Formulae For Memorization / Reference

(A) Conversion Factors

1 m = 39.370 inch = 3.28084 ft = 1.09361 yd = 0.00062137 mile

1 inch = 0.025400 m = 2.5400 cm

1 km/h = (1/3.600) m/s; = 0.62137 mi/h; = 0.911342 ft/s;

1 m/s = 3.600 km/h; = 2.23694 mi/h; = 3.2808 ft/s;

1 mi/h = 1.46667 ft/sec = 0.44704 m/s = 1.60935 km/h

1 ft/sec = 0.68182 mi/h = 0.30480 m/s = 1.097283 km/h

1 km = 1×10^{3} m 1 cm = 1×10^{-2} m 1 mm = 1×10^{-3} m 1 μm = 1×10^{-6} m

1 mile = 1609.344 m = 6.3360×10^{4} in = 5280 ft = 1760 yds = 8 furlong

1 cm = 1×10^{-2} m 1 cm^2 = $1\times10^{-4} m^2$ 1 cm^3 = 1×10^{-6} m^3

1 year = 365 days = 8760 hrs = 525, 600 min = 31536000 sec

$T_{spin,\,earth}$ = 24 hrs v_{spin} ~ 1670 km/h ~ 1037 mi/h

$T_{orbit,\,earth}$ = 365 days v_{orbit} ~ 30, 000 km/h ~ 18, 560 mi/h

π = 3.141593 (and not just 3.14) 1 radian = 57.29578° 1^{o} = 0.0174533 radian

1 rpm = $2\pi/60$ = 0.1047198 rad/sec = $2\pi r/60$ m = $(0.1047198)(r)$ m

B) Perimeters

Circle of radius r (circumference): $2\pi r = \pi d$ $(d = 2r)$

Square of side l: $4l$

Rectangle of length l and width w: $2(l + w)$

Trapezoid of lengths and widths l_1 , l_2 , w_1 , w_2: $l_1 + w_1 + l_2 + w_2$

Triangle of sides a , b , c: $(a + b + c)$

C) Diagonals

Square of side l: $(\sqrt{2})(l)$ Rectangle of length l and width w: $\sqrt{(l^2 + w^2)}$

D) Half Diagonals

Square of side l: $l/\sqrt{2}$ Rectangle of length l and width w: $(1/2)\sqrt{(l^2 + w^2)}$

E) Areas

Circle of radius r: $\pi r^2 = (\pi/4)d^2 = 0.785398d^2$ Square of side l: l^2

Rectangle of length l and width w: $l \times w$ Parallelogram $(a)(b)(sin\theta)$

Triangle of base a and height h: $(1/2)(a)(h)$

Trapezoid of base l_1 and heights w_1 , w_2: base x average height = $(l_1)\left(\frac{w_1 + w_2}{2}\right)$

Surface of a sphere of radius r: $4\pi r^2 = \pi d^2$

surface of a cylinder of radius r and height h: $(2\pi r)(r + h)$

F) Volumes

Sphere of radius r: $(4/3)\pi r^3 = 4.1888r^3 = 0.523599d^3$ Cubic Box of side l: l^3

Rectangular Box of length l, width w and height h: $l \times w \times h$

Cylinder of radius r and height h: $(\pi r^2)(h)$

G) Trigonometry

$sin\ \theta =$ opposite/hypotnuse $\quad cos\ \theta =$ adjacent/hypotnuse $\quad tan\ \theta =$ opposite/adjacent $= sin\theta / cos\theta$

$sin^2\theta + cos^2\theta = 1 \quad sec^2\theta - tan^2\theta = 1 \quad csc^2\theta - cot^2\theta = 1$

$sin\ 2\theta = 2 sin\ \theta\ cos\ \theta \quad cos 2\theta = cos^2\theta - sin^2\theta = 2cos^2\theta - 1 = 1 - 2sin^2\theta \quad tan\ 2\theta = \dfrac{2\,tan\,\theta}{1 - tan^2\theta}$

$sin\,(-\theta) = -sin\ \theta \quad cos\,(-\theta) = cos\ \theta \quad tan\,(-\theta) = -tan\ \theta$

$sin(90 + \theta) = cos\ \theta \quad sin(90 - \theta) = cos\ \theta \quad sin(180 - \theta) = sin\ \theta \quad sin(180 + \theta) = -sin\ \theta$

$cos(90 + \theta) = -sin\ \theta \quad cos(90 - \theta) = sin\ \theta \quad cos(180 + \theta) = -cos\ \theta \quad cos(180 - \theta) = -cos\ \theta$

$tan(90 + \theta) = -cot\ \theta \quad tan(90 - \theta) = cot\ \theta$

$sin\,(A \pm B) = sin\ A\ cos B \pm cos A\ sin B \quad cos(A \pm B) = cos A\ cos B \mp sin\ A\ sin B$

$tan\ (A \pm B) = \dfrac{tan\,A \pm tan B}{1 \mp tan\,A\ tan B} \quad sin\left(\dfrac{\theta}{2}\right) = \sqrt{\dfrac{1 - cos\theta}{2}} \quad cos\left(\dfrac{\theta}{2}\right) = \sqrt{\dfrac{1 + cos\theta}{2}} \quad tan\left(\dfrac{\theta}{2}\right) = \sqrt{\dfrac{1 - cos\theta}{1 + cos\theta}}$

$$sin A \pm sin B = 2\,sin\left(\frac{A \pm B}{2}\right) cos\left(\frac{A \mp B}{2}\right)$$

$$cos A + cos B = 2cos\left(\frac{A + B}{2}\right) cos\left(\frac{A - B}{2}\right)$$

$$cos A - cos B = 2sin\left(\frac{A + B}{2}\right) sin\left(\frac{B - A}{2}\right)$$

$(cos A)(cos B) = (\frac{1}{2})[cos(A + B) + cos(A - B)] \quad (sin A)(sin B) = (\frac{1}{2})[cos(A - B) + cos(A + B)]$

H) Pythagorean Theorem

$(adjacent)^2 + (opposite)^2 = (hypotenuse)^2 \quad \theta = tan^{-1}$ (opposite / adjacent)

I) Quadratic Equation

$ax^2 + bx + c = 0 \quad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad \sqrt{b^2 - 4ac} =$ discriminant

$x^2 + 2\beta x + \gamma = 0 \quad x = -\beta \pm \sqrt{\beta^2 - \gamma}$

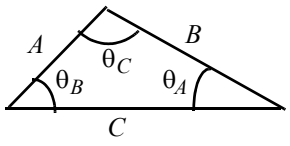
J) Triangles: Sine and Cosine Laws

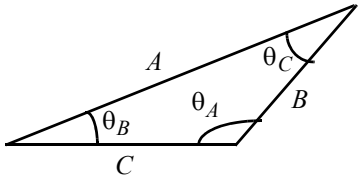
If triangles of sides A, B, C and A', B', C' are similar, then $A/A' = B/B' = C/C'$

For *any* triangle of sides A, B, C and angles $\theta_A, \theta_B, \theta_C$:

cosine law: $A^2 = B^2 + C^2 - 2BC\,cos\ \theta_A \quad cos\ \theta_A = (B^2 + C^2 - A^2)/(2BC)$

sine law: $A/(sin\ \theta_A) = B/(sin\ \theta_B) = C/(sin\,\theta_C)$





K) Algebra

$(a + b)^2 = a^2 + b^2 + 2ab \quad (a - b)^2 = a^2 + b^2 - 2ab \quad (a^2 - b^2) = (a + b)(a - b)$

$log(ab) = log\,a + log\,a \quad log(a/b) = log\,a - log\,a \quad log\,a^n = n\,log\,a$

$ln(ab) = lna + lnb \quad ln(a/b) = lna - lnb \quad ln\,a^n = n\,lna$

L) All exponents and trigonometric functions are dimensionless numbers!