

## Force Problems I

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1. What net force is needed to accelerate a 100 kg bag  $2 \text{ m/s}^2$  to the left?
2. What is the acceleration of a 2 kg object if the net force on it is 5 N to the right?
3. What is the acceleration of a 2 kg object if the net force on it is 5 N straight down?
4. A car of mass 1000 kg is accelerating with a constant rate of  $1.5 \text{ m/s}^2$ . What is the net force acting on the car?
5. An airplane is accelerating down the runway. The mass of the airplane is 15,000 kg. If the engines are producing a net thrust of 45,000 N, what is the acceleration of the airplane?
6. There is a net force of 200 N acting on a girl on a skateboard. If her acceleration is  $4 \text{ m/s}^2$ , what is her mass?
7. What net force is needed to accelerate a 5 kg object straight up at  $3 \text{ m/s}^2$ ?
8. What is the net force acting on a 1200 kg car that has a constant velocity of 20 m/s?
9. An astronaut in space pushes a 2000 kg satellite with a force of 100 N. What is the acceleration of the satellite?
10. If a net force of 500 N causes something to accelerate at  $15 \text{ m/s}^2$ , what is its mass?

*Now some problems where you have to calculate the acceleration first!*

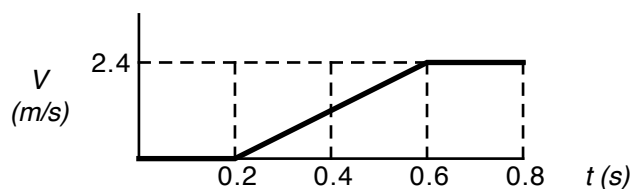
11. What net force is needed for a 1700 kg car to go from 0 m/s to 30 m/s in 6 seconds?
12. What net force is needed if a 60 kg person covers 5 meters in 1.3 seconds, assuming she starts from rest and has a constant acceleration?
13. What net force is needed to accelerate a 4 kg object from 10 m/s to 25 m/s in 5 seconds?

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14. What is the net force on a 65 kg person who slides to a stop in a distance of 3.2 meters in 1.5 seconds?

15. You are in your car, mass 1500 kg, traveling down the highway with a speed of 25 m/s. You see traffic ahead and apply the brakes. You slow down to 15 m/s in 4 seconds. What was the net force on the car?

16. The velocity vs time graph for a 0.75 kg cart is shown in the diagram to the right:



- a. What is the net force on the cart at time 0.1 seconds?
- b. What is the net force on the cart at time 0.4 seconds?
- c. What is the net force on the cart at time 0.7 seconds?

17. The mini-launchers you used in lab fire 0.025 kg steel spheres with a speed of 3 m/s after pushing them about 0.02 meters.

- a. What is the net force on a steel sphere while being launched?
- b. Once it is in the air, what is the net force on the steel sphere?

**Answers:**

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|--------------------------|--------------------------------------|--|----------------------|
| 1) 200 N to the left     | 2) 2.5 m/s <sup>2</sup> to the right | 3) 2.5 m/s <sup>2</sup> down                   | 4) 1500 N            |
| 5) 3 m/s <sup>2</sup>    | 6) 50 kg                             | 7) 15 N up                                     | 8) 0 N               |
| 9) 0.05 m/s <sup>2</sup> | 10) 33.3 kg                          | 11) 8500 N                                     | 12) 355 N            |
| 13) 12 N                 | 14) (-)185 N                         | 15) (-)3750 N (& a = (-)2.5 m/s <sup>2</sup> ) |                      |
| 16. a) 0 N               | b) 4.5 N                             | c) 0 N   | 17. a) 5.63 N        |
|                          |                                      |  | b) 0.25 N (gravity!) |