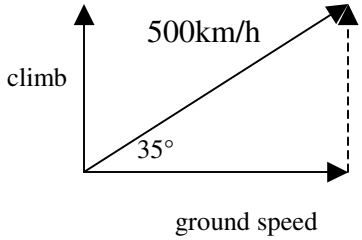
Resolution of Vectors into Rectangular Components

Example 1: An airplane lifts off at 500km/h at a 35° angle to the ground. How fast is the plane climbing into the air? How fast is the plane moving relative to the ground?



Ground speed:

$\cos 35 = \frac{x}{500}$

$x = 500\cos 35$

$x \doteq 410$

Climb:

$\sin 35 = \frac{x}{500}$

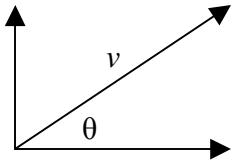
$x = 500\sin 35$

$x \doteq 287$

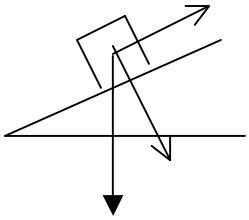
The plane is moving forward at 410km/h and rising at 287km/h.

Any vector can be resolved into **rectangular components**.

The horizontal component is $|\vec{v}|\cos\theta$.
The vertical component is $|\vec{v}|\sin\theta$.

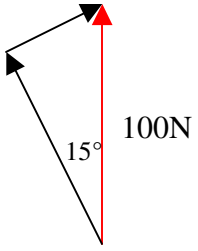


Example 2: A box weighing 100N is resting on a ramp with an incline of 15°. Resolve the weight into rectangular components that keep the box at rest.



The weight pulls straight down.
The box is held in place by to vectors components:
a force perpendicular to the ramp, $\vec{n}$, and the force of friction, $\vec{f}$, parallel to the ramp.

$\vec{n} = 100\cos 15 = 96.6$
$\vec{f} = 100\sin 15 = 25.9$



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