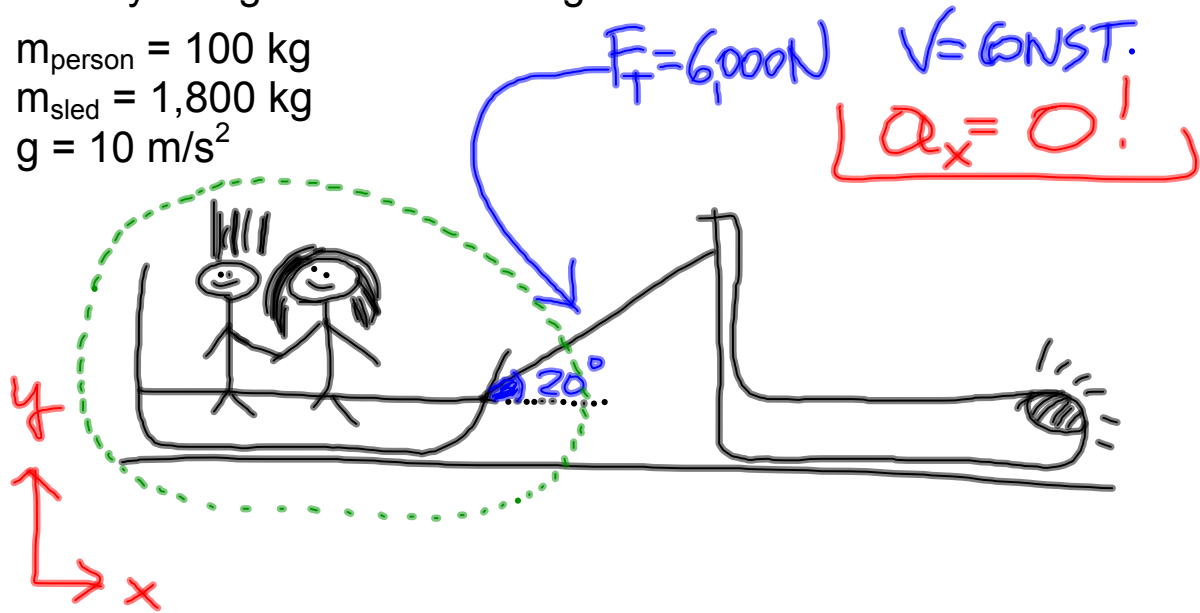


1. A snowmobile is pulling a sled with 2 people in it with constant velocity along a horizontal rough road.

$$m_{\text{person}} = 100 \text{ kg}$$

$$m_{\text{sled}} = 1,800 \text{ kg}$$

$$g = 10 \text{ m/s}^2$$

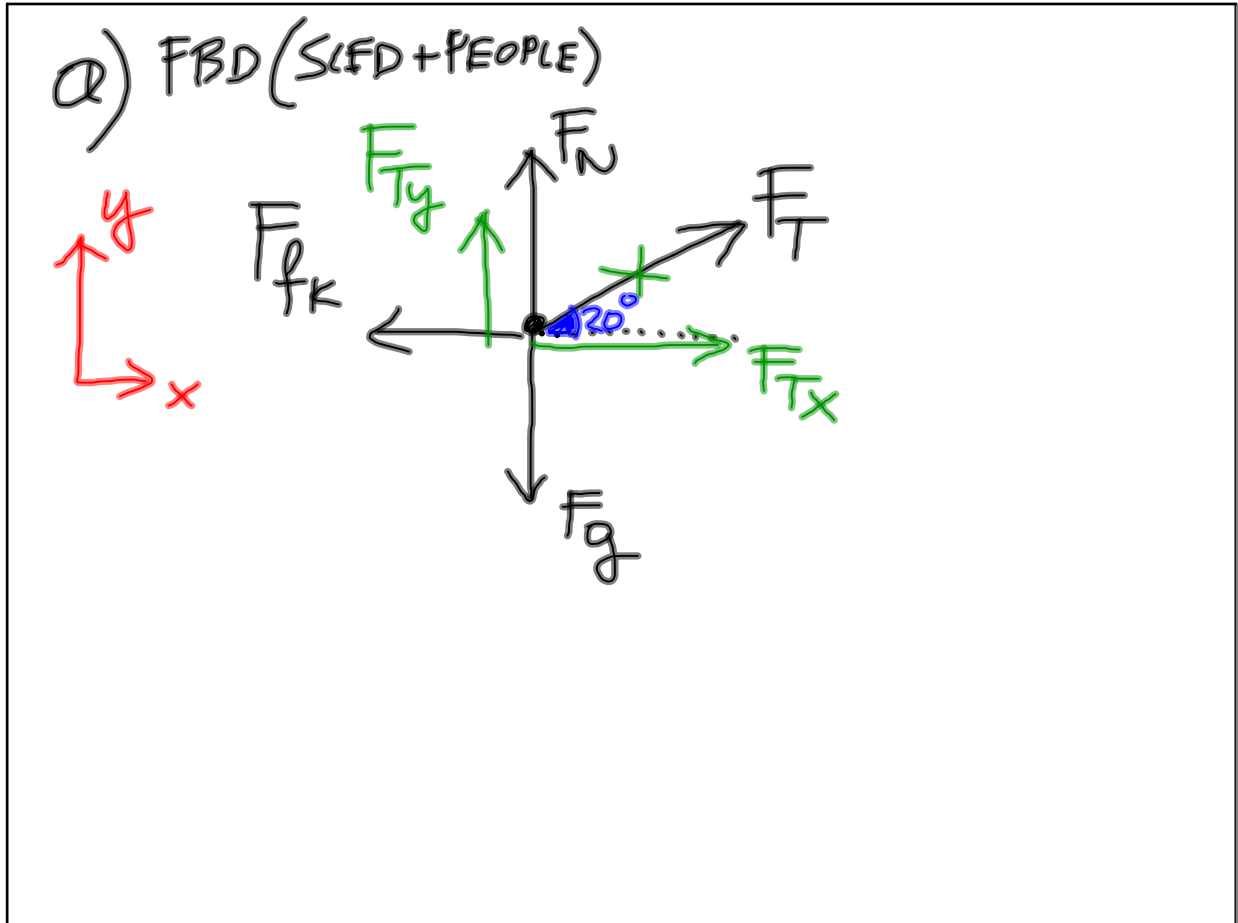


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- FBD (sled + people)
- What is the mass of the system?
- What is the weight of the system?
- $F_N = ?$
- $F_{fk} = ?$
- $\mu_k = ?$

g) Cable breaks; $a_x = ?$

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$$\begin{aligned} F_{Tx} &= F_T \cdot \cos(20^\circ) & F_{Tx} &= 6000 \cdot \cos(20^\circ) \\ F_{Ty} &= F_T \cdot \sin(20^\circ) & F_{Ty} &= 6000 \cdot \sin(20^\circ) \end{aligned}$$

$$\begin{aligned} F_{Tx} &= 5,638 \text{ N} \\ F_{Ty} &= 2,052 \text{ N} \end{aligned}$$

b) $m_{\text{SYS}} = m_{\text{SLED}} + m_{\text{PEOPLE}}$

$m_{\text{SYS}} = 2,000 \text{ kg}$

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$$c) F_g = m \cdot g$$

$$F_g = (2,000)(10)$$

$$F_g = 20,000 \text{ N}$$

$$d) \textcircled{y}: \text{N2L: } \sum F_y = m_{\text{sys}} \cdot a_y = 0$$

$$F_N + F_{Ty} - F_g = 0$$

$$F_N + 2,052 - 20,000 = 0$$

$$F_N = 17,948 \text{ N}$$

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$$e) \textcircled{x}: \text{N2L: } \sum F_x = m \cdot a_x = 0$$

$$F_{Tx} - F_{fk} = 0$$

$$F_{fk} = F_{Tx}$$

$$F_{fk} = 5,638 \text{ N}$$

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f)

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

$$F_{fk} = \mu_k \cdot F_N$$

$$\mu_k = \frac{5,638}{17,948}$$

$$\mu_k = 0.31$$

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