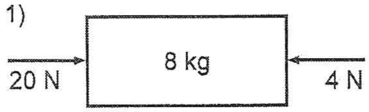
Anne Sirs

SPH3U-2 FBD'S & NEWTON'S 2nd LAW (HORIZONTAL) WS#8

Each of the following free body diagrams represents a different problem. From the given data, solve for the missing quantities. Complete solutions for each problem should be shown (use a separate sheet if necessary).

→ +

1)



F_{net} = + 16 N

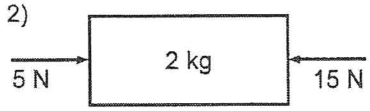
a = $\frac{+16\,N}{8\,kg}$

= + 2 N/kg

or

+2 m/s²

2)

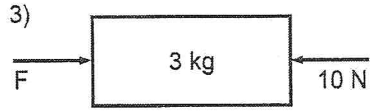


F_{net} = − 10 N

a = $\frac{-10\,N}{2\,kg}$

= − 5 m/s²

3)



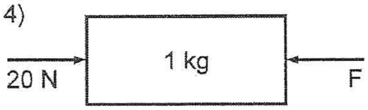
uniform motion

F_{net} = 0

a = 0

F = + 10 N

4)



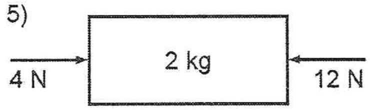
a = zero

type of motion = uniform

F_{net} = 0

F = − 20 N

5)

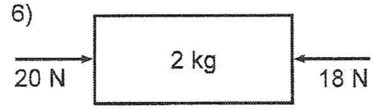


F_{net} = − 8 N

a = $\frac{-8\,N}{2\,kg}$

= − 4 m/s²

6)



F_{net} = + 2 N

a = $\frac{+2\,N}{2\,kg}$

= + 1 m/s²

7)

20 N → [10 kg] ← 4 N

F_{net} = +16 N

a = $\frac{+16\,N}{10\,kg}$

= +1.6 N/kg

8)

F → [10 kg] ← 5 N

a = 2.0 m/s² → = + 2.0 m/s²

F_{net} = m · a

= (10 kg)(+ 2 m/s²)

= +20 N

F = ~~......~~

F_{net} = (+F) + (-5N)

+20N = F - 5N

+20N + 5N = F

∴ F = +25N

9)

F → [10 kg] ← 5 N

a = 2.0 m/s² ← = - 2.0 m/s²

F_{net} = m · a

= (10 kg)(- 2 m/s²)

= - 20 N

F = impossible

F must be -15N for Fnet to be -20N which is impossible if F is pushing to right.

→ + [E]

10)

20 N → [15 kg] ← F

F_{net} = 7.5 N [East]

a = $\frac{F_{net}}{m}$ = $\frac{+7.5\,N}{15\,kg}$

= 0.5 N [E]

F = 12.5 N [W]

11)

50 N → [80 kg] ← F

v_1 = 6 m/s [East] = + 6 m/s

v_2 = 6 m/s [West] = - 6 m/s

Δt = 4.0 s

a = $\frac{v_2 - v_1}{\Delta t}$ = $\frac{-6\,m/s - (+6\,m/s)}{4.0\,s}$

= $\frac{-12\,m/s}{4.0\,s}$ = - 3 m/s²

F_{net} = m a

= (80 kg)(-3 m/s²)

= -240 N

= 240 N [W]

F = 290 [W]

12)

6 N → / ← F [10 kg] ← 5 N

a = 1.7 m/s² ← = - 1.7 m/s²

Δt = 5.0 s

F_{net} = m a

= (10 kg)(-1.7 m/s²)

= -17 N

F = - 18 N

Δv =

a = $\frac{\Delta v}{\Delta t}$

∴ Δv = a · Δt = (-1.7 m/s²)(5.0 s)

= - 8.5 m/s