

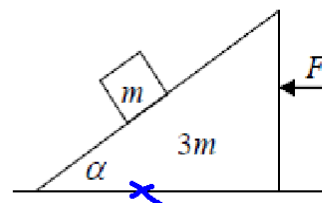
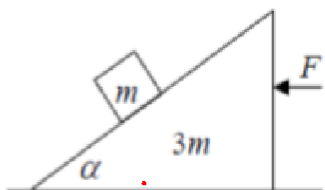
Fri 5<sup>th</sup> Mar

Title

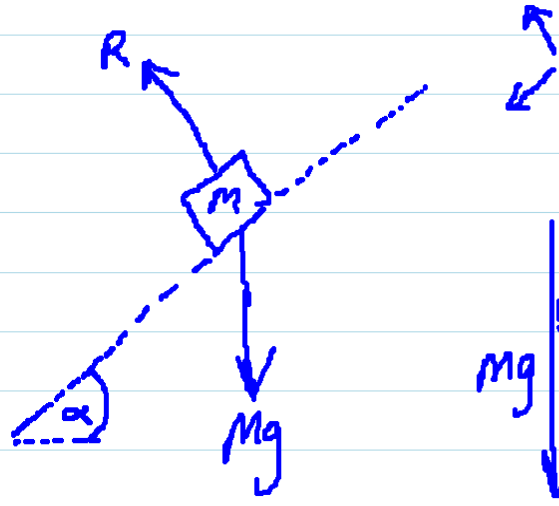
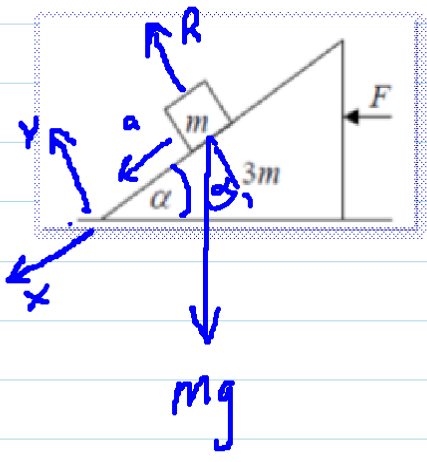
- (b) A smooth wedge of mass  $3m$  and slope  $\alpha$  rests on a smooth horizontal surface.

A particle of mass  $m$  is placed on the smooth inclined face of the wedge and released from rest.

A horizontal force  $F$  is applied to the wedge to keep it from moving.



- (i) Show, on separate diagrams, the forces acting on the wedge and on the particle.
- (ii) Prove that the reaction between the wedge and the horizontal surface is  $mg(3 + \cos^2 \alpha)$ .
- (iii) If the speed of the particle after 1 s is 4.9 m/s find the value of  $\alpha$ .

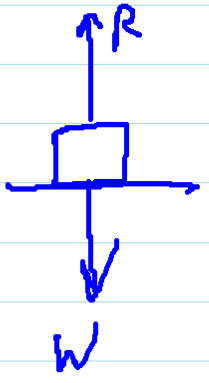


$$\cos \alpha = \frac{y}{mg}$$

$$y = mg \cos \alpha$$

$$\sin \alpha = \frac{x}{mg}$$

$$x = mg \sin \alpha$$



Along y  
up = DOWN

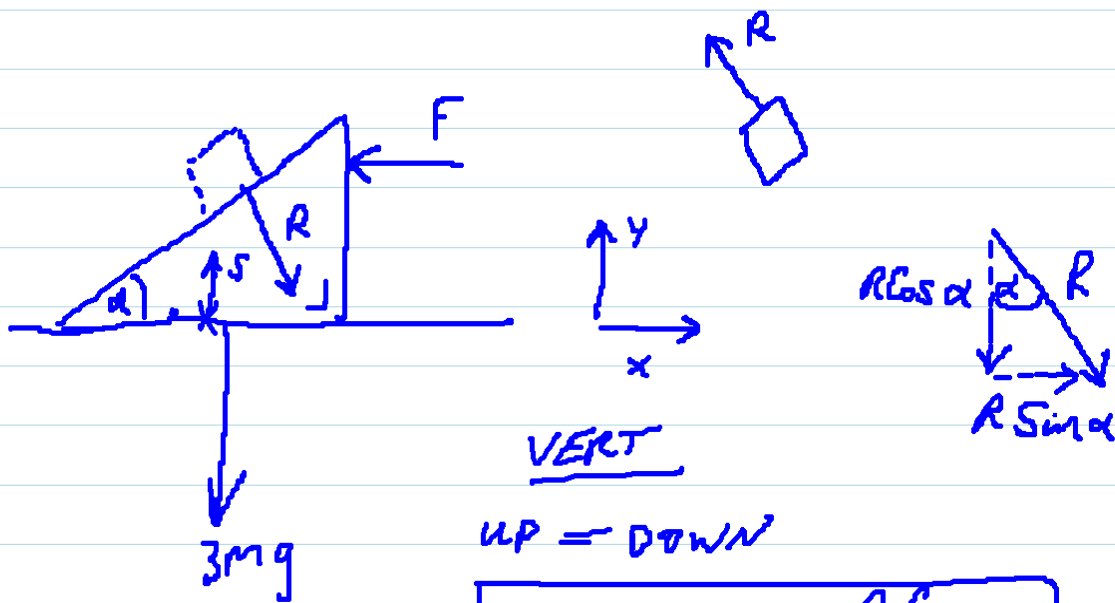
$$R = mg \cos \alpha$$

Along x

$$F = ma$$

$$mg \sin \alpha = ma$$

$$a = g \sin \alpha$$



VERT

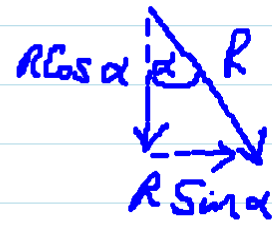
UP = DOWN

$$\boxed{S = 3mg + R \cos \alpha}$$

HORIZ

LEFT = RIGHT

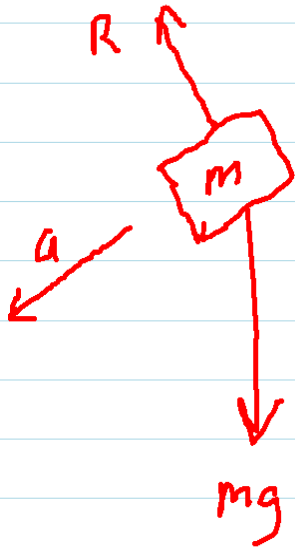
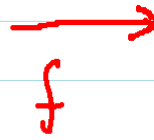
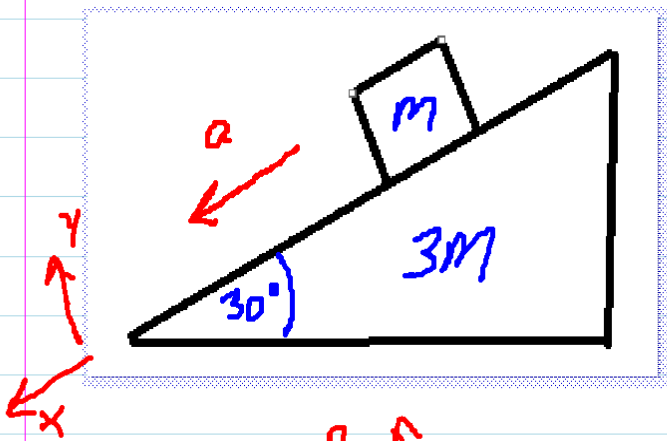
$$\boxed{F = R \sin \alpha}$$



$$S = 3mg + (mg \cos \alpha) \cos \alpha$$

$$S = 3mg + mg \cos^2 \alpha$$

$$= mg(3 + \cos^2 \alpha)$$



VERT

