# IB Physics SL1 - Forces on Inclined Plane Problems

**Directions: Complete each problem IN your notebook. - Draw a complete and well labled FBD showing weight, wt. component directed INTO RAMP (perpendicular), wt. component directed DOWN ramp (parallel to surface), applied force (if any), friction.**

1. A car is sitting at the top of a 14.5 degree hill. If the car has a mass of 575 kg and a coefficient of friction of 0.21. What is the net force? [Draw free body diagram]

Step 1 Find $F_g$
Step 2 Find $F_{gx}$ and $F_{gy}$
Step 3 Find $F_N$
Step 4 Find $F_f$
Step 5 Find $F_{net}$

Will the car roll down the hill?

2. A 750 kg car is sitting at the top of Columbia hill (27.5 degree) and accelerates from rest to the school the engine applies a force 1100 N while the coefficient of friction is 0.44.
a) What is $F_{net}$?
b) What is the car's acceleration?
c) How fast will the car be going at the bottom of the hill 425 m below, if the driver does not hit the brakes?

3. For Columbia hill, what force would be necessary to accelerate a car from rest up the hill from Dairy Mart to the school, 475 m down the hill, in 45 seconds?

4. Jerrica is pulling a sled with a force of 275 N at a 63 degree angle above the horizontal. The sled and the contents have a mass of 65 kg. The coefficient of friction is 0.293. If she starts pulling the sled from rest…
a) What is the net force?

b) What is the net acceleration?

c) How much time will it take her to drag the sled 75 m across the softball field?

5. J Schmidt is pushing 575 N on a 18.5 kg lawnmower at am angle of 27 degrees below the horizontal to move at a constant speed. [HINT – DRAW AN ACCURATE PICTURE]
a) What is the normal force?

b) What is the frictional force?

c) What is the coefficient of friction?