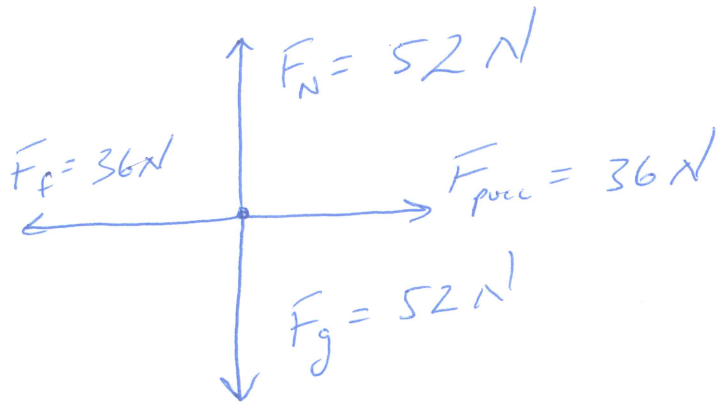


17) $F_g = W_{\text{sled}} = 52 \text{ N}$

$F_{\text{pull}} = 36 \text{ N} \rightarrow$

$\mu_k = ?$



$$F_{f_k} = \mu_k F_N$$

$$\mu_k = \frac{F_{f_k}}{F_N}$$

$$= \frac{36 \text{ N}}{52 \text{ N}}$$

$$= .69$$

SINCE THE PROBLEM STATES THE SLED IS MOVING AT A CONSTANT SPEED THEN ALL FORCES MUST BE BALANCED

$$\Rightarrow F_{\text{pull}} = F_{f_k}$$

18) $m = 105 \text{ kg} \Rightarrow w = F_g = m g = F_N$

$F_{f_s} = 102 \text{ N}$

$\mu_s =$

$$= (105 \text{ kg})(9.81 \text{ m/s}^2)$$

$$= 1030.05 \text{ N}$$

$$F_{f_s} = \mu_s F_N$$

$$\mu_s = \frac{F_{f_s}}{F_N} = \frac{102 \text{ N}}{1030.05 \text{ N}} = .099$$

.10

$$19.) W = F_g = 134 \text{ N} = F_N$$

$$\mu_s = .55$$

$$F_{f_s} = \mu_s F_N$$

$$F_{f_s} = ?$$

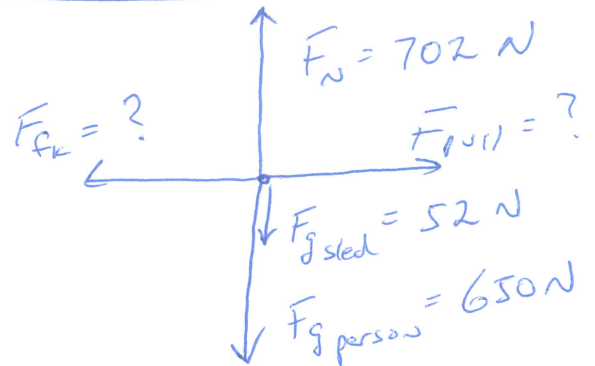
$$= (.55)(134 \text{ N})$$

$$= \boxed{73.7 \text{ N}}$$

$$20.) \mu_k = .12$$

$$W = F_{g_{\text{person}}} = 650 \text{ N}$$

$$F_{\text{pull}} = ?$$



CONSTANT SPEED \Rightarrow All Forces BALANCE

$$F_{f_k} = \mu_k F_N$$
$$= (.12)(702 \text{ N})$$

$$= \boxed{84.24 \text{ N}}$$

$$21) 5.8 \text{ N NEEDED FOR STEEL TO MOVE} = F_{f_k}$$

$$\text{DRY STEEL } \mu_k = .58$$

* First solve for F_N

$$F_f = \mu F_N \Rightarrow F_N = \frac{F_f}{\mu} = \frac{5.8 \text{ N}}{.58} = 10 \text{ N}$$

* THE PLOG W μ FOR STEEL TREATED WITH OIL

$$F_f = \mu F_N = (.06)(10 \text{ N}) = \boxed{.6 \text{ N}}$$