1. A car exerts a force of 10,000 N while driving on a horizontal stretch of road. How much work is done when the car travels 50 m? A: $5 \cdot 10^5$ J.

2. A 12 kg sled & rider is pulled by a 50 N for 200 m. The force acts at a 60° angle with the ground. How much work is done by the applied force? A: 5000 J.

3. A 150 kg object is stopped by a force applied at a 30° angle with the ground. The object is stopped in 20 m with 500 J of work. What is the magnitude of the force? A: 29 N.

4. An 82 kg trucker loads a crate as shown below. He pushes the 50 kg box such that his arms are parallel to the ground. He pushes with a 200 N force. How much work is done by the trucker on the box? A: 800 J.

5. A car 1600 kg is traveling down the road at 20 m/s. If the car accelerates up to 30 m/s over a distance of 200 m then a) How much work is done by the car? b) How much power is exerted by the car, in watts and horsepower? A: a) $8 \cdot 10^5$ J. b) $2 \cdot 10^5$ w, 268 hp.

6. After accelerating, the car mentioned in the previous problem now locks the brakes and skids to a stop in 300 m. a) How much work is done by the brakes? b) How much power is exerted by the car’s brakes? A: a) $-1.44 \cdot 10^6$ J. b) $1.44 \cdot 10^5$ w

7. What average power must a crane deliver in order to raise a 150 kg girder through 70 m in 20 s at a constant speed? A.: $5145$ w.
8. A 50 kg box is dragged 30 m on a horizontal floor, applying a $F = 100 \, N$ exerted by a person. Such force acts doing a $60^\circ$ angle. The coefficient of kinetic friction is 0.2. Calculate: a) The work done for each one of these forces $F$, the friction, the weight and the normal. b) The net work done on the box. A: a) ...... b) 1760 J.

9. What is the kinetic energy of a 25 g dart that is thrown at 20 m/s? A: 5 J.

10. A 800 kg elevator rises straight up 60 meters. What is the change in potential energy of the elevator relative to the ground? A: $4.7 \cdot 10^5 \, J$.

11. A projectile is shot upward from the earth with a speed of 30 m/s. How high is it when its speed is 15 m/s? Ignore air friction. A: 34.4 m.

12. A 2 m pendulum makes an angle of 30 degree with the vertical. Calculate its speed at the bottom of its swing. A: 2.3 m/s.

13. A 1400 kg does 200,000 J of work when it accelerates across 180 m. The car starts from 25 m/s before traveling the 180 m. What is the final velocity of the car? A: 30.2 m/s.

14. A particle of mass $m = 5 \, kg$ is released from point A and slides on the frictionless track shown in figure. Determine: a) The particle’s speed at points B, C and D. b) The net work done by the gravitational force in moving the particle from A to C. c) How high is the particle when its speed is 4 m/s? A: a) 3.42 m/s, 7 m/s, 8.96 m/s. b) 122.5 J. c) 2.8 m/s.

15. An 900 kg dragster finishes the race with some unknown velocity. A parachute is deployed after crossing the finish line and exerts a stopping force of 20,000 N across a distance of 250 m before the dragster slows down to 25 m/s. What was the speed of the dragster when it passes the finish line. A: 111 m/s
16. A bullet, 20 g, is shot through a piece of wood. The bullet enters the wood at 600 m/s. The wood is 7 cm thick. The wood exerts 15,000 N of force to slow the bullet down. How fast is the bullet traveling when it leaves the piece of wood on the opposite side? A: 505 m/s.

17. A musket ball, 0.22 kg, is shot with a speed of 300 m/s into a metal can holding some clay. The musket ball penetrates 15 cm into the clay before coming to a stop. a) What is the kinetic energy of the musket ball before it hits the clay if its mass is 0.22 kg? b) How much work does the clay do in stopping the musket ball? c) What average force does the clay exert in stopping the musket ball? d) Calculate the speed of the musket ball when it has penetrated the clay only 5 cm. A: a) 9900 J. b) ........ c) 66000 N. d) 261 m/s

18. A 20 kg box is given an initial speed of 10 m/s along a horizontal surface with a coefficient of kinetic friction of 0.2. How far will the box slide before coming to rest? Do not use the kinematic equations of motion. A: 25.5 m

19. A 1000 kg car coasts from rest down a driveway that is inclined 25º to the horizontal and is 16 m long. How fast is the car going at the end of the driveway if a friction of 3000 N opposes the motion? A: 3.35 m/s.

20. Starting from rest, a 4.00 kg block slides 3.50 m down a rough 30.0º incline. The coefficient of kinetic friction between the block and the incline is \( \mu = 0.400 \). Determine the work done by: a) The force of gravity. b) The friction force between block and incline. c) The normal force. d) Determine the speed of the block after sliding 3.50 m. A: a) \( W_g = 68.6 \) J. b) \( W_f = -47.4 \) J. c) ........ d) 3.2 m/s.

21. A 2 kg block is shot up the incline in figure with an initial speed of 4 m/s. How far up the incline will it go if the coefficient of friction between it and the incline is 0.1? A: 1.6 m.

22. A teacher wants to determine the coefficient of friction between a block and a particular surface. She places a block of mass 3 kg on an inclined plane. The plane makes an angle of 30º with respect to the horizontal. The block starts from rest a distance of 12 m up the incline. He lets the block go, and it slides down the plane and along a table top. The block comes to rest 8 m from the start of the incline. The coefficient of kinetic friction is the same on the incline and the tabletop. What is the coefficient of friction? A: \( \mu = 0.33 \).
23. Consider the track shown. The section AB is one quadrant of a circle of radius 2.0 m and is frictionless. B to C is a horizontal span 3.0 m long with a coefficient of kinetic friction $\mu_k = 0.25$. The section CD under the spring is frictionless. A block of mass 1.0 kg is released from rest at A. After sliding on the track, it compresses the spring by 0.20 m. Determine: a) The velocity of the block at point B. b) The velocity of the block at C. c) The stiffness constant $k$ for the spring. Answer: a) 6.3 m/s. b) 4.9 m/s. c) 610 N/m.

24. Wyle E. Coyote is trying to catch that road runner- when will he learn? As part of this new ACME trap he throws a ball down on a spring as shown below. What is the velocity of the ball the instant it makes contact with the spring? What is the spring’s constant? Answer: a) 5.4 m/s. b) 15680 N/m.

25. Based on the information diagramed below. Answer the following questions:

a) What is the speed of the wagon when the spring is compressed 5 meters? b) At which compression distance of the spring is the speed of the wagon half of what was at the instant it hit the spring? A: a) 6.7 m/s. b) 5.2 m.