

You pull a 25.0 kg box across a waxed floor with a " μ " 0.220 and a force of 125 N directed 30.0° above the horizontal. What the acceleration?

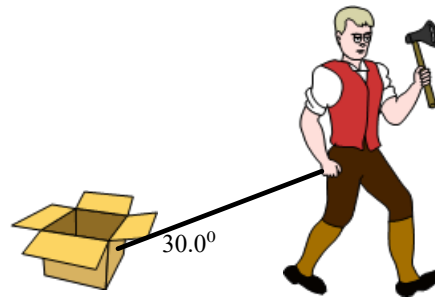
Steps to solve:

1) Data (conversions)

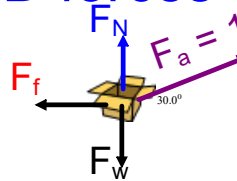
- $m_{\text{box}} = 25 \text{ kg}$
- $\hookrightarrow F_w = -245 \text{ N}$
- $f_a = 125 \text{ N}$ at 30.0°
- acceleration ?
- $\mu = 0.220$

2) ID Plane of Motion?

horizontal
now only forces "||", " \perp "



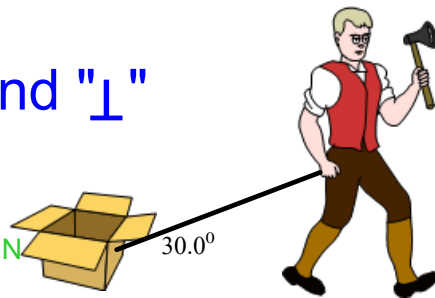
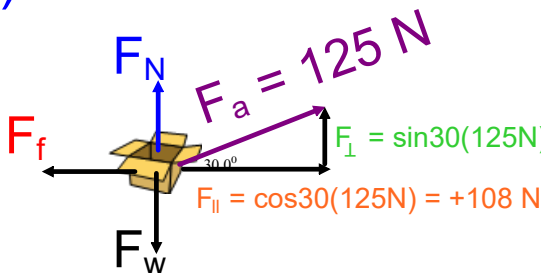
3) ID forces on object?



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Steps to solve:

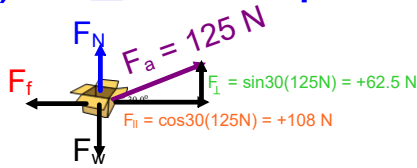
4) break all forces into "||" and " \perp "



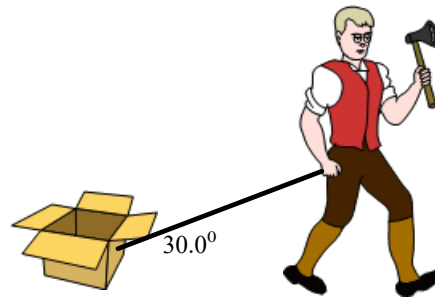
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Steps to solve:

5) \parallel, \perp "tee square" a) TM?



- b) Law?
- c) ΣF

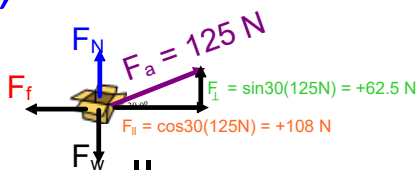


\parallel	\perp
TM? accel.	TM? rest
▣ 2nd Law	▣ 1st Law
$\Sigma F = ma$	$\Sigma F = 0$

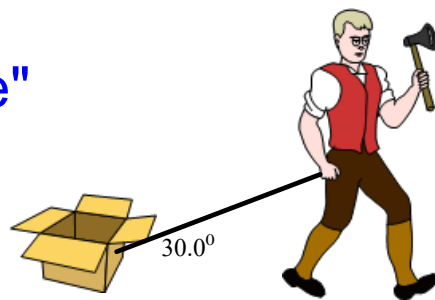
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Steps to solve:

6) List forces in "tee square"



- a) TM?
- b) Law?
- c) ΣF



\parallel	\perp
TM? accel.	TM? rest
▣ 2nd Law	▣ 1st Law
$\Sigma F = ma$	$\Sigma F = 0$
$F_f + F_{\parallel} = ma$	$F_w + F_N + F_{\perp} = 0$
$a = \frac{F_f + F_{\parallel}}{m}$	$F_N = -F_{\perp} - F_w$

7) Solve for your variable

In this case you need to find F_f to be able to calculate "a" in the parallel and you need to find F_N in the perpendicular to find F_f

$$a = \frac{(-42.6 \text{ N}) + (+108 \text{ N})}{25.0 \text{ kg}}$$

$$a = 2.6 \text{ m/s}^2$$

$$F_N = -(+62.5 \text{ N}) - (-245 \text{ N})$$

$$F_N = +183 \text{ N}$$

$$F_f = \mu F_N$$

$$F_f = 0.220(+183 \text{ N})$$

$$F_f = -42.6 \text{ N}$$

