Vectors

A car travels 4 mi north, 6 mi south, 18 mi west, 13 mi south, 15 mi east and 4 mi north. What is the cars total distance traveled and what is the cars total displacement traveled?

A boats sail pushes the boat with 4 Newtons north. The current pushes the boat with 3 Newtons of force eastward. What is the magnitude and direction of the motion of the boat?

An arrow is fired on an arc. If the arrow strikes the ground with a total velocity of 34 m/s at an angle of 30 degrees, what is the velocity of the x and y components of the arrow descent?

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Kinematics

A ball rolls off a shelf. If the shelf is 3 meters in the air, how long does it take to reach the ground? (Assuming no air resistance)

A meteor is spotted traveling towards Earth at 450 m/s. If it strikes the ground 3 minutes later how fast was it traveling. (Assuming no air resistance)

A cheetah is running at a constant speed of 45 mph. If it maintains this speed for 30 minutes, how far does it travel?

Projectiles

A ball is kicked off a 30 meter cliff horizontally at 5 m/s. How far away does it land?

An arrow is shot 45 m/s at an angle of 30 degrees. How far away does it land?

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**Force**

A 500 kg box is pushed from rest up to speed with an acceleration of 50 m/s/s. How much force is acting on this box?

A 45 kg box is falling at 6 m/s/s, what is the air resistance acting up on the box?

A 1 kg stapler slides down a 45 degree incline. Label all the forces acting on the stapler.

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**Energy**

1….. How much potential energy does a 3 kg flower pot have sitting on a 3 meter tall shelf?

2… A 1000 kg car is traveling with 4500 J of kinetic energy, how fast is it traveling?

3… If a .5 kg icicle falls of a 10 meter tall roof, ignoring air resistance how fast does it strike the ground?

Momentum

A 500 kg car is travelling at 50 m/s, how much momentum does this car contain?

A 50kg train collides with another stationary on of similar mass travelling at 30 m/s. After they collide they stick together. How fast are they moving now?

Two cars (500 kg and 400kg) are travelling at 45 m/s towards each other. They crash into on another. How much total momentum is in this system?

Waves

A sound wave has a frequency of 450 Hz. What is the wavelength of this wave?

A light ray travelling 45 degrees to the normal bends as it enters an unknown material. The angle it beds toward is 30 degrees. What is the index of refraction of the unknown?

What is the ration of the speed of sound to the speed of light?