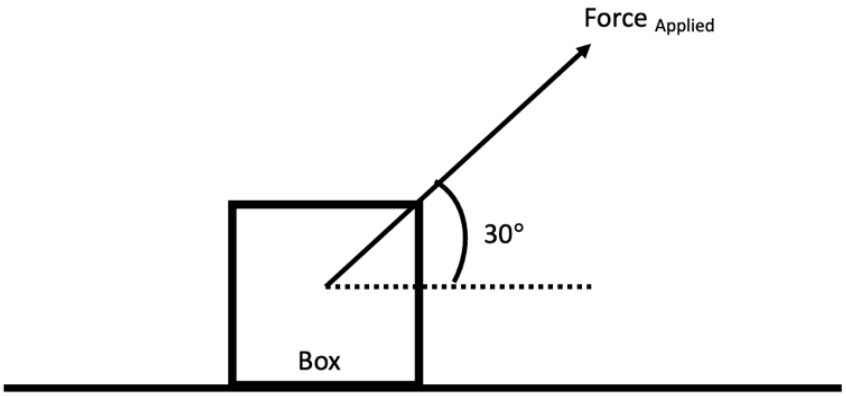
Breaking Forces Into Components:

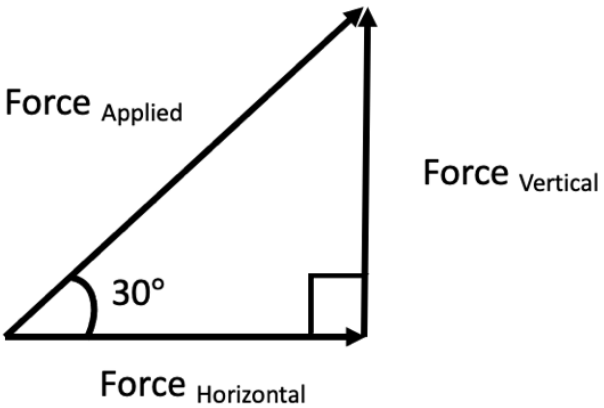
Depending on how your coordinate system is defined, it may be beneficial or necessary to break a force down into components.

For example, let's say you are pulling a box along the floor at an angle of 30 degrees (relative to the floor) with a force of 100 Newtons. We can break the applied force (the force that you apply to the box by pulling it) into a horizontal and vertical component.

Here is a free body diagram to model the situation:



Now, looking just at the applied force, it can be broken into a horizontal and vertical component:



Using trigonometry and the right-angle triangle that was created, we can now generate equations for the horizontal and vertical forces.

Using our knowledge of trigonometry (SOH CAH TOA), we can find the magnitude of the vertical force:

$$\sin(30°) = \frac{Opposite}{Hypotenuse}$$

$$\sin(30°) = \frac{Force_{Vertical}}{Force_{Applied}}$$

$$\sin(30°) * Force_{Applied} = Force_{Vertical}$$ multiply both sides by $Force_{Applied}$

$$Force_{Vertical} = \sin(30°) * Force_{Applied}$$

$$Force_{Vertical} = \sin(30°) * 100N$$

$$Force_{Vertical} = 50N$$

Similarly, we can find the magnitude of the horizonal force:

$$\cos(30°) = \frac{Adjacent}{Hypotenuse}$$

$$\cos(30°) = \frac{Force_{Horizontal}}{Force_{Applied}}$$ multiply both sides by $Force_{Applied}$

$$\cos(30°) * Force_{Applied} = Force_{Horizontal}$$

$$Force_{Horizontal} = \cos(30°) * Force_{Applied}$$

$$Force_{Horizontal} = \cos(30°) * 100N$$

$$Force_{Horizontal} \cong 86.6N$$