Glossary

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This is intended to be a list of basic definitions for common things in math. This will likely be updated as the year goes on, the most recent version will be at `https://MckinleyX.github.io/files/glossary.pdf`.

If you think something should be added to the list, or I've made an error, contact me!

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§1 Common symbols

Here's a list of some of the more common symbols you'll see:
$\forall$ — for all
$\exists$ — there exists
$\in$ — is an element of
$\because$ — because
$\therefore$ — therefore
$\mathbb{Z}$ — the set of all integers
$\mathbb{Z}^+$ — the set of all positive integers
$\mathbb{Z}^*$ — the set of all nonnegative integers
$\mathbb{R}$ — the set of all real numbers
$a \mid b$ — a divides b
$\square$, $\blacksquare$, QED, RIP[1], WWWWW[2] — Used to denote the end of a proof. There are a *lot* of ways to do this. I personally like $\square$.
$\implies$ — implies. $p \implies q$ if q is true whenever p is true. (Note that if p is false q is not necessarily false.)
$\binom{n}{r}$ — n choose r

§2 Less common symbols

Here are some symbols that are less common:
$\mathbb{N}$ — the set of all natural numbers – be careful around this since not everyone agrees whether 0 is included. In IB it is.
$\mathbb{Q}$ — the set of all rational numbers
$\mathbb{C}$ — the set of all complex numbers
$\iff$ — if and only if, commonly abbreviated as "iff". $p \iff q$ means that both $p \implies q$ and $q \implies p$.

[1]Result Is Proven
[2]Which Was What We Wanted

§3 Sample proof

The syntax for proofs tends to be pretty flexible, since the most important thing is the actual math being done, not your English. Your proof style may be completely different from mine — that's fine! That being said, here's a sample proof of a problem:

Problem. Prove that $\frac{a+b}{2} \geq \sqrt{ab}$ for $a, b \geq 0$.

Proof. Let $x = \sqrt{a}$ and $y = \sqrt{b}$.
Note that

$$(x-y)^2 \geq 0$$

Now, after a bit of manipulation,

$$\begin{aligned} x^2 - 2xy + y^2 &\geq 0 \\ x^2 + y^2 &\geq 2xy \\ \frac{x^2+y^2}{2} &\geq xy \end{aligned}$$

Finally, substituting in, we have

$$\frac{a+b}{2} \geq \sqrt{ab}$$

And we are done. □