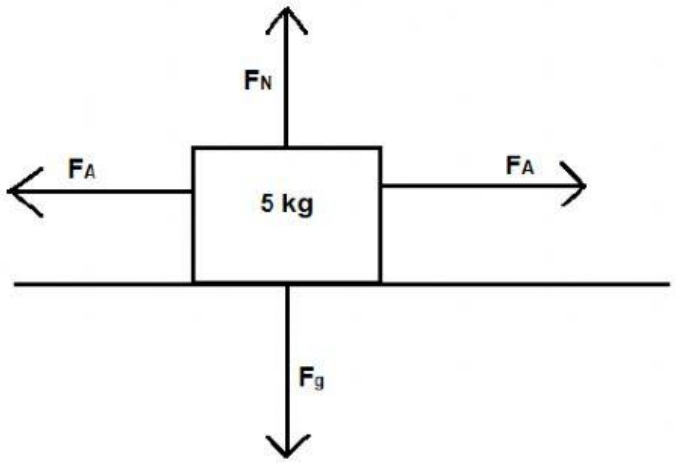
Newton's laws worksheet 7

Examples: Newton's 1st law

State whether the following objects will be

- Remain stationary,
- (move at a)constant velocity,
- accelerate left,
- accelerate right,
- accelerate up or
- accelerate down.

1. A box of mass 5kg, is resting on a table and is pulled to the right with a force of 40 N and to the left with a force of 40N.



Check whether the horizontal and vertical forces balance out

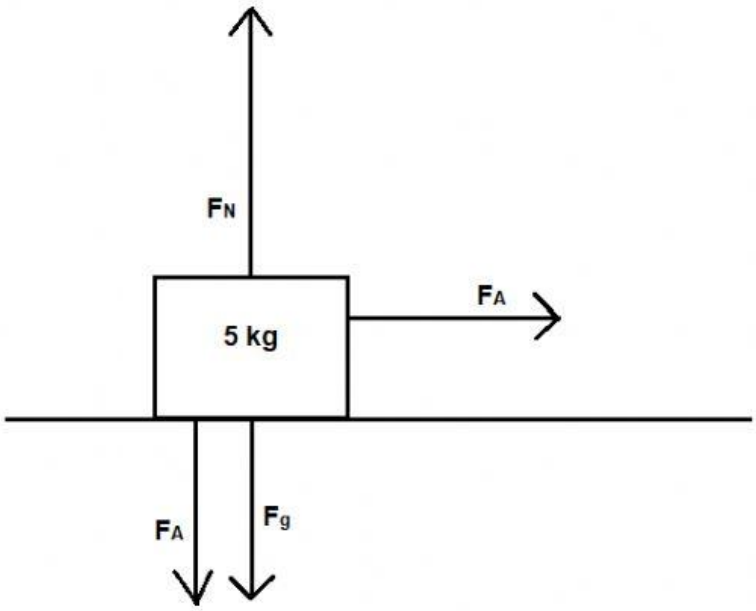
Horizontal: $F_A$left = $F_A$right

Vertical: $F_g = F_N$ (the table exerts a force upwards on the box)

Thus the object will _____ _____ {2 words}

2. A box of mass 10kg is pushed down on the floor with a force of 100N.

Then pulled to the right at 50N.



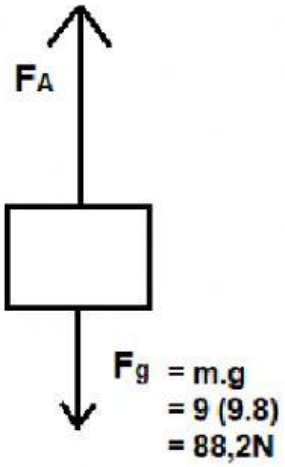
Check whether the horizontal and vertical forces balance out

Horizontal: $F_A$right

Vertical: $F_N = F_g + F_A$ (the normal force of the table pushing up on the box needs to be greater than in example 1, since someone is pushing the box down on the table now too).

Thus the object _____ _____

3. An object with a mass of 9 kg is lifted with a force of 120N

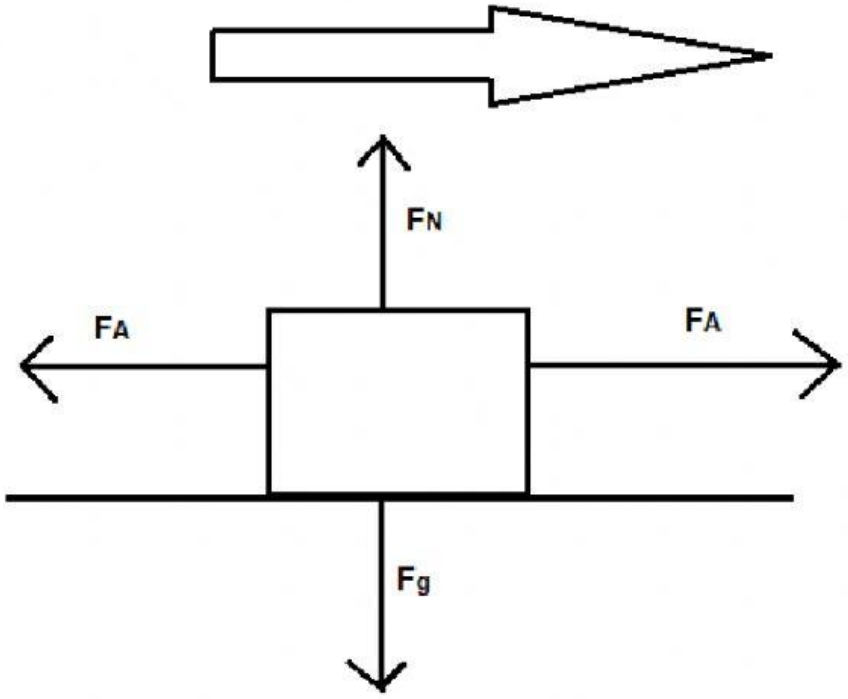


Notice that there is no normal force on the object, since it is not resting on an object

$F_A > F_g$

Thus the object will _____ _____

4. An object is accelerating to the right when a force of 100 N is applied to the right. When in motion a force of 100 N is applied to the left.



Horizontal: $F_A$left = $F_A$right

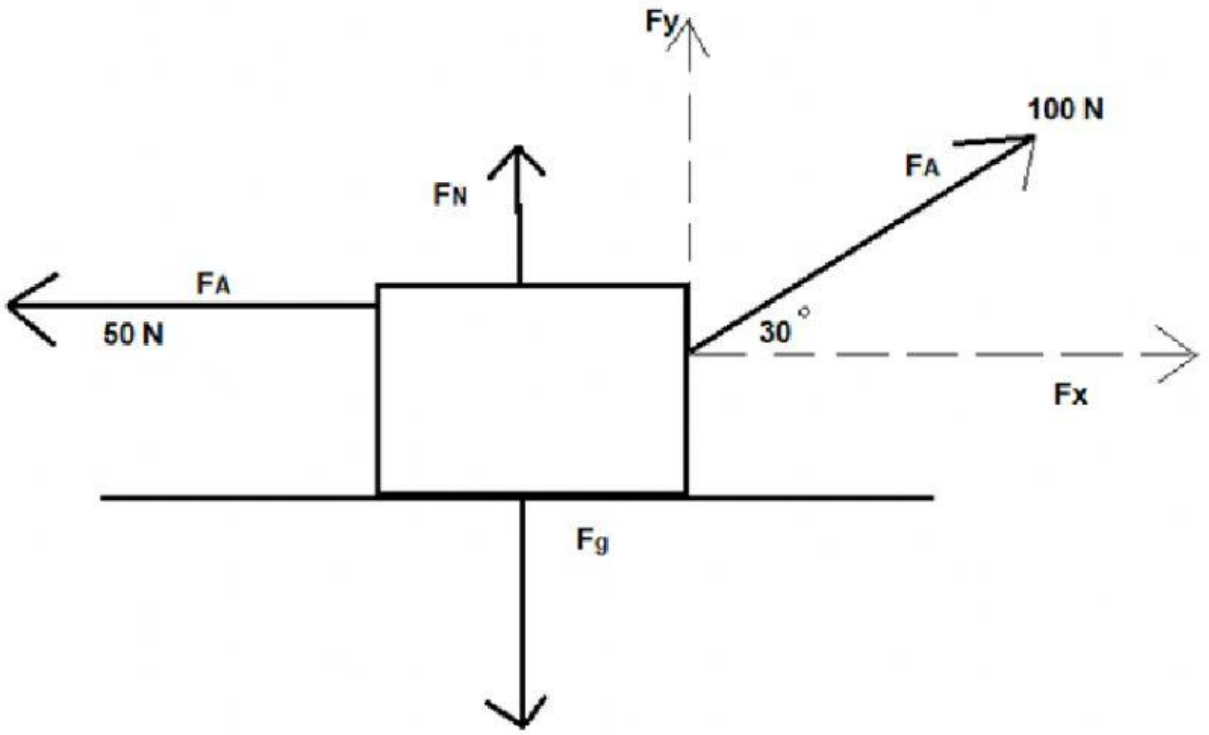
Vertical: $F_g = F_N$ (the table exerts a force upwards on the box)

Thus the object moves at a constant velocity to the right

But why does the object not become stationary?

Since it was already in motion when the forces balanced out, it would continue to move, but at a _____ _____

5. A 7kg object is pulled to the right with a force of 100 N and at an angle of 30° to the horizontal and to the left with a force of 50 N.



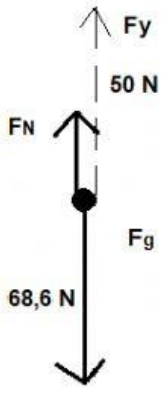
If you pull an object at an angle you need to calculate the Fx and Fy components first

Fx = F.cos Θ

= 100. Cos 30

= 86,60 N right

The 86,6 N force to the right is greater than the 50 N force to the left.



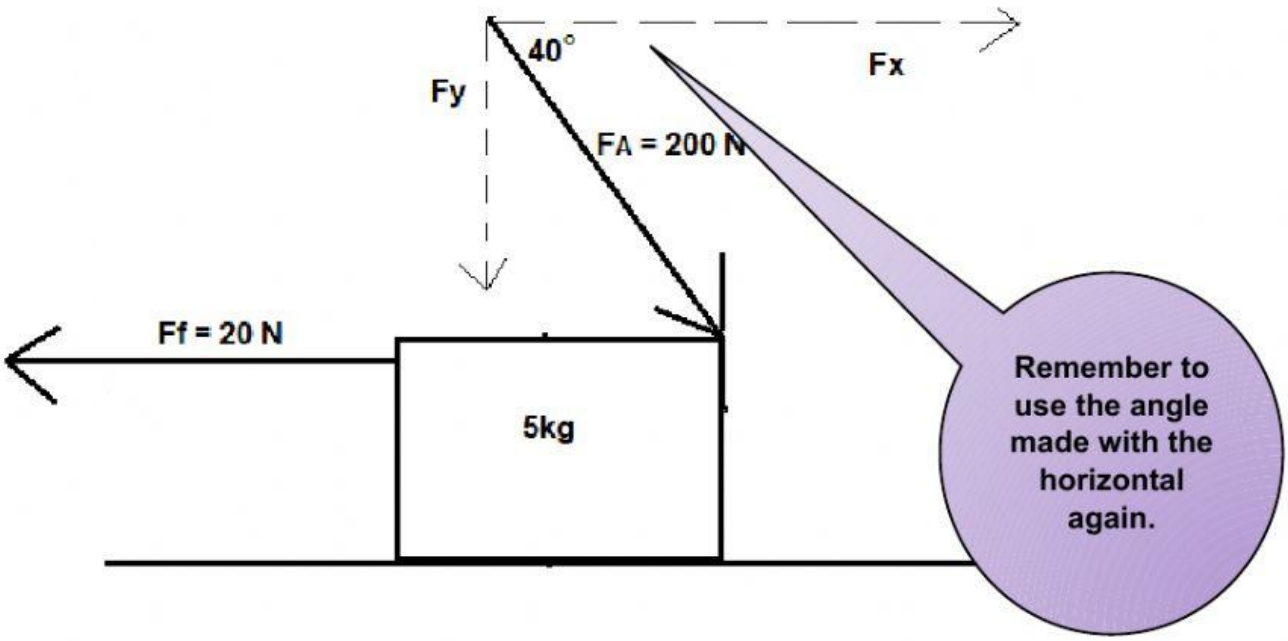
You can assume here that the vertical forces balance out

and thus the object doesn't move vertically

The vertical forces balance out and the object just ends up:_____ _____

6. A 5kg box is pushed down with a force of 200 N at an angle of 40° to the horizontal.

There is a frictional force of 20 N on the box to the left.



Horizontal forces:

Fx = F.Cos Θ

= 200 (cos 40)

= 153,21 N

Ff = 20 N

Thus Fxnet = Fx – Ff

= 153,21 – 20

= 133,21 N

The object : _____ _____