

Reasonable Values

Use the tables below to determine if your values are reasonable. The tables are Adapted from “The Magnitudes of Physics”— The Physics Teacher, 1996

Velocity:

Velocity of ...	Miles/ hour	Meters/second
Brisk Walking Pace	3.75 mi/hr	1.67 m/s
Cheetah in a Hurry	60 mi/hr	27 m/s
Sound at sea level, 20 degrees Celsius	758 mi/hr	339 m/s
Bullet from an M16 rifle	2250 mi/hr	1006 m/s
Electromagnetic waves (light is a type of EM wave) in a vacuum (nothingness); this is the fastest anything can travel	671,000,000 mi/hr = 6.71 x 10 ⁸ mi/hr	300,000,000 m/s = 3.0 x 10 ⁸ m/s

Conversions: mi/hour x 1609 m/ mi x 3600 s/hour = m/s

Acceleration:

Acceleration of...	Ft/s ²	m/s ²
An object where the sum of the forces on the object equals zero	0	0 m/s ²
Object dropped near the surface of the earth at 0 latitude		9.78039 m/s ²
Object dropped near the surface of the earth at 90 latitude		9.83217 m/s ²
Object dropped near the surface of the earth – average (mean)	32 ft/s ²	9.8067 m/s ²
Acceleration that causes “blackout” in a few seconds	230 ft/s ²	70 m/s ²
Seat ejected from jet	490 ft/s ²	150 m/s ²

Object dropped near the surface of the sun	880 ft/s ²	270 m/s ²
Auto crashed from 60 mi/hour into a fixed barrier (very short stopping time-no bounce)	3300 ft/s ²	1000 m/s ²
Proton in proton accelerator at Ferilab (outside of Chicago)	2.9 x 10 ¹⁴ ft/s ² =290,000,000,000,000 ft/s ²	90,000,000,000,000 m/s ² = 9 x 10 ¹³ m/s ²

Forces:

Force of...	Pounds	Newtons
Proton on Electron /and Electron on Proton in Hydrogen atom (electromagnetic force)	1.7 x 10 ⁻⁸ Pounds = .000000017 pounds	8 x 10 ⁻⁸ Newtons = .00000008 Newtons
Earth on a Nickel /Nickel on the earth – (Gravitational force)	.011 Pounds	.051 Newtons
Earth on a Man /Man on the Earth- (Gravitational force)	160 Pounds	730 Newtons
Between Protons in a nucleus (Strong force)	2200 Pounds	10,000 Newtons
An automobile making a reasonable stop – Tires on Ground/ Ground on Tires (Static Frictional force)	2200 Pounds	10,000 Newtons
747 Jet Engines getting jet up to speed – Engines on Air/ Air on Engines (Normal Force)	170,000 pounds	770,000 Newtons
Earth on the Moon/ and Moon on the Earth- (Gravitational force)	4.5 x 10 ¹⁹ Pounds= 45,000,000,000,000,000,000 Pounds	2 x 10 ²⁰ Newtons= 200,000,000,000,000,000,000 Newtons

Energy:

Energy of...	Kilocalories (Food Calories)	Joules
Metabolization of an apple	100 Kilocalories	460,000 Joules

All the Fossil fuels on Earth	$4.8 \times 10^{19} =$ 48,000,000,000,000,000,000 Kilocalories	200,000,000,000,000,000,000,000 $= 2 \times 10^{23}$ Joules
Hiroshima size Atomic Bomb	$1.0 \times 10^{12} =$ 1,000,000,000,000 Kilocalories	4,200,000,000,000,000 = 4.2×10^{15} Joules
Lightning flash	240,000 Kilocalories	1,000,000,000 = 1×10^9 Joules
One push up (done by average size man)	.071 Kilocalories	300 Joules
Stored in a Flashlight battery	1.7 Kilocalories	7000 Joules
Gravitational Potential Energy of a 747 at 30,000 feet	4,800,000 Kilocalories	20,000,000,000 = 2×10^{10} Joules
Kinetic Energy of a Rifle Bullet	9.6 Kilocalories	40,000 Joules
Kinetic Energy of a Walking man	.014 Kilocalories	60J
Kinetic Energy of a running man	.96 Kilocalories	4000 J