Name: _____ Phys 12

**Worksheet 4.2 Conservation of Energy, Power, and Efficiency**

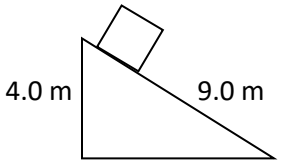
1. Physics student is dropped (don't ask why or you're next). If they reach the floor at a speed of 3.2 m/s, from what height did they fall?

2. A heavy object is dropped from a vertical height of 8.0 m. What is its speed when it hits the ground?

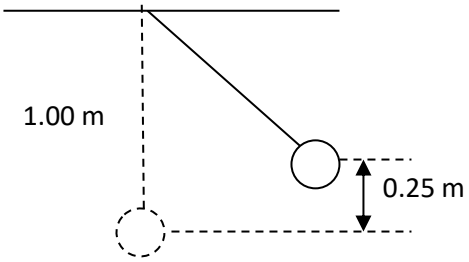
3. A bowling ball is dropped from the top of a building. If it hits the ground with a speed of 37.0 m/s, how tall was the building?

4. A safe is hurled down from the top of a $1.3 \times 10^2$ m building at a speed of 11.0 m/s. What is its velocity as it hits the ground?

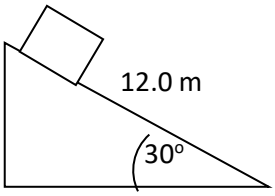
5. A box slides down a frictionless ramp. If it starts at rest, what is its speed at the bottom?




6. A pendulum is dropped from the position shown, 0.25 m above its equilibrium position. What is the speed of the pendulum bob as it passes through its equilibrium position?

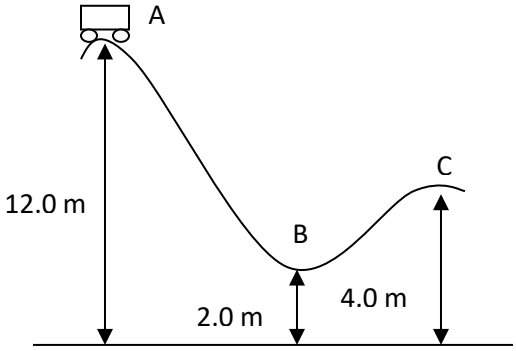



7. A box slides down a frictionless incline as shown. If the box starts from rest, what is its speed at the bottom?

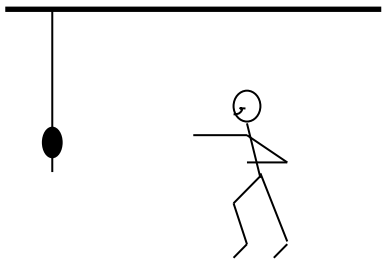



8. A roller coaster car starts from rest at point A. What is its speed at point C if the track is frictionless?

9. A 2.5 kg object is dropped from a height of 10.0 m above the ground. Calculate the speed of the object as it hits the ground.




10. An 80.0 kg student running at 3.5 m/s grabs a rope that is hanging vertically. How high will the student swing?



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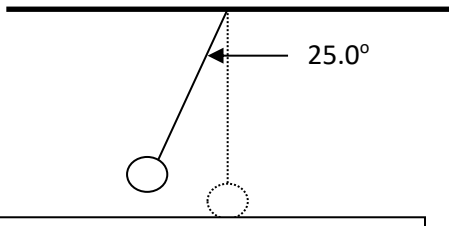
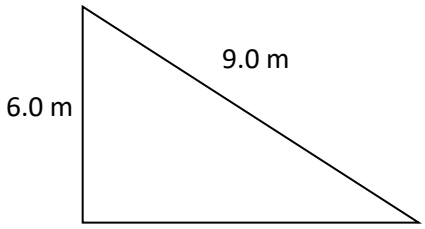
11. A pendulum is 1.20 m long. If the pendulum is pulled until it makes a 25.0° angle to the vertical, what is the speed of the pendulum bob when it passes through its equilibrium position?
HINT: Determine the vertical drop of the pendulum bob first.




1) 0.52 m 2) 13 m/s 3) 69.8 m 4) 52 m/s 5) 8.9 m/s 6) 2.2 m/s 7) 10.8 m/s 8) 13 m/s 9) 14 m/s 10) 0.63 m 11) 1.5 m/s

12) A 45.0 kg student runs at a constant velocity up the incline shown. If the power output of the student is $1.50 \times 10^3$ W, how long does it take the student to run the 9.0 m along the incline? (1.8 s)




13) A 20.0 kg object is lifted vertically at a constant velocity 2.50 m in 2.00 s. Calculate the power output of the student. (245 W)

14) A 2.00 kg object is accelerated uniformly from rest to 3.00 m/s while moving 1.5 m across a level frictionless surface. Calculate the power output. (9.0 W)

15) An 8.5 x 102 kg elevator is pulled up at a constant velocity of 1.00 m/s by a 10.0 kW motor. Calculate the efficiency of the motor. (83%)

16) A 5.0 kg object is accelerated uniformly from rest to 6.0 m/s while moving 2.0 m across a level surface. If the force of friction is 4.0 N, calculate the power output. ($1.5 \times 10^2$ W)

17) A $5.00 \times 10^2$ W electric motor lifts a 20.0 kg object 5.00 m in 3.50 s. What is the efficiency of the motor? (56%)

18) If a $1.00 \times 10^2$ kW motor has an efficiency of 82%, how long will it take to lift a 50.0 kg object to a height of 8.00 m? (0.048 s)