Powers of two and Primes

i	2^i	p_i
1	2	2
2	4	3
3	8	5
4	16	7
5	32	11
6	64	13
7	128	17
8	256	19
9	512	23
10	1,024	29
11	2,048	31
12	4,096	37
13	8,192	41
14	16,384	43
15	32,768	47
16	65,536	53
17	131,072	59
18	262,144	61
19	524,288	67
20	1,048,576	71
21	2,097,152	73
22	4,194,304	79
23	8,388,608	83
24	16,777,216	89
25	33,554,432	97
26	67,108,864	101
27	134,217,728	103
28	268,435,456	107
29	536,870,912	109
30	1,073,741,824	113
31	2,147,483,648	127
32	4,294,967,296	131

Common Values

$\pi \approx 3.141,592,653$ $\qquad \ln 10 \approx 2.302,585,092$

$e \approx 2.718,281,828$ $\qquad \log_2 10 \approx 3.321,928,094$

$\sqrt{2} \approx 1.414,213,562$ $\qquad \sqrt{e} \approx 1.648,721,270$

$\ln 2 \approx 0.693,147,180$ $\qquad \sqrt{\pi} \approx 1.772,453,850$

$\log_{10} 2 \approx 0.301,029,995$

Arithmetic Series

$$a_{n+1} = a_n + d \quad \Leftrightarrow \quad a_n = a_1 + d(n-1)$$
$$\Leftrightarrow \quad a_n = a_m + d(n-m)$$
$$a_k + a_{n-k+1} = a_1 + a_n$$
$$S_n = \frac{n}{2}(2a_1 + d(n-1))$$

Geometric Series

$$a_{n+1} = qa_n \quad \Leftrightarrow \quad a_n = q^{n-1}a_1$$
$$a_k{}^2 = a_{k-1}a_{k+1}, \quad k \geq 2$$
$$a_k a_{n-k+1} = a_1 a_n$$
$$\sum_{i=0}^{n} c^i = \frac{c^{n+1}-1}{c-1}, \quad c \neq 1$$
$$\sum_{i=0}^{\infty} c^i = \frac{1}{1-c}, \quad c \neq 1$$
$$\sum_{i=1}^{\infty} c^i = \frac{c}{1-c}, \quad |c| < 1$$
$$\sum_{i=0}^{n} ic^i = \frac{nc^{n+2} - (n+1)c^{n+1} + c}{(c-1)^2}, \quad c \neq 1$$
$$\sum_{i=0}^{\infty} ic^i = \frac{c}{(1-c)^2}, \quad |c| < 1$$

Combinatorics

$$\binom{n}{k} = \frac{n!}{(n-k)!k!}$$
$$\binom{n}{k} = \binom{n}{n-k}$$
$$\binom{n}{k} = \frac{n}{k}\binom{n-1}{k-1}$$
$$\binom{n}{k} = \binom{n-1}{k} + \binom{n-1}{k-1}$$
$$\binom{n}{m}\binom{m}{k} = \binom{n}{k}\binom{n-k}{m-k}$$
$$\binom{n}{k} = (-1)^k\binom{k-n-1}{k}$$
$$\sum_{k=0}^{n}\binom{n}{k} = 2^n$$
$$\sum_{k=0}^{n}\binom{r+k}{k} = \binom{r+n+1}{n}$$
$$\sum_{k=0}^{n}\binom{k}{m} = \binom{n+1}{m+1}$$
$$\sum_{k=0}^{n}\binom{r}{k}\binom{s}{n-k} = \binom{r+s}{n}$$

Basic Algebraic Equations

$$(a \pm b)^2 = a^2 \pm 2ab + b^2$$
$$(a \pm b)^3 = a^3 \pm b^3 \pm 3a^2b + 2ab^2$$
$$a^2 - b^2 = (a+b)(a-b)$$
$$a^3 \pm b^3 = (a \pm b)(a^2 \pm ab + b^2)$$
$$(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2ac + 2bc$$
$$(a+b+c)^3 = a^3 + b^3 + c^3 + 3a^2b + 3ab^2 + 3a^2c +$$
$$+3ac^2 + 3bc^2 + 3b^2c + 6abc$$

Properties of Powers

$$a^m a^n = a^{m+n}, \qquad \frac{a^m}{a^n} = a^{m-n}, \qquad \frac{1}{a^n} = a^{-n}$$
$$(a^m)^n = a^{mn}, \qquad \sqrt[n]{a}^m = a^{\frac{m}{n}}$$

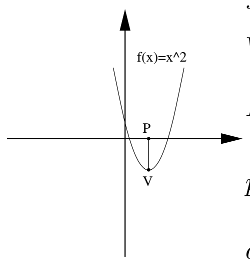
Properties of Logarithms

$$a^n \Rightarrow \log_a n$$
$$\log_a a = 1, \qquad \log_a 1 = 0, \qquad a^{log_a x} = x$$
$$\log_a a^x = x, \qquad \log_a \frac{1}{x} = -\log_a x, \qquad \log_a x^n = n\log_a x$$
$$\log_{a^n} x = \frac{1}{n}\log_a x, \qquad \log_b x = \frac{\log_a x}{\log_a b}$$
$$\log_a xy = \log_a x + \log_a y, \qquad \log_a \frac{x}{y} = \log_a x - \log_a y$$

System of Linear Equations

$$\begin{cases} a_1x + b_1y + c_1 = 0 \\ a_2x + b_2y + c_2 = 0 \end{cases}$$
$$x = \frac{b_1c_2 - b_2c_1}{a_1b_2 - c_2b_1} \qquad y = \frac{c_1a_2 - c_2a_1}{a_1b_2 - a_2b_1}$$
$$\begin{cases} a_1x + b_1y + c_1z + d_1 = 0 \\ a_2x + b_2y + c_2z + d_2 = 0 \\ a_3x + b_3y + c_3z + d_3 = 0 \end{cases}$$
$$A_1 = b_3c_2 - b_2c_3 \qquad B_1 = a_3d_2 - a_2d_3$$
$$A_2 = b_1c_3 - b_3c_1 \qquad B_2 = a_1d_3 - a_3d_1$$
$$A_3 = b_2c_1 - b_1c_2 \qquad B_3 = a_2d_1 - a_1d_2$$
$$x = \frac{A_1d_1 + A_2d_2 + A_3d_3}{A_1a_1 + A_2a_2 + A_3a_3}$$
$$y = \frac{B_1c_1 + B_2c_2 + B_3c_3}{A_1a_1 + A_2a_2 + A_3a_3}$$
$$z = \frac{B_1b_1 + B_2b_2 + B_3b_3}{A_1a_1 + A_2a_2 + A_3a_3}$$

Parabola



$$f(x) = ax^2 + bx + c$$
$$V = (-\frac{b}{2a}; \frac{4ac - b^2}{4a})$$
$$P = (-\frac{b}{2a}; 0)$$
$$px + q = 0 \quad \Rightarrow \quad x = -\frac{p}{2} \pm \sqrt{\frac{p^2}{4} - q}$$
$$ax^2 + bx + c = 0 \quad \Rightarrow \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Pascal's Triangle

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
1 7 21 35 35 21 7 1
1 8 28 56 70 56 28 8 1
1 9 36 84 126 126 84 36 9 1
1 10 45 120 210 252 210 120 45 10 1