

To Master

Key

~ Factoring & Distributing ~

$x^2 - x$	$x(x-1)$
$x^4 - x^2$	$x^2(x^2-1) = x^2(x+1)(x-1)$
$7^5 - 7^3$	$7^3(7^2-1) = 7^3(48)$
$z^3 - z$	$z(z^2-1) = z(z+1)(z-1)$
$10^{(b+1)}$	$= 10^b(10)$
$10^{(b-1)}$	$\frac{10^b}{10}$
$a^b - a^{b-1}$	$a^b(1 - \frac{1}{a})$ or $a^{b-1}(a-1)$
$pq + pr + qs + rs$	$p(q+r) + s(q+r) = (p+s)(q+r)$
$x^2 - y^2$	$(x-y)(x+y)$
$x^2 + 2xy + y^2$	$(x+y)(x+y)$
$x^2 - 2xy + y^2$	$(x-y)(x-y)$
$(a+b)^2$	$a^2 + 2ab + b^2$
$a^2 - 1$	$(a-1)(a+1)$
$(x+y)(x+y)$	$x^2 + 2xy + y^2$
$(x-y)(x+y)$	$x^2 - y^2$

$(x-y)(x-y)$	$x^2 - 2xy + y^2$
Absolute value Equation for e.g. height not 10 or more away from 50. etc.	$ x-20 \leq 10$ x is not more than 10 away from 20
$x^2 \geq 64$ compound ineq.	$ 8 = 64$
$p^3 - p$	$p(p^2 - 1) = p(p-1)(p+1)$
$a^b + a^{b+1}$	$a^b(1+a)$ or $a^{b+1}(\frac{1}{a} + 1)$
$3^5 + 3^6$	$3^5(1+3) = 3^5(4)$
$m^n - m^{n-1}$	$m^n(1 - \frac{1}{m})$ or $m^{n-1}(m-1)$
$xw + yw + zx + zy$	$w(x+y) + z(x+y) = (w+z)(x+y)$
$x^4 - 5x^2 + 4 = 0$ Solve roots	$x^2 = z$ $(x-4)(x-1)$ $x^2 = 4$ $x = \pm 4$ $z^2 - 5z + 4$ $z = 4$ $z = 1$ $x^2 = 1$ so $x = \pm 1$
Quadratic equation	$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Discriminant explain ≥ 0 ≤ 0	$b^2 - 4ac$ $> 0 \rightarrow 2$ solutions $< 0 \rightarrow$ no solutions $= 0 \rightarrow 1$ solution
Direct - linear sequence	$S_n = nk + x$
Recursive - linear sequence	$S_n = S_{n-1} + k$ $S_1 = k + x$
Direct - exponential sequence	$S_n = K^n x$
Recursive - exponential sequence	$S_n = S_{n-1} k$ $S_1 = kx$

$x < y$	
↳ Reciprocal if $x > 0$ $y > 0$	$\frac{1}{x} > \frac{1}{y}$
↳ Reciprocal if $x < 0$ $y < 0$	$\frac{1}{x} > \frac{1}{y}$
↳ Reciprocal if $x < 0$ $y > 0$	Nothing
Sequence formula for factorial (recursive)	$S_n = S_{n-1} \times n$
$\frac{1}{5y} = \frac{1}{2z} - \frac{1}{x}$	$\frac{x-2z}{2xz}$
Solve for y $\frac{1}{x} + \frac{1}{5y} = \frac{1}{2z}$	$y = \frac{2xz}{5x-10z}$
Solve for x $4^{x-1} < 4^x - 120$	$4^x(\frac{1}{4} - 1) < -120$ so $4^x > 160$ $x > 4$
$\frac{x^2}{9} - \frac{4}{y^2} = 12$	$(\frac{x}{3} - \frac{2}{y})(\frac{x}{3} + \frac{2}{y}) = 12$ diff of squares!!
Algebraic rep. of remainders	$x = Qy + r$ or $\frac{x}{y} = Q + \frac{r}{y}$ ↳ gives you decimal
Compound interest	$A = P(1 + \frac{r}{n})^{nt}$ $r = \text{int. rate}$ $n = \# \text{ of times compounded per year}$ $t = \# \text{ of years}$
Simplify $\frac{1}{\sqrt{n+1} - \sqrt{n}}$	$\frac{1}{(\sqrt{n+1} - \sqrt{n})(\sqrt{n+1} + \sqrt{n})} = \frac{1}{n+1 + n}$
$\frac{1}{x} - \frac{1}{x+1} = \frac{1}{x+4}$	$x+1 - x = \frac{x(x+1)}{x+4}$ $x+4 = x^2+x$ $x=2$ $0 = x^2-4$ $x=-2$

$$\frac{1}{x} + \frac{1}{5y} = \frac{1}{2z}$$

$$\frac{2xz}{5y} = \frac{x}{2z} - \frac{2z}{x}$$

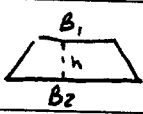
$$\frac{2xz}{5y} = \frac{x^2 - 2z^2}{x \cdot 2z}$$

$$5(x-2z) = \frac{2xz}{x \cdot 2z} = 1$$

TO MASTER

~ Geometry ~

Key

Sum of interior angles of a polygon?	Area $(n-2) \times 180$ $n = \# \text{ of sides}$
Area of a trapezoid	 $\frac{B_1 + B_2}{2} \times h$
Area of a Rhombus	Diagonal $\times$ Diagonal Rhomb. has equal sides but not eq. angles
Triangle inequality?	 $x - y < z < x + y$
Pythagorean triples & multiples?	3, 4, 5 $\rightarrow$ 6, 8, 10 5, 12, 13, 7, 24, 25, 8, 15, 17
special right triangles and their sides	45:45:90 $x : x : x\sqrt{2}$ 30:60:90 $x : x\sqrt{3} : 2x$
Formula for diagonal of a cube	$s\sqrt{3}$ ✓
Area of equilateral triangle	$\frac{s^2\sqrt{3}}{4}$ ✓ $\frac{\text{base} \times \text{height}}{2}$
Circumference of a circle	$2\pi r$ ✓
$\frac{60}{360}$ $\frac{240}{360}$	$\frac{240}{360} = \frac{2}{3}$ $\frac{120}{360} = \frac{1}{3} \cdot \frac{60}{360} = \frac{1}{6}$
Circumference of a circle	$2\pi r$
Area of a circle	πr^2
Given perimeter quad. max area?	Max area = square
Given area quad. minimum perimeter?	
surface surface area sphere? volume sphere?	$4\pi r^2 = \text{surf}$ $\frac{4}{3}\pi r^3 = \text{Area sphere}$

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Key

~ Number Properties ~

Divisibility by 4?	by 2, two times or last 2 digits div. by 4
Divisibility by 8?	by 2, <u>three</u> times (not 4) or last 3 digits div. by 4
How to determine divisibility of two #s. e.g. is 72 div by 27?	Compare prime factorization, if number you want to divide by has equal or less primes than dividend quotient then yes!
GCF w/ prime factorization	Overlap! which #s in common
LCM/LCD	Eliminate duplicates and keep highest powers
$2 \times 5 \times 6$ div. by 4? $2 \times 5 \times 6 \times 10$ div by 8?	yes $2 \times (2) \rightarrow 5$ is odd so 2×6 are even. yes $\rightarrow$ each time you multiply by an even # then result will be div by 2 x n. $(2 \times 2 \times 2) = 8$
Product of k consecutive integers will be divisible by?	$k!$
0^x	0
x^0	1
# of factors perfect square # of factors non-perfect square	ODD! ✓ EVEN! ✓
Exponents of perfect square	even exponents! $3^2 \rightarrow 9$ $4^2 \rightarrow 16$ ✓
$\sqrt{180}$	$\sqrt{2 \times 180} = \frac{\sqrt{2^2 \times 3^2 \times 5} \quad 6\sqrt{5} \checkmark}{\cancel{2 \times 2 \times 3 \times 3 \times 5 \times 2 \times 2}} \rightarrow 30 \times 3$
$\sqrt{80} - \sqrt{45}$	Find common base! $\sqrt{5} \checkmark$
$\frac{4}{\sqrt{2}}$	$2\sqrt{2} \checkmark$
$\frac{4}{3 - \sqrt{2}}$	use conjugate $\frac{12 + 4\sqrt{2}}{7} \checkmark$
Express remainder algebraically	$X = QN + R$