

FUNDAMENTAL CONSTANTS AND PHYSICAL DATA

Gravitational constant.....	$G = 6.67 \times 10^{-11} \text{ N} \cdot \text{m}^2/\text{kg}^2$
Constant in Coulomb's Law	$k = 9.00 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2$
Elementary charge.....	$e = 1.60 \times 10^{-19} \text{ C}$
Mass of electron	$m_e = 9.11 \times 10^{-31} \text{ kg}$
Mass of proton	$m_p = 1.67 \times 10^{-27} \text{ kg}$
Permeability of free space	$\mu_0 = 4\pi \times 10^{-7} \text{ T} \cdot \text{m}/\text{A}$
Speed of light.....	$c = 3.00 \times 10^8 \text{ m/s}$

Earth

radius	$= 6.38 \times 10^6 \text{ m}$
mass	$= 5.98 \times 10^{24} \text{ kg}$
acceleration due to gravity at the surface of Earth (for the purposes of this examination)	$g = 9.80 \text{ m/s}^2$
period of rotation.....	$= 8.61 \times 10^4 \text{ s}$
radius of orbit around Sun	$= 1.50 \times 10^{11} \text{ m}$
period of orbit around Sun.....	$= 3.16 \times 10^7 \text{ s}$

Moon

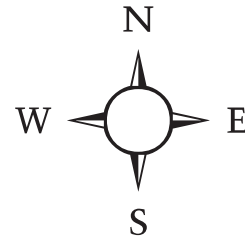
radius	$= 1.74 \times 10^6 \text{ m}$
mass	$= 7.35 \times 10^{22} \text{ kg}$
period of rotation.....	$= 2.36 \times 10^6 \text{ s}$
radius of orbit around Earth.....	$= 3.84 \times 10^8 \text{ m}$
period of orbit around Earth.....	$= 2.36 \times 10^6 \text{ s}$

Sun

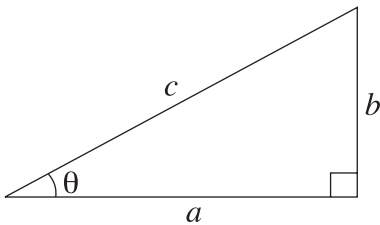
mass	$= 1.98 \times 10^{30} \text{ kg}$
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MATHEMATICAL FORMULAE

METRIC PREFIXES			
Prefix	Symbol	Numerical	Exponential
mega	M	1 000 000	10^6
kilo	k	1 000	10^3
hecto	h	100	10^2
deca	da	10	10^1
		1	10^0
deci	d	0.1	10^{-1}
centi	c	0.01	10^{-2}
milli	m	0.001	10^{-3}
micro	μ	0.000001	10^{-6}



For Right-angled Triangles:

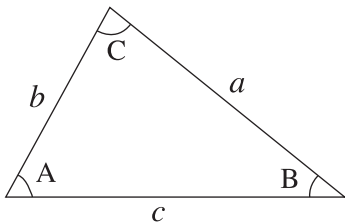


$$a^2 + b^2 = c^2$$

$$\sin \theta = \frac{b}{c} \quad \cos \theta = \frac{a}{c} \quad \tan \theta = \frac{b}{a}$$

$$\text{area} = \frac{1}{2} ab$$

For All Triangles:



$$\text{area} = \frac{1}{2} \text{base} \times \text{height}$$

$$\text{Sine Law : } \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\text{Cosine Law : } c^2 = a^2 + b^2 - 2ab \cos C$$

Circle:

$$\text{Circumference} = 2\pi r$$

$$\text{Area} = \pi r^2$$

Quadratic Equation:

$$\text{If } ax^2 + bx + c = 0, \text{ then } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

PHYSICS FORMULAE

Vector Kinematics in Two Dimensions:

$$v = v_0 + at \quad \bar{v} = \frac{v + v_0}{2}$$
$$v^2 = v_0^2 + 2ad \quad d = v_0t + \frac{1}{2}at^2$$

Vector Dynamics:

$$F_{\text{net}} = ma \quad F_g = mg$$
$$F_{\text{fr}} = \mu F_N$$

Work, Energy, and Power:

$$W = Fd \quad E_p = mgh$$
$$E_k = \frac{1}{2}mv^2 \quad P = \frac{W}{\Delta t}$$

Momentum:

$$p = mv \quad \Delta p = F\Delta t$$

Equilibrium:

$$\tau = Fd$$

Circular Motion:

$$T = \frac{1}{f}$$
$$a_c = \frac{v^2}{r} = \frac{4\pi^2 r}{T^2}$$

Gravitation:

$$F = G \frac{m_1 m_2}{r^2} \quad E_p = -G \frac{m_1 m_2}{r}$$

Electrostatics:

$$F = k \frac{Q_1 Q_2}{r^2} \quad E = \frac{F}{Q} \quad E = \frac{kQ}{r^2}$$
$$\Delta V = \frac{\Delta E_p}{Q} \quad E = \frac{\Delta V}{d}$$
$$E_p = k \frac{Q_1 Q_2}{r} \quad V = \frac{kQ}{r}$$

Electric Circuits:

$$I = \frac{Q}{\Delta t} \quad V = IR$$
$$V_{\text{terminal}} = \mathcal{E} \pm Ir \quad P = VI$$

Electromagnetism:

$$F = BIl \quad F = QvB$$
$$B = \mu_0 nI = \mu_0 \frac{N}{l} I \quad \mathcal{E} = Blv$$
$$\Phi = BA \quad \mathcal{E} = -N \frac{\Delta \Phi}{\Delta t}$$
$$V_{\text{back}} = \mathcal{E} - Ir$$
$$\frac{V_s}{V_p} = \frac{N_s}{N_p} = \frac{I_p}{I_s}$$