

Energy, work and Power Mastery Assignment

Due Date _____

This must be turned in on time to earn the right to take the mastery test.

Name _____

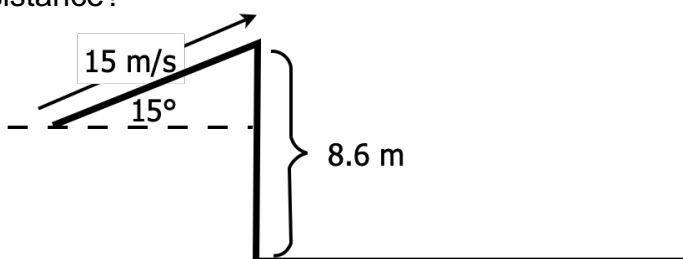
Do all your work on a separate sheet of paper.

Clearly and neatly show all your work.

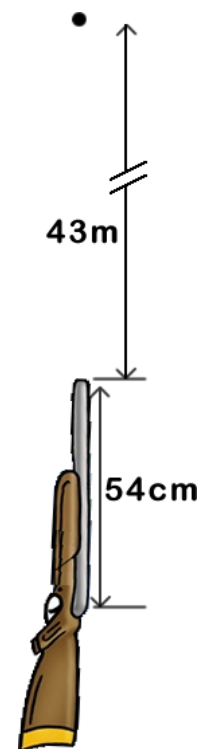
Staple this page to the top of answers.

Use energy relationships to solve each problem. Only use kinematics to find time or average velocity when looking for power.

1. A bicycle coasts down a 100m long hill. The hill is straight and makes a 30° angle with the ground. If the bicycle is traveling at 15 m/s before it begins to coast. What is the speed at the bottom of the hill, neglecting friction and air resistance?
2. A Dare Devil Dan is trying a risky stunt when he rides a skateboard upwards off a ledge at a 15° angle with the ground at 15 m/s. He then proceeds to drop to another ramp 8.60 m below the point where he was traveling 15 m/s. What is his speed at the landing, neglecting air resistance?



3. Dare Devil Dan, 82 kg, has done it again. He plans on dropping from a hovering helicopter. When he drops, he will feel an average resistive force due to air resistance/friction of 81 N for the first 1000 m. He then opens his special parachute. At this point, his parachute applies a resistive force such that when he lands in an additional 100 m, he will be at rest. What is the magnitude of the parachute's resistive force?
4. A 62 kg skateboarder is coasting along a level road at 15m/s. She then coasts up a curved hill to a new vertical height of 8.0 m. She then applies a frictional force to stop herself by dragging her foot along the ground to create a frictional force of 1500 N. How much distance did it take to come to a rest?
5. A Red Rider BB gun shoots a 0.12 g projectile, called a "BB," to a speed of 35 m/s when the BB is 43 m above end of the rifle's barrel.
 - a. How much force launched the BB if it was exerted across the 54 cm long rifle barrel?
 - b. How much power was used to launch the BB if it started from rest at the bottom of the rifle barrel?



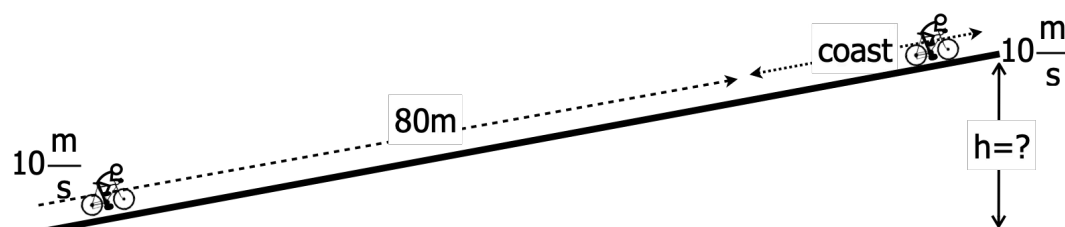
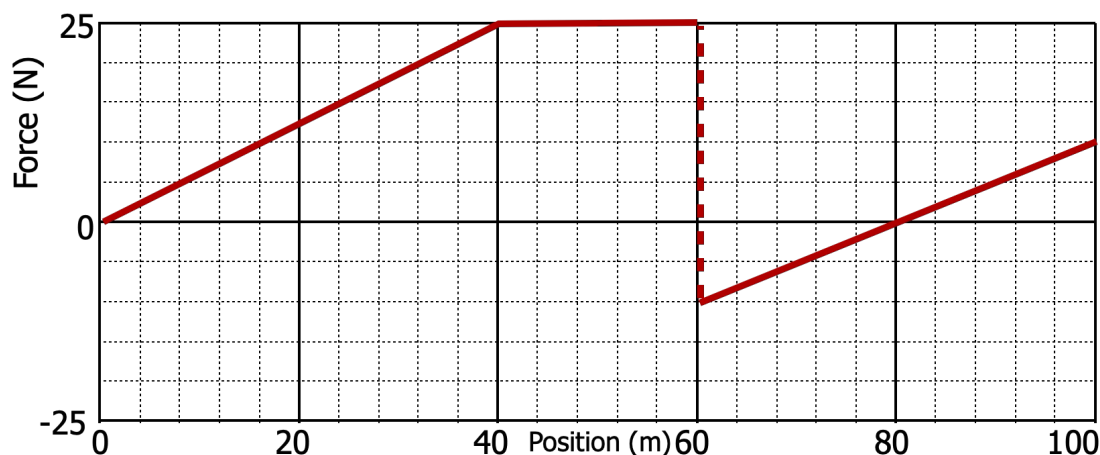
6. An 800 kg elevator moves at a constant upwards speed of 2 m/s across 10 m. How much power did this require?
7. A Porsche Carrera GT, 1361 kg, can come to a rest from 27 m/s in 32 m. If the car starts from rest, it can travel to 48 m/s in 13.1 seconds. How much power is exerted in starting and stopping the car.



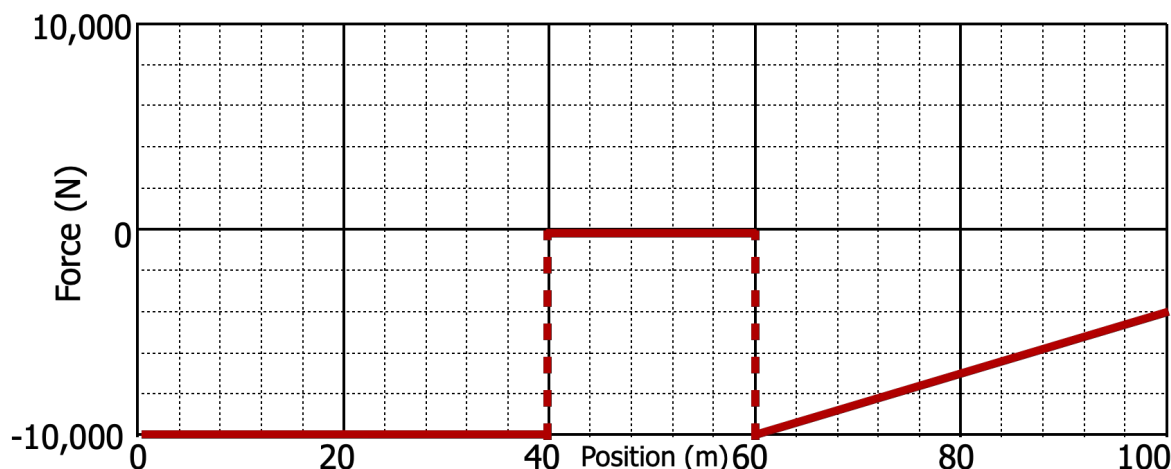
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8. A 100 kg bicyclist is traveling at 10 m/s at the bottom of a hill. Then he applies the forces shown on the graph above along 80 meters of the incline. After traveling 80 m along the incline, he coasts. At the very top of the incline, he is traveling 10 m/s. How high is the top of the incline?



9. An 1100 kg car is traveling 25 m/s when the force above is applied for 50 meters along a hill. After 50 meters along the hill the car is 11 m lower than when it started. How much power did the car's brakes exert?
10. The Daisy brand "Red Rider" BB gun, (made famous in the movie "Christmas Story,") shoots a 0.00012 kg BB at 97.5 m/s, 320 ft/s. If this gun uses a spring that is compressed to a maximum of 15 cm to fire the BB, then what is the spring's force constant?