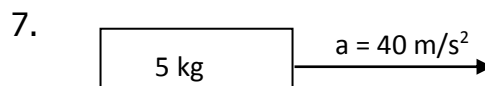


FORCE = Mass X Acceleration

1. Your bicycle has a mass of 9.1 kilograms. You accelerate at a rate of 1.79 m/s^2 . Calculate the net force that is accelerating the bicycle.
2. The Space Shuttle has a liftoff mass of 2,041,000 kg and accelerates at a rate of 16 m/s^2 . Calculate the force (thrust) that is accelerating the Space Shuttle.
3. A rocket accelerates at 56 m/s^2 . It has a mass of 800,000 kg. Calculate the force (thrust) that the rocket engines must supply.
4. A runner has a mass of 89 kilograms. He produces a force of 84 Newtons between the ground and his running shoes. How fast does he accelerate? (unit for acceleration: m/s^2)
5. Calculate the acceleration of a car if the force on the car is 450 Newtons and the mass is 1300 kilograms. (unit for acceleration: m/s^2)



Force = _____



Force = _____

Challenge: A student is pushing a 50 kg cart, with a force of 600 N. Another student measures the speed of the cart, and finds that the cart is only accelerating at 3 m/s^2 . How much friction must be acting on the cart? Hint: Draw a diagram showing the cart, and the two forces acting on it.

NEWTON'S 2ND LAW OF MOTION

What is Newton's law of force and acceleration?

Newton's law of force and acceleration, or Newton's 2nd law of motion, states that the acceleration of an object depends on the mass of the object and the net force applied. *Acceleration is the rate at which velocity changes over time.* Acceleration occurs when an object changes speed, direction, or both.

The Acceleration of an Object Depends on Its Mass and the Force Applied to it.

According to Newton's law of force and acceleration, an object accelerates in the direction of the force. Acceleration can be calculated using the following equation:

$$\text{FORCE} = \text{MASS} \times \text{ACCELERATION}$$

$$F = m \times a$$

Objects that are more massive have greater inertia than objects that are less massive, so more force is needed to accelerate them. You can rearrange the formula to find an object's acceleration:

$$\text{ACCELERATION} = \text{FORCE} / \text{MASS}$$

$$a = F / m$$

1. How much force is being applied to each ball?
2. Which ball will have the greatest acceleration?
3. How would doubling the force applied to ball A affect the ball's acceleration?
4. If 50 Newtons of force moves ball A from the starting line to the finish line, how much work is done. Show your work. **Work = Force x Distance (work is measured in Joules – J)**
5. How fast will ball C accelerate? (show your work) The unit for acceleration is m/s².