Newton's 2nd Law

For each problem, draw a free body diagram. Have the length of the arrows represent the magnitude of the force.   All calculations must be shown.

1. An 8.0 kg box is pulled across a smooth, frictionless floor by a force of 77 N applied by a rope.

a) What is the normal force on the floor? __78 N__   b) What is the acceleration of the box? __9.6 m/s²__

Draw FBD	Calculation A	Calculation B
$\uparrow F_N$ $\boxed{8} \rightarrow 77N$ $\downarrow F_g = Mg$ $= 8(9.8)$ $= 78 N$	$F_{NET_y} = 0$ $F_N - F_g = 0$ $F_N = F_g = 78\ N$	$F_{NET_x} = ma$ $77 = 8a$ $a = \dfrac{77}{8} = 9.6\dfrac{m}{s^2}$

2. An 8.0 kg box is pulled across a smooth, frictionless floor by a force of 77 N applied by a rope at a 40° angle to the floor.

a) What is the normal force on the floor? __29 N__   b) What is the acceleration of the box? __7.4 m/s²__

Draw FBD	Calculation A	Calculation B
F_N $\uparrow 77\sin 40 = 49N$ $\boxed{8} \rightarrow 77\cos 40$ $= 59 N$ $\downarrow$ $F_g = 78N$	$F_{NET_y} = 0$ $F_N + 77\sin 40 - 78 = 0$ $F_N = 78 - 49$ $F_N = 29\ N$	$F_{NET_x} = ma$ $59 = 8a$ $a = 7.4 m/s^2$

3. An 8.0 kg box is pushed across a smooth, frictionless floor by a force of 77 N applied at a 35° angle to the floor.

a) What is the normal force on the floor? __127 N__   b) What is the acceleration of the box? __7.4 m/s²__

Draw FBD	Calculation A	Calculation B
$\uparrow F_N$ $\boxed{8} \rightarrow 59N$ $\downarrow \downarrow 49 N$ $F_g = 78N$	$F_{NET_y} = 0$ $F_N - 49 - 78 = 0$ $F_N = 127N$	$F_{NET_x} = ma$ $59 = 8a$ $a = 7.4\ m/s^2$