Components of Vectors

Recall: $m = \dfrac{rise}{run}$

Similarly, any vector can be **resolved** into its perpendicular, or rectangular, vector components.

Vector, $\vec{v}$, at an angle of ϑ to the horizontal, is the **resultant** (or sum), of its perpendicular components $\vec{x}$ and $\vec{y}$.

To determine $|\vec{v}|$, we can use Pythagorean Theorem if we know $|\vec{x}|$ and $|\vec{y}|$.

Since we know the direction of $\vec{v}$, relative to $\vec{x}$ (or $\vec{y}$), we can use trigonometry to determine the direction and /or magnitude of the other vectors.

Eg. $\cos\vartheta = \dfrac{|\vec{x}|}{|\vec{v}|}$ and $\sin\vartheta = \dfrac{|\vec{y}|}{|\vec{v}|}$

   So, $|\vec{x}| = |\vec{v}| \cos\vartheta$ $|\vec{y}| = |\vec{v}| \sin\vartheta$

Example 1 Determine the perpendicular components for the following vectors:
a) 250N on bearing of 50°   b) 120 km/h S80°E

Example 2 A cable exerts a force of 350N at an angle of 27.9° with the horizontal. Resolve this force into its perpendicular components.

Example 3 Alec drove 8 km east and then 6 km north.
a) Draw the perpendicular component vectors and the resultant vector, $|\vec{r}|$.
b) Calculate the magnitude and direction, relative to the horizontal vector, of the resultant vector.