AlgebraFormula Sheet

Properties of Exponents

$a^m a^n = a^{m+n}$

$\frac{a^m}{a^n} = a^{m-n}$

$a^0 = 1$

$a^{-n} = \frac{1}{a^n}$

$(a^m)^n = a^{mn}$

$(ab)^n = a^n b^n$

$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$

$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$

$a^{\frac{m}{n}} = \sqrt[n]{a^m} = (\sqrt[n]{a})^m$

$\sqrt[n]{ab} = \sqrt[n]{a}\sqrt[n]{b}$

$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$

Quadratic Formula

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Distance

$d = rt$

$r = \frac{d}{t} \quad t = \frac{d}{r}$

Simple Interest

$I = prt$

Variation

Direct: $y = kx$

Inverse: $y = \frac{k}{x}$

Joint: $z = kxy$

Quadratic Function

$f(x) = ax^2 + bx + c$
or
$f(x) = a(x-h)^2 + k$

Vertex of a Parabola

(h, k)

where $h = \frac{-b}{2a}$ *and*

$k = f(h) = c - \frac{b^2}{4a}$

Geometry

	Perimeter	Area
Square:	$P = 4s$	$A = s^2$
Rectangle:	$P = 2l + 2w$	$A = lw$
Triangle:	$P = a + b + c$	$A = \frac{1}{2}bh$
Parallelogram:	$P = 2a + 2b$	$A = bh$
Trapezoid:	$P = a + b + c + d$	$A = \frac{1}{2}h(b + c)$

	Circumference	Area
Circle:	$C = 2\pi r = \pi d$	$A = \pi r^2$

Volume

Rectangular Solid:	$V = LWH$
Cube:	$V = s^3$
Right Circular Cylinder:	$V = \pi r^2 h$
Right Rectangular Pyramid:	$V = \frac{1}{3}LWH$
Right Circular Cone:	$V = \frac{1}{3}\pi r^2 h$
Sphere:	$V = \frac{4}{3}\pi r^3$

Lines

Slope: $m = \frac{y_2 - y_1}{x_2 - x_1}$

Slope-Intercept: $y = mx + b$

Point-Slope: $y - y_1 = m(x - x_1)$

Standard Form: $Ax + By = C$

Factoring

Difference of Squares: $A^2 - B^2 = (A + B)(A - B)$

Perfect Square Trinomials: $A^2 + 2AB + B^2 = (A + B)^2$

$A^2 - 2AB + B^2 = (A - B)^2$

Sum of Cubes: $A^3 + B^3 = (A + B)(A^2 - AB + B^2)$

Difference of Cubes: $A^3 - B^3 = (A - B)(A^2 + AB + B^2)$

Distance

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Midpoint

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Circles

$$(x-h)^2 + (y-k)^2 = r^2$$

Compound Interest

Compounded n *times per year:* $A = P\left(1 + \frac{r}{n}\right)^{nt}$

Compounded Continuously: $A = P e^{rt}$

Change-of-Base

$$\log_b(x) = \frac{\log(x)}{\log(b)} = \frac{\ln(x)}{\ln(b)}$$

Pythagorean Theorem

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

Logarithms

$y = \log_a(x)$ *if and only if* $a^y = x$

$\log_a(1) = 0$

$\log_a(a) = 1$

$\log_a(MN) = \log_a(M) + \log_a(N)$

$\log_a(a^x) = x$

$a^{\log_a(x)} = x$

$\log_a\left(\frac{M}{N}\right) = \log_a(M) - \log_a(N)$

$\log(x) = \log_{10}(x)$

$\log_a(M^p) = p\log_a(M)$

$\ln(x) = \log_e(x)$

Multiplication Table

x	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***	***12***	***13***	***14***	***15***
1	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
2	*2*	***4***	*6*	*8*	*10*	*12*	*14*	*16*	*18*	*20*	*22*	*24*	*26*	*28*	*30*
3	*3*	*6*	***9***	*12*	*15*	*18*	*21*	*24*	*27*	*30*	*33*	*36*	*39*	*42*	*45*
4	*4*	*8*	*12*	***16***	*20*	*24*	*28*	*32*	*36*	*40*	*44*	*48*	*52*	*56*	*60*
5	*5*	*10*	*15*	*20*	***25***	*30*	*35*	*40*	*45*	*50*	*55*	*60*	*65*	*70*	*75*
6	*6*	*12*	*18*	*24*	*30*	***36***	*42*	*48*	*54*	*60*	*66*	*72*	*78*	*84*	*90*
7	*7*	*14*	*21*	*28*	*35*	*42*	***49***	*56*	*63*	*70*	*77*	*84*	*91*	*98*	*105*
8	*8*	*16*	*24*	*32*	*40*	*48*	*56*	***64***	*72*	*80*	*88*	*96*	*104*	*112*	*120*
9	*9*	*18*	*27*	*36*	*45*	*54*	*63*	*72*	***81***	*90*	*99*	*108*	*117*	*126*	*135*
10	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*	*90*	***100***	*110*	*120*	*130*	*140*	*150*
11	*11*	*22*	*33*	*44*	*55*	*66*	*77*	*88*	*99*	*110*	***121***	*132*	*143*	*154*	*165*
12	*12*	*24*	*36*	*48*	*60*	*72*	*84*	*96*	*108*	*120*	*132*	***144***	*156*	*168*	*180*
13	*13*	*26*	*39*	*52*	*65*	*78*	*91*	*104*	*117*	*130*	*143*	*156*	***169***	*182*	*195*
14	*14*	*28*	*42*	*56*	*70*	*84*	*98*	*112*	*126*	*140*	*154*	*168*	*182*	***196***	*210*
15	*15*	*30*	*45*	*60*	*75*	*90*	*105*	*120*	*135*	*150*	*165*	*180*	*195*	*210*	***225***