

**QUIZ 1**

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Name, Surname: _____

No / Section: _____

Problem: Determine the magnitude and coordinate direction angles of the resultant force acting at point *A* on the post.

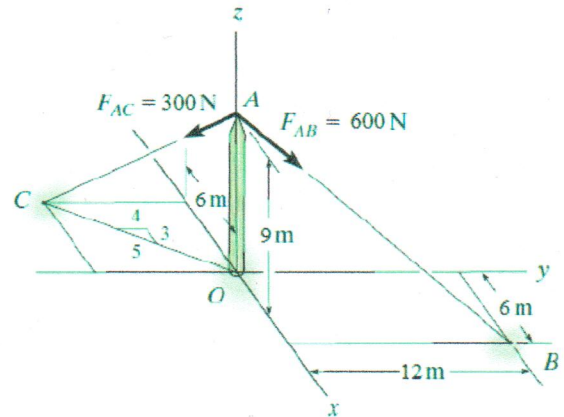
Formulas that may be useful;

$$\mathbf{A} = |\mathbf{A}| \mathbf{u}_A$$

$$A_x = \cos \alpha |\mathbf{A}|$$

$$A_y = \cos \beta |\mathbf{A}|$$

$$A_z = \cos \gamma |\mathbf{A}|$$



Unit Vectors: $A(0, 0, 9)$, $B(6, 12, 0)$, $C(-6, -8, 0)$

$A \rightarrow B$

$$\vec{r}_{AB} = (6-0)\vec{i} + (12-0)\vec{j} + (0-9)\vec{k} = \{6\vec{i} + 12\vec{j} - 9\vec{k}\} \text{ m}$$

$$\vec{u}_{AB} = \frac{\vec{r}_{AB}}{|\vec{r}_{AB}|} = \frac{6\vec{i} + 12\vec{j} - 9\vec{k}}{\sqrt{6^2 + 12^2 + (-9)^2}} = \left\{ \frac{2}{\sqrt{29}}\vec{i} + \frac{4}{\sqrt{29}}\vec{j} - \frac{3}{\sqrt{29}}\vec{k} \right\}$$

$A \rightarrow C$

$$\vec{r}_{AC} = (-6-0)\vec{i} + (-8-0)\vec{j} + (0-9)\vec{k} = \{-6\vec{i} - 8\vec{j} - 9\vec{k}\} \text{ m}$$

$$\vec{u}_{AC} = \frac{\vec{r}_{AC}}{|\vec{r}_{AC}|} = \frac{-6\vec{i} - 8\vec{j} - 9\vec{k}}{\sqrt{(-6)^2 + (-8)^2 + (-9)^2}} = \left\{ -\frac{6}{\sqrt{181}}\vec{i} - \frac{8}{\sqrt{181}}\vec{j} - \frac{9}{\sqrt{181}}\vec{k} \right\}$$

Force Vectors:

$$\vec{F}_{AB} = |\vec{F}_{AB}| \vec{u}_{AB} = 600 \cdot \left(\frac{2}{\sqrt{29}}\vec{i} + \frac{4}{\sqrt{29}}\vec{j} - \frac{3}{\sqrt{29}}\vec{k} \right) = \{222.83\vec{i} + 445.67\vec{j} - 334.25\vec{k}\} \text{ N}$$

$$\vec{F}_{AC} = |\vec{F}_{AC}| \vec{u}_{AC} = 300 \cdot \left(-\frac{6}{\sqrt{181}}\vec{i} - \frac{8}{\sqrt{181}}\vec{j} - \frac{9}{\sqrt{181}}\vec{k} \right) = \{-133.79\vec{i} - 178.39\vec{j} - 200.69\vec{k}\} \text{ N}$$

Resultant Force:

$$\vec{F}_R = \vec{F}_{AB} + \vec{F}_{AC} = \{89.04\vec{i} + 267.28\vec{j} - 534.94\vec{k}\} \text{ N}$$

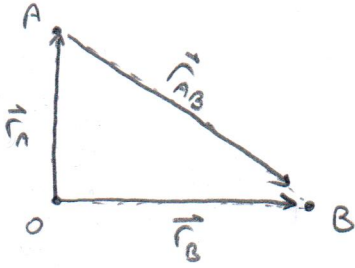
$$|\vec{F}_R| = \sqrt{(F_R)_x^2 + (F_R)_y^2 + (F_R)_z^2} = 604.59 \text{ N} \quad \text{Ans.}$$

$$\cos \alpha = \frac{(F_R)_x}{|\vec{F}_R|} = 0.14727 ; \alpha = 81.53^\circ = 81.5^\circ // \quad \text{Ans.}$$

$$\cos \beta = \frac{(F_R)_y}{|\vec{F}_R|} = 0.44208 ; \beta = 63.76^\circ = 63.8^\circ // \quad \text{Ans.}$$

$$\cos \gamma = \frac{(F_R)_z}{|\vec{F}_R|} = -0.88480 ; \gamma = 152.23^\circ = 152.2^\circ // \quad \text{Ans.}$$

⇒ AB vektörü için,



$$\vec{r}_A + \vec{r}_{AB} = \vec{r}_B$$

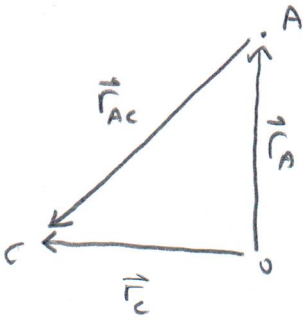
$$\vec{r}_{AB} = \vec{r}_B - \vec{r}_A$$

$$\vec{r}_A = \{9\vec{k}\} \text{ m}$$

$$\vec{r}_B = \{6\vec{i} + 12\vec{j}\} \text{ m}$$

$$\vec{r}_{AB} = \{6\vec{i} + 12\vec{j} - 9\vec{k}\} \text{ m}$$

⇒ AC vektörü için,



$$\vec{r}_A + \vec{r}_{AC} = \vec{r}_C$$

$$\vec{r}_{AC} = \vec{r}_C - \vec{r}_A$$

$$\vec{r}_A = \{9\vec{k}\} \text{ m}$$

$$\vec{r}_C = \{-6\vec{i} - 8\vec{j}\} \text{ m}$$

$$\vec{r}_{AC} = \{-6\vec{i} - 8\vec{j} - 9\vec{k}\} \text{ m}$$