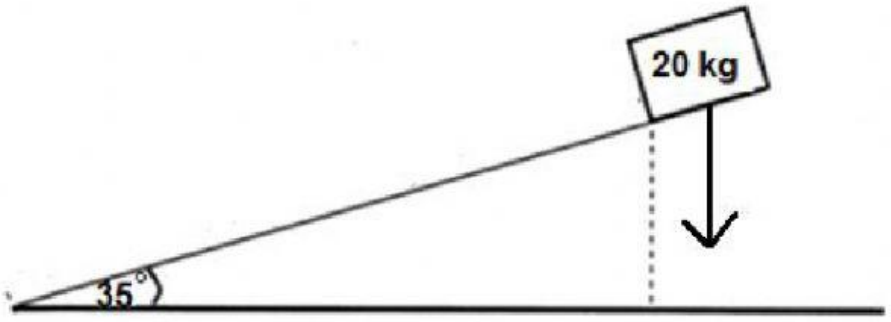
Newton laws worksheet 13

Watch this video on breaking gravitational force into components before you continue

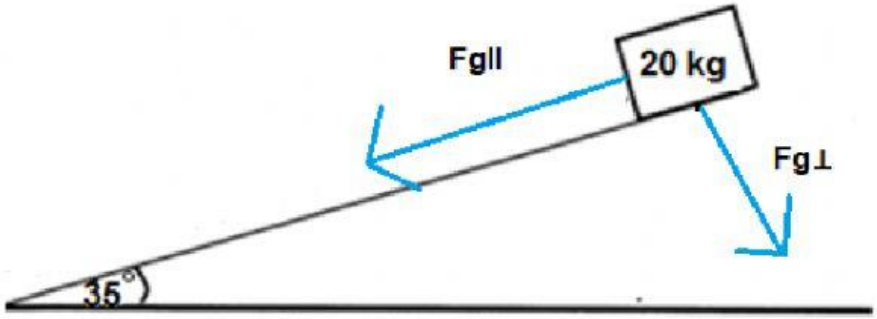
Breaking gravitational force up into components



The gravitational force on an object resting on a slope acts straight down.

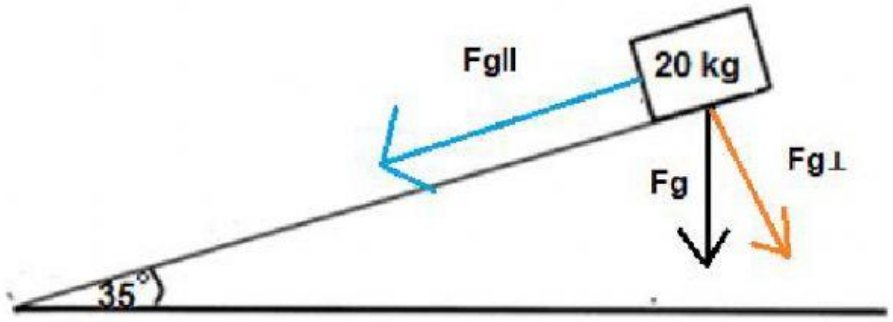
However, since the object isn't going to fall straight down, and break the ramp, it is not useful to calculate that force.

We then break gravitational force up into 2 components – called Fgll and Fg⊥

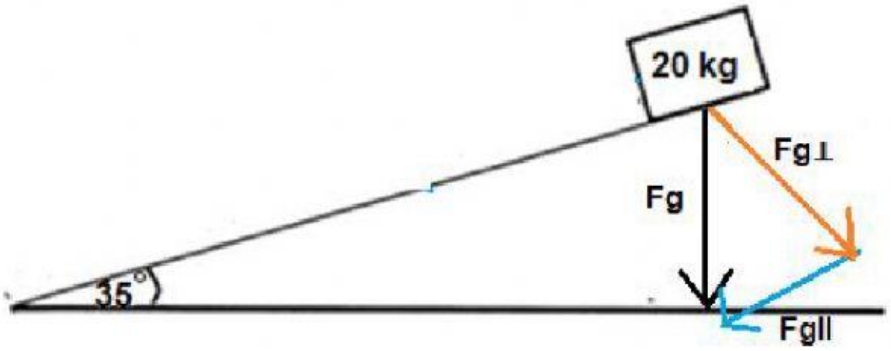


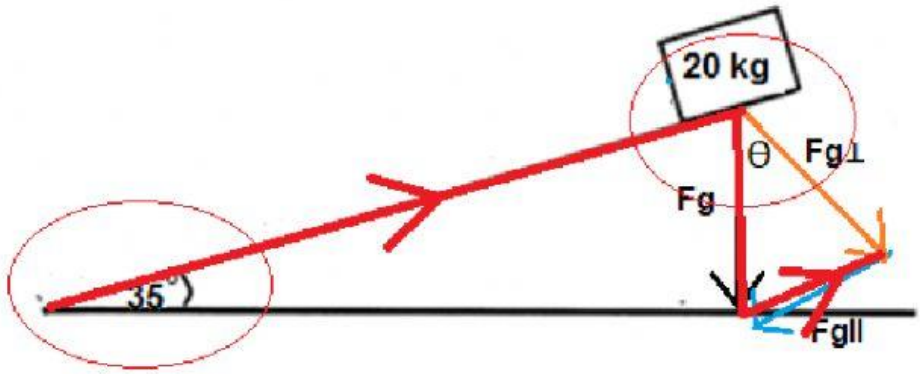
The Fgll is the force of gravity that is trying to pull the box down the slope, and acts parallel to the slope, thus Fgll

The Fg⊥ is the force of gravity that is trying to pull the box down onto the slope and acts perpendicular to the slope.



We can draw a triangle of this





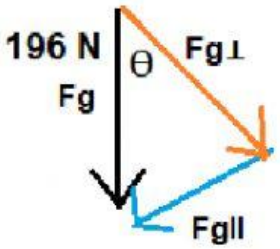
If we look at alternate angles then the angle of 35° is at the top of the above triangle

Now we just need to use trig to solve for the triangle

Fg = m.g

= 20(9,8)

= 196 N



Soh Cah Toa

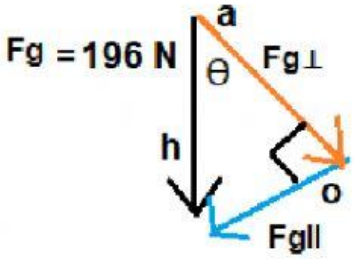
$\text{Sin } \Theta = \frac{o}{h}$

$\text{Sin } 30 = \frac{Fgll}{196}$

Cross multiply

Fgll = (196) Sin 30

= 98 N



$\cos \Theta = \frac{a}{h}$

$$\cos 30 = \frac{Fg_{\perp}}{196}$$

$Fg_{||} = (196) \cos 30$

$= 169{,}74$ N

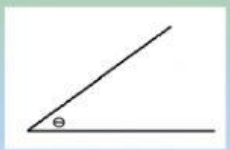
But honestly we don't need to draw the triangle every time that we want to solve for the $Fg_{||}$ and $Fg_{\perp}$

If you can remember this then you can just use this

$Fg_{||} = Fg.\sin \Theta$

$Fg_{\perp} = Fg.\cos \Theta$

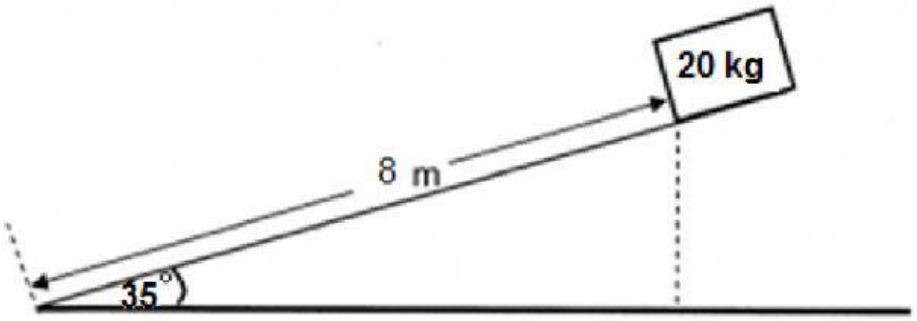
Θ will always be this angle



Exercise 11

Calculate the force of gravity on the box, parallel and perpendicular to the slope {ignore the 8m length) No direction necessary

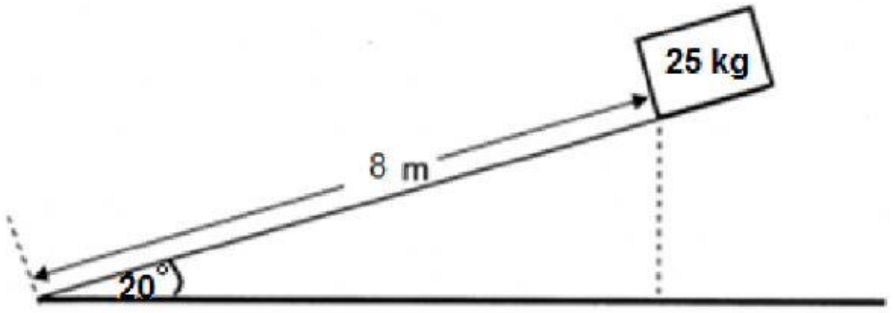
11.1



$Fg_{||}$ = _____

$Fg_{\perp}$ =_____

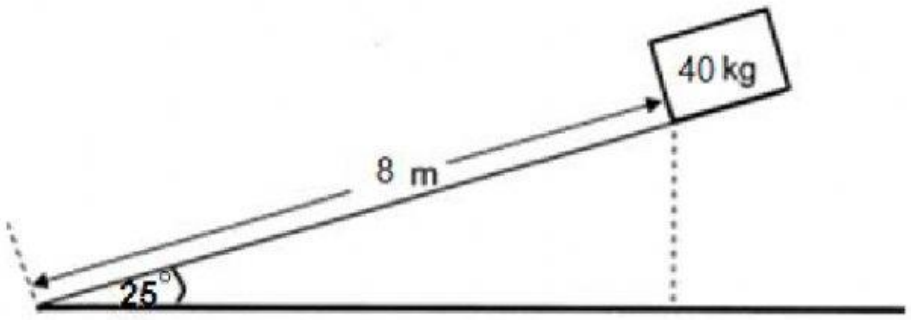
11.2



$F_{g\parallel}$ = _____

$F_{g\perp}$ =_____

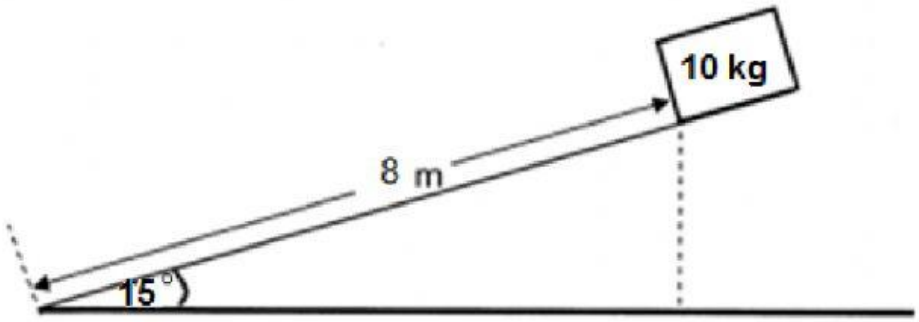
11.3



$F_{g\parallel}$ = _____

$F_{g\perp}$ =_____

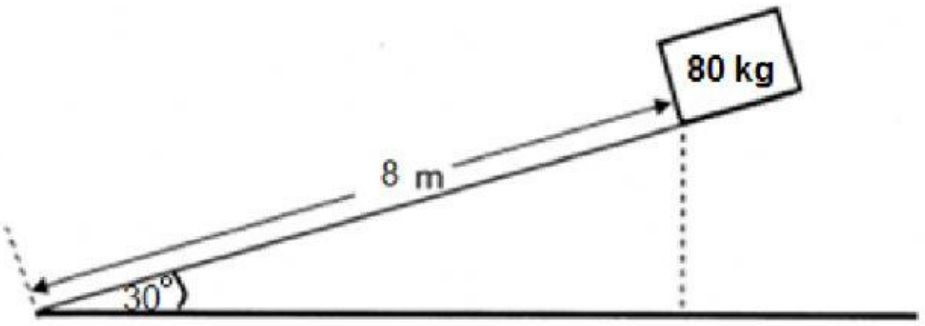
11.4



$F_{g\parallel}$ = _____

$F_{g\perp}$ =_____

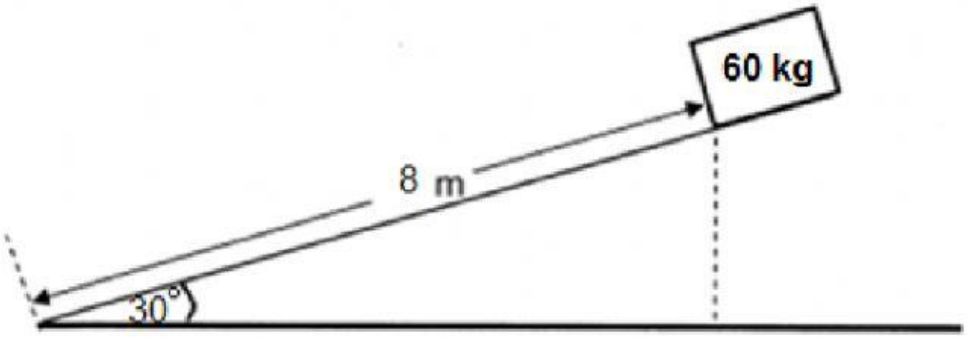
11.5



$F_{g\parallel}$ = _____

$F_{g\perp}$ =_____

11.6



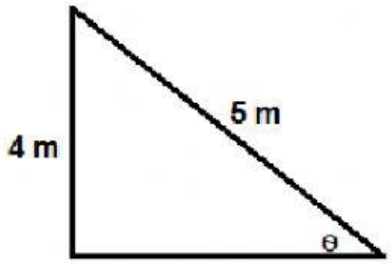
$F_{g\parallel}$ = _____

$F_{g\perp}$ =_____

Exercise 12

Calculate the unknown side, as well as the indicated angle in each of the following triangles.

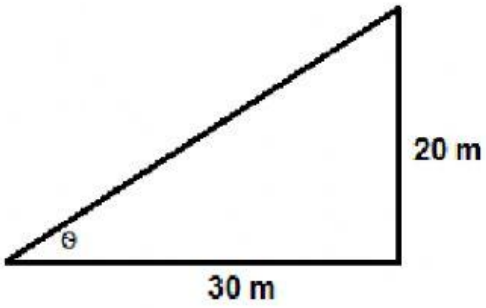
12.1



Side =

θ = °

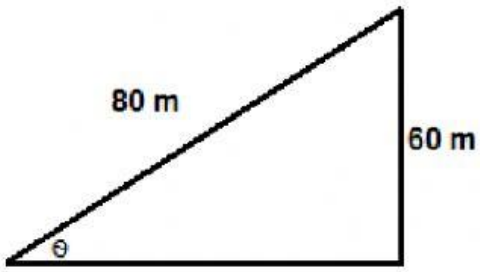
12.2



Side =

θ = °

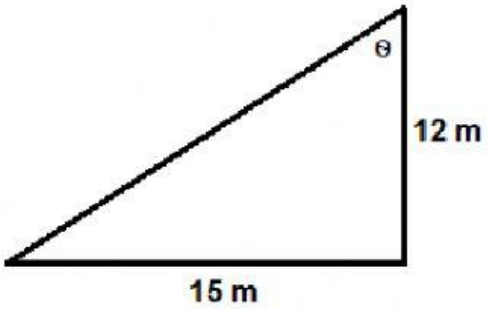
12.3



Side =

θ = °

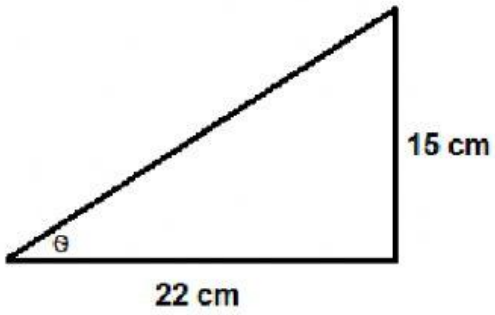
12.4



Side =

θ = °

12.5



Side =

Θ = °