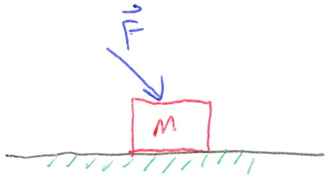
# FORCES: FRICTION – FUNDAMENTAL EXAMPLE SOLUTIONS

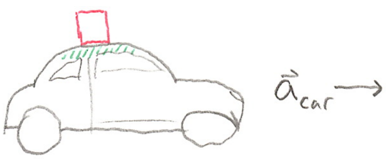
① 




WITHOUT FRICTION, THE BOX WOULD SLIDE TO THE RIGHT RELATIVE TO THE FLOOR. FRICTION ACTS IN THE OPPOSITE DIRECTION OF THAT RELATIVE MOTION. SO FRICTION ACTS TO THE LEFT.

ANS: a ←

② 



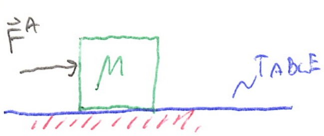

WITHOUT FRICTION, THE BOX WOULD SLIDE TO THE LEFT RELATIVE TO THE CAR ROOF. FRICTION ACTS IN THE OPPOSITE DIRECTION OF THAT RELATIVE MOTION. SO FRICTION ACTS TO THE RIGHT.

ANS: b) TO THE RIGHT

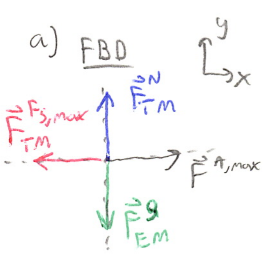
*ANOTHER WAY TO THINK ABOUT THIS....

THE BLOCK IS ACCELERATING WITH THE CAR TO THE RIGHT. THE ONLY HORIZONTAL FORCE ON THE BOX IS FRICTION. SO IT MUST ALSO POINT TO THE RIGHT.

③ 




a) FBD




$$\Sigma F_x = ma_x$$

$$|\vec{F}^{A,max}| - |\vec{F}^{Fs,max}_{TM}| = 0$$

$$|\vec{F}^{A,max}| = \mu_s |\vec{F}^N_{TM}|$$

$$\Sigma F_y = ma_y$$

$$|\vec{F}^N_{TM}| - |\vec{F}^g_{EM}| = 0$$

$$|\vec{F}^N_{TM}| = mg$$

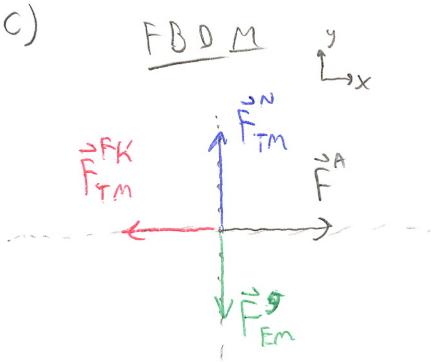
$$|\vec{F}^{A,max}| = \mu_s mg$$

b) IF $|\vec{F}^A| = \frac{1}{2} |\vec{F}^{A,max}|$

THE BOX WILL REMAIN STATIONARY WITH RESPECT TO THE TABLE SURFACE

c) NEXT PAGE...

c) FBD M




$$\Sigma F_y = m a_y$$

$$|\vec{F}^{N}_{TM}| - |\vec{F}^{g}_{EM}| = 0$$

$$|\vec{F}^{N}_{TM}| = mg$$

$$\Sigma F_x = m a_x$$

$$|\vec{F}^{A}| - |\vec{F}^{FK}_{TM}| = m a_x$$

$$|\vec{F}^{A}| - \mu_K |\vec{F}^{N}_{TM}| = m a_x$$

$$|\vec{F}^{A}| - \mu_K mg = m a_x$$

$$a_x = \frac{|\vec{F}^{A}| - \mu_K mg}{m}$$

$$a_x = \frac{20 - (0.3)(5)(9.8)}{5} \approx 1.1 \text{ m/s}^2$$