Newton's 3rd Law

When one object exerts a force on a second object,

the second object simultaneously exerts an identical* force on the first object in the opposite direction.

* same magnitude & same kind of force

Action and reaction forces are always equal, even if the resulting motion is not

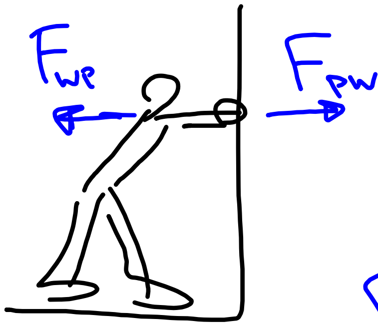
NAMING FORCES

Who pushes whom, which way?

(avoid force naming the type of force until the end)

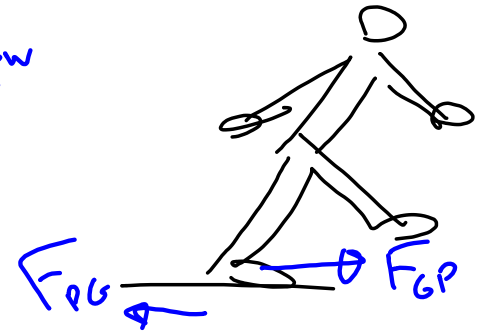
The person pushes the wall to the R

The wall pushes the person to the L



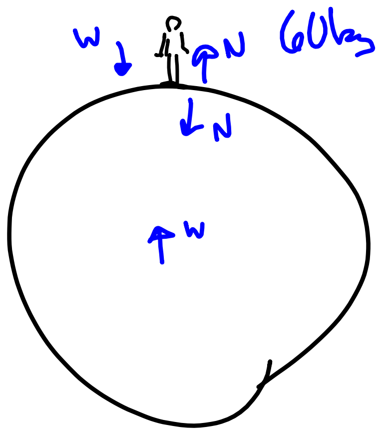
The person pushes the ground to L

The ground pushes the person to R



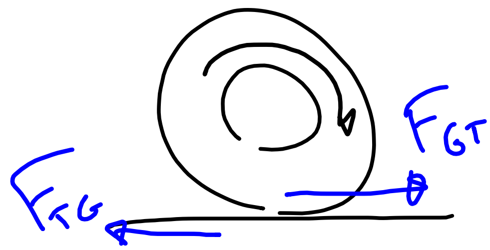
The person pushes the ground D

The ground pushes the person U



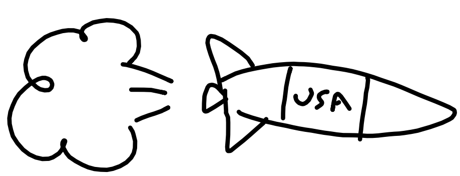
The tire pushes the ground to L

The ground pushes the tire to R

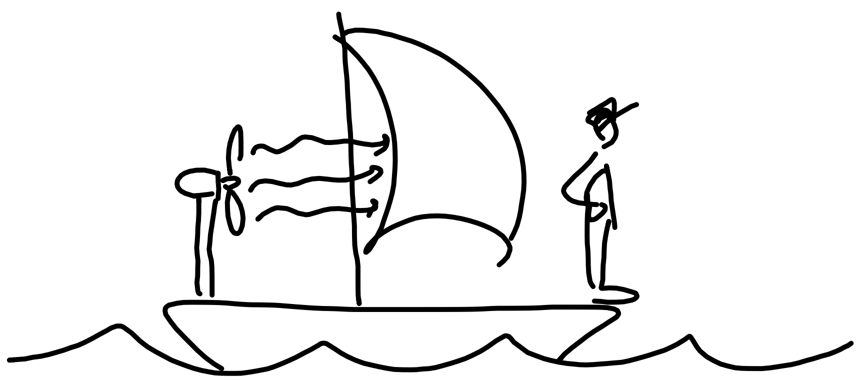


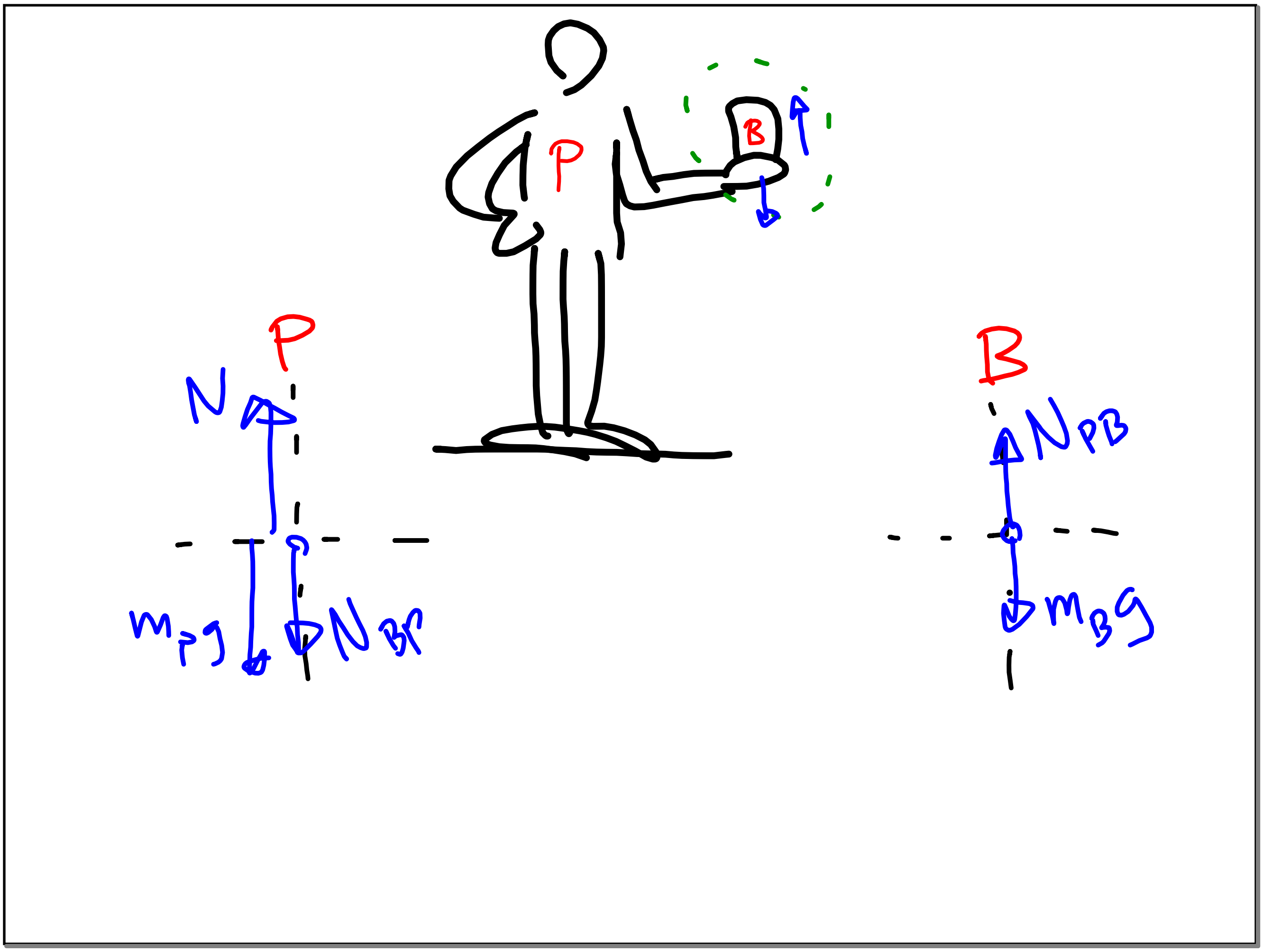
60 × 7,000,000,000

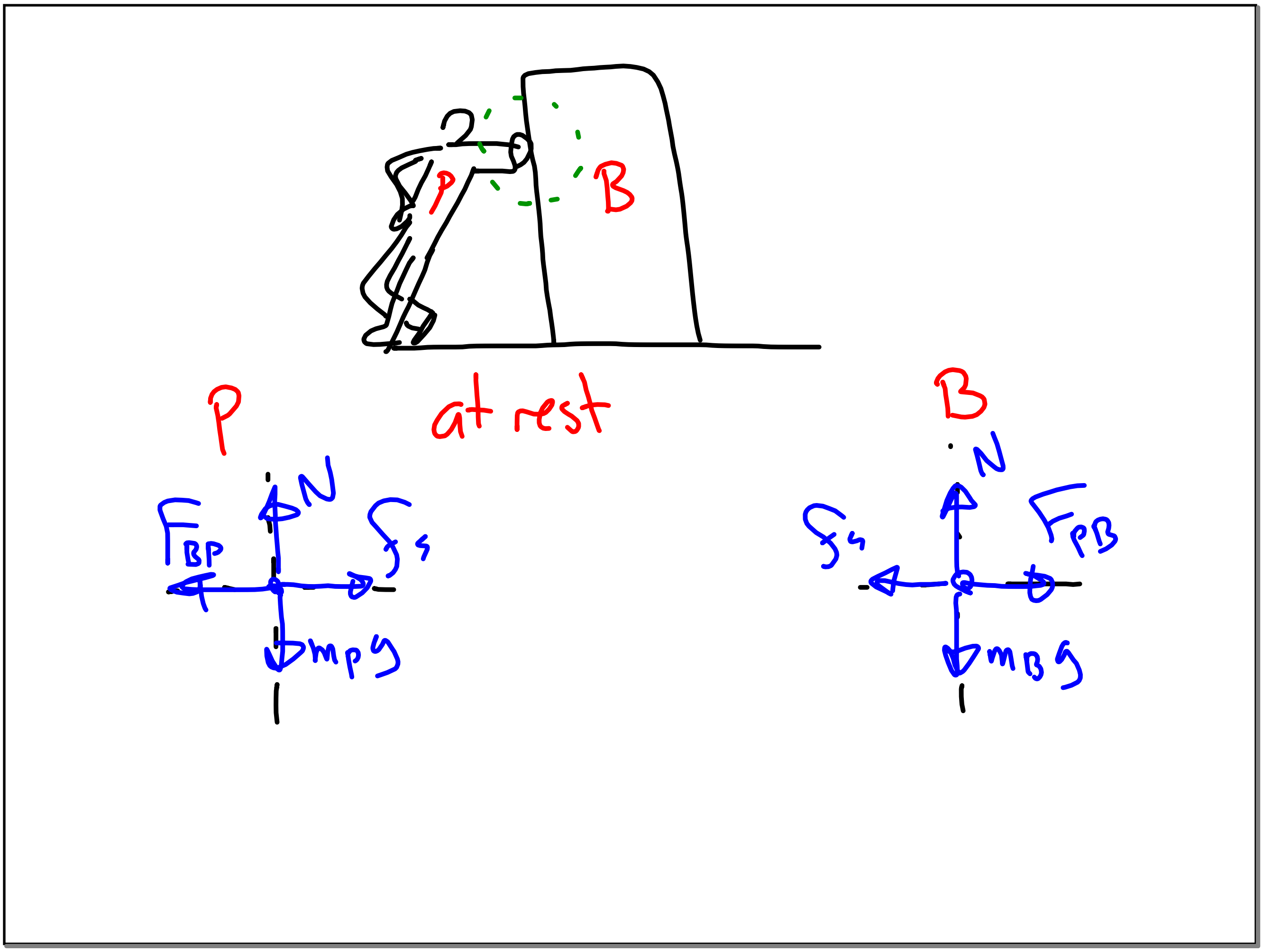
6,000,000,000,000,000,000,000,000 kg



Would this work?




P
B
P
N
$m_P g$
N_{BP}
B
N_{PB}
$m_B g$

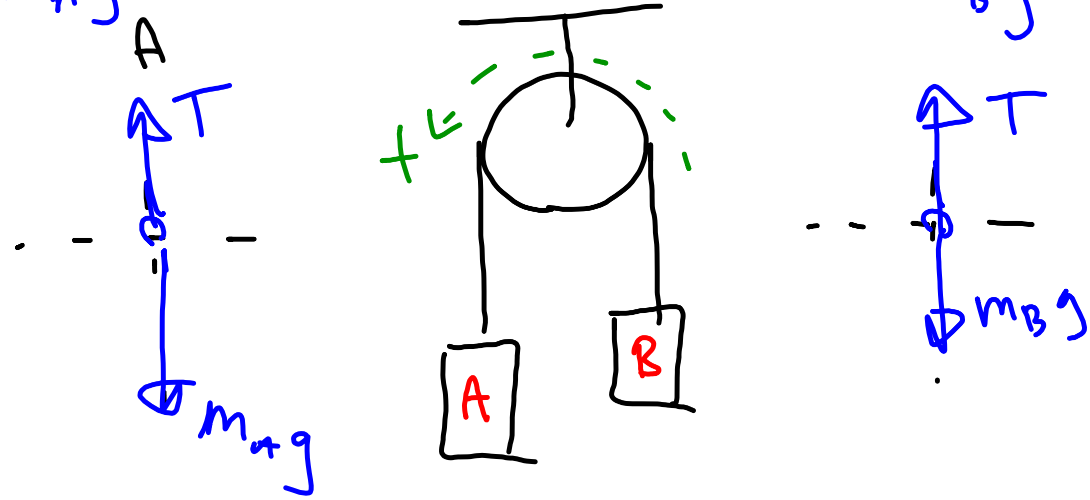

P
B
at rest
P
N
F_{BP}
f_s
$m_P g$
B
N
f_s
F_{PB}
$m_B g$

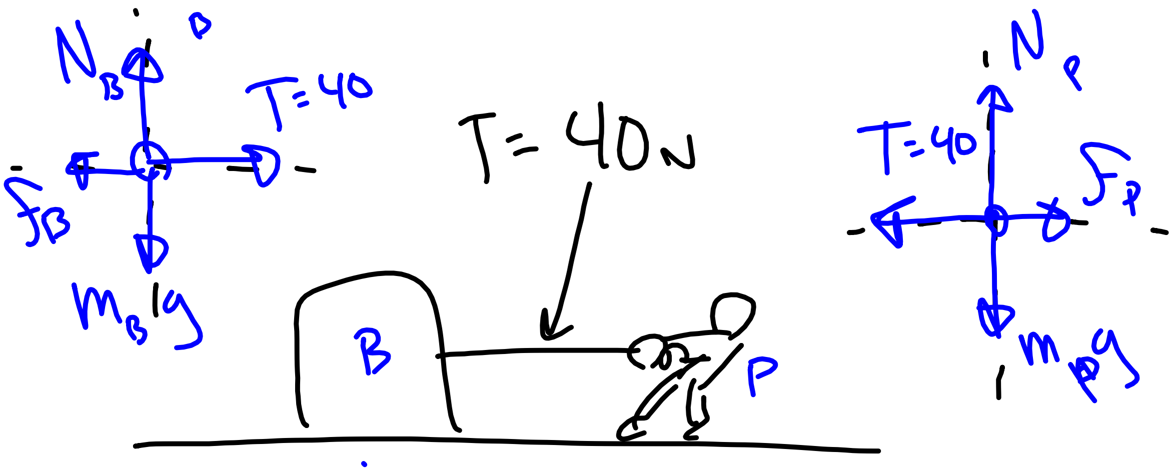
$$\sum F = ma$$

$$m_A g - T = m_A a$$

$$\sum F = ma$$

$$T - m_B g = m_B a$$



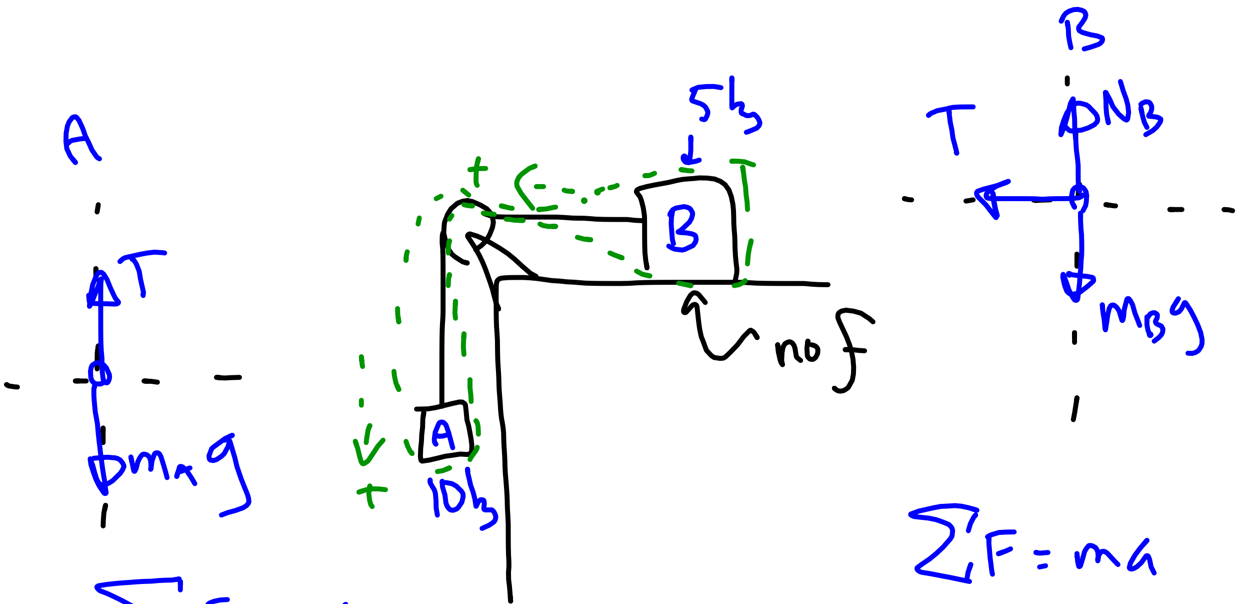


$$\sum F = ma$$

$$T - f_B = m_B a$$

$$\sum F = ma$$

$$f_P - T = m_P a$$



$$\sum F = ma$$

$$m_A g - T = m_A a$$

$$(10)(10) - T = 10a$$

$$100 - 5a = 10a$$

$$100 = 15a$$

$$\frac{100}{15} = a$$

$$6.7\,\text{m/s}^2 = a$$

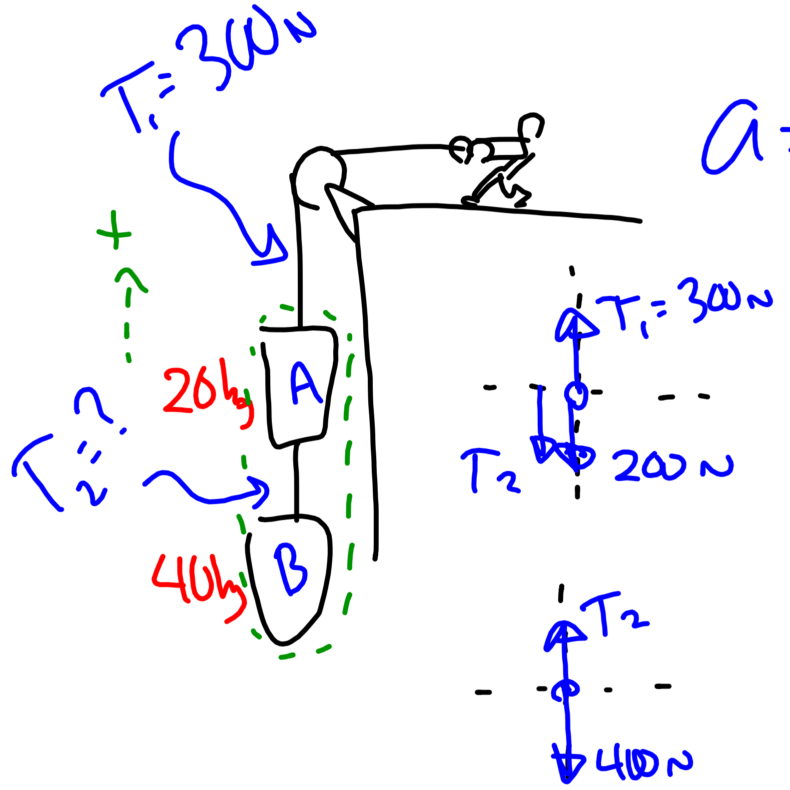
$$\sum F = ma$$

$$T = m_B a$$

$$T = 5a$$

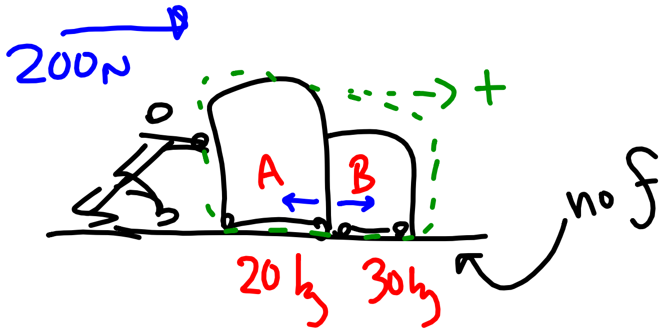
$$T = 33.5\,\text{N}$$

$$a = 6.7\,\text{m/s}^2$$

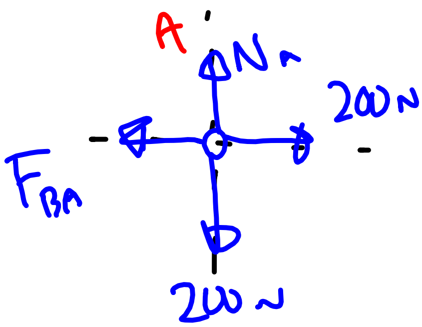


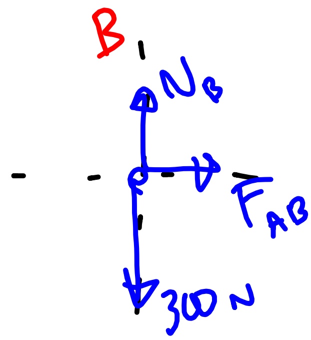
$$300 - T_2 - 200 = 20a$$
$$100 - T_2 = 20a$$

$$T_2 - 400 = 40a$$



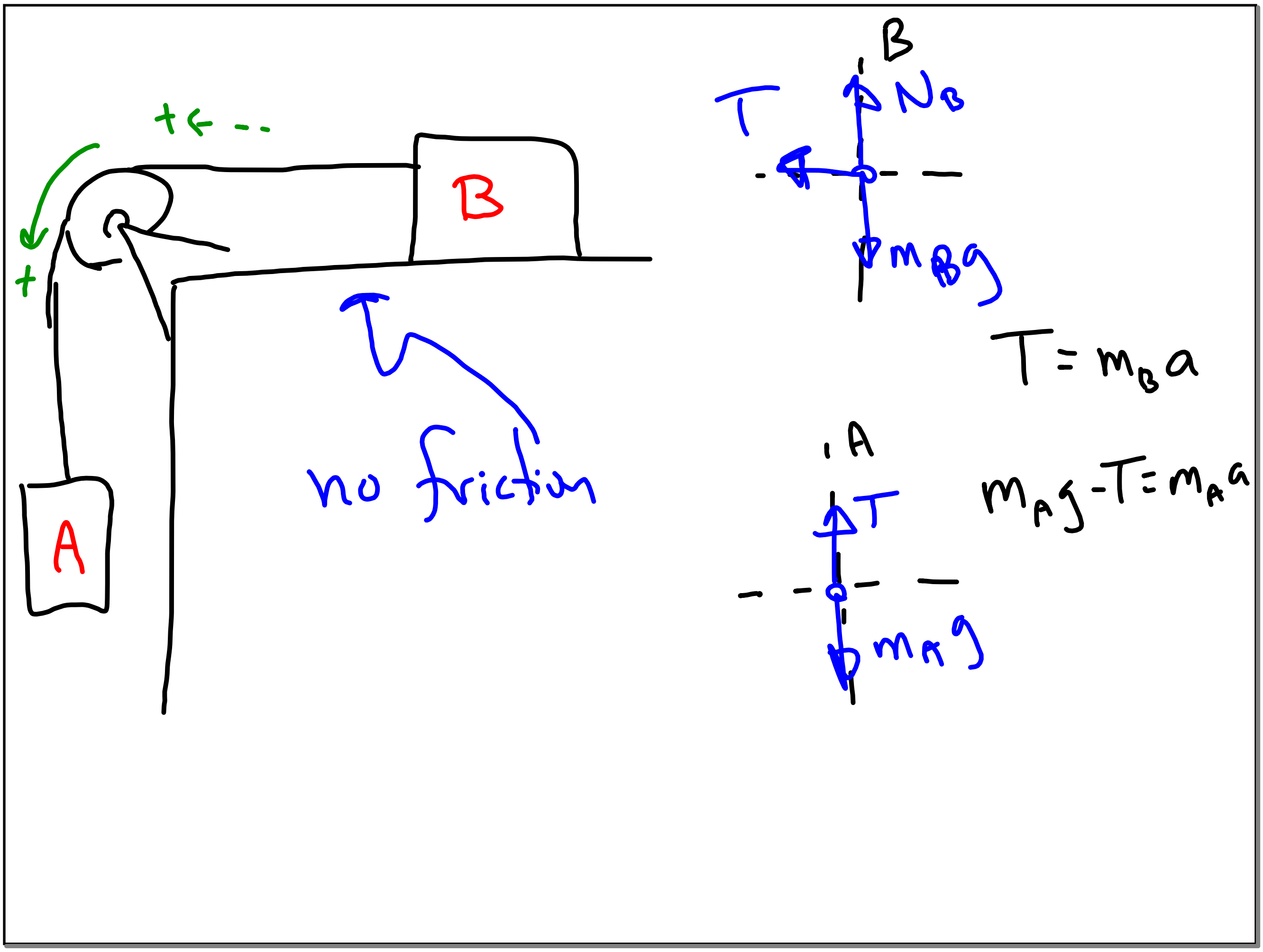
$$a = \frac{\sum F_{ext}}{M_{total}} = \frac{200\,N}{50\,kg}$$

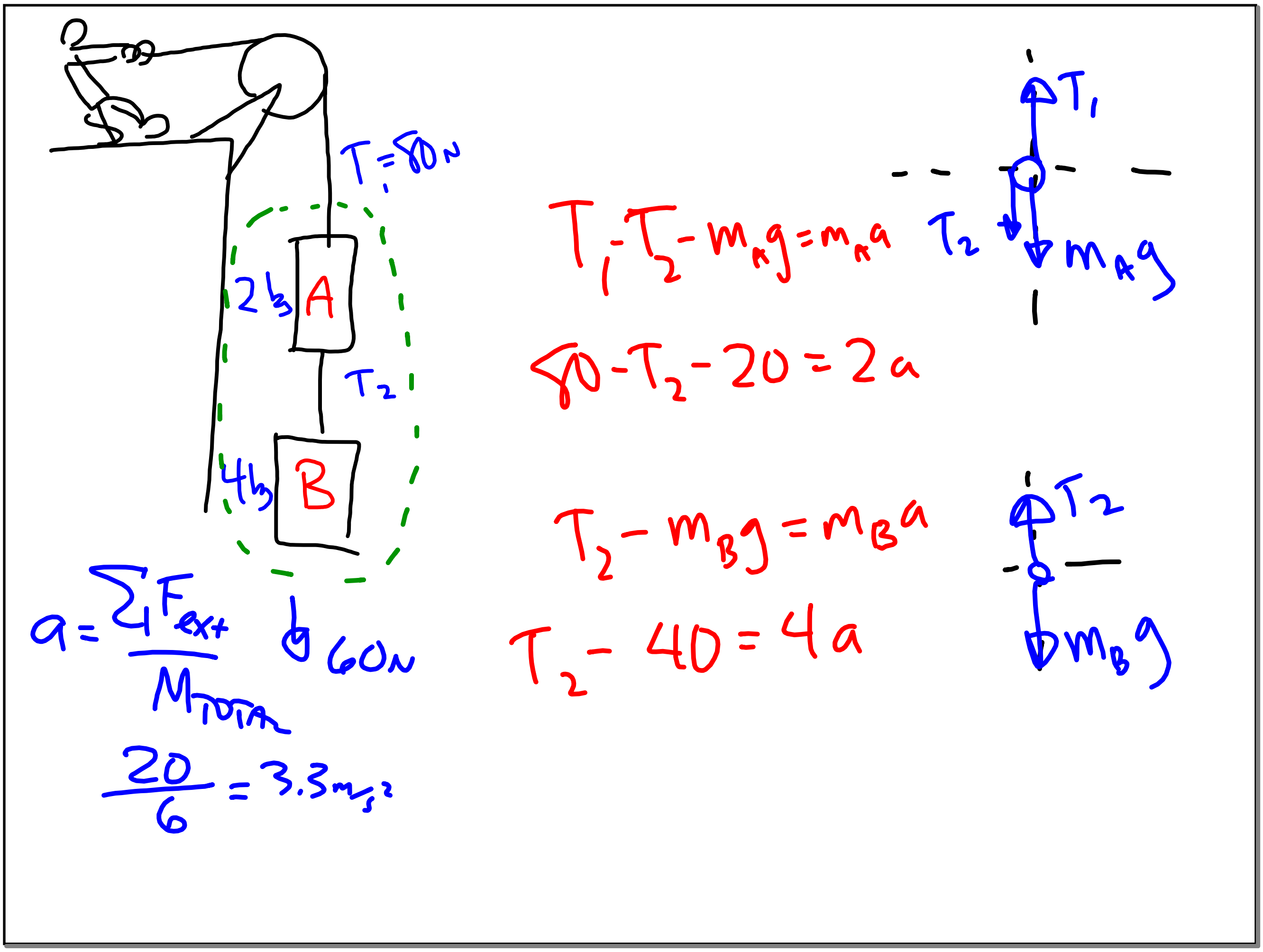


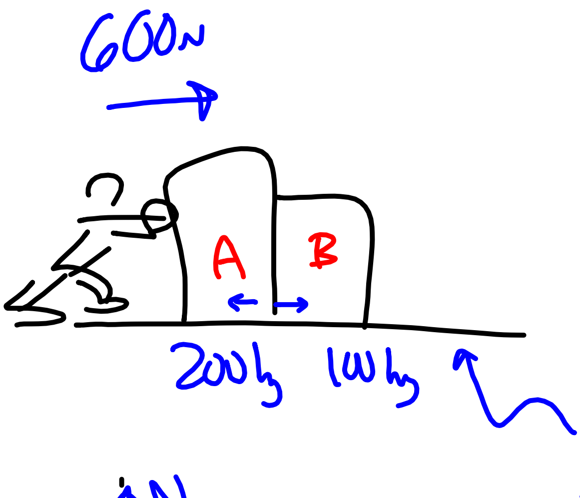


$$200 - F_{AB} = 20a$$
$$200 - 30a = 20a$$
$$+30a \quad +30a$$
$$200 = 50a$$
$$4\,\frac{m}{s^2} = a$$

$$F_{AB} = 30a$$
$$F_{AB} = 30(4) = 120\,N$$

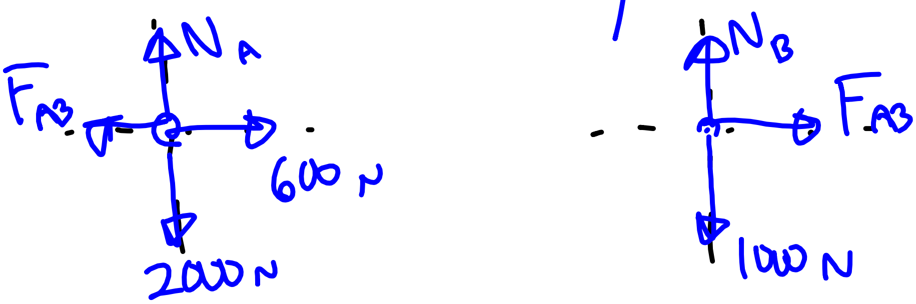

+ ← - -
+
B
A
no friction
B
T
N_B
$m_B g$
$T = m_B a$
A
T
$m_A g$
$m_A g - T = m_A a$


T1 = 80 N
A
2 kg
T2
B
4 kg
60 N
T1 - T2 - mAg = mAa
80 - T2 - 20 = 2a
T2 - mBg = mBa
T2 - 40 = 4a
T1
T2
mAg
T2
mBg
a = ΣFext / MTOTAL
20/6 = 3.3 m/s²



$F_{AB} =$

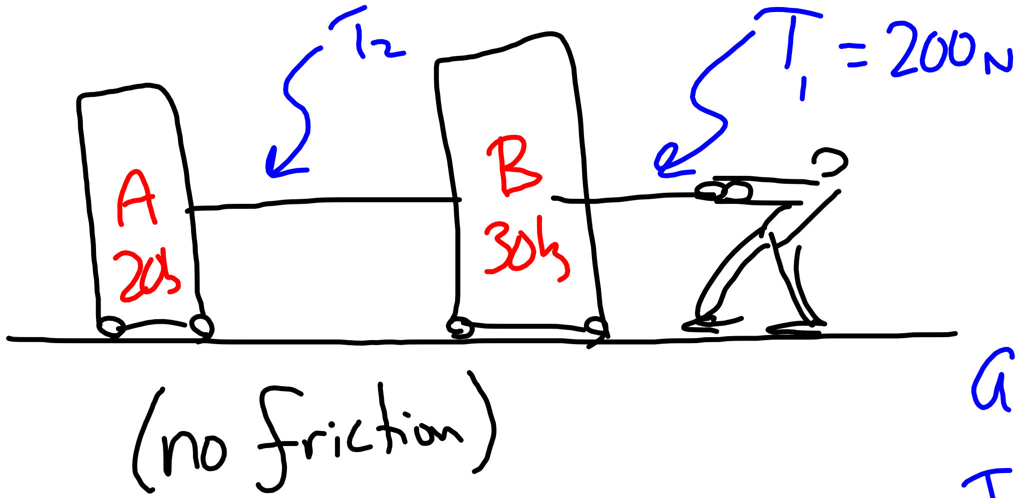
$a =$



$\sum F = ma$ $\qquad$ $\sum F = ma$

$600 - F_{AB} = 200a$ $\qquad$ $F_{AB} = 100a$

$F_{AB} = 200N$



$a = ?$

$T_2 = ?$

$\Sigma F = ma$

$T_2 = 20a$

$\Sigma F = ma$

$200 - T_2 = 30a$

$200 - 20a = 30a$

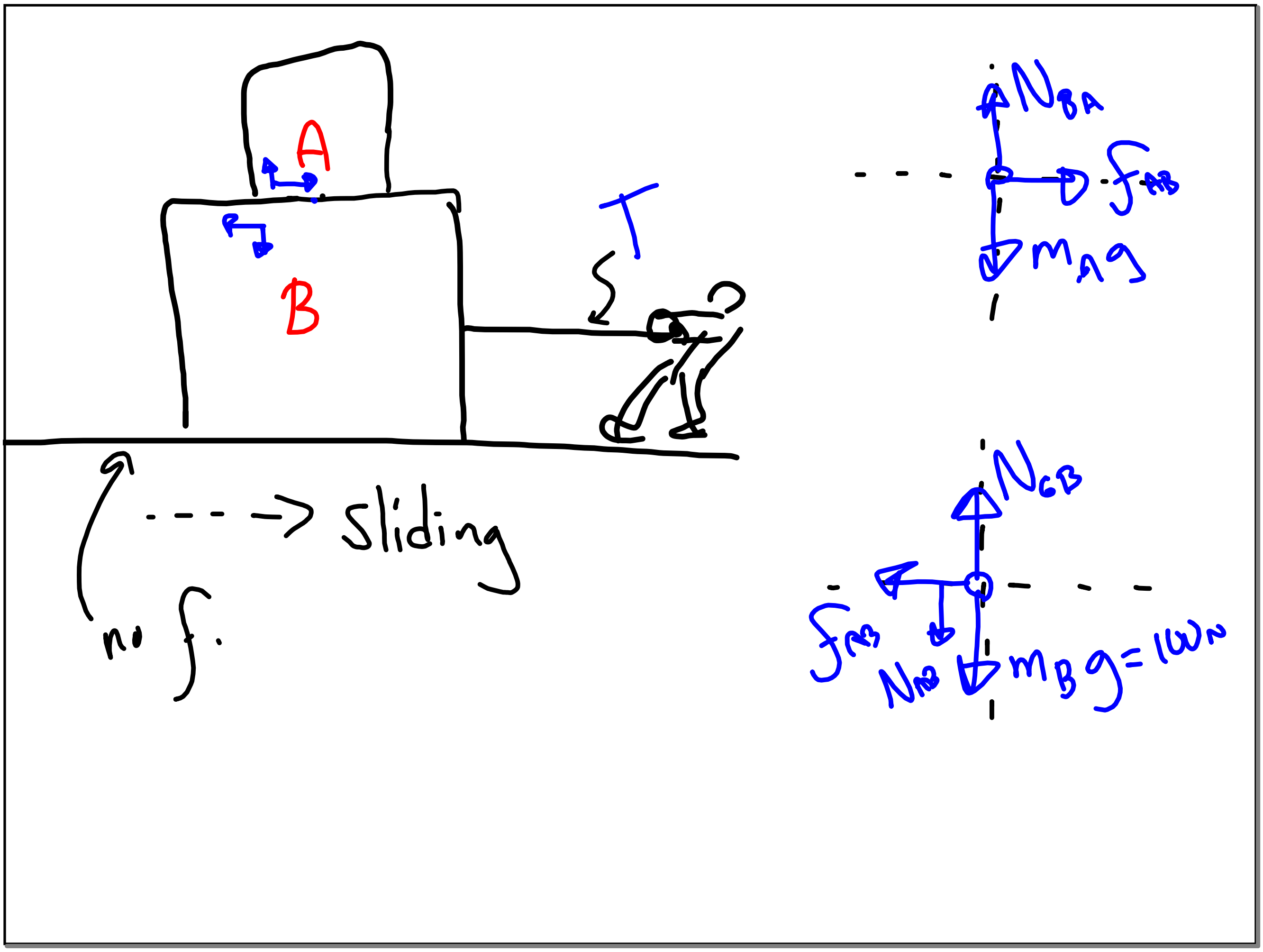
$200 = 50a$

$4\ \frac{m}{s^2} = a$

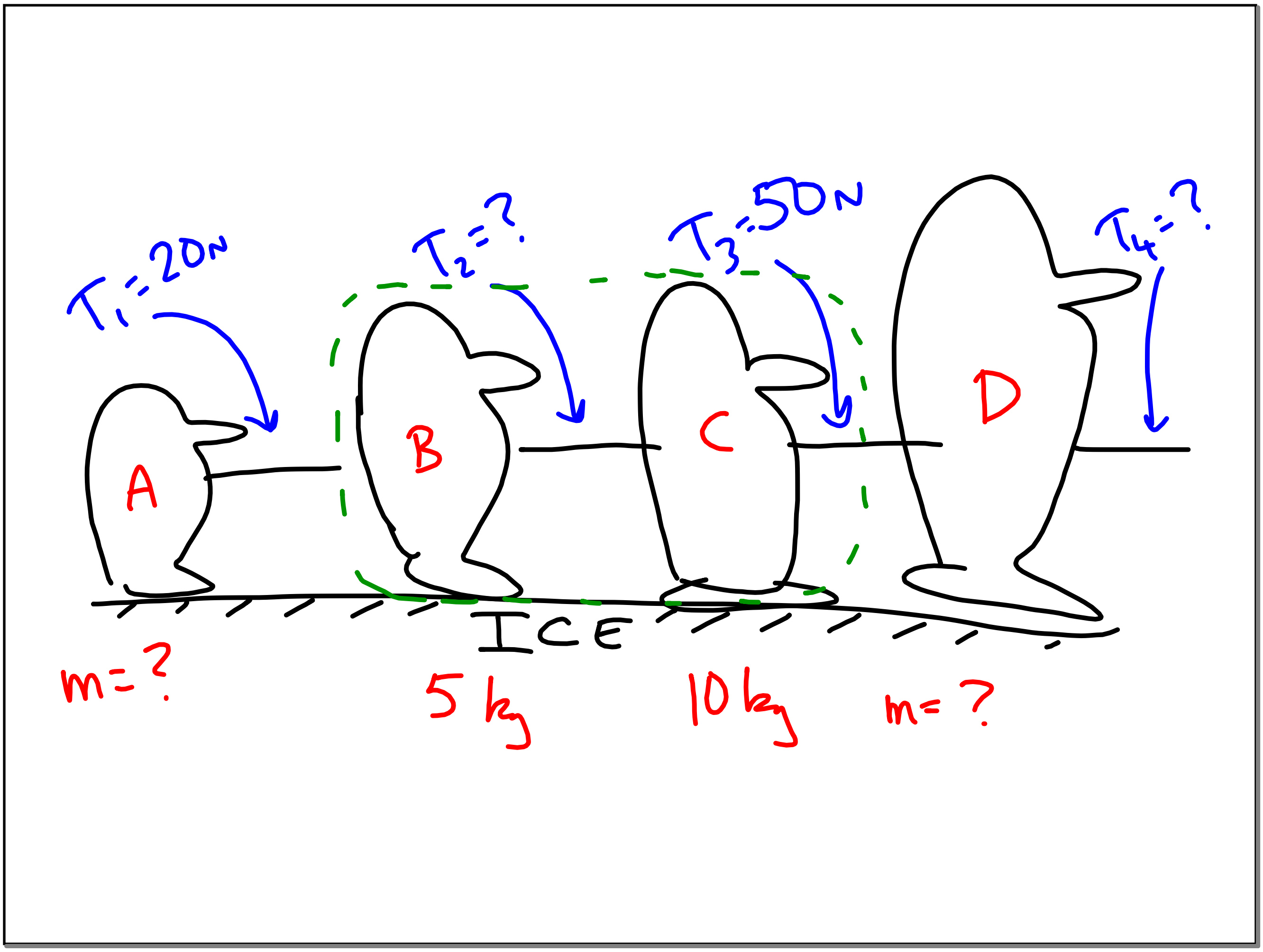
$T_2 = 20(4)$

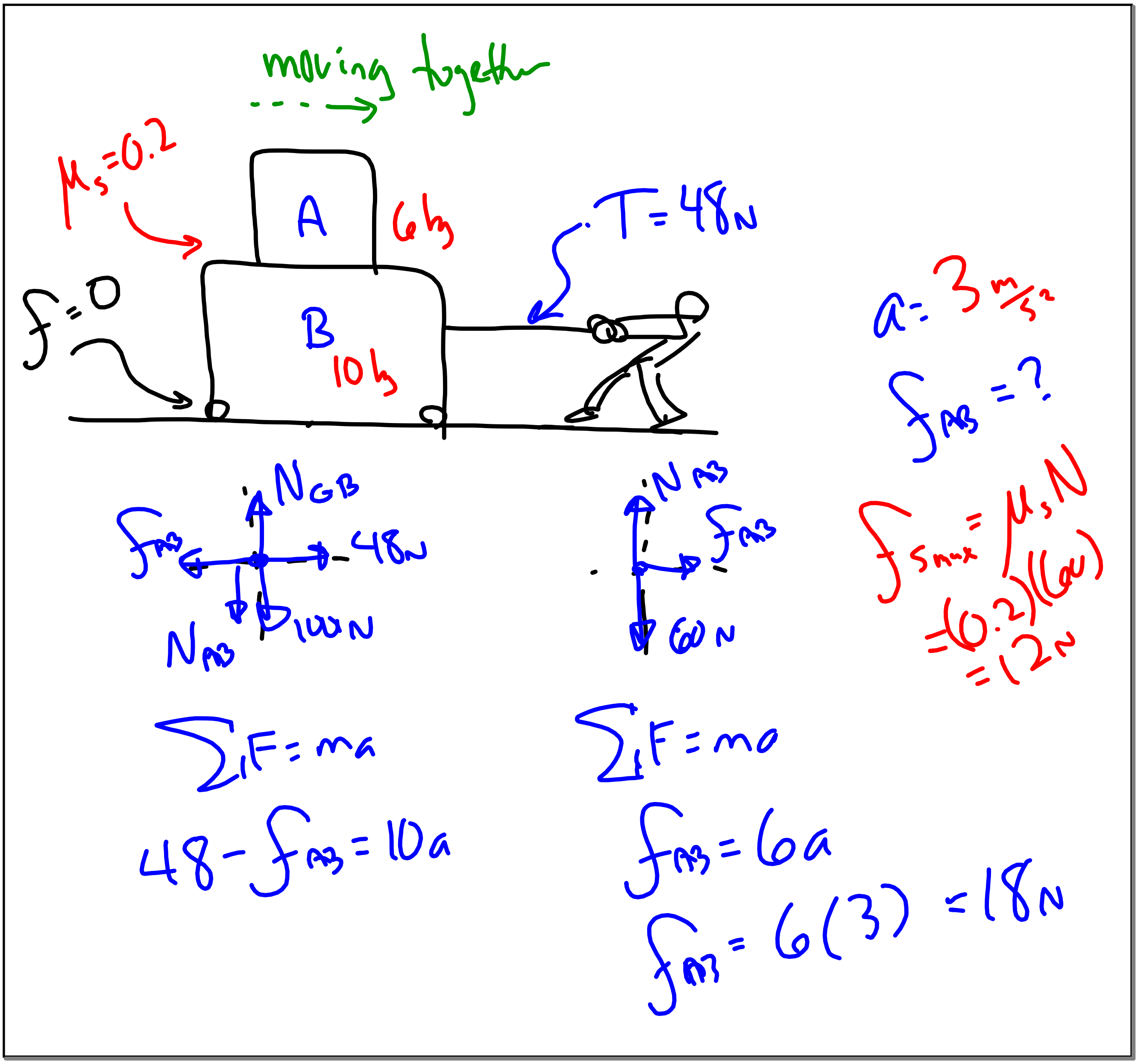
$T_2 = 80\,N$

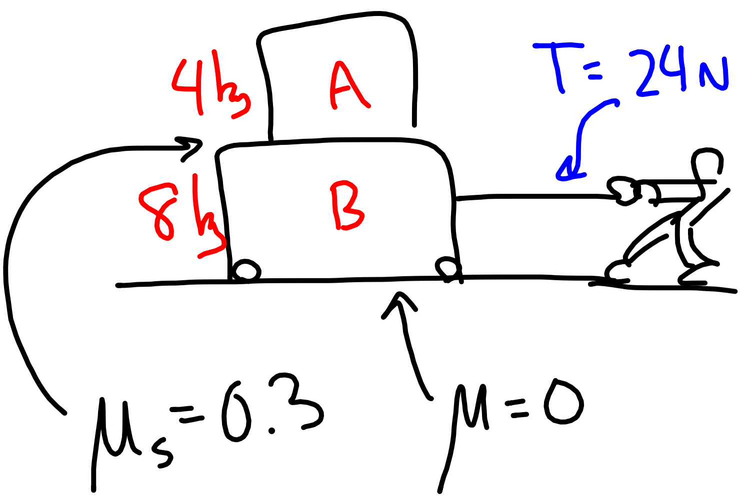
$$a = \frac{\Sigma F_{ext}}{M_{tot}} = \frac{200}{50} = 4\ \frac{m}{s^2}$$



A
B
T
sliding
no f.
N_{BA}
f_{AB}
$m_A g$
N_{GB}
f_{AB}
N_{AB}
$m_B g = 100N$


T1 = 20N
T2 = ?
T3 = 50N
T4 = ?
A
B
C
D
ICE
m = ?
5 kg
10 kg
m = ?


moving together
μs=0.2
A
6kg
T=48N
f=0
B
10kg
a=3 m/s²
fAB=?
NGB
fAB
48N
NAB
100N
NAB
fAB
60N
fsmax=μsN
=(0.2)(60)
=12N
ΣF=ma
48−fAB=10a
ΣF=ma
fAB=6a
fAB=6(3)=18N



$f_{s\,max} = 12\,N$

$f_{AB} = 8\,N$

not slipping