

P.S. Physics (Chapter 3) Force Practice Problems

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Directions: Solve the following force problems. Show all work and label to receive full credit.

1. A baseball with a mass of 0.8 kg is given an acceleration of 20 m/s/s. How much force was applied to the ball?

$$F = (0.8 \text{ kg})(20 \text{ m/s}^2) \quad F = 16 \text{ N}$$

2. A golf ball hit with a force of 15 N travels with an acceleration of 25 m/s/s. What is the mass of the golf ball?

$$m = \frac{15 \text{ N}}{25 \text{ m/s}^2} \quad m = 0.6 \text{ kg}$$

3. A force of 1500 N is applied to a 1000 kg car. What is the acceleration of the car?

$$a = \frac{1500 \text{ N}}{1000 \text{ kg}} \quad a = 1.5 \text{ m/s}^2$$

4. How much force is required to give a 20 kg bicycle an acceleration of 12 m/s/s?

$$F = (20 \text{ kg})(12 \text{ m/s}^2) \quad F = 240 \text{ N}$$

5. A tennis player hits a ball with a force of 4 N. If the mass of the ball is 0.25 kg, what will be the acceleration of the ball?

$$a = \frac{4 \text{ N}}{0.25} \quad a = 16 \text{ m/s}^2$$

6. How much force is required to stop a 1200 kg car in 2 seconds if the car is traveling at a speed of 33 m/s? (First calculate acceleration.)

$$a = \frac{22 \text{ m/s}}{2 \text{ sec}} = 11 \text{ m/s}^2 \quad F = (1200 \text{ kg})(11 \text{ m/s}^2) = 13,200 \text{ N}$$

7. During a 10 second interval, a bus increases its speed from 30 m/s to 36 m/s. If the force applied to the bus is 12 500 N, what is the mass of the bus? (First calculate acceleration.)

$$a = \frac{36 - 30}{10} = 0.6 \text{ m/s}^2 \quad m = \frac{12500}{0.6} \quad m = 20833 \text{ kg}$$

8. A force applied to a 0.25 kg hockey puck gives the puck an acceleration of 16 m/s/s. What acceleration would the same force give to a 0.5 kg baseball? (First calculate force on the hockey puck.)

$$F = (0.25)(16) \quad \text{hockey puck} = 4 \text{ N} \quad a = \frac{4 \text{ N}}{0.5} \quad a = 8 \text{ m/s}^2$$

9. How much force must be produced by the engine of a 900 kg racing car to move the car from rest to a speed of 40 m/s in 4 seconds? (First calculate acceleration.)

$$a = \frac{40}{4} \quad a = 10 \text{ m/s}^2 \quad F = (900 \text{ kg})(10 \text{ m/s}^2) \quad F = 9000 \text{ N}$$

10. A 12 kg rock dropped from a tenth story window falls to the earth with an acceleration of 9.8 m/s/s. How large is the force of gravity pulling on the rock?

$$F = (12 \text{ kg})(9.8 \text{ m/s}^2) \quad F = 117.6 \text{ N}$$



12. Suppose two 4-newton forces act on an object in the same direction. What is the net force on the object?

$$\begin{array}{l} 4N \rightarrow \\ 4N \rightarrow \end{array} \quad 8N$$

13. Five different forces act on an object. Is it possible for the net force on the object to be zero? Explain.

yes - combinations need to balance (cancel)

$$\begin{array}{l} (9N) \quad 2N \rightarrow \\ 3N \rightarrow \\ 4N \rightarrow \end{array} \quad \begin{array}{c} \rightarrow \\ \leftarrow \\ \leftarrow \end{array} \quad \begin{array}{l} 4N \\ 5N \end{array} \quad (9N)$$

14. An automobile with a mass of 1000 kilograms accelerates when the traffic light turns green. If the net force on the car is 4000 N, what is the car's acceleration?

$$a = \frac{4000N}{1000kg} \quad a = 4m/s^2$$

15. Calculate the acceleration of a 2000-kg single engine airplane just before takeoff when the thrust of its engine is 500 N.

$$a = \frac{500N}{2000kg} \quad a = 0.25m/s^2$$

16. Calculate the acceleration of a 300,000 kg jumbo jet just before takeoff when the thrust for each of its four engines is 30,000 N.

$$a = \frac{120000}{300,000} \quad a = 0.4m/s^2 \quad 30,000 \times 4$$

17. Calculate the horizontal force that must be applied to a 1-kg puck to make it accelerate on a horizontal friction-free air table with the same acceleration it would have if it were dropped and fell freely.

$$F = (9.8m/s^2)(1) = 9.8N$$

18. What is the weight on Earth of a girl with a mass of 30 kg?

$$W = (30kg)(9.8m/s^2) \quad W = 294N$$

19. If a 1-N net force accelerates a 1-kg mass at 1 m/s², what is the acceleration caused by a net force of 2N on a 2-kg mass?

$$a = \frac{2N}{2kg} \quad a = 1m/s^2$$

20. Calculate the force acting a falling 1 kg mass.

$$F = (1kg)(9.8m/s^2) \quad F = 9.8N$$

21. A force of 20 N acts upon a 5 kg block. Calculate the acceleration of the object.

$$a = \frac{20N}{5kg} \quad a = 4m/s^2$$

22. An object of mass 300 kg is observed to accelerate at the rate of 4 m/s^2 . Calculate the force required to produce this acceleration.

$$F = (300 \text{ kg})(4 \text{ m/s}^2) \quad F = 1200 \text{ N}$$

23. A hockey player has a mass of 125 kg. How much does he weigh?

$$W = (125 \text{ kg})(9.8) \quad W = 1225 \text{ N}$$

24. Suppose a dancer weighs 112 pounds. How much does she weigh in N?

$$112 \times 0.45 = 50.4 \text{ kg} \quad W = (50.4 \text{ kg})(9.8 \text{ m/s}^2)$$
$$W = 493.92 \text{ N}$$

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