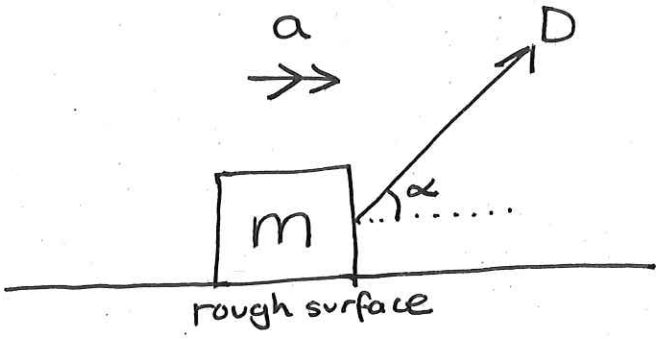
YEAR 2 APPLIED **FORCES AND FRICTION** Chapter 5

- EQUATIONS

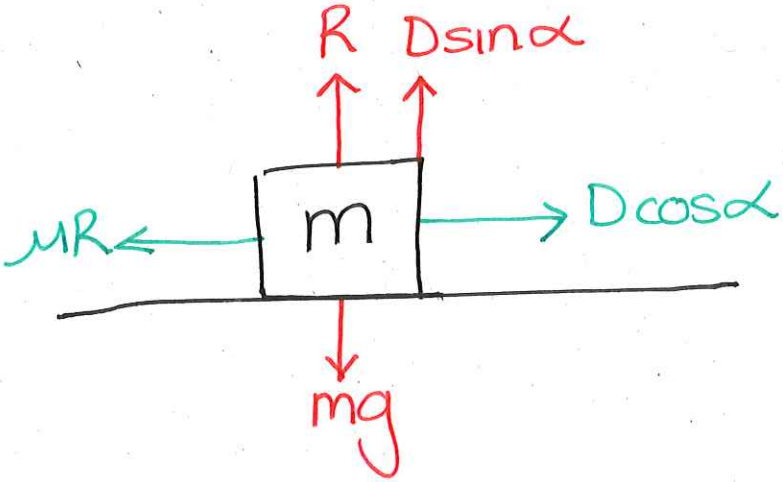
$F = ma$ Resultant Force = mass × acceleration

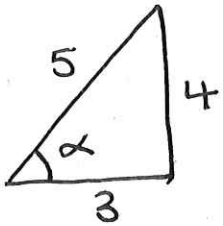
$F = \mu R$ Friction Force = coefficient × Reaction Force

- VERTICAL AND HORIZONTAL COMPONENTS



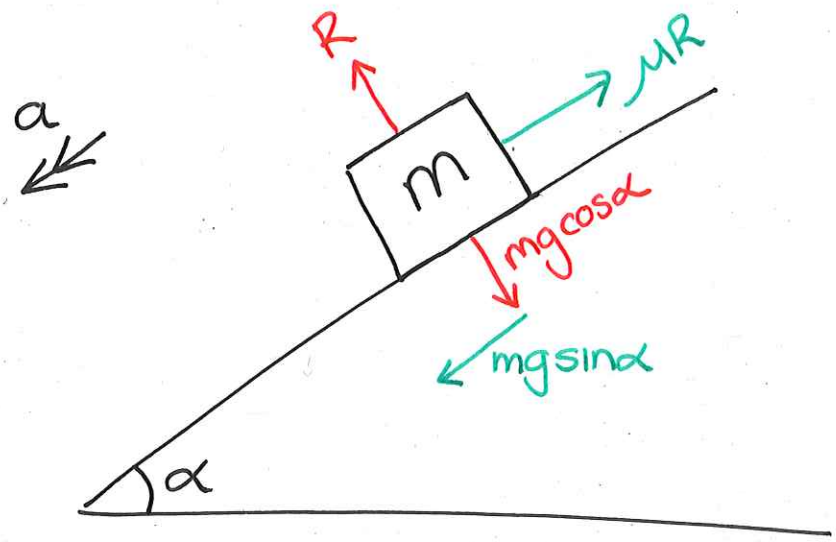
becomes:





$\sin\alpha = \frac{4}{5}$ $\cos\alpha = \frac{3}{5}$ $\tan\alpha = \frac{4}{3}$

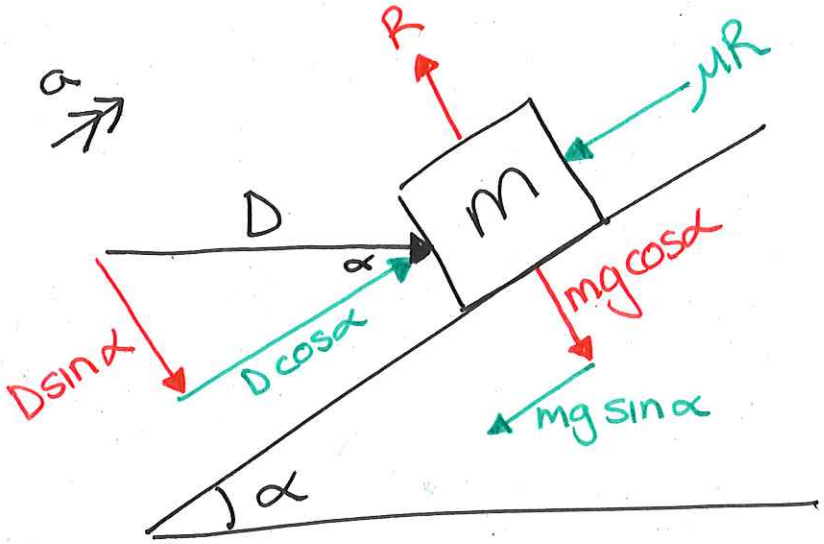
– ON A SLOPE (NO EXTERNAL FORCES)



$F = ma$ $\qquad mg\sin\alpha - \mu R = ma$

$F = \mu R$ $\qquad F = \mu(mg\cos\alpha)$

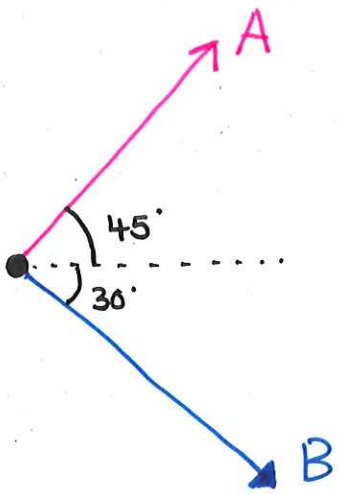
– ON A SLOPE (WITH EXTERNAL FORCE)



$F = ma$ $\qquad D\cos\alpha - mg\sin\alpha - \mu R = ma$

$F = \mu R$ $\qquad F = \mu(D\sin\alpha + mg\cos\alpha)$

- FINDING DIRECTION OF RESULTANT FORCE



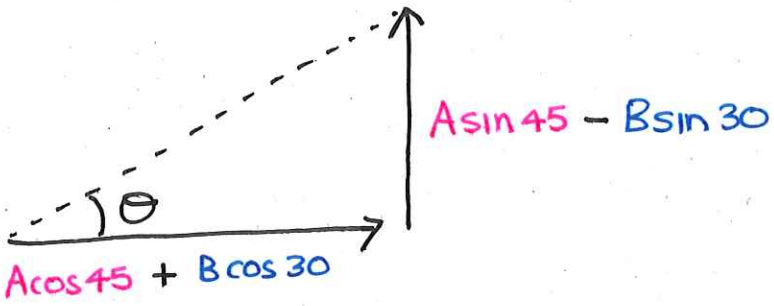
Find vertical resultant force

$$\underset{\uparrow}{A \sin 45} - \underset{\downarrow}{B \sin 30}$$

Find horizontial resultant force

$$\underset{\rightarrow}{A \cos 45} + \underset{\rightarrow}{B \cos 30}$$

construct triangle of resultant forces

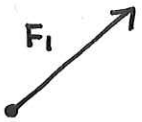


use basic trig to find θ

use pythagoras to find magnitude

- FORCES AND VECTORS

$F_1 = 3i + 5j$



$F_2 = -4i - 3j$

Resultant Force $= F_1 + F_2$

$= 3i + 5j + -4i - 3j$

$= -1i + 2j$

resultant force

or you can use column vectors

$$\begin{pmatrix} 3 \\ 5 \end{pmatrix} + \begin{pmatrix} -4 \\ -3 \end{pmatrix} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$$

$-1i + 2j$