Virtual Learning

Physics

Work Energy Theorem

May 18, 2020

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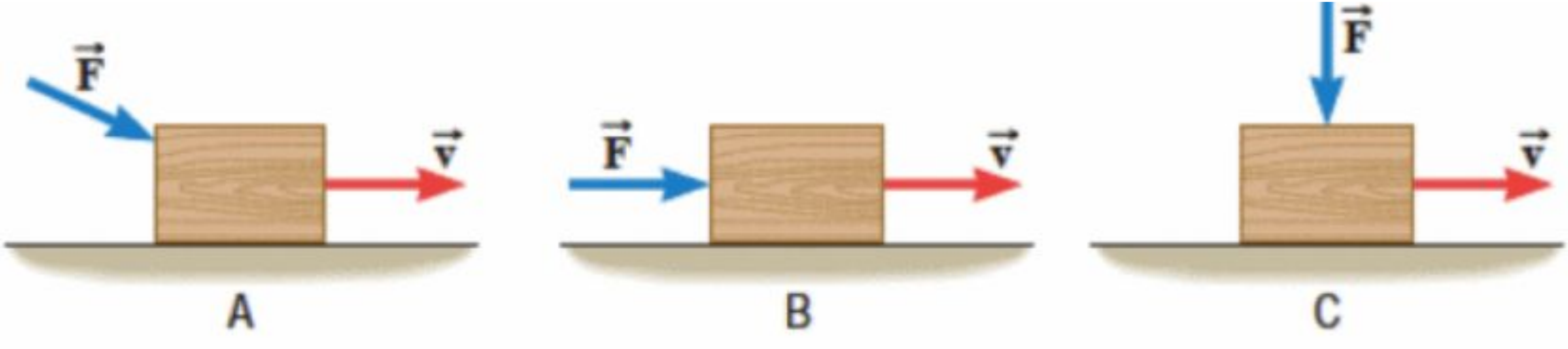
Objective/Learning Target:

Students will examine the work energy theorem and use it to solve various problems.

Quick Review #1

The same force F pushes in three different ways on a box moving with a velocity v, as the drawings show. Rank the work done by the force F in ascending order (smallest first):



Quick Review #1 Answer

Justification: Work is maximized when the force is applied in the same direction as the movement. The greater the component of the force with the direction of motion, the greater the work. In C there is no work being done since the direction of the force is perpendicular to the direction of movement, and there is no component of force in the direction of movement. In A there is a component of force with the direction of motion. In B, the full force is in the same direction as the motion, and will therefore be doing the largest amount of work Therefore, the correct answer is (C, A, B).

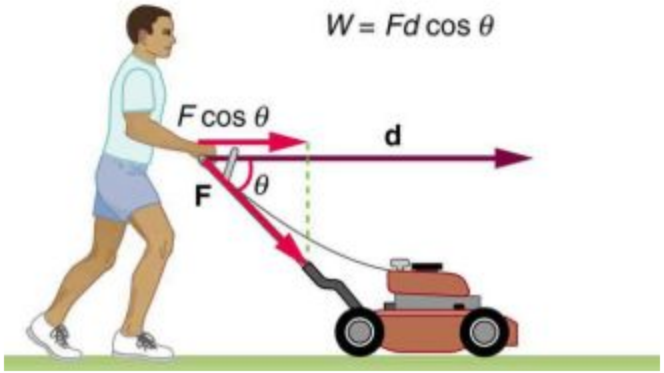
Quick Review #2

Steve pushes the wall with a force of 250N for 5 minutes. How much work does Steve do on wall?

Quick Review #2 Answer

He may expend energy when he pushes on the wall, but, if the wall doesn't move, no work is done on the wall.

Work



Link: Work Energy Theorem

Directions:

- Read through Work Energy Theorem.
- Work through any examples on a separate piece of paper before you scroll down to the solution.
- On a separate piece of paper complete the practice problems on the following slides.
- Check your answers.
- For additional practice check out the conceptual questions and the problems and exercises in the table of contents for the online text linked above.

Practice Problem #1

What change in kinetic energy does an airplane experience on takeoff if it is moved a distance of 500 m by a sustained net force of 5000 N?

Practice Problem # 1 Answer

Work = ΔKE

Fd = ΔKE

5000 N x 500 m = 2500000 J

= 2.5MJ

Practice Problem #2

A 14700 N Car is traveling at 30 m/s. The brakes are suddenly applied and the car slides to a stop. The average braking force between the tires and the road is 7100 N. How far will the car slide once the brakes are applied?

Practice Problem #2 Answer

Work = ΔKE , Mass = F/g = 14700N/9.8m/s² =1500kg

$$Fd = \frac{1}{2} mv^2$$

$$d = \frac{\frac{1}{2} mv^2}{F}$$

$$= \frac{\frac{1}{2}(1500\ kg \times (30\ m/s)^2)}{7100\ N}$$

$$= 95\ meters$$

Practice Problem #3

The same 14700 N car is now traveling at 10 m/s. The friction remains at 7100N. Now how far will the car slide once the brakes are applied?

Practice Problem #3 Answer

$Work = \Delta KE$

$Fd = \frac{1}{2} mv^2$

$$d = \frac{\frac{1}{2} mv^2}{F}$$

$$= \frac{\frac{1}{2}(1500\ kg \times (10\ m/s)^2)}{7100\ N}$$

$= 10.6$ meters or 1/9 as far.

Additional Practice

For additional practice check out the conceptual questions and the problems and exercises in the table of contents from the online text linked above.