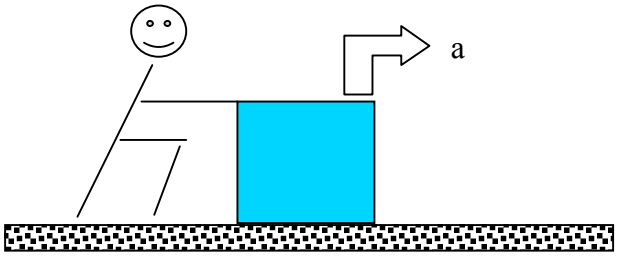
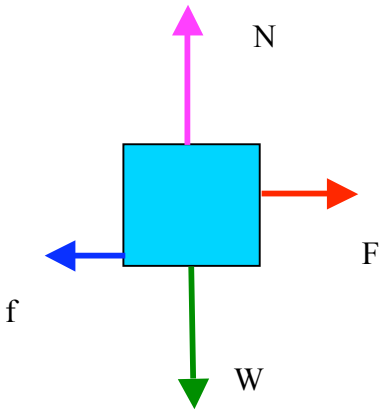
Physics 103 FBD Name_____

The diagram below illustrates you pushing a box horizontally across a rough surface.





(a) Using the box on the right, draw arrows representing each force acting on the box. Give each force a label. (FBD)

(b) For each force acting on the box, write a one sentence description of the force. (ie. W=force of gravity pulling down on the box due to the earth)

N->force of the ground pushing up on the box (contact force perpendicular to surface of contact)
W -> Force of the earth pulling down on the box (gravitational force)
F -> Force of person pushing on the box
f -> frictional force of the ground dragging on the box (contact force parallel to surface of contact)

(c) For each force, give a one sentence description of the third law partner for that force. (each of these forces is equal in magnitude and opposite in direction to the force on the box described in (b))

N-> force of the box pushing down on the ground (contact force perpendicular to surface of contact)
W -> Force of the box pulling up on the earth (gravitational force)
F -> Force of box pushing on the person
f -> frictional force of the box dragging on the ground (contact force parallel to surface of contact)
Note that the normal force is NOT the third law partner of the gravitational force. Think about an object falling through the air where there is no normal force, but there is still a gravitational force between the earth and the object.

(d) Using Newton's second law, write down an equation for the forces in the x-direction and an equation for the forces in the y-direction.
$\Sigma F_x = F - f = ma_x$ (where m is the mass of the box)
$\Sigma F_y = N - W = ma_y = 0$ (because there is no acceleration in the y-direction)