

1 Putnam

1. Divide and conquer to understand better, i.e. to check if something is divisible, break it up, $\frac{10+5}{2} = \frac{10}{2} \frac{5}{2}$, now check, if one is fraction and other is not, then sum is integer + fraction.

2 Patterns Of Proofs

2.1 Proof by Contradiction

1. A proof by contradiction is essentially proving the contrapositive of $T \implies P$, which is, $\neg P \implies F$, this means if we can prove that $\neg P \implies F$, then P must be true.
2. We have to assume the initial statement is false, and take the negation to be true.
3. If a sequence of deduction contradicts the hypothesis then we have an indirect proof.
4. If it contradicts a fact to be known true we have reductio ad absurdum.

2.2 Proofs about Sets

1. Informally, a set is just a collection of objects, which are called elements.
2. A set can contain a set.
3. $\{x, x\} = \{x\}$.

Symbol	Set	Elements
\emptyset	empty set	
\mathbb{N}	non-negative integers	$\{0, 1, 2, \dots\}$
\mathbb{Z}	integers	$\{\dots, -1, 0, 1, \dots\}$
\mathbb{Q}	rational numbers	0.5, -9, 33.33, ect
\mathbb{R}	real numbers	$\pi, \sqrt{2}, 9.9$, ect.
\mathbb{C}	complex numbers	i, 34, ect.

1. \mathbb{R}^+ is only positive real numbers.