AP PHYSICS C MECHANICS: FORMULA SHEET

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Numbers

Trignometric Functions

θ	0°	30°	37°	45°	53°	60°	90°
$\sin\theta$	0	1/2	3/5	√2/2	4/5	√3/2	1
$\cos\theta$	1	√3/2	4/5	√2/2	3/5	1/2	0
$\tan\theta$	0	√3/3	3/4	1	4/3	√3	∞

Unit Symbols

m - meter
kg - kilogram
s - second
C - coulumb
N - newton
J - Joule

Prefixes

Factor	Prefix	Symbol
10^{9}	Giga	G
10^{6}	mega	M
10^{3}	kilo	k
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p

Important constants

Speed of light: $c = 3.00 \cdot 10^{8}$ m/s

universal grav. constant: $G = 6.67 \cdot 10^{-11} \frac{N \cdot m^2}{kg^2}$

acceleration: $g = 9.8$ m/s²

Important assumption

#1 Frame of reference of any problem is inertial unless otherwise stated

geometry Trignom

Rectangle: $A = bh$

Triangle: $A = \frac{1}{2}bh$

Circle: $A = \pi r^2$, $C = 2\pi r$, $s = r\theta$

rectangular solid: $V = \ell wh$

cylinder: $V = \pi r^2 \ell$, $S = 2\pi r\ell + 2\pi r^2$

Sphere: $V = \frac{4}{3}\pi r^3$, $S = 4\pi r^2$

Right Triangle: $a^2 + b^2 = c^2$

Formula

Kinematic

$v = \frac{dx}{dt}$ $\quad \Delta x = \int_{t_0}^{t_f} v(t)\,dt$

$a = \frac{dv}{dt}$ $\quad \Delta v = \int_{t_0}^{t_f} a(t)\,dt$

Basic Formulas for acceleration

Bigs kinematic Eqations:

$v = v_0 + at$

$\Delta x = \left(\frac{v + v_0}{2}\right) t$

$\Delta x = v_0 t + \frac{1}{2}at^2$

$\Delta x = vt - \frac{1}{2}at^2$

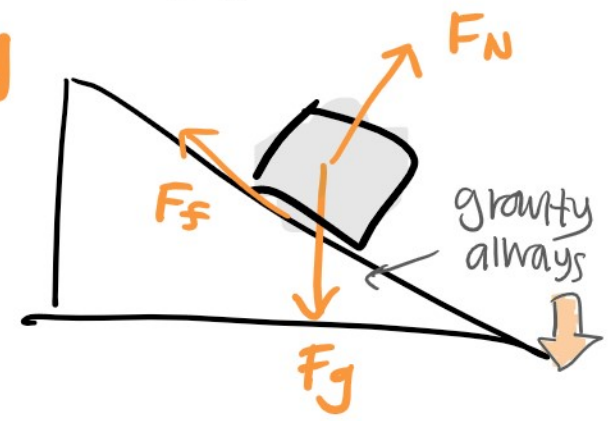
$v^2 = v_0^2 + 2a\Delta x$

acceleration MUST be constant

newtons Law

Newton's 2nd Law

$\Sigma F = ma$



Friction Formula

$F_f = \mu F_N$ ← Always perpendicular to surface

Tension - solve using $\Sigma F = ma$; Tension always constant along string

Collision

$F = \frac{dp}{dt}$

$\Delta P_i = \Delta P_f$ conservation of Linear momentum

impulse $F\Delta t = J = \Delta P = mv$

$J = \int_{t_1}^{t_2} F(t)\,dt$ calculus impulse

center of mass

$x_{cm} = \frac{1}{M}\int x\,dm = \frac{1}{M}\int x(\lambda\,dx)$

$\lambda = \frac{dm}{dx}$ ↑ linear density

$M = \int dm = \int \lambda\,dx$ ↑ Find the mass

work energy Power

$\Delta E = W = \int F\,dx$ energy ...

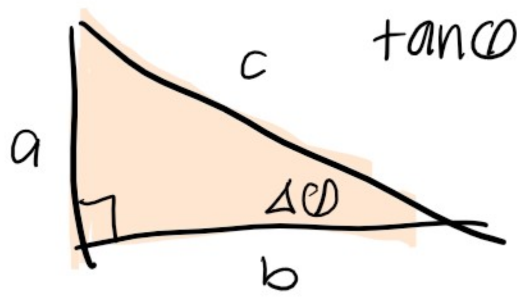
Right Triangle

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

$\sin\theta = a/c$

$\cos\theta = b/c$

$\tan\theta = a/b$



$$\Delta E = W = \int F\,dx$$ energy work

$$P = \frac{dE}{dt} = \frac{W}{t} = Fv$$ power

$$PE_{grav} = mgh \qquad PE_{spring} = \frac{1}{2}kx^2$$

$$KE = \frac{1}{2}mv^2$$

Rotational motion

$\Delta x = r\Delta\theta$

$v = r\omega$

$a = r\alpha$

Linear 2 Angular

$$W = \int_{\theta_1}^{\theta_2} \tau\, d\theta$$

$$P = \tau\omega$$ Power Formula

$$\tau = \vec{r} \times \vec{F} = I\alpha$$ Torque

$$I = \int r^2\, dm$$ Rotational Inertia

$$KE = \frac{1}{2}I\omega^2$$ Angular KE

$$L = I\omega = rp$$ angular momentum

Centripetal Acceleration

$$L_i = L_F$$ conservation of angular momentum

$$a_c = \frac{v^2}{r} = r\omega^2$$