

Part B

1. Use Newton's Laws of Inertia to explain the following.
 - a) A person dressed for the winter is standing outdoors in the middle of a pond on frictionless ice. What would the person do, without help from anyone else, in order to reach the shore?
 - b) A car is driving on an icy road. It tries to turn around a curve but continues in a straight line and ends up in the ditch.
 - c) You are riding on a bus that is moving at 5 m/s south. You toss a coin straight upwards into the air. You do not move your hand. The coin lands in your hand.
 - d) According to a legend, a horse, having studied physics, learned Newton's laws. When it was told to pull a cart, it refused, saying that if it pulled the cart forward, according to Newton's Third Law, there would be an equal but opposite reaction force. Thus, there would be balanced forces acting on the cart and, according to Newton's Second Law, the cart would not accelerate. How would you reason with this horse?
2. A horizontal force of 75.0 N accelerates a person on a skateboard, with total mass of 65.0 kg, at 0.900 m/s/s.
 - a) What is the net force acting on the skateboard and its rider?
 - b) Draw a free-body diagram of this situation.
 - c) What is the force of friction in this case?
3. Two forces act on a sled of mass 80.0 kg. One force of 125 N acts in a southerly direction. A second force of 175 N acts in a westerly direction. The sled is pulled over a level snow-covered surface and accelerates at 1.50 m/s².
 - a) Draw a free-body diagram showing the view from the top.
 - b) What is the net force accelerating the sled?
 - c) What is the sum of the two given forces?
 - d) What is the force of friction on the sled?
 - e) If the sled starts from rest, what is the displacement during the first 3 seconds?
4. A force of 50.0 N acting 35° from the horizontal is pulling a toboggan and passenger, total mass of 50.0 kg, along a level snow-covered surface. From rest, the toboggan moves 5.00 m in 3.5 s.
 - a) Calculate the acceleration.
 - b) What is the net force pulling the toboggan forward?
 - c) Draw a free-body diagram (side view).
 - d) Determine the force of friction.

