# Interview & Cognitive Ability Cheat Sheet

*github.com/mpettersson/InterviewReview/CognitiveAbilityCheatSheet.pdf*

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Numbers** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| **Letters** | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| **Primes** | 2 | 3 | 5 | 7 | 11 | 13 | 17 | 19 | 23 | 29 | 31 | 37 | 41 | 43 | 47 | 53 | 59 | 61 | 67 | 71 | 73 | 79 | 83 | 89 | 97 | 101 |

## Exponents

$x^0 = 1$

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

$x^m \times x^n = x^{m+n}$

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

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

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

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

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

## Logarithms

$log_b k = c \equiv b^c = k$

$log_b x = \frac{log_a x}{log_a b}$

$log_b(xy) = log_b x + log_b y$

$log_b\left(\frac{x}{y}\right) = log_b x - log_b y$

## Percent & Fractions

$x\% \times y \equiv y\% \times x$

$\text{p}\% = \frac{x^{end} - x^{start}}{x^{start}} \times 100$

$x^{start} = \frac{x^{end}}{(100 \pm p)\%}$

Given $\frac{a}{b}$ and $\frac{c}{d}$ if $ad > cb$ then $\frac{a}{b} > \frac{c}{d}$.

## Graph Equations

Slope = $\boldsymbol{m}$, Y-Intercept = $\boldsymbol{b}$

$y = mx + b$

$m = \frac{y^2 - y^1}{x^2 - x^1}$

## Miscellaneous

$$n! = \begin{cases} und. & n < 0 \\ 1 & n = 0 \\ n(n-1)! & n > 0 \end{cases}$$

$abs(x) = (x^2)^{.5}$

$ceiling\left(\frac{a}{b}\right) = \left\lfloor \frac{a+b+1}{b} \right\rfloor$

$$f(x) = \begin{cases} 0 & x = 0 \\ 1 & x \neq 0 \end{cases} = \left\lceil \frac{x^2}{x^2+1} \right\rceil$$

$\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$

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

## Permutations

Order Matters

## Combinations

Order Does Not Matter

| With Repetition | Without Repetition |
|---|---|
| $n^r$ | $P(n,r) = {}^nP_r = {}_nP_r = \frac{n!}{(n-r)!}$ |
| $\frac{(n+r-1)!}{r!(n-1)!}$ | $C(n,r) = {}^nC_r = {}_nC_r = \binom{n}{r} = \frac{n!}{r!(n-r)!}$ |

Number of Possible Items = $\boldsymbol{n}$. Number of Chosen Items = $\boldsymbol{r}$.

## Sets

A set of size $\boldsymbol{n}$ has $\boldsymbol{2^n}$ subsets.

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

If $A \cap B = \emptyset$, then $n(A \cup B) = n(A) + n(B)$.

$n(A \cup B) = n(A - B) + n(A \cap B) + n(B - A)$

## Probability ($P$)

Num. of Possible Results = $\boldsymbol{n}$.
Total Num. of Possible Results = $\boldsymbol{t}$.
Events = $\boldsymbol{A}$, $\boldsymbol{B}$.
Independent Events = $\boldsymbol{C}$, $\boldsymbol{D}$.

$P(A) = \frac{n}{t}$

$0 \leq P(A) \leq 1$

$P(\neg A) = 1 - P(A)$

$P(A \cap B) = P(A) \times P(B \text{ given } A)$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(C \text{ given } D) = P(C)$

$P(C \cup D) = P(C) + P(D)$

$P(C \cap D) = P(C) \times P(D)$

| Fraction | Decimal | Percent |
|---|---|---|
| 1/2 | 0.500 | 0.50% |
| 1/3 | 0.333 | 0.33% |
| 1/4 | 0.250 | 0.25% |
| 1/5 | 0.200 | 0.20% |
| 1/6 | 0.167 | 0.17% |
| 1/7 | 0.143 | 0.14% |
| 1/8 | 0.125 | 0.13% |
| 1/9 | 0.111 | 0.11% |
| 1/10 | 0.100 | 0.10% |

| | Binary | | Intl. System of Units (SI) | |
|---|---|---|---|---|
| | Power of 2 | Value | Power of 10 | Value |
| **Bit (b)** | $2^1$ | 2 | N/A | |
| **Nibble** | $2^2$ | 4 | | |
| **Byte (B)** | $2^3$ | 8 | | |
| **Word (w)** | $2^4$ | 16 | | |
| **Doubleword (d)** | $2^5$ | 32 | | |
| **Quadword (q)** | $2^6$ | 64 | | |
| **Kilobyte (kB)** | $2^{10}$ | 1,024 | $10^3$ | 1 Thousand |
| **Megabyte (MB)** | $2^{20}$ | 1,048,576 | $10^6$ | 1 Million |
| **Gigabyte (GB)** | $2^{30}$ | 1,073,741,824 | $10^9$ | 1 Billion |
| **Terabyte (TB)** | $2^{40}$ | 1024 GB | $10^{12}$ | 1 Trillion |
| **Petabyte (PB)** | $2^{50}$ | 1024 TB | $10^{15}$ | 1 Quadrillion |
| **Exabyte (EB)** | $2^{60}$ | 1024 PB | $10^{18}$ | 1 Quintillion |
| **Zettabyte (ZB)** | $2^{70}$ | 1024 EB | $10^{21}$ | 1 Sextillion |
| **Yottabyte (YB)** | $2^{80}$ | 1024 ZB | $10^{24}$ | 1 Septillion |