**Force and Projectile Motion Problems**

1. Mireille and Sadie want to hit Miss Takken’s car and put a dent in it. If they can only launch a 4 kg Physics textbook horizontally off a 10.1 m high roof and the car is parked 12 m away with which velocity do they need to launch the book to ensure a direct hit?

2. Aly and Josie are sitting in a 2000 kg parked car when Kayla and Byron suddenly slam into the front of their car with a moving 1500 kg car imparting a 45 000 N force. If the coefficient of friction between Aly and Josie’s car and the road is 0.36 determine the acceleration of their car. Include a FBD with all applicable values.

3. Jayden is at the airport flying off to a sunny destination. Jayden decides to ride the movable sidewalk (velocity 4 m/s [E]) at the airport (not because it is any faster than walking but when do you get to ride a movable sidewalk otherwise!). Jayden looks down and notices a duck walking at a speed of 2 m/s [S] on the same sidewalk. Having always been secretly afraid of ducks, Jayden turns around and runs at a velocity of 5 m/s [W]. According to Carson located beside the movable sidewalk at a speed of 0 m/s

a. What is Jayden’s velocity relative to Carson?

b. What is velocity of the duck relative to Carson?

4. Brad and Owen are trying to push a large cumbersome physics device, with Patrycja, Madelyn and Simon sitting on top with a mass of 220 kg combined, across the floor. Brad pushes with a force of 450 N [NE] with his mass of 66 kg and Owen pushes with a force of 560 N [S50°E] with his 65 kg. If the coefficient of friction between the floor and the 400 kg physics device is 0.35 how far can they push the device in 10 s (assuming they start from rest and continue to apply the same unbalanced force the whole time)?

5. Mark, Matt and Alex are trying to pull a 150 kg sled up a 15° incline. As well Skye, Mackenzie and Jeremy are sitting on the sled and each have a mass of 70 kg (very large sled). If the coefficient of friction between the sled and the incline is 0.34, what force do each of the three students need to apply to move the sled up the incline with constant velocity? (Assume they share the load equally and act straight up the incline)

6. a. The force of gravity between Planet Sagar and Planet Byron is 5.6 x 104 N. If they are at a distance of 4.5 time the radius of the earth from each other what are their respective masses? (Assume Sagar is the same mass as Byron)

b. If Sagar went to Jupiter what would his mass be?

c. If Byron went to the moon what would be his weight? (g = 1.6 m/s2)

7. Jeremy and Simon play a game involving pushing a box full of physics textbooks (50 kg) and seeing how far it will slide. The box and floor have a coefficient of friction of 0.22. If Jeremy gives the box an initial velocity of 5 m/s during her turn how far will the box travel before stopping? If Simon gives the box an initial velocity of 6 m/s, but Alex throws in two extra books of 3 kg each (just before he lets go), how far is he able to slide the box before it comes to rest?