Newton's Second Law

November-16-15 9:54 AM

Newton's 2nd Law: IF an unbalanced Force acts on a body it will accelerate. The rate of acceleration is directly proportional to the force and inversely proportional to the mass.

$$a = \frac{F}{m}$$

Note: Usually written as $F = ma$

Reminder: Units $F = m \cdot a$

Force $\rightarrow N = kg \cdot m/s^2$

mass, acceleration

Ex. Dead Jeff is swept off the floor with a force of 50 N. DJ is 53 kg. What acceleration does he experience being swept across the floor?

$F = 50N$
$m = 53kg$
$a = ?$

$F = ma$

$\frac{F}{m} = \frac{ma}{m}$

$a = \frac{F}{m} = \frac{50N}{53kg} = 0.94 m/s^2$

What is the force of gravity on a 3kg thing.

$F = ?$
$m = 3kg$
$a = 9.8 m/s^2$

$F = m \cdot a = 3 * 9.8 = 29.4N$

sig figs $\rightarrow 29N$

Andy (cat) throws a 25g toy mouse into the air with a 3N force. What is the toy's

acceleration.

$F = 3N \rightarrow kg \cdot m/s^2$

$m = 25g \Rightarrow^{kg} = 0.025\,kg$

$a =$

$F = ma$

$a = \frac{F}{m} = \frac{3}{0.025} = 120\,m/s^2$

Net Force → The vector sum of all forces.

$$F_{Net} = m \cdot a$$

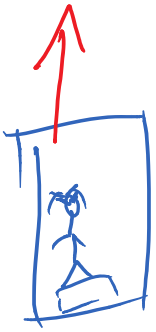
$$F_{Net} = \sum F$$

sigma = sum (addition)

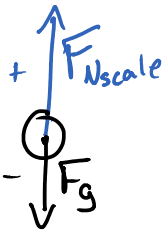
Elevator problem:

Jenna is standing on a scale that reads 650N. in an elevator (on Earth). The elevator is currently at rest. The elevator can accelerate at a rate of $1.35\,m/s^2$.

a) What does the scale read when the elevator is moving upward?



Jenna →



① $F_{Net} = m \cdot a$

② $F_{Net} = F_g + F_{Nscale}$

$F_{Net} =$

Substitute (#1) into (#2)

$F_{net} =$

$F_g = -650N$

$F_{Nscale} =$

$m = 66.3\,kg$

$a = 1.35\,m/s^2$

$F_g = m(9.8)$

Substitute #1 into #2

$m \cdot a = F_g + F_{Nscale}$

$(66.3\,kg)(1.35\,m/s^2) = -650N + F_{Nscale}$

$89.505N = -650N + F_{Nscale}$

$+650 \qquad +650$

$F_{Nscale} = 739.505N$

The scale would read 740 N.

b) What does the scale read when the elevator goes down?

560.494N

Practice p. 112 & 115