# Newton's 2nd Law

Newton discovered that:

acceleration varies directly with **force** ….and…

acceleration varies inversely with **mass**.

Thus… $a \propto F$ and $a \propto 1/m$

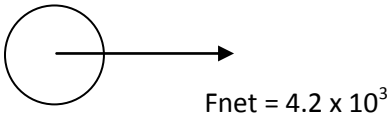
In a formula: $a = F/m$

because you must consider all forces, and there may be several forces:

**Fnet = ma**

**Practise EASY: USING Fnet = ma with Fnet provided**

$a = 2.7\ m/s^2$ [E] $F_{net} = 4.2 \times 103$ N [E] m = ?



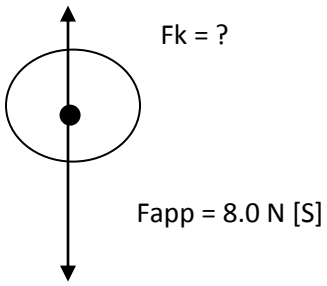

Fnet = ma

$4.2 \times 10^3$ N = m (2.7 $m/s^2$)

m = $1.6 \times 10^3$ kg (rounded to 2 sig. digs)

**MEDIUM: USING Fnet = ma with Fnet not provided**

m = 2.5 kg a = 3.0 $m/s^2$




Fnet = ma *** Fnet = sum of all forces!**

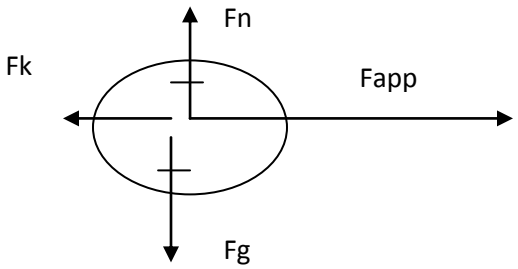
Fapp + Fk = ma

8.0 + Fk = (2.5 kg) (3.0 $m/s^2$)

Fk = 7.5 – 8.0 = -0.5 N [S]

The friction is 0.5 N [N]

**HARD**: **USING Fnet = ma with coefficient of friction**




a = 1.8 m/s2  μk = 0.08  m = 19 kg  Fapp = ?

Fnet = ma

Fapp + Fk = ma  **I don't know Fk yet!

Fk = μk (Fn) = μk (Fg) = μk (mg)

Fk = 0.08 (19kg) (9.8 N/kg)

Fk = 14.9 N

Fapp + (-14.9) = (19) (1.8)

Fapp = _____N [fwd]