

NEWTON'S SECOND LAW MATH PRACTICE + FORCE DIAGRAMS

Directions: For problems involving math, write the formula, show your work, and box your answer. For problems requiring explanation, write in complete sentences.

Information you need:

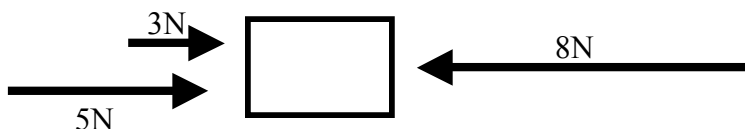
Force is measured in *Newtons*.

Acceleration due to gravity is 9.8 m/s^2 .

Force equals mass multiplied by acceleration (mass must be in kg). $F = m \times a$

Acceleration equals force divided by mass (mass must be in kg). $A = F/m$

1. Three forces act on a box that is initially at rest as shown below. Determine the net force acting on the crate and describe the resulting motion of the crate.



2. Suppose two 4-newton forces act on an object in the same direction. What is the net force on the object?
3. Five different forces act on an object. Is it possible for the net force on the object to be zero? Explain.
4. What happens to an object when an unbalanced force acts on it?
5. An automobile with a mass of 1000 kilograms accelerates when the traffic light turns green. If the net force on the car is 4000 newtons, what is the car's acceleration?
6. Calculate the acceleration of a 2000-kg, single-engine airplane just before takeoff when the thrust of its engine is 500 N.
7. Calculate the acceleration of a 300,000 kg jumbo jet just before takeoff when the thrust for each of its four engines is 30,000N.

8. 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.
9. A 100-kg crate, sliding on the floor, is brought to a stop by a 25-N force. What is the deceleration of the crate?
10. What is the weight on earth of a girl with a mass of 30 kg?
11. If a 1-N net force accelerates a 1-kg mass at 1m/s^2 , what is the acceleration caused by a net force of 2N on a 2-kg mass?
12. A horizontal force of 100N is required to push a crate across a factory floor at a constant speed. What is the net force acting on the crate?
13. An occupant of a car has a chance of surviving a crash if the deceleration during the crash is not more than 30 g. Calculate the force on a 70-kg person decelerating at the same rate.
14. a. Calculate the force acting on a falling 1kg mass.
- b. Calculate the force acting on a falling 2kg mass.
- c. Think back to our initial observations about falling objects, and why certain ones hit the ground before others. Give the *mass* of the 2 objects from parts A&B and the *force* acting on those objects, tell me which object is *accelerating* faster (has a higher rate of acceleration). Explain.
- d. Tell me whether or not you think that the *mass* of an object determines the rate at which it will fall.

