

Work & Kinetic Energy

1. A 100 Newton wind is blowing a 75 kg ice-boarder across a frozen frictionless pond for a distance of 50 meters.
 - a. How much work did the wind do on the ice-boarder?

 - b. Assuming that the initial velocity of the ice-boarder was 0 m/s, how fast were they going at the end of the 50 meters?

2. Betty pushes her physics book ($m=2$ kg) with a speed of 4 m/s. She lets go, and the book slides to stop in 0.75 meters.
 - a. What was the initial kinetic energy of the book?

 - b. What was the final kinetic energy of the book?

 - c. How much work did friction do?

 - d. What was the force of friction on the book?

3. A 60 kg skier has a kinetic energy of 6750 J at the bottom of a hill, and skids to a stop in a distance of 35 meters.
 - a. What was the velocity of the skier just before the skid?

 - b. What was the average force of friction on the skier while skidding?

4. You are pulling your 25 kg cousin in a toy wagon with a force of 150 N and at a constant velocity. You pull for a distance of 250 meters.
 - a. How much work did you do on your cousin?

 - b. How much work did friction do on your cousin?

 - c. Why did your cousin gain no kinetic energy?

5. A car has a mass of 1500 kg and a velocity of 20 m/s.
 - a. What is the kinetic energy of the car?

 - b. If the car gains an additional 400,000 J of kinetic energy, how fast will it travel?

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6. A 1750 kg car is driving down the road with a speed of 15 m/s. The car speeds up by applying a force of 3500 N over a distance of 75 meters.
- What is the initial kinetic energy of the car?
 - How much work did the force do on the car?
 - What is the final kinetic energy of the car?
 - What is the final velocity of the car?
7. Al is pulling Charlene ($m=70$ kg) with a force of 25 N for a distance of 20 meters. At the end of the 20 meters, Charlene has a speed of 3 m/s. Assuming that Charlene's initial velocity was 0,
- How much work did Al do on Charlene?
 - What is Charlene's final kinetic energy?
 - Why are your answers to a and b different?
 - How much work did friction do?
 - What was the average force of friction?

Answers:

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|-----------------|--------------|--------------|--------------------------|
| 1. a) 5000 J | b) 11.5 m/s | | |
| 2. a) 16 J | b) 0 J | c) -16 J | d) -21.3 N |
| 3. a) 15 m/s | b) -193 N | | |
| 4. a) 37,500 J | b) -37,500 J | | |
| 5. a) 300,000 J | b) 30.6 m/s | | |
| 6. a) 197,000 J | b) 263,000 J | c) 460,000 J | d) 22.9 m/s |
| 7. a) 500 J | b) 315 J | c) friction | d) -185 J e) -9.3 N |