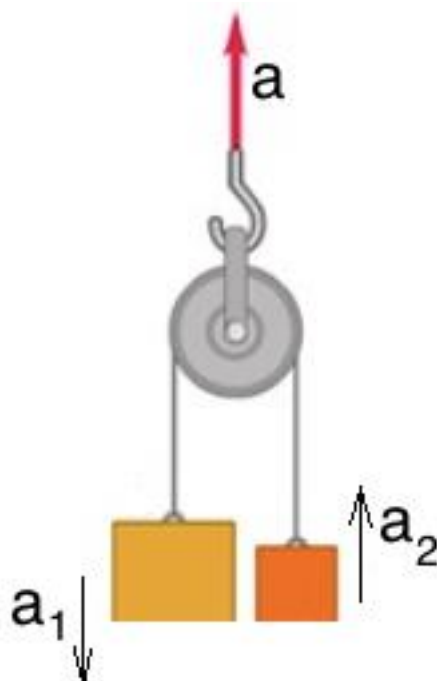


### Answer on Question #40893 – Physics – Mechanics

TWO MASSES ARE CONNECTED BY A STRING PASSING OVER A PULLEY ACCELERATING UPWARD. IF  $a_1$  AND  $a_2$  BE THE ACC. OF THE TWO BODIES THEN, FIND THE RELATION BETWEEN  $a, a_1$  AND  $a_2$ .

**Solution:**



$a_1$  – acceleration of the first body;

$a_2$  – acceleration of the second body;

$a$  – acceleration of the pulley;

This acceleration of the pulley is in upward direction. Therefore a pseudo force will act on both the masses in the downward direction.

Be extremely careful to note that  $a'$  is the acceleration of  $m_1$  and  $m_2$  in the pulley frame of system and NOT the inertial frame which is the ground. We can write equation of motion for both masses and solve for  $a'$  and T.

Now we have to find  $a_1$  and  $a_2$  which are their acceleration in the ground frame of reference. Now the entire system is going upwards with  $a$ .

$m_1$  is moving upward with  $a$  and downwards with  $a'$

So its total downward acceleration will be  $a_1 = a' - a$

Mass b is moving upwards with  $a$  and upwards with  $a'$

So its total upwards acceleration will be  $a_2 = a' + a$

Relations between  $a_1, a_2$  and  $a$ :

$$a_1 = a' - a$$

**Answer:**  $a_1 = a' - a$   
 $a_2 = a' + a$

$$a_2 = a' + a$$