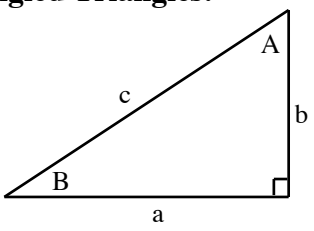
DATA TABLE

Pi	π	$= 3.14$
Gravitational constant	G	$= 6.67 \times 10^{-11}$ N•m^2/kg^2
Acceleration due to gravity at the surface of Earth (for the purposes of this examination)	g	$= 9.80$ m/s^2
Earth		
radius		$= 6.38 \times 10^{6}$ m
radius of orbit about Sun		$= 1.50 \times 10^{11}$ m
period of rotation		$= 8.61 \times 10^{4}$ s
period of revolution about Sun		$= 3.16 \times 10^{7}$ s
mass		$= 5.98 \times 10^{24}$ kg
Moon		
radius		$= 1.74 \times 10^{6}$ m
radius of orbit about Earth		$= 3.84 \times 10^{8}$ m
period of rotation		$= 2.36 \times 10^{6}$ s
period of revolution about Earth		$= 2.36 \times 10^{6}$ s
mass		$= 7.35 \times 10^{22}$ kg
Sun		
mass		$= 1.98 \times 10^{30}$ kg
Constant in Coulomb's Law	k	$= 9.00 \times 10^{9}$ N•m^2/C^2
Elementary charge	e	$= 1.60 \times 10^{-19}$ C
Mass of electron	m_e	$= 9.11 \times 10^{-31}$ kg
Mass of proton	m_p	$= 1.67 \times 10^{-27}$ kg
Mass of neutron	m_n	$= 1.68 \times 10^{-27}$ kg
Permeability of free space	μ_o	$= 4\pi \times 10^{-7}$ T• m/A
Planck's constant	h	$= 6.63 \times 10^{-34}$ J•s
	h	$= 4.14 \times 10^{-15}$ eV•s
Speed of light	c	$= 3.00 \times 10^{8}$ m/s
Rydberg's constant	R	$= 1.097 \times 10^{7}$ m^{-1}
Unified atomic mass unit	u	$= 1.66 \times 10^{-27}$ kg
Boltzmann's constant	k	$= 1.38 \times 10^{-23}$ J/K
Gas constant	R	$= 8.31$ J/mol•K
Density of water		$= 1.00 \times 10^{3}$ kg/m^3
Density of air		$= 1.29$ kg/m^3
Standard atmospheric pressure		$= 1.01 \times 10^{5}$ Pa
Volume of one mole of gas at STP		$= 22.4$ L (2.24×10^{-2} m^3)
Avogadro's number	N	$= 6.02 \times 10^{23}$ particles/mol
Absolute zero		$= -273$ °C

You may detach this page for convenient reference.
Exercise care when tearing along perforations.

For Right-angled Triangles:

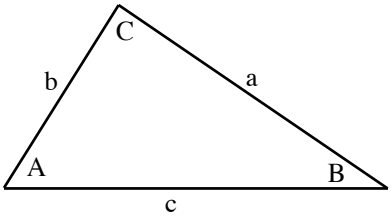


$$a^2 + b^2 = c^2$$

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

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

For All Triangles:



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

$$\sin 2A = 2\sin A \cos A$$

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

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

Circle:

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

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

Sphere:

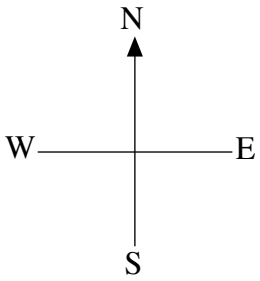
$$\text{Surface area} = 4\pi r^2$$

$$\text{Volume} = \frac{4}{3}\pi r^3$$

Prefixes:

giga	$(G) = 10^9$	milli	$(m) = 10^{-3}$
mega	$(M) = 10^6$	micro	$(\mu) = 10^{-6}$
kilo	$(k) = 10^3$	nano	$(n) = 10^{-9}$
centi	$(c) = 10^{-2}$	pico	$(p) = 10^{-12}$

Relative Compass Directions:



Quadratic Equation:

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

EQUATIONS

1. Vector Kinematics: (for constant acceleration)

$\vec{v} = \vec{v}_0 + \vec{a}t$ $\qquad \vec{v}_{av} = \dfrac{v + v_0}{2}$ $\qquad v^2 = {v_0}^2 + 2ad$

$\vec{d} = \vec{v}_0 t + \dfrac{1}{2}\vec{a}t^2$

2. Vector Dynamics:

$F_f = \mu F_N$ $\qquad \vec{F}_{net} = m\vec{a}$

3. Mechanical Energy and Vector Momentum:

$W = Fd$ $\qquad E_p = mgh$ $\qquad E_k = \dfrac{1}{2}mv^2$

$P = \dfrac{W}{\Delta t}$ $\qquad \vec{p} = m\vec{v}$ $\qquad \Delta\vec{p} = \vec{F}_{net}\Delta t$

4. Equilibrium:

$\tau = Fd$

5. Circular Motion and Gravitation:

$a_c = \dfrac{v^2}{r} = \dfrac{4\pi^2 r}{T^2}$ $\qquad F = G\dfrac{m_1 m_2}{r^2}$

$E_p = -G\dfrac{m_1 m_2}{r}$ $\qquad r^3 \propto T^2$

6. Electrostatics:

$F = k\dfrac{Q_1 Q_2}{r^2}$ $\qquad E = \dfrac{V}{d}$ $\qquad V = \dfrac{kQ}{r}$

$E_p = k\dfrac{Q_1 Q_2}{r}$ $\qquad \vec{F} = Q\vec{E}$ $\qquad V = \dfrac{\Delta E_p}{Q}$

7. Circuitry:

$Q = It$ $\qquad V = IR$ $\qquad P = VI$

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8. Electromagnetism:

$F = BIl$ $\quad B = \frac{\mu_0 I}{2\pi d}$ $\quad \tau = NIAB$

$F = QvB$ $\quad B = \mu_0 \frac{N}{l} I$ $\quad \Phi = BA$

$\mathcal{E} = -N\frac{\Delta\Phi}{\Delta t}$ $\quad B = \mu_0 nI \left(\text{where } n = \frac{N}{l}\right)$ $\quad \frac{V_s}{V_p} = \frac{N_s}{N_p}$

$\mathcal{E} = Blv$

9. Quantum Mechanics: (Section I)

$E(\text{energy}) = hf$ $\quad c = f\lambda$ $\quad W_0 = hf_0$

$E_{k_{max}} = hf - W_0$ $\quad \lambda = \frac{h}{p}$ $\quad E_n = (-13.6eV)\frac{Z^2}{n^2}$

10. Fluid Theory: (Section II)

$\rho = \frac{m}{V}$ $\quad PV = NkT$ $\quad PV = \frac{1}{3}Nmv^2$

$F = \rho Vg$ $\quad P = \frac{F}{A}$ $\quad P = P_G + P_a$

$PV = nRT$ $\quad P + \frac{1}{2}\rho v^2 + \rho gh = \text{constant}$ $\quad E_k = \frac{3}{2}kT$

$Av = \text{constant}$

11. AC Circuits and Electronics: (Section III)

$Q = CV$ $\quad E_p = \frac{1}{2}CV^2$ $\quad \tau = RC$

$X_C = \frac{1}{2\pi fC}$ $\quad Z = \sqrt{R^2 + (X_L - X_C)^2}$ $\quad X_L = 2\pi fL$

$f_0 = \frac{1}{2\pi\sqrt{LC}}$ $\quad \beta\ (\text{current gain}) = \frac{\Delta I_C}{\Delta I_B}$ $\quad A_f = \frac{A}{1 - \beta A}$

$(\text{where } \beta = \text{ feedback ratio})$