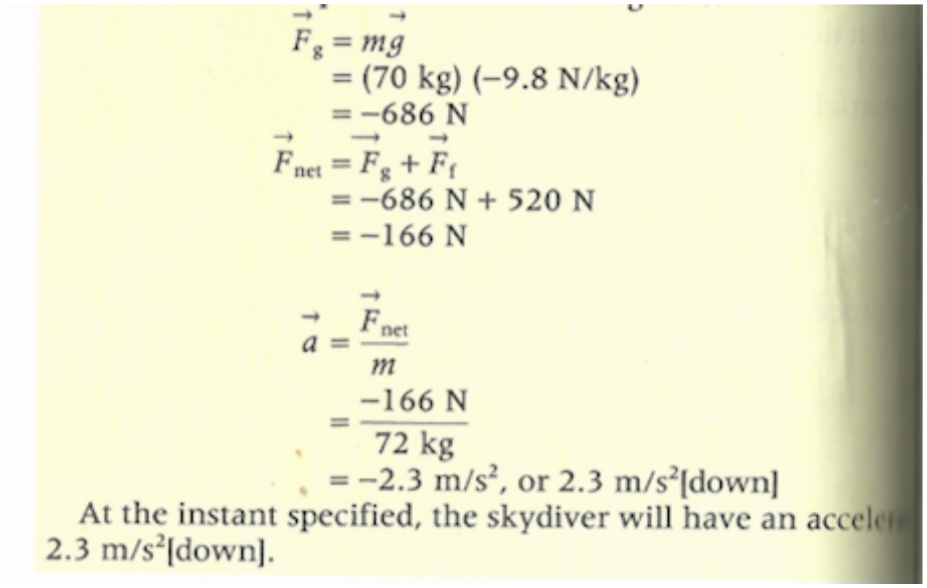
Newton's second Law of Motion
Practice Problems Set 2

Western International High School

Nada Saab

Sample Problem

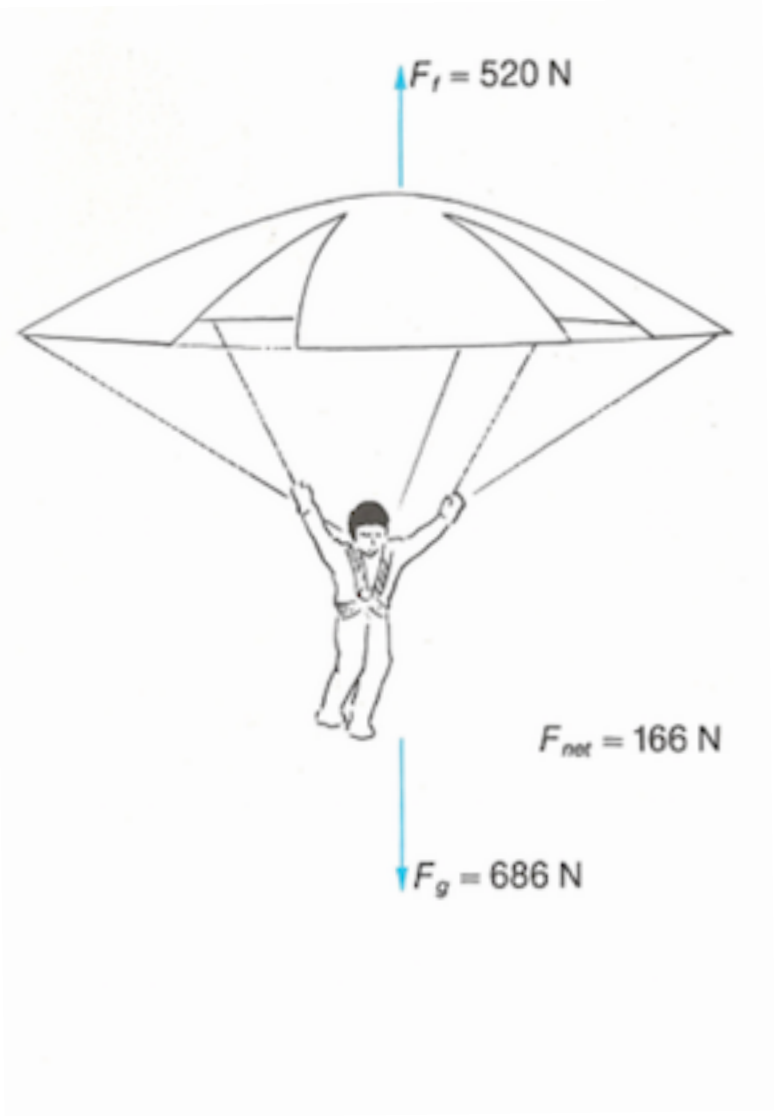
A skydiver, complete with parachute, has a mass of 70 kg. A short time after the skydiver jumps from the aircraft, the force of air resistance acting on him is 520 N. What is his acceleration at that instant?



$$\vec{F}_g = m\vec{g}$$
$$= (70\text{ kg})(-9.8\text{ N/kg})$$
$$= -686\text{ N}$$
$$\vec{F}_{net} = \vec{F}_g + \vec{F}_f$$
$$= -686\text{ N} + 520\text{ N}$$
$$= -166\text{ N}$$

$$\vec{a} = \frac{\vec{F}_{net}}{m}$$
$$= \frac{-166\text{ N}}{72\text{ kg}}$$
$$= -2.3\text{ m/s}^2\text{, or } 2.3\text{ m/s}^2\text{[down]}$$

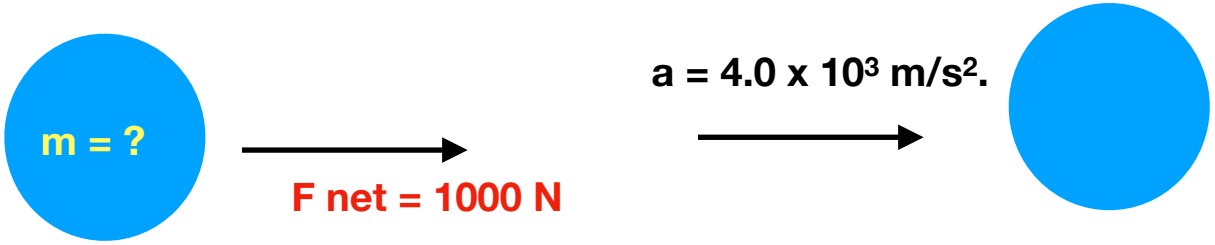
At the instant specified, the skydiver will have an accele
2.3 m/s²[down].


$F_r = 520$ N
$F_{net} = 166$ N
$F_g = 686$ N

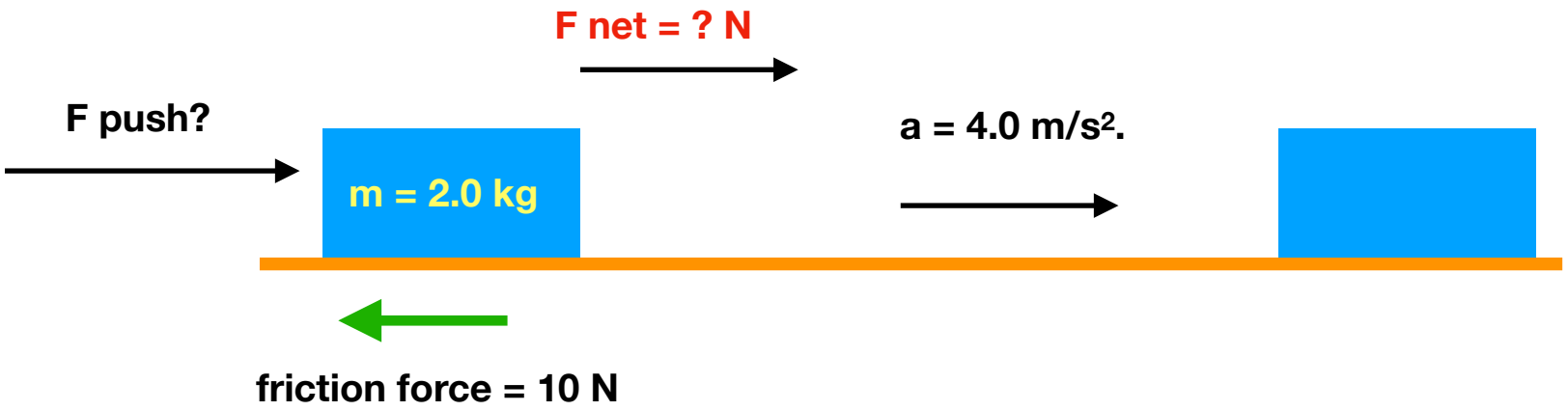
Practice Problems

1) The net force on a 5.0 kg bowling ball is 20 N. What is its acceleration?
Answer: 4.0 m/s^2

2) A baseball hit by a bat with an average force of 1000 N accelerates at 4.0 x 10^3 m/s^2. What is the ball's mass? Answer: 0.25 kg



3) What unbalance force is needed to accelerate a 2.0 kg block of wood at 4.0 m/s^2 along a rough table, against a 10 N force of friction? Answer:7.5×10^4 N



1) Net Force = mass x acceleration

$$F_{net} = m \times a$$

2) Net Force = (All positive direction forces) - (All negative direction forces)

Net force = F push - Friction force

4) An automobile traveling at 20 m/s hits a tree. The driver who has a mass of 55 kg comes to rest in 0.10 s after the impact.

a) what is the average force that acts on the driver?
b) What distance does the driver travel after the car firs this the tree.

Answer: (a) a = -200 m/s^2, F net = -11000N
(b) 1.0 m

Formulas and equations

1) Net Force = mass x acceleration

$$F_{net} = m \times a$$

2) Net Force = (All positive direction forces) - (All negative direction forces)

3) $W = Fg = m \times 9.8$

4)

$$f_{kinetic\ frictional\ force} = (\text{coefficient of kinetic friction})\ F_{Normal}$$

$$f_k = \mu_k \times F_N$$

Kinematic Equations for Motion with Constant Acceleration
$v = v_o + at$
$x = \frac{1}{2}(v_o + v)t$
$v^2 = v_o^2 + 2ax$
$x = v_o t + \frac{1}{2}at^2$