Seesaws 1

Seesaws

Seesaws 2

Question:

- You and a child half your height lean out over the edge of a pool at the same angle. If you both let go simultaneously, who will tip over faster and hit the water first?

Seesaws 3

Observations About Seesaws

- A balanced seesaw can
  - remain horizontal
  - rock back and forth easily
- Equal-weight children balance a seesaw
- Unequal-weight children don't balance
- But moving the heavy child inward helps

Seesaws 4

Physics Concept

- Rotational Inertia
  - A body at rest tends to remain at rest.
  - A body that's rotating tends to keep rotating.

Seesaws 5

Physical Quantities

- Angular Position – an object's orientation
- Angular Velocity – change in angular position with time
- Torque – a twist or spin

Seesaws 6

Newton's First Law of Rotational Motion

- A rigid object that's not wobbling and that is free of outside torques rotates at a constant angular velocity.

Seesaws 7

Center of Mass

- Point about which object's mass balances
- A free object rotates about its center of mass while its center of mass follows the path of a falling object

Seesaws 8

Physical Quantities

- Angular Position – an object's orientation
- Angular Velocity – change in angular position with time
- Torque – a twist or spin
- Angular Acceleration – change in ang. velocity with time
- Angular Mass – measure of object's rotational inertia

Angular Mass is commonly called "Moment of Inertia"

Seesaws 9

Newton's Second Law of Rotational Motion

- The torque exerted on an object is equal to the product of that object's angular mass times its angular acceleration. The angular acceleration is in the same direction as the torque.

Torque = Moment of Inertia · Angular Acceleration

Seesaws 10

Physics Concept

- A force can produce a torque
- A torque can produce a force

Torque = Lever Arm · Force

(where the lever arm is perpendicular to the force)

Seesaws 11

Physics Concept

- Net Torque
  - The sum of all torques on an object.
  - Determines that object's angular acceleration.

Seesaws 12

Question:

- You and a child half your height lean out over the edge of a pool at the same angle. If you both let go simultaneously, who will tip over faster and hit the water first?

Summary about Seesaws

- A balanced seesaw
  - experiences zero net torque
  - moves at constant angular velocity
  - requires all the individual torques to cancel
- Force and lever arm contribute to torque
- Heavier children produce more torque
- Sitting close to the pivot reduces torque