

Chapter 3: Nature of Dynamic Forces

1. State the Law of Inertia.
2. The mass of a metal ball measured is 5 kg. What is its mass in Mars?
3. A force of 20N is used to push a 70 kg crate (box) a distance of 3 m across a level warehouse floor. How much work is done?
4. A force of 285N is used to push a 90 kg crate a distance of 4 m across a level warehouse floor.
 - a. How much work is done?
 - b. What is the change in crate's potential energy?
5. How much work is done in raising a 2-kg box from the ground to a height of 2 m?
6. How much (a) work is done in raising a 9 kg wooden plank from the ground to a height of 1.78 m and (b) how potential energy does the plank have in its new position?
7. In a warehouse a worker uses a horizontal force of 100N to push a crate up a ramp 100 m long that is 20° above the horizontal as shown in Figure 3.7. Calculate the work done.

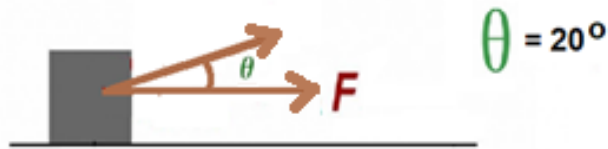


Figure 3.7

8. A man uses a horizontal force of 275N to push a crate up a ramp 7 m long that is 25° above the horizontal. Refer to Figure 3.8.
 - a. How much work does the man perform?
 - b. If the man takes 15 s to push the crate up the ramp, what is his power output in watts?



Figure 3.8

9. A cargo weighing 2Kg broke free from the top of the cargo ramp as shown in Figure 3.9. Ignoring friction, determine the velocity of the cargo the instant it reaches the bottom of the ramp.

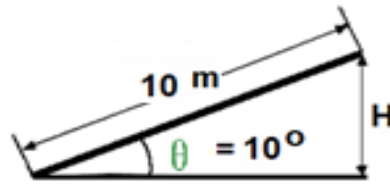


Figure 3.9

10. State the conservation of energy principle.
11. Name the energy converted when a ball drops from a still position 2m above the ground.
12. A 40 kg wooden crate is being pushed across a wooden floor with a force of 200N. If frictional coefficient $\mu_k = 0.3$, find the acceleration of the crate.
13. An 85 kg wooden crate is being accelerated at 0.118 m/s^2 across a wooden floor by a force of M. If frictional coefficient $\mu_k = 0.3$, find M in Newton.
14. A wooden board is being nailed by a 2 kg hammer head. The hammer's speed is 10 m/s when it strikes the nail. The nail moved 2 cm into the board, find the average force the hammer is exerting on the nail.
15. A 2.5 kg snowball moving at a speed of 30 m/s strikes and sticks to a 75 kg man standing on the frictionless surface of a frozen pond. What is the man's final velocity after the snowball hits him?
16. A 2000 kg solar car strikes a fence at a speed of 20 m/s and comes to a stop in 4 s. What is the average force acted on the car?
17. A certain solar car has a mass of 495 kg and travelling at velocity of 65 km/hr. Its engines develop a total thrust of 650N. If air resistance is ignored, how long does this solar car takes to reach its velocity starting from rest?
18. A 0.65 kg ball moving in the + x-direction at 11m/s is hit by a bat. Its final velocity is 21 m/s in the -x-direction. The bat acts on the ball for 0.22 s. Find the average force F exerted on the ball by the bat.
19. Name 4 principal type of gears and one of their applications