanced external torque acts on a rotating system, the angular momentum of that system is constant.
15. When the spinning man in the picture pulls his arms inward close to his body, what decreases?
    When he pulls his arms in he decreases his rotational inertia and his rotational speed increases as a result.
16. When the spinning man in the picture pulls his arms inward close to his body, what increases?
    When he pulls his arms in he decreases his rotational inertia and his rotational speed increases as a result.



Torque Practice Problems

Torque = force * lever arm $\tau = Fd$ ✓ distance & radius can be used

1. F = 10 N, d= .4m τ= 4 N·m
   $\tau = F \cdot d = 10N \cdot 0.4m = 4\ N\cdot m$

2. F= 3N, d= 4 m, τ=12Nm
   $\tau = F \cdot d \therefore d = \frac{\tau}{F} = \frac{12\ N\cdot m}{3N} = \boxed{4m}$

3. F= 0.48N, d= 10m, τ= 4.8Nm
   $\tau = F \cdot d \therefore F = \frac{\tau}{d} = \frac{4.8\ N\cdot m}{10m} = \boxed{0.48\ N}$

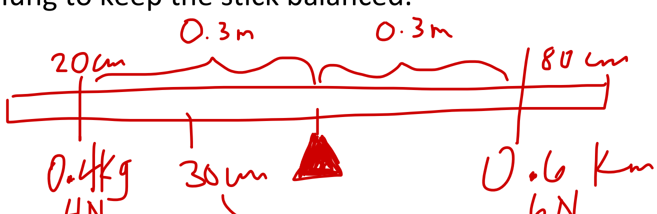
4. A water faucet is turned on when a force of 2N is exerted on the handle at a distance of .06m from the pivot point. What is the torque?
   $\tau = F \cdot d = 2N \cdot 0.06m = \boxed{0.12\ N\cdot m}$

5. Ned tightens a bolt be exerting 6 N of force on his wrench at a distance of .4 m from the fulcrum - - how much torque did he apply?
   $\tau = F \cdot d = 6N \cdot 0.4m = \boxed{2.4\ N\cdot m}$

Torques are often balanced (It may help to draw a picture)
Force X distance (on one side) = Force X distance (on the other). Distances are always to the pivot point.

6. If 200N Amy and 300N Sue both sit on opposite ends of a see-saw. Amy sits 2.5 meters from the center – where should Sue sit so they will be balanced? ($Fd_{amy} = Fd_{Sue}$)
   $\frac{200N \cdot 2.5m}{300N} = \frac{300N \cdot d}{300N}$ $\boxed{d = 1.67\ m}$

7. A meter stick is supported by a knife edge at the 50 cm mark and has masses of .4 kg and .6 kg hanging from the 20 cm and 80 cm marks, respectively. Where should a third mass of 0.3 kg be hung to keep the stick balanced.



4N · 0.3m = 1.2 N·m   6N · 0.3m = 1.8 N·m

0.4×10 = 4N
0.6×10 = 6N
0.3×10 = 3N

I need 0.6 N·m counterclockwise

$\frac{0.6}{3} = \frac{3N \cdot d}{3}$ = 0.2m away from the 50cm mark.