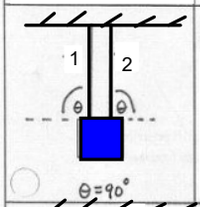
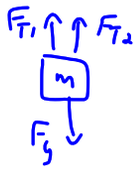
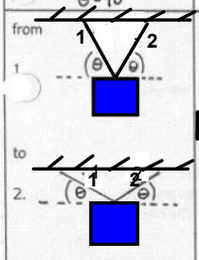
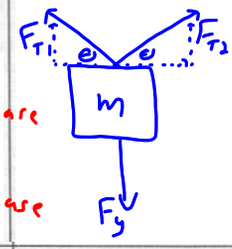
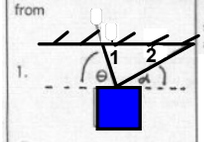
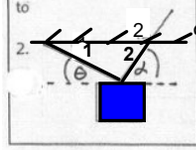
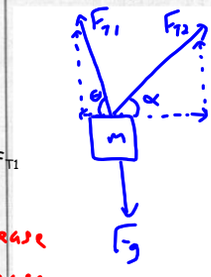
PHY 621 Tension Activity

Purpose: To see and feel how the magnitudes of the tensions, in supporting strings, depends on the angles of the supporting strings.

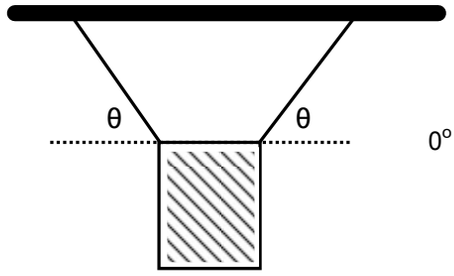
Scenario	Pluck and Observe	FBD for object (showing components)	$F_{net\,y} = \Sigma F_Y$
	How does the tension in each supporting string compare? $F_{T1} = F_{T2}$		$F_{T1} + F_{T2} - F_g = 0N$ $F_{T1} + F_{T2} = F_g$
from 1.  to 2.	What happens to the tension in each supporting wire as you decrease the angle θ? F_{T1} will increase F_{T2} will increase		$F_{T1y} + F_{T2y} - F_g = 0$ $F_{T1y} + F_{T2y} = F_g$
from 1.  to 2. 	1. Compare the tension in each supporting string when the angles are not equal. $F_{T1} > F_{T2}$ 2. What happens to the tensions, F_{T1} and F_{T2} as the angle θ decreases while the angle α increases? F_{T1} will decrease F_{T2} will increase	(for initial case only) 	$F_{T1y} + F_{T2y} - F_g = 0$ $F_{T1y} + F_{T2y} = F_g$

How do the roles of the horizontal and vertical component vectors compare?

Vertical components counter gravity they hold it up by opposing weight

Horizontal components don't support any of the weight. They only act against each other. So to keep that consistent, they change the overall tension in the string

How Changing Angles Affects Tension Vectors



$0^\circ < \theta \leq 90^\circ$

If θ increases, then sin θ increase

but $|F_{T1}|$ decreased

and $|F_{T2}|$ decreased.

So, $F_{T1y} = |F_{T1}| \sin\theta$ will remain constant

+

and $F_{T2y} = |F_{T2}| \sin\theta$ will remain constant.

$= F_g$

If θ increases, then cos θ decreases

while $|F_{T1}|$ decreases

and $|F_{T2}|$ decreases.

So, $F_{T1x} = |F_{T1}| \cos\theta$ will decrease

=

and $F_{T2x} = |F_{T2}| \cos\theta$ will decrease.

Can your support an object of mass on a string that is completely horizontal? Justify your answer.

No, must have F_{Ty} & F_{Tx} components

$\theta = \tan^{-1}\left(\frac{F_{Ty}}{F_{Tx}}\right) = 0$