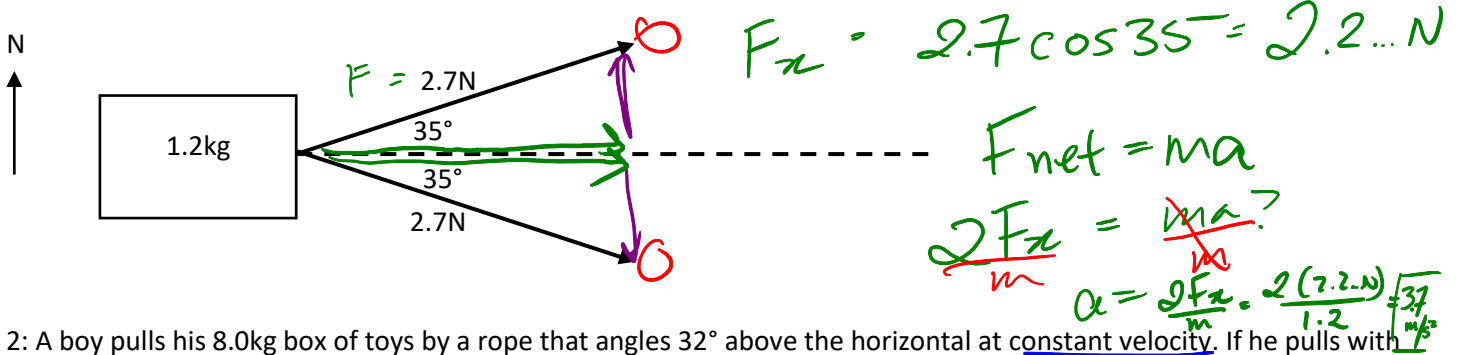


**3.1 Forces in 2D**

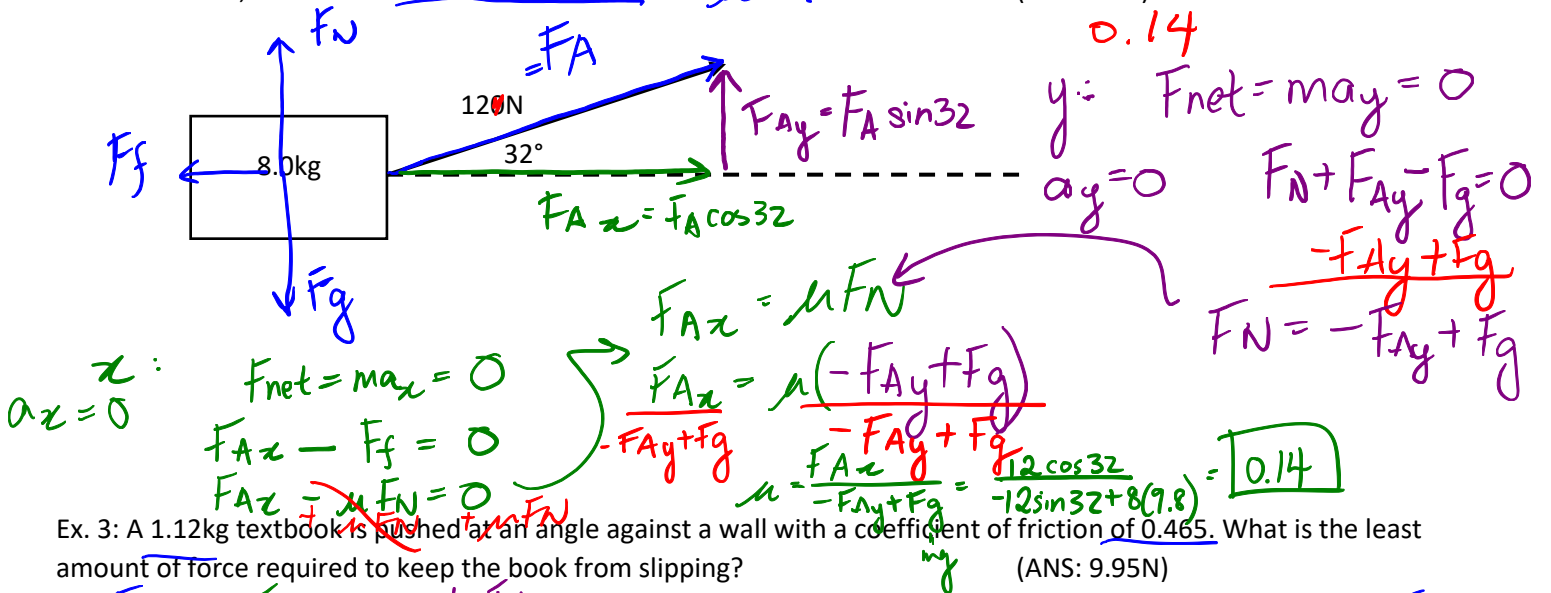
Review: In grade 11, we've mostly dealt with forces acting in 1 dimension. What happens when we have forces acting on an object in 2D?

Key point: break your forces down into horizontal and vertical components and resolve these separately. Similar as last unit, you're breaking a 2D problem into 2 x 1D problems.

Ex. 1: Two children pull a toboggan (1.2kg) as shown below. If they pull on the ropes parallel to the ground, determine the acceleration of the toboggan. Friction is negligible. (ANS: 3.7m/s<sup>2</sup>)



Ex. 2: A boy pulls his 8.0kg box of toys by a rope that angles 32° above the horizontal at constant velocity. If he pulls with a force of 120N, what is the coefficient of friction? (ANS: 0.14)



Ex. 3: A 1.12kg textbook is pushed at an angle against a wall with a coefficient of friction of 0.465. What is the least amount of force required to keep the book from slipping? (ANS: 9.95N)

