

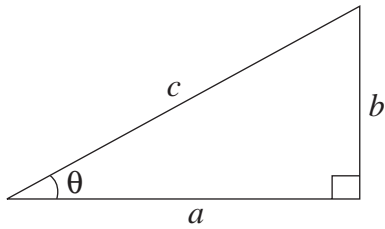
TABLE OF CONSTANTS

Gravitational constant	$G = 6.67 \times 10^{-11} \text{ N} \cdot \text{m}^2/\text{kg}^2$
Acceleration due to gravity at the surface of Earth (for the purposes of this examination)	$g = 9.80 \text{ m/s}^2$
Earth	
radius	$= 6.38 \times 10^6 \text{ m}$
radius of orbit about Sun	$= 1.50 \times 10^{11} \text{ m}$
period of rotation	$= 8.61 \times 10^4 \text{ s}$
period of revolution about Sun	$= 3.16 \times 10^7 \text{ s}$
mass	$= 5.98 \times 10^{24} \text{ kg}$
Moon	
radius	$= 1.74 \times 10^6 \text{ m}$
radius of orbit about Earth	$= 3.84 \times 10^8 \text{ m}$
period of rotation	$= 2.36 \times 10^6 \text{ s}$
period of revolution about Earth	$= 2.36 \times 10^6 \text{ s}$
mass	$= 7.35 \times 10^{22} \text{ kg}$
Sun	
mass	$= 1.98 \times 10^{30} \text{ kg}$
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	$m_p = 1.67 \times 10^{-27} \text{ kg}$
Mass of neutron	$m_n = 1.68 \times 10^{-27} \text{ kg}$
Permeability of free space	$\mu_o = 4\pi \times 10^{-7} \text{ T} \cdot \text{m/A}$
Speed of light	$c = 3.00 \times 10^8 \text{ m/s}$

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

MATHEMATICAL EQUATIONS

For Right-angled Triangles:

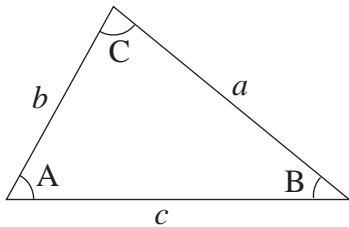


$$a^2 + b^2 = c^2$$

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

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

For All Triangles:



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

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

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

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

Circle:

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

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

Sphere:

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

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

Quadratic Equation:

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

Vector Kinematics in Two Dimensions:

$$v = v_0 + at \qquad \bar{v} = \frac{v + v_0}{2}$$

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

Vector Dynamics:

$$F_{\text{net}} = ma \qquad F_g = mg$$

$$F_{\text{fr}} = \mu F_N$$

Work, Energy, and Power:

$$W = Fd \qquad E_p = mgh$$

$$E_k = \frac{1}{2}mv^2 \qquad P = \frac{W}{t}$$

Momentum:

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

Equilibrium:

$$\tau = Fd$$

Circular Motion:

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

Gravitation:

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

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Electrostatics:

$$F = k \frac{Q_1 Q_2}{r^2} \quad E = \frac{F}{Q}$$

$$\Delta V = \frac{\Delta E_p}{Q} \quad E = \frac{\Delta V}{d}$$

$$E_p = k \frac{Q_1 Q_2}{r} \quad V = \frac{kQ}{r}$$

Electric Circuits:

$$I = \frac{Q}{t} \quad V = IR$$

$$V_{\text{terminal}} = \mathcal{E} \pm Ir \quad P = IV$$

Electromagnetism:

$$F = BIl \quad F = QvB$$

$$B = \mu_0 nI = \mu_0 \frac{N}{l} I \quad \mathcal{E} = Blv$$

$$\Phi = BA \quad \mathcal{E} = -N \frac{\Delta \Phi}{\Delta t}$$

$$V_{\text{back}} = \mathcal{E} - Ir$$

$$\frac{V_s}{V_p} = \frac{N_s}{N_p} = \frac{I_p}{I_s}$$