Read 5.1

Finish chapter 4 today

$w = mg$

$m = \frac{w}{g}$

BRITISH

if w(lbs) $g = 32 ft/s^2$

if w(N) $g = 9.8 m/s^2$

SI

Interactive Question

A ping-pong ball collides with a bowling ball. Which of experiences a greater force from the other one due to the collision?

A) The ping-pong ball
B) The bowling ball
C) They experience the same force
D) The force on each depends on its velocity
E) The force on each depends on its mass

Interactive Question

C

A book is resting on the surface of a table. Consider the following four forces that arise in this situation.

(1) the force of the earth pulling on the book
(2) the force of the table pushing on the book
(3) the force of the book pushing on the table
(4) the force of the book pulling on the earth

Which two forces form an "action-reaction" pair which obey Newton's third law?

A) 1 and 2
B) 1 and 3
C) 1 and 4
D) 2 and 4
E) 3 and 4

Interactive Question

D

A horse pulls a cart along a flat level road. Consider the following four forces that arise in this situation.

(1) The force of the horse pulling on the cart.
(2) The force of the cart pulling on the horse.
(3) The force of the horse pushing on the road.
(4) The force of the road pushing on the horse.

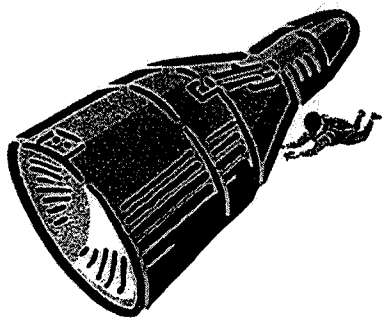
Which two forces form an "action-reaction" pair which obey Newton's third law.

A) (1) and (4)
B) (1) and (3)
C) (2) and (4)
D) (3) and (4)
E) (2) and (3)

Interactive Question

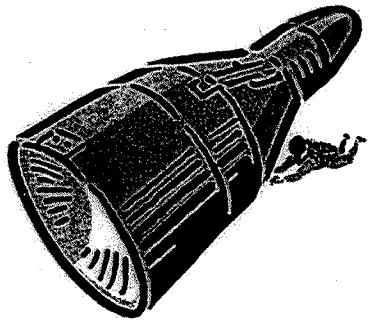
E

An astronaut who is walking in space pushes on a spaceship with a force of 36 N. The astronaut has a mass of 92 kg and the spaceship has a mass of 11000 kg. Which statement is true?



A) The astronaut will accelerate, but not the spaceship.
B) No net force will be exerted on the astronaut or on the spaceship.
C) A force will be exerted on the astronaut but not on the spaceship.
D) The astronaut and the spaceship will have the same magnitude of acceleration.
E) None of the above.

Problem: An astronaut who is walking in space pushes on a spaceship with a force of 36 N. The astronaut has a mass of 92 kg and the spaceship has a mass of 11000 kg. What happens?



+

ship

$F_{net} = ma$

$F_{as} = m_s a_s$

$a_s = \frac{F_{as}}{m_s}$

$a_s = \frac{-36\,N}{11{,}000\,kg}$

$a_s = -.0033\ m/s^2$

astronaut

$F_{net} = ma$

$F_{sa} = m_a a_a$

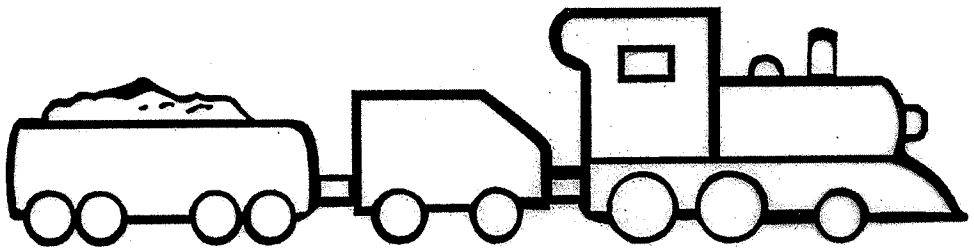
$a_a = \frac{F_{sa}}{m_a}$

$a_a = \frac{36\,N}{92\,kg}$

$a_a = .39\ m/s^2$

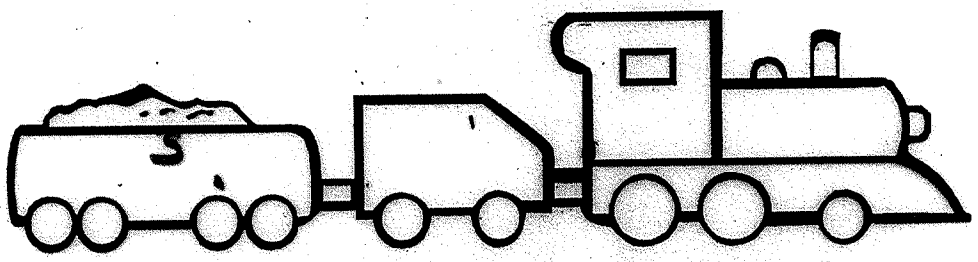
Interactive Question

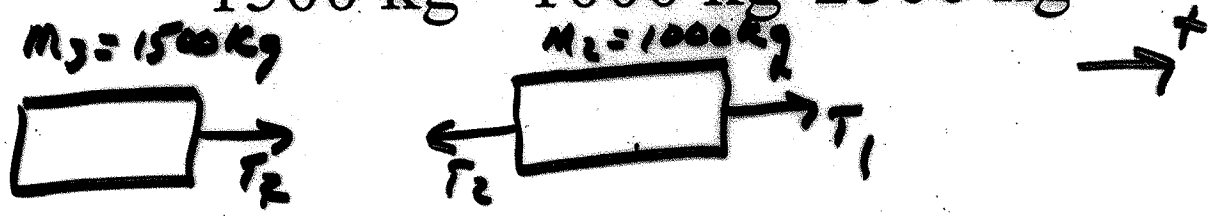
A train is *accelerating* to the right. There is no friction opposing the motion. How does the tension between the engine and the 2nd car compare with the tension between the 2nd car and the third car?



A) It is less.
B) It is the same.
C) It is greater.
D) More information is needed.

Problem: A train is *accelerating* at a rate of 5.0 m/s^2. There is no friction opposing the motion. What is the tension between each of the cars?





3 $F_{net} = m_3 a$

$T_2 = (1500\,kg)(5\,m/s^2)$

$T_2 = 7.5 \times 10^3\,N$

$T_1 - T_2 = m_2 a$

$T_1 = m_2 a + T_2$

$T_1 = (1000\,kg)(5\,m/s^2) + 7.5 \times 10^3\,N$

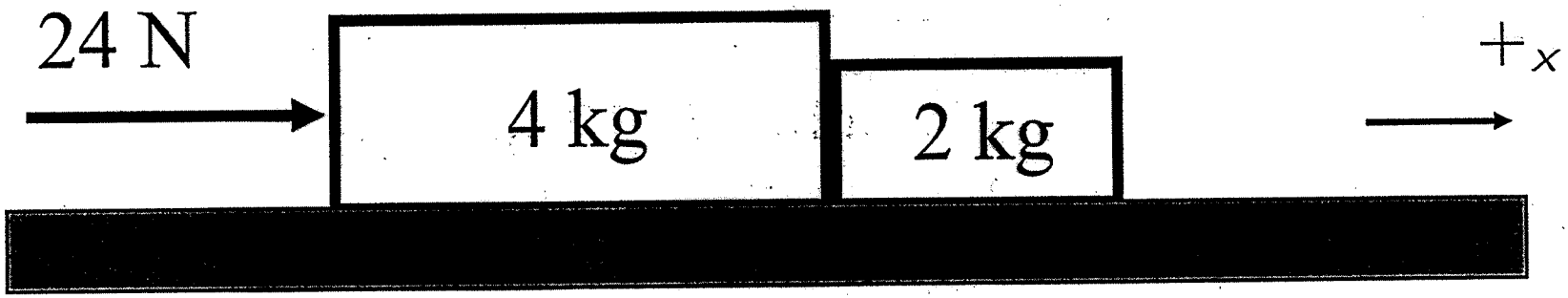
$T_1 = 1.3 \times 10^4\,N$

Problem: A 4 kg block and a 2 kg block can move on a horizontal surface. The blocks are pushed by a 24 N force in the positive x direction as shown. A frictional force of 8 N acts on the 4 kg block and a frictional force of 4 N acts on the 2 kg block.

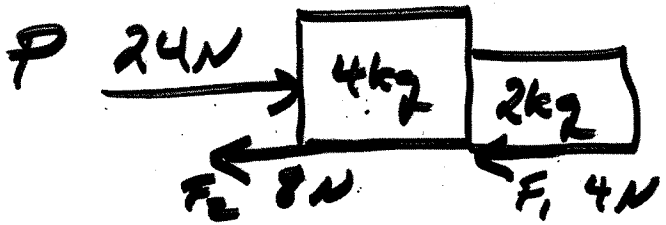
A) What is the net force acting on the two blocks?

B) Determine the acceleration of the blocks.

C) What is the force of the 2 kg block pushing on the 4 kg block?



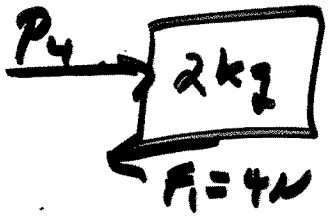
→ +



a) $F_{Net} = P - F_2 - F_1 = 24N - 8N - 4N = \underline{12N}$ ←

b) $F_{Net} = m_{net} a$ $\quad a = \frac{F_{Net}}{m_{net}} = \frac{12N}{6kg} = \underline{2 m/s^2}$

c)



$F_{net} = P_4 - F_1 = m_{2kg} a$

$P_4 = F_1 + m_{2kg} a$

$= 4N + (2kg \times 2 m/s^2)$

$= \underline{8N}$

$\boxed{-8N}$