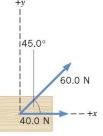
Physics 02-01 Newton's Laws		Name:
Force		
 A or a Is a Unit: (N) Measured by a 		
Newton's First Law of Motion		
A body at remains at on by a net external	_, or, if in motion, remains in _	at a unless acted
Property of objects to remain in is a measure of inertia	motion or rest.	
Newton's Second Law of Motion Acceleration of a system is directly proportion inversely proportional to the		of as the net and
	$a = \frac{F_{net}}{m} \text{ or } F_{net} = ma$	
Newton's Third Law of Motion Whenever one body exerts a on a to t Every force has an equal and opposite reaction	the force that it exerts.	xperiences a force that is equal in
A football player named Al is blocking a player on 100 kg, what is his acceleration?	the other team named Bob. Al a	applies a 1500 N force on Bob. If Bob's mass is
What is the size of the force on Al?		
If Al's mass is 75 kg, what is his acceleration?		
A 0.046 kg golf ball hit by a driver can accelerate a much average force does the golf ball experience?		le the driver is in contact with the ball. How

Physics	02-01	Newton	's Laws
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Homework

- 1. Forces are vectors. Look back in previous lessons and explain how to add vectors.
- 2. You are riding in a car when it turns to the left abruptly. Why do you feel like you are being forced to the right?
- 3. Which statement is correct? (a) Net force causes motion. (b) Net force causes change in motion. Explain your answer and give an example.
- 4. A system can have a nonzero velocity while the net external force on it is zero. Describe such a situation.
- 5. An airplane has a mass of 3.1×10^4 kg and takes off under the influence of a constant net force of 3.7×10^4 N. What is the net force that acts of the plane's 78-kg pilot? (Cutnell 4.1) **93 N**
- 6. In the amusement park ride known as Magic Mountain Superman, powerful magnets accelerate a car and its riders from rest to 45 m/s (about 100 mph) in a time of 7.0 s. The mass of the car and riders is 5.5×10^3 kg. Find the average net force exerted on the car and riders by the magnets. (Cutnell 4.3) 3.5×10^4 N
- 7. When a 58-g tennis ball is served, it accelerates from rest to a speed of 45 m/s. The impact with the racket gives the ball a constant acceleration over a distance of 44 cm. What is the magnitude of the net force acting on the ball? (Cutnell 4.5) **130**N
- 8. A 1580-kg car is traveling with a speed of 15.0 m/s. What is the magnitude of the net force that is required to bring this car to a halt in a distance of 50.0 m? (Cutnell 4.6) **3560 N**
- 9. A person with a black belt in karate has a fist that has a mass of 0.70 kg. Starting from rest, this fist attains a velocity of 8.0 m/s in 0.15 s. What is the magnitude of the average net force applied to the fist to achieve this level of performance? (Cutnell 4.7) 37 N
- 10. A 350-kg sailboat has an acceleration of 0.62 m/s² at an angle of 64° north of east. Find the magnitude and direction of the net force that acts on the sailboat. (Cutnell 4.12) **220 N at 64° N of E**
- 11. A force vector has a magnitude of 720 N and a direction of 38° N of E. Determine the magnitude and direction of the components of the force that point along the N-S line and the E-W line. (Cutnell 4.10) 440N, 570N
- 12. Only two forces act on an object (mass = 3.00 kg), as in the drawing. Find the magnitude and direction (relative to the x axis) of the acceleration of the object. (Cutnell 4.13) **30.9 m/s² at 27.2° above x axis**
- 13. What net external force is exerted on a 1100-kg artillery shell fired from a battleship if the shell is accelerated at 2.40×10^4 m/s²? What force is exerted on the ship by the artillery shell? (OpenStax 4.15) **2.64** × **10**⁷ **N**, **2.64** × **10**⁷ **N**



- 14. Find the net force for the following forces: 3 N East, 2 N West, 5 N North, and 4 N South. (RW) 1.41 N at 45° N of E
- 15. Find the net force for the following forces: 10 N up and 14 N at 30° above the horizontal. (RW) **20.9 N at 54.5° above** horizontal