

Newton's Second Law of Motion - Worksheet

1. A little boy pushes a wagon with his dog in it. The mass of the dog and wagon together is 45 kg. The wagon accelerates at 0.85 m/s^2 . What force is the boy pulling with?
2. A 1650 kg car accelerates at a rate of 4.0 m/s^2 . How much force is the car's engine producing?
3. A 68 kg runner exerts a force of 59 N. What is the acceleration of the runner?
4. A crate is dragged across an ice covered lake. The box accelerates at 0.08 m/s^2 and is pulled by a 47 N force. What is the mass of the box?
5. 3 women push a stalled car. Each woman pushes with a 425 N force. What is the mass of the car if the car accelerates at 0.85 m/s^2 ?
6. A tennis ball, 0.314 kg, is accelerated at a rate of 164 m/s^2 when hit by a professional tennis player. What force does the player's tennis racket exert on the ball?
7. In an airplane crash a woman is holding an 8.18 kg baby. In the crash the woman experiences a horizontal de-acceleration of 88.2 m/s^2 . How many g's is this de-acceleration? How much force must the woman exert to hold the baby in place?
8. When an F-14 airplane takes-off an aircraft carrier it is literally catapulted off the flight deck. The plane's final speed at take-off is 68.2 m/s. The F-14 starts from rest. The plane accelerates in 2 seconds and has a mass of 29,545 kg. What is the total force that gets the F-14 in the air?
9. A sports car accelerates from 0 to 60 mph, 27 m/s, in 6.3 seconds. The car exerts a force of 4106 N. What is the mass of the car?
10. A sled is pushed along an ice covered lake. It has some initial velocity before coming to a rest in 15 m. It took 23 seconds before the sled and rider come to a rest. If the rider and sled have a combined mass of 52.5 kg, what is the magnitude and direction of the stopping force? What do "we" call the stopping force?
11. A car is pulled with a force of 10,000 N. The car's mass is 1267 kg. But, the car covers 394.6 m in 15 seconds.
 - (a) What is expected acceleration of the car from the 10,000 N force?
 - (b) What is the actual acceleration of the car from the observed data of x and t?
 - (c) What is the difference in accelerations?
 - (d) What force caused this difference in acceleration?
 - (e) What is the magnitude and direction of the force that caused the difference in acceleration?
12. A little car has a maximum acceleration of 2.57 m/s^2 . What is the new maximum acceleration of the little car if it tows another car that has the same mass?
13. A boy can accelerate at 1.00 m/s^2 over a short distance. If the boy were to take an energy pill and suddenly have the ability to accelerate at 5.6 m/s^2 , then how would his new energy-pill-force compare to his earlier force? If the boy's earlier force was 45 N, what is the size of his energy-pill-force?

14. A cartoon plane with four engines can accelerate at 8.9 m/s^2 when one engine is running. What is the acceleration of the plane if all four engines are running and each produces the same force?
15. While dragging a crate a workman exerts a force of 628 N. Later, the mass of the crate is increased by a factor of 3.8. If the workman exerts the same force, how does the new acceleration compare to the old acceleration?
16. A rocket accelerates in a space at a rate of "1 g." The rocket exerts a force of 12,482 N. Later in flight the rocket exerts 46,458 N. What is the rocket's new acceleration? What is the rocket's new acceleration in "g's"?
17. A race car exerts 19,454 N while the car travels at a constant speed of 201 mph, 91.36 m/s. What is the mass of the car?