

Dynamics Problems Review

1. A net force of 41.6 N accelerates an object at 4.2 m/s^2 . What is the mass of the object? (9.9 kg)
2. A toy car, starting from rest, moves 5.2 m in 3.2 s . If a 0.4 N force acts on it,
 - a) what was its acceleration? (1.0 m/s^2)
 - b) what was its mass? (0.4 kg)
3. A dry ice puck, mass 1.5 kg , is accelerated 1.8 cm/s^2 by a force. A rock is placed on top of the puck and the combined mass is accelerated by the same force resulting in an acceleration of 0.8 cm/s^2 . Determine the rock's mass. (1.9 kg)
4. The force of friction on an object is 4.8 N . If the object has a mass of 12.7 kg and is accelerated 1.2 m/s^2 . What is the pulling force? (20 N)
5. A sled, mass 7.8 kg , is pulled over snow with a force of 5.2 N . If the acceleration of the sled is 0.61 m/s^2 , determine the frictional force. (-0.44 N)
6. A car located on a level highway has a mass of 400 kg . The frictional force on the car is 750 N . What acceleration will a force of $2.25 \times 10^3\text{ N}$ produce on the car? (3.75 m/s^2)
7. A 20 kg sled is pulled along level ground. The sled's rope makes an angle of 60° with the snow-covered ground. If the pull on the rope is 180 N and the friction is 15 N , what is the acceleration of the sled? (3.75 m/s^2)
8. A red wagon, mass 5.6 kg is pulled on level ground by a force of 23 N , 30° with the ground. If the frictional force is 7.5 N , determine the acceleration of the wagon. (2.2 m/s^2)
9. A constant force of 20 N is applied at an angle of 40° to a 4 kg block which rests on a horizontal surface gives the block a velocity of 8 m/s in 2.5 s . Determine the force of friction between the block and the surface. Assume the block was initially at rest. (-2.5 N)
10. A constant force of 16 N is applied at an angle of 33° to a 2.5 kg block which rests on a horizontal surface giving the block a velocity of 6 m/s in 1.5 s . Determine the force of friction between the block and the surface. Assume the block was initially at rest. (-3.4 N)
11. A dog sled with a mass of 80 kg is pulled by two dogs. The first dog pulls on the sled with a force of 37.5 N [NE] while the second pulls with a force of 45 N [21° S of E]. If the frictional force on the sled is 7.5 N , determine the acceleration of the sled. (0.77 m/s^2 [8.6° N of E])

12. A 1000 kg barge is pulled upstream by ropes attached to two horses walking along the opposite sides of a canal. If each horse pulls with a force of 350 N at an angle of 45° with a line parallel to the shore and the resistance of the barge through the water is 50 N , determine the acceleration of the boat. (0.44 m/s^2 [Upstream])
13. A 12.5 kg mass is pulled on by two forces, \vec{F}_1 and \vec{F}_2 . Determine the acceleration of the mass if the force of friction is 5.0 N . $\vec{F}_1 = 10.0\text{ N}$ [30.3° N of W]; $\vec{F}_2 = 15.0\text{ N}$ [19.7° S of W] (1.42 m/s^2 [W])
14. An object is pulled by two forces, the first 40 N [NE] and the second 30 N [37° S of E] If the acceleration of the object is 1.5 m/s^2 , what is the mass of the object? (35.5 kg)
15. An object is pulled by two forces, both of magnitude 70 N . The first acts at 25° W of N and the second at 25° E of N. If the acceleration of the object is 2.2 m/s^2 and the frictional force acting is 26.9 N , what is the mass of the object? (45.4 kg)
16. An object is being lowered by two ropes. The tension in each is 54 N and each rope makes an angle of 30° with the horizontal. If the object has a mass of 10.0 kg , what is its acceleration? (-4.4 m/s^2)
17. An object is being raised by two ropes. The tension in each is 88 N and each rope makes an angle of 21° with the vertical. If the object has a mass of 13.5 kg , what is its acceleration? (2.4 m/s^2)
18. A fish hangs from a spring scale supported from the roof of an elevator.
- If the elevator has an upward acceleration of 1.2 m/s^2 and the scale reads 200 N , what is the true force of gravity on the fish? (178 N)
 - Under what circumstances will the scale read 150 N ? ($\vec{a} = -1.55\text{ m/s}^2$)
 - What will the scale read if the elevator cable breaks? (0)

