Skating 1

Skating

Skating 2

Question:

A rotary lawn mower spins its sharp blade rapidly over the lawn and cuts the tops off the grasses. Would the blade still cut the grasses if they weren't attached to the ground?

Skating 3

Observations about Skating

- When you're at rest on a level surface:
  - Without a push, you remain stationary
  - With a push, you start moving that direction
- When you're moving on a level surface:
  - Without a push, you coast steady & straight
  - With a push, you change direction or speed

Skating 4

Physics Concept

- Inertia
  - A body at rest tends to remain at rest
  - A body in motion tends to remain in motion

Skating 5

Simplifying a Situation

- Real-world complications are a nuisance
- Complications can mask simple physics
- Solution: overwhelm the complications!
- To demonstrate inertia:
  - work on level ground (goodbye gravity)
  - work fast (goodbye friction and air resistance)

Skating 6

Newton's First Law, Version 1

An object that is free of external influences moves in a straight line and covers equal distances in equal times.

Skating 7

Physical Quantities

- Position – an object's location
- Velocity – its change in position with time

Skating 8

Newton's First Law, Version 2

An object that is free of external influences moves at a constant velocity.

Skating 9

Physical Quantities

- Position – an object's location
- Velocity – its change in position with time
- Force – a push or a pull

Skating 10

Newton's First Law

An object that is not subject to any outside forces moves at a constant velocity.

Skating 11

Question:

A rotary lawn mower spins its sharp blade rapidly over the lawn and cuts the tops off the grasses. Would the blade still cut the grasses if they weren't attached to the ground?

Skating 12

Physical Quantities

- Position – an object's location
- Velocity – change in position with time
- Force – a push or a pull
- Acceleration – change in velocity with time
- Mass – measure of object's inertia

Skating 13

Newton's Second Law

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

$$\text{force} = \text{mass} \cdot \text{acceleration}$$

Skating 14

Summary about Skating

- Skates can free you from external forces
  - You normally coast – constant velocity
  - If at rest, you remain at rest
  - If moving, you move steadily and straight
- When you experience external forces
  - You accelerate – you change velocity
  - Acceleration depends on force and mass