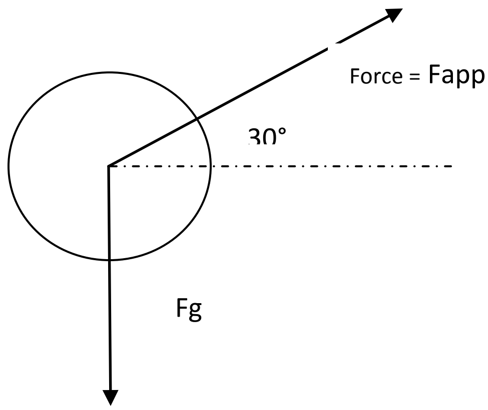
Forces in 2D – 2.4

You now know how to break vectors into 'x' and 'y' components. You also know how to analyze vectors with regards to these components separately ie: projectiles – analyze horizontal motion independently of vertical motion. Hurrah! You are ready to look at forces – just more of the same.

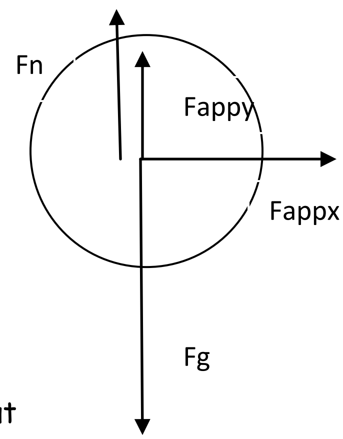
An adult is pulling a child on a sled with a force 'Fapp' at an angle 30° above the horizontal. The child and sled have a mass of 35 kg. What is the forward acceleration?



So..Fappx = (cos 30) x Fapp

Fappy = (sin 30) x Fapp

You will need to break the applied force into it's 'x' and 'y' components. See above formulas.



Since I put in Fappy and Fappx, I did not need to put in Fapp.

Notice that I also added in

Fn. **Tricky part**: The sled is not moving up or down so the vertical forces must be equal. So… Fn + Fappy = Fg. Notice Fn does not equal Fg!!

If I add friction to this system, you need to calculate it with the following familiar formula:

Ff = μFn …you need to calculate Fn using: Fn + Fappy = Fg

So…

#1 Fg = mg

#2 Fappy = cos30 •Fapp

#3 Fn = Fg – Fappy

#4 Ff = μFn That gives you Friction !!!

If I know friction and Fappx and the mass of the object, I **can calculate the acceleration**!