

Conceptual Physics Chapter 3

Scalar

Vector

Resultant

What is the resultant velocity of an airplane that normally flies at 200 km/hr if it encounters a 50 km/hr tailwind?

How about if it encounters a 50 km/hr headwind?

An airplane heads due North at an airspeed of 70 mi/hr. If there is a wind from the East at 20 mi/hr, what is the resultant ground speed of the plane?

Our crew team can row at 2 mi/hr in still water. If they head due North and the current is from the West at 1 mi/hr, find their resultant speed relative to the shore.

When we take two vectors and ADD them, the thing we get is called the RESULTANT, or VECTOR SUM.

It is also possible to take a single vector and break it down into pieces, the pieces are called COMPONENTS.

The process of breaking a vector down into components is called RESOLUTION.

The COMPONENTS -- if added -- will add up to the original vector.

A vector may be resolved into any number of components, but we almost always use two components. The two components are almost always horizontal and vertical.

Resultant

Components

RESOLUTION.

Example:

Gus Guido just got a job at Burger King. He is sweeping up after the store closed. He is pushing the broom with a force of 10 pounds. The handle makes an angle of 30 degrees with the floor. How much of his force is pushing the broom forward and how much is pushing down?

If Gus changed the angle to 20 degrees would the horizontal component of the force increase, decrease, or remain the same?

Example:

Chris Alfano is pulling his brother in a little red wagon. The handle of the wagon makes an angle of 20 degrees with the horizontal. If he is pulling with a force of 15 pounds, calculate the horizontal and vertical components of the force.

An airplane is moving at 150 mi/hr. If it is heading 50 degrees North of East, find the Northward component of the plane's velocity.

Projectile Motion:

Projectile is a type of motion in 2 dimensions (horizontal and vertical) which occurs when an object is projected into the air, usually at an angle.

Examples:

Gravity acts vertically ONLY!

Gravity has NO horizontal component!

So, if we want to describe projectile motion, we break it down into horizontal and vertical components and treat them independently.

http://galileo.phys.virginia.edu/classes/109N/more_stuff/Applets/ProjectileMotion/enapplet.html



A projectile is launched at an angle into the air. Neglecting air resistance, what is its vertical acceleration?

What is its horizontal acceleration?

At which point in its path does a projectile have MINIMUM speed?

If air resistance is negligible, a projectile will rise to its maximum height in the same time it takes to fall from that height to the ground. This is because the effect of gravity when it is going up is the same as when it is falling back down.

A major challenge!

A boy is at the top of a 5 meter tower. He throws a baseball horizontally. It hits the ground 20 meters from the base of the tower. At what speed did he throw the ball?