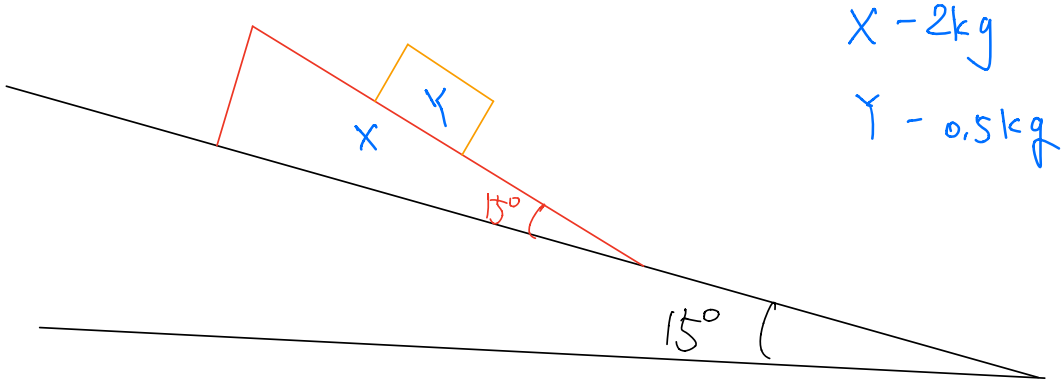
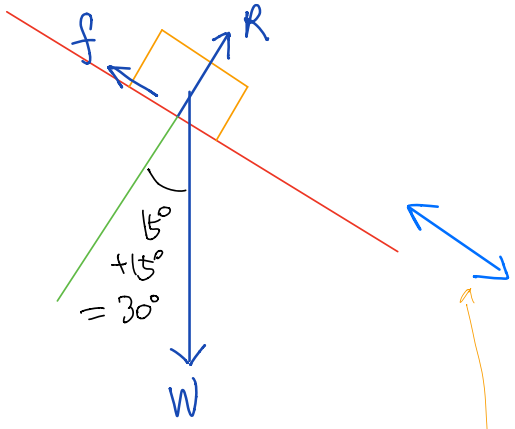
X - 2kg

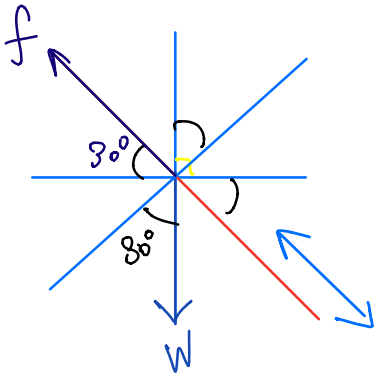
Y - 0.5kg

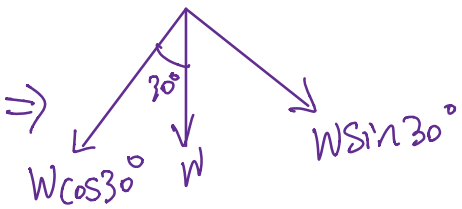


ⓐ ① Free body diagram :



ⓐ ② Find Magnitude of friction :
(* Balance direction *)





• Y block is stationary.

$\therefore f = W\sin 30^\circ$

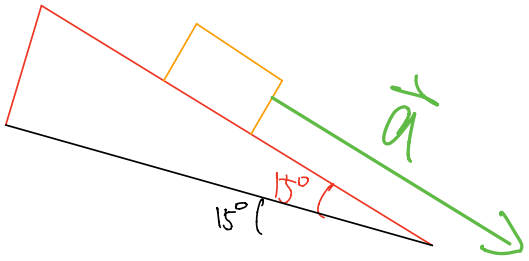
$= mg\sin 30^\circ$

$= (0.5)(9.81)\sin 30^\circ$

$= 2.4525\ N$

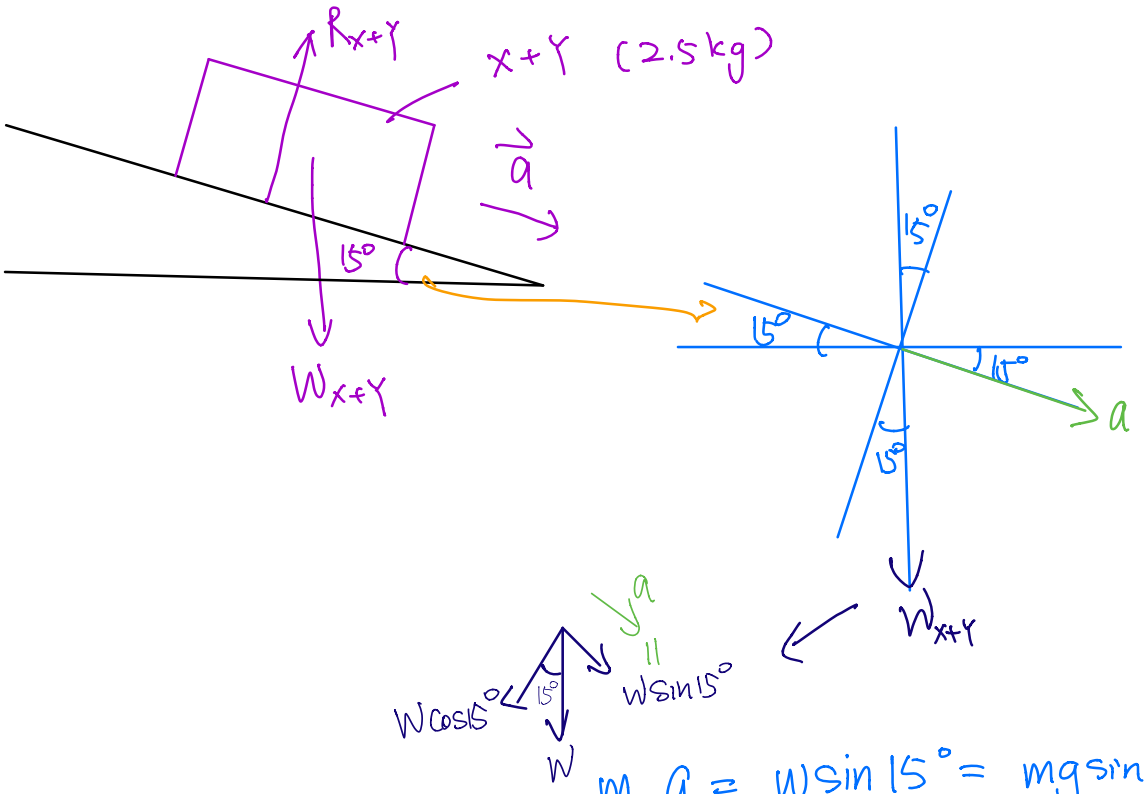
(b) (i) Find acceleration of Y. (= acceleration of X+Y)

Consider both blocks together.



$\vec{a}$ is moving along the inclination of Smooth plane (black line). It is best to consider direction along $\vec{a}$.

Object total mass = 0.5 kg + 2 kg = 2.5kg



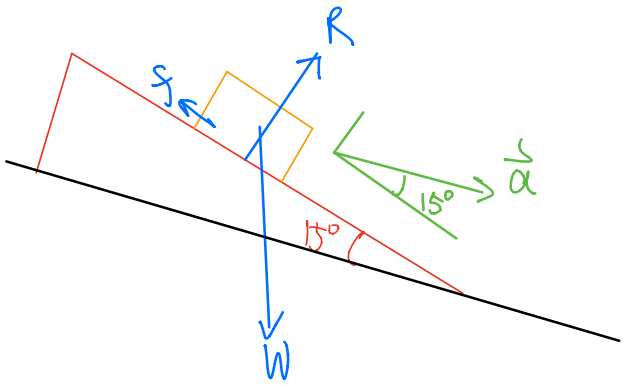
$$m_{X+Y}\, a = W_{X+Y} \sin 15^\circ = mg \sin 15^\circ$$

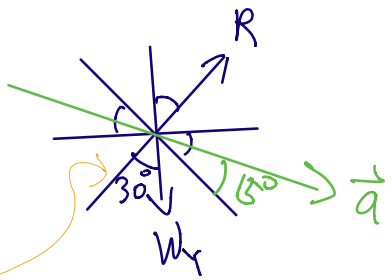
$$a = (9.81)(\sin 15^\circ)$$

$$= 2.54\ N$$

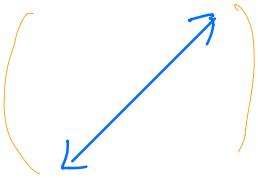
Direction of $\vec{a}$ = along the smooth plane.

(b) (2) Find magnitude and direction of reaction force between X and Y.





Consider this direction



$$m_y a \sin 15^\circ = R - W_y \cos 30^\circ$$

$$R = (0.5)(2.54)(\sin 15^\circ) + (0.5)(9.81)(\cos 30^\circ)$$

$$= 4.57\ N$$