Pakistan School
Kingdom of Bahrain

Resolution of a Vector into its Rectangular Components.

Class 11

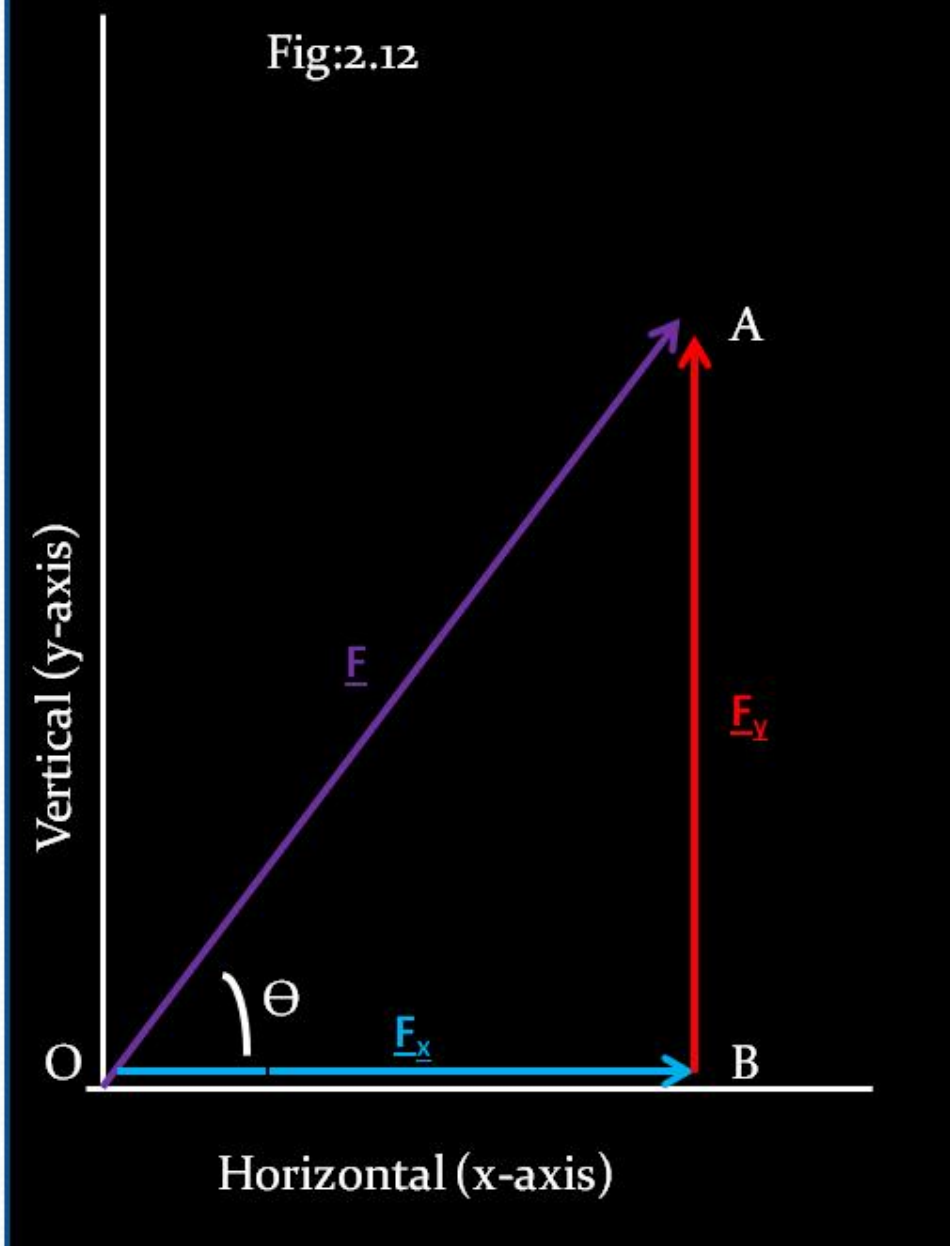
Objective

- Students will be able to create a vector by resolution of vectors.

Resolution of a Vector into its Rectangular Components.

- Consider a force vector F , which makes angle 0 with x — axis, In order to find its rectangular components, draw perpendicular from the head of vector, on x — axis and y — axis, which meet at point B and C respectively, as shown in fig. 2.12. Represent arrowheads at point B and C, pointing away from origin.
- OB and OC are called rectangular components of given vector F , because they are at right angle with each other. Since OB is along x — axis therefore, can be labeled as F_x and OC is acting along y — axis therefore, can be labeled as F_y. In order to verify, how or why they are called rectangular components of F, if we add them according to head-to-tail rule the resultant F can be achieved, as shown in figure 2.12.
- In order to find magnitudes of F_x and F_y consider **Δ OAB**, which is a right angle triangle. As we know,

Fig:2.12



In order to find magnitudes of F_x and F_y consider Δ OAB, which is a right angle triangle. As we know,

$$Cos\theta = \frac{base}{hypotenuse} = \frac{F_x}{F} \Rightarrow F_x = F\ Cos\theta ...(2.3)$$

Similarly

$$Sin\theta = \frac{Perpendicular}{hypotenuse} = \frac{F_y}{F} \Rightarrow F_y = F\ Sin\theta ...(2.3)$$

- From Eq.2.3 and Eq. 2.4 magnitudes of F_x and F_y, can be calculated.
- In Eq.2.3 and Eq. 2.4 , 0 is the angle which F makes with positive x — direction in anti-clockwise sense.

Method to find the resultant of rectangular components of vector.

- If F_x and F_y are given then find their resultant simply by adding them according to head-to-tail rule (a scaled diagram is not required), a right angled triangle forms as shown in figure 2.12. To find magnitude of the resultant F apply Pythagoras
- theorem as: $(Hypotenuse)^2 = (Base)^2 + (Perpendicular)^2$

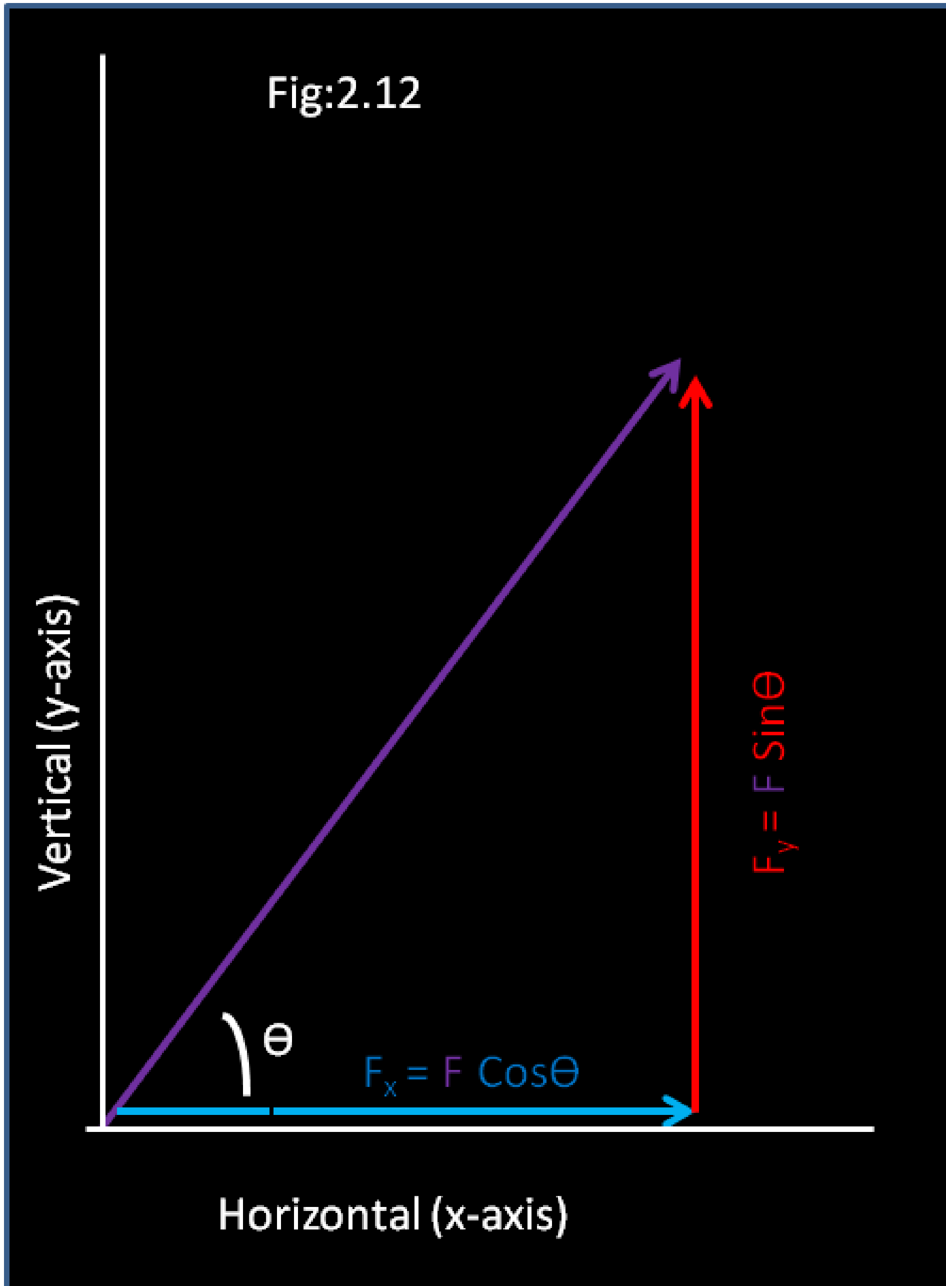
Or $(\vec{F})^2 = (\vec{F}_x)^2 + (\vec{F}_y)^2 \Rightarrow F = \sqrt{(\vec{F}_x)^2 + (\vec{F}_y)^2}$.....(2.5)

To find the direction, $tan\theta = \frac{Perpendicular}{Base} = \frac{F_y}{F_x}$

$$\theta = tan^{-1}(\frac{F_y}{F_x})$$

Eq 2.5 and Eq 2.6 can be used to find magnitude and direction of the resultant. In three dimensional cases.

$$\mathbf{F} = \sqrt{\mathbf{F}_x^2 + \mathbf{F}_y^2 + \mathbf{F}_z^2}$$



Closure

- What is Resolution of vectors?
- Braking up of vectors into its components

Home Work

- Write a note on resolution of vectors?
- Or
- Draw a chart about resolution of vectors