

W3.12**DYNAMICS $\Sigma F \neq 0$ – KEY****Word problems**

For each question sketch a picture and draw a FBD.

- 1) A 10-kg “dead donkey in cement” is pulled to the right across a rough floor ($\mu \neq 0$) by a horizontal force of 40 N. If the “donkey” accelerates to the right at 1 m/s^2 , what is the μ between the floor and the “donkey”? $\mu = 0.3$
- 2) A horizontal force pushes a 20-kg crate to the right across a rough floor where $\mu = 0.5$. If the crate accelerates to the right at 6 m/s^2 , what is the magnitude of the horizontal push? $F_{\text{push}} = 220 \text{ N}$
- 3) A 40-kg safe is pulled to the right across a rough floor ($\mu \neq 0$) by a rope angled at 36.87° above the horizontal. If the tension in the rope is 200 N and the safe accelerates to the right at 2.5 m/s^2 , what is the μ between the safe and the floor?
 $\mu = 0.214$
- 4) A large 1kg basketball falls 20 meters in 4 seconds starting from rest. (Hint: What is the acceleration?) What is the average drag force (air resistance) acting upwards on the ball as it falls? $F_{\text{air}} = 7.5 \text{ N}$
- 5) A 4-kg book is pressed horizontally against a rough wall ($\mu \neq 0$) by a force. If the book accelerates downward at 2 m/s^2 and the coefficient of friction between the wall and the book is 0.4, what is the size of the force? $F_P = 80 \text{ N}$
- 6) Drew, Bill and Keith push horizontally on Chuck (100-kg). Drew and Bill each push to the right with a force of “ $2F$ ” and Keith pushes to the left with a force of “ F ”. Chuck moves and accelerates to the right at 2 m/s^2 across the rough floor where $\mu = 0.5$. What is the magnitude of Keith’s push? $F = 233 \text{ N}$
- 7) A block of unknown mass is pulled across a horizontal surface with a force of 50 N. If the μ between the surfaces is 0.2 and the acceleration of the block is 5 m/s^2 , what is the mass of the block? $\text{mass} = 7.14 \text{ kg}$
- 8) A 10-kg child is pushed up a 36.87° ramp by a force, P (parallel to the surface of the ramp). If the child accelerates at 4 m/s^2 (up the ramp) and the μ between the surfaces is 0.2, what is the magnitude of P ? $F_P = 116 \text{ N}$