Constants and units: $g = 9.8\,\mathrm{m/s^2}$, $1\,\mathrm{mm} = 10^{-3}\mathrm{m}$, $1\,\mathrm{cm} = 10^{-2}\,\mathrm{m}$, $1\,\mathrm{km} = 10^3\,\mathrm{m}$, $1\,\mathrm{in} = 2.54\,\mathrm{cm}$, $1\,\mathrm{mi} = 1609\,\mathrm{m}$; $1\,\mathrm{N}\,(\mathrm{newton}) = \mathrm{kg}\cdot\mathrm{m/s^2}$, $1\,\mathrm{J}\,(\mathrm{joule}) = \mathrm{N}\cdot\mathrm{m} = \mathrm{kg}\cdot\mathrm{m^2/s^2}$, $1\,\mathrm{W}$ (watt)=J/s. density=mass/volume.
Volumes. Cylinder: $\pi R^2 h$, sphere: $\frac{4}{3}\pi R^3$, cone: $\frac{1}{3}\pi R^2 h$
Quadratic equation. $ax^2 + bx + c = 0\,,\ x = \left(-b \pm \sqrt{b^2 - 4ac}\right)/(2a)$
Derivatives/integrals. $\frac{d}{dt}t^n = nt^{n-1}\,,\ \int r^n\,dr = \frac{1}{n+1}r^{n+1}$
Vectors. If $\vec{c} = \vec{a} + \vec{b}$, then $c_x = a_x + b_x\,,\ c_y = a_y + b_y\,,\ c_z = a_z + b_z$ and $c = \sqrt{c_x^2 + c_y^2 + c_z^2}$.
Dot product: $\vec{a}\cdot\vec{b} = a_x b_x + a_y b_y + a_z b_z = ab\cos\alpha$. Cross product: $|\vec{A}\times\vec{B}| = A * B * \sin\alpha\,,$ $\hat{\imath}\times\hat{\jmath} = \hat{k}\,,\ \hat{\jmath}\times\hat{k} = \hat{\imath}\,,\ \hat{k}\times\hat{\imath} = \hat{\jmath}$.
Kinematics: $v = dx/dt\,,\ a = dv/dt = d^2x/dt^2$. Constant a: $v - v_0 = at$, $x - x_0 = \frac{v_0+v}{2}t = v_0 t + \frac{1}{2}at^2 = \frac{v^2 - v_0^2}{2a}$. Projectile: $v_x = const\,,\ x - x_0 = v_x t\,,\ v_y = v_{0y} - gt\,,\ y - y_0 = v_{0y}t - \frac{1}{2}gt^2 = (v_{0y}^2 - v_y^2)/(2g)$. Range: $\left(v_0^2/g\right) * \sin(2\theta)$
Circular motion with constant speed: $\omega = v/R$, $a_c = v^2/R = \omega^2 R$, towards center.
The three Laws of motion: (1) If $\vec{F}_{net} = 0$ then $\vec{v} = const$; (2) $\vec{F}_{net} = m\vec{a}$; (3) $\vec{F}_{21} = -\vec{F}_{12}$
Specific forces. Gravity: $m\vec{g}$ (down). Normal $\vec{N}$ - perpendicular to surface; tension T - constant along the string. Spring force: $F = -kx$ (k is spring constant).
Friction - parallel to surface; kinetic: $f_k = \mu_k N$; static: $f_s \le \mu_s N$ with $N = mg$ (horizontal plane) or $N = mg\cos\theta$ (inclined plane).
Inclined plane. Components of gravity: $mg\sin\theta$ (parallel to plane, downhill) and $mg\cos\theta$ (perpendicular to plane). Kinetic friction: $\mu_k mg\cos\theta$ (parallel to plane, opposite to direction of motion).
Centripetal motion: $F_{net} = mv^2/R$; direction of $\vec{F}_{net}$ - towards center of revolution.
Work and power. Constant force $W = \vec{F}\cdot(\vec{r}_2 - \vec{r}_1) = F_x\Delta x + F_y\Delta y + F_z\Delta z$ (or, $W = F\Delta r\cos\alpha$); general: $W_{AB} = \int_A^B \vec{F}\cdot d\vec{r}$. Power: $P = W/\Delta t = \vec{F}\cdot\vec{v}$. Work by specific forces: gravity: $W_g = -mg\Delta y$ (and Δx does not matter); normal: $W_N = 0$;
kinetic friction: $W_f = -fL$; spring $W_s = \frac{1}{2}k\left(x_i^2 - x_f^2\right)$
Kinetic energy and work-energy theorem: $K = \frac{1}{2}mv^2\,,\ \Delta K = W$ where W is the *net* work (i.e. work by all forces).
Potential energy. For conservative forces (with path-independent work) introduce $U(\vec{r})$ so that $W_{AB} = U_A - U_B = -\Delta U$. For specific forces: gravity: $U_g = mgh$; spring: $U_s = \frac{1}{2}kx^2$. If *only* conservative forces, then energy conservation: $\Delta K + \Delta U = 0$ or $K + U = const$. If also non-conservative forces (e.g., friction) with work $W_{non-cons}$, then $\Delta(K + U) = W_{non-cons}$
Momentum. $\vec{p} = m\vec{v}\,,\ \vec{P}_{tot} = \sum m_i\vec{v}_i$. Impulse $\Delta\vec{p} = \vec{F}_{av}\Delta t$. Conservation: if $\vec{F}_{ext} = 0$, then $\vec{P}_{tot} = const$ (e.g., in collisions). **Center-of-mass:** $\vec{R}_{cm} = \frac{1}{M}\sum m_i\vec{r}_i\,,\ M = \sum M_i$; $\vec{P} = M\vec{V}_{cm}$
Rotation (kinematics): If N-number of revolutions, then $\theta = 2\pi N$. Angular velocity $\omega = d\theta/dt$ (in rad/s); ang. acceleration $\alpha = d\omega/dt$ (in rad/s^2). If $\alpha = const$, then $\theta = \frac{\omega_0+\omega}{2}t = \omega_0 t + \frac{1}{2}\alpha t^2$, or $\theta = \frac{\omega^2 - \omega_0^2}{2\alpha}$, and $\omega = \omega_0 + \alpha t$. Connection with linear: $\omega = v/r\,,\ \alpha = a/r$
Dynamics: $K = \frac{1}{2}I\omega^2$; I-moment of inertia. For point masses: $I = \sum m_i r_i^2$, for solid bodies $I = \int dV\,\rho r^2$. Specific I's: rod (about center) $ML^2/12$; rod (about end) $ML^2/3$; hoop MR^2; disk $MR^2/2$; solid sphere $\frac{2}{5}MR^2$; spherical shell $\frac{2}{3}MR^2$. Parallel axes theorem: $I = I_{CM} + MD^2$
Rotation+linear: $K = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$. If $\omega = v/R$ (e.g., rolling) $K = \frac{1}{2}mv^2(1 + I/(mR^2))$