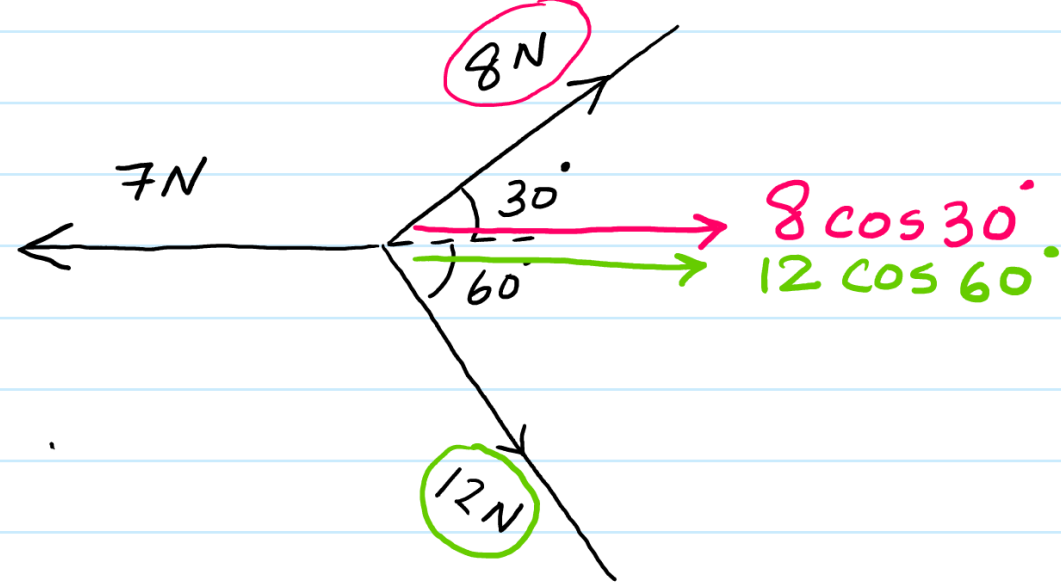


Continuation of "Resolution of Vectors"

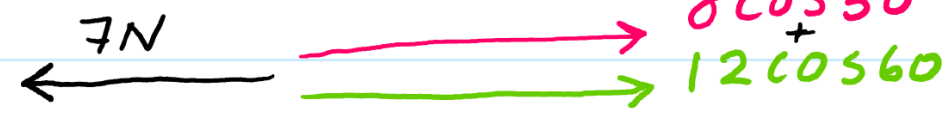
Q.1 The diagram below shows 3 forces.



Calculate the **magnitude & direction** of the **fourth force** which if **applied**, would **ensure** that the object is **only** able to move in the **VERTICAL PLANE**.

Answer:.

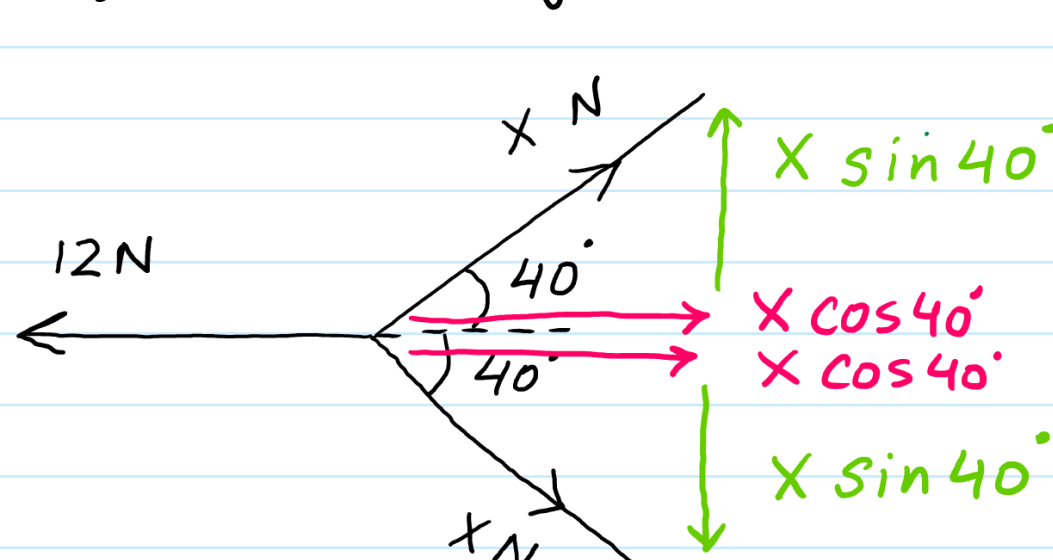
The question implies that there should be **NO horizontal movement** or we can say that the horizontal forces must **balance out**.



So to balance out the horizontal movement, 4th force must be of $12.9 - 7 = 5.9\text{N}$ (acting to the left).

Q.2 The diagram shows 3 forces

acting on an object.



Given that this object is in **Equilibrium**. Find the value of X?

Equilibrium :- forces should **balance** (both in the horizontal & in the vertical plane)

Lets consider horizontal forces. for **EQ.** the forces on the **RIGHT** must balance out with the forces on the **LEFT**. hence

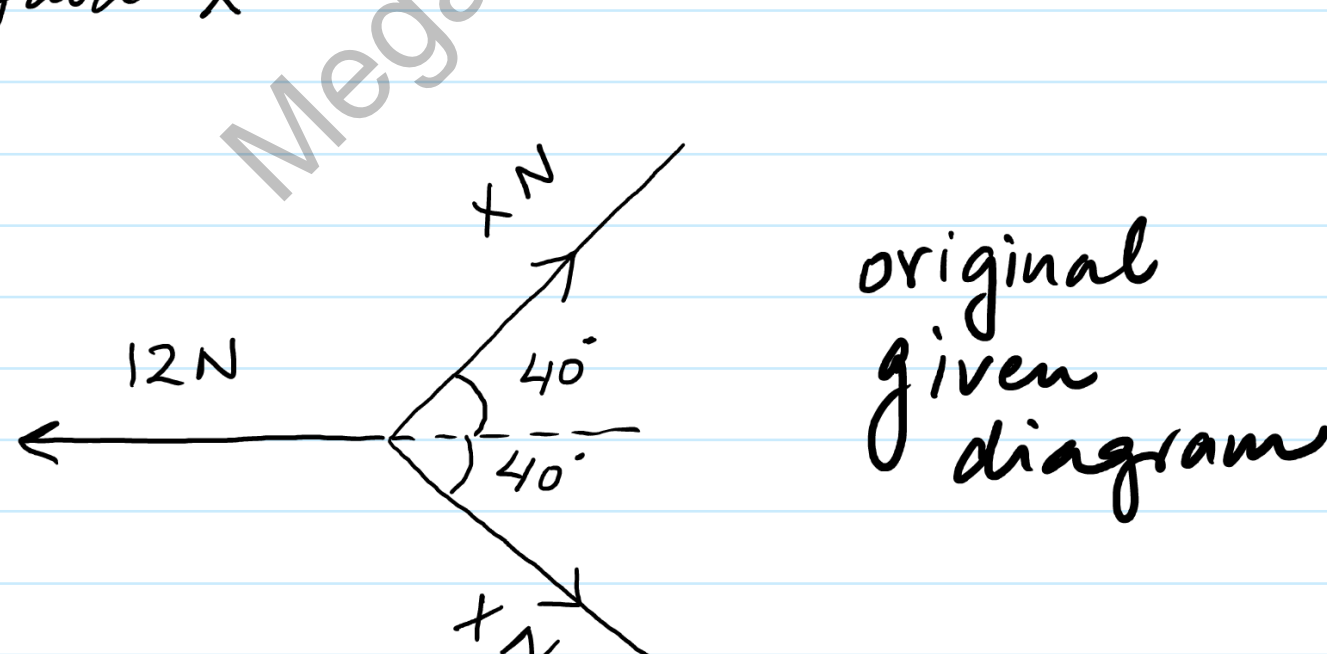
$$X \cos 40 + X \cos 40 = 12\text{N}$$

$$2X \cos 40 = 12$$

$$X = 7.8\text{N}$$

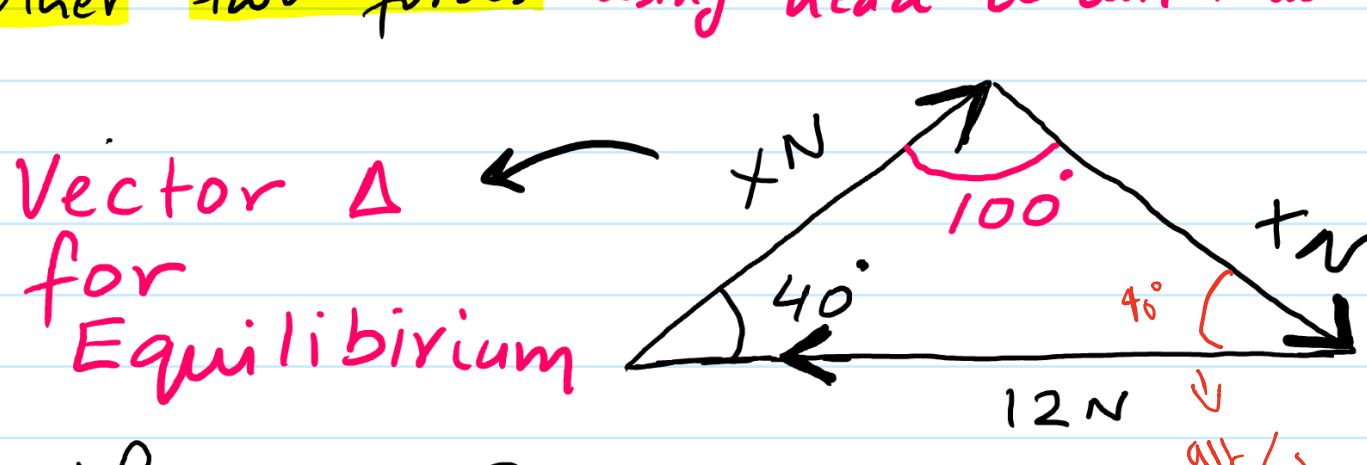
Note: The same answer of X, can also be obtained using an **alternate method**. This method is called **constructing a VECTOR TRIANGLE FOR EQUILIBRIUM**.

* How do we construct **Vector triangle for Equilibrium** to find X.



original given diagram

Step # 1 :- **Out of 3 forces, ignore any one force (eg 12N) & join the other two forces using head to tail Rule.**



Find X?

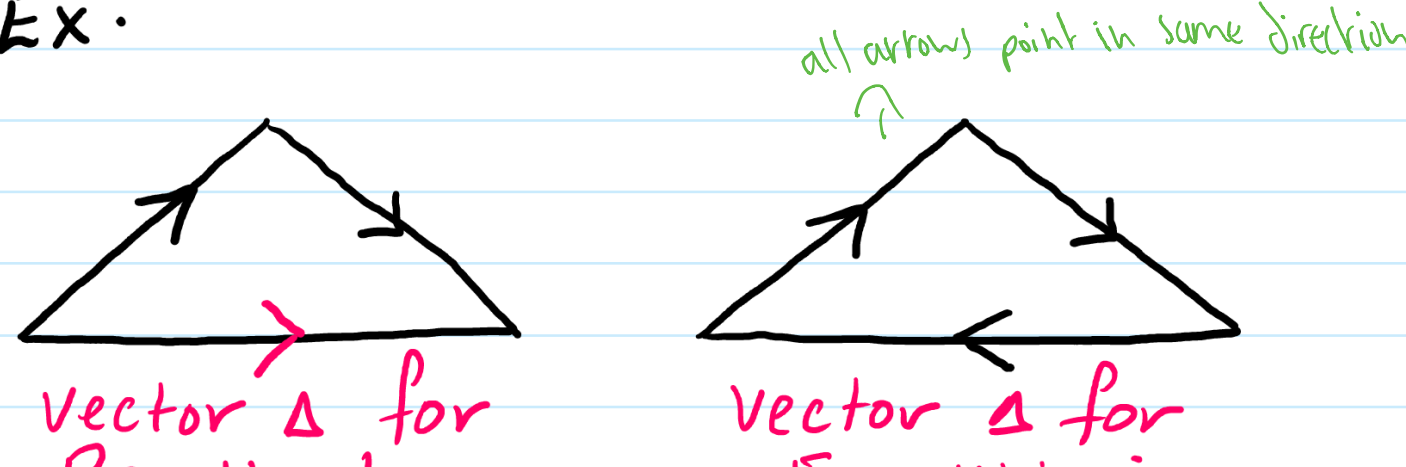
Step # 2 :- **Now shift the previously ignored force in a manner so as to complete a triangle.**

Use Sine Rule

$$\frac{X}{\sin 40} = \frac{12}{\sin 100}$$

$$X = 7.8\text{N}$$

Ex.



Note: Q: How is vector triangle for Equilibrium different from vector triangle which we constructed previously to obtain Resultant.

In case of Resultant, the head of the Resultant use to point toward the head to the vector but In case of Equilibrium, all arrows point in the same sense.

Limitation of Second method is

Since triangle has 3 sides :: Vector triangle for Eq. can only be constructed if there are **3 forces given in the Question (not more than 3)** whereas first method can be used for more than 3 well