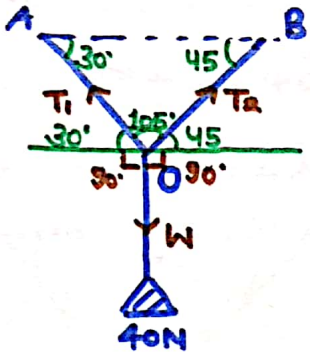
BTEUP. 2010

Question :- 40 N weight is hanging with the help of 2- ropes, which are at an angle of 30° and 45° from horizontal. Find the tension in each rope.

Given data :-

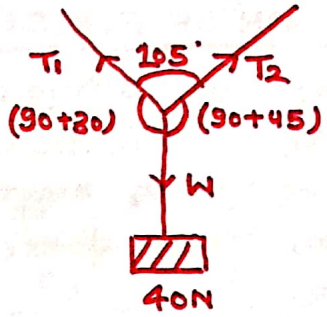


To find :- T_1 & T_2 in N.

Solve :- from Lami's theorem -

$$\frac{W}{\sin(105)} = \frac{T_1}{\sin(90+45)} = \frac{T_2}{\sin(90+30)}$$

or -



$$\frac{40}{\sin 105} = \frac{T_1}{\cos 45} = \frac{T_2}{\cos 30}$$

$$\frac{40}{\sin 105} = \frac{T_1}{\cos 45}$$

$$T_1 = \frac{40 \times \cos 45}{\sin 105^\circ}$$

$$[T_1 = 29.28\ N]$$

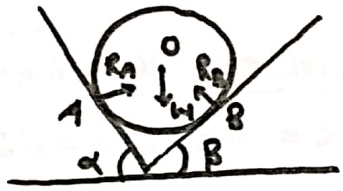
$$\frac{T_1}{\cos 45} = \frac{T_2}{\cos 30}$$

$$T_2 = \frac{T_1 \times \cos 30}{\cos 45^\circ}$$

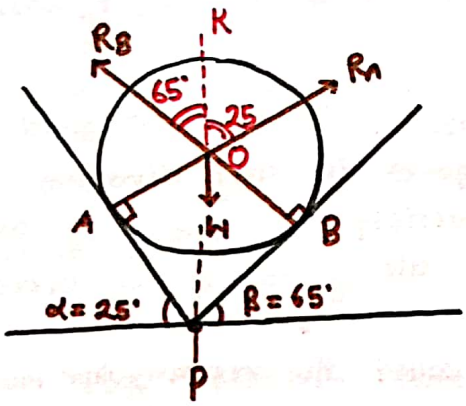
$$[T_2 = 35.86\ N]$$

BTEUP: 2011

Question:- find the reactions R_A and R_B of given geometry. $\alpha = 25°$; $\beta = 65°$; $W = 500\ N$; Radius $= r$.



Solve:-



$\angle R_B OK = \beta = 65°$

$\angle R_A OK = \alpha = 25°$

from lami's theorem at point O.

$$\frac{W}{\sin R_B O R_A} = \frac{R_B}{\sin R_A O W} = \frac{R_A}{\sin R_B O W}$$

$$\frac{500}{\sin(25+65)} = \frac{R_B}{\cos 65° = \sin(90+65)} = \frac{R_A}{\sin(180-65)}$$

$$\frac{500}{\sin 90°} = \frac{R_B}{\cos 65} = \frac{R_A}{\sin 65}$$

$$\frac{500}{1} = \frac{R_B}{0.4226} = \frac{R_A}{0.9063}$$

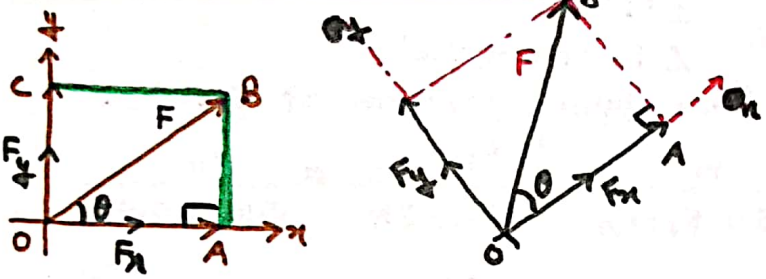
$R_A = 500 \times 0.9063$

$[R_A = 453\ N]_{//}$

$R_B = 500 \times 0.4226$

$[R_B = 211\ N]_{//}$

RESOLUTION OF FORCES:-



(a) (b)

→ A force can be resolved into 2-components, which are either perpendicular to each other (or) inclined to each other.

* If the 2-components are ⊥r to one another then they are known as Rectangular Components.

* And if they are inclined to each other, they are called inclined components.

fig:(a) from parallelogram law of forces.

OB is the resultant diagonal of forces OA and OC.

hence, OA and OC are the resolved parts of OB(F).

Resolved part in OX-Direction:-

$\cos\theta = \frac{OA}{OB} \Rightarrow OA = OB\cos\theta = F\cos\theta$

Resolved part in OY-direction:-

$\sin\theta = \frac{OC}{OB} \Rightarrow OC = OB\sin\theta = F\sin\theta.$

Can also be written as $= F\cos(90-\theta)$

Hence;

The rule is - "To find resolved part of any force in any direction, this force multiply by cosine of angle between along the given direction".

This is called the rectangular law of forces.