PHY 621

Forces Applied At An Angle

Problems broken down into smaller steps (good for terminology review):

1. Charlie is helping to move a table, with a mass of 98.4 kg, for his mother. He pulls on the table with a force of 950. N applied at an angle of elevation of 50 degrees. He starts to drag the table east across the floor. The coefficient of kinetic friction for the wood against the tile is 0.296.
   a) What is the vertical component of the force Charlie is applying?
   b) What is the normal force acting on the table?
   c) What is the force of kinetic friction acting on the table?
   d) What is the horizontal component for the force Charlie is applying?
   e) What is the horizontal acceleration of the table?

2. Bob is scooping snow. On the scoop he exerts a force of 675 N at an angle of depression of 60 degrees to the horizontal. The scoop has a mass of 8.5 kg. The scoop moves horizontally to the East at a constant speed across the snow covered asphalt.
   a) What is the vertical component of the force that Bob is applying?
   b) What is the normal force acting on the scoop?
   c) What is the horizontal component of the force that Bob is applying?
   d) What is the force of kinetic friction acting on the scoop?
   e) What is the coefficient of kinetic friction for the scoop-on-snow covered asphalt?

Problems NOT broken down into so many small steps!

3. Darcie pulls a little sled, of mass 12.9 kg, along the snow by applying a force along the handle. The handle is elevated at an angle θ to the horizontal. The sled is accelerating eastward at 0.234 m/s^2. The sled is moving against a kinetic friction force of 16.2 N[W]. The coefficient of kinetic friction is 0.188.
   a) What is the normal force acting on the sled?
   b) What is the vertical component of the force that Darcie is applying along the handle?
   c) What is the size of the applied force and what is the angle θ?

4. James, our super custodian, pushes a dry mop at a constant speed across the cafeteria floor. The coefficient of sliding friction for the mop against the floor is 0.215. He pushing with a force of 33.6 N at an angle of depression of 28 degrees to the horizontal. What is the mass of the mop?

5. Linda and Monica are about to move wooden chest of mass 63.85 kg along a vinyl floor. The coefficient of kinetic friction for the wood-on-vinyl interface is 0.4262. On the count of three, Linda pulls the chest from the front with a rope exerting a tension force of 250.N [E 30^0 up]. And, Monica pushes it from behind at an unknown angle to the horizontal. The chest begins to move with an acceleration of 1.009 m/s^2 [E] even though a friction force of 247.8 N opposes the motion. What was the size and direction of force exerted by Monica?

Answers: **1**a) 728 N [up] b) 238 N [up] c) -70.3 N [up] d) 611 N [E] e) 5.49 m/s^2 [E]
2 a) -585 N [up] b) 668 N [up] c) 338 N [E] d) – 338 N [E] e) 0.505
3 a) 86.2 N [up] b) 40.4 N [up] c) 44.7 N [E 64.5 $^\circ$ up]
4. 12.5 kg
5. 1.2 x 10^2 N [E 39.9 $^\circ$ down]