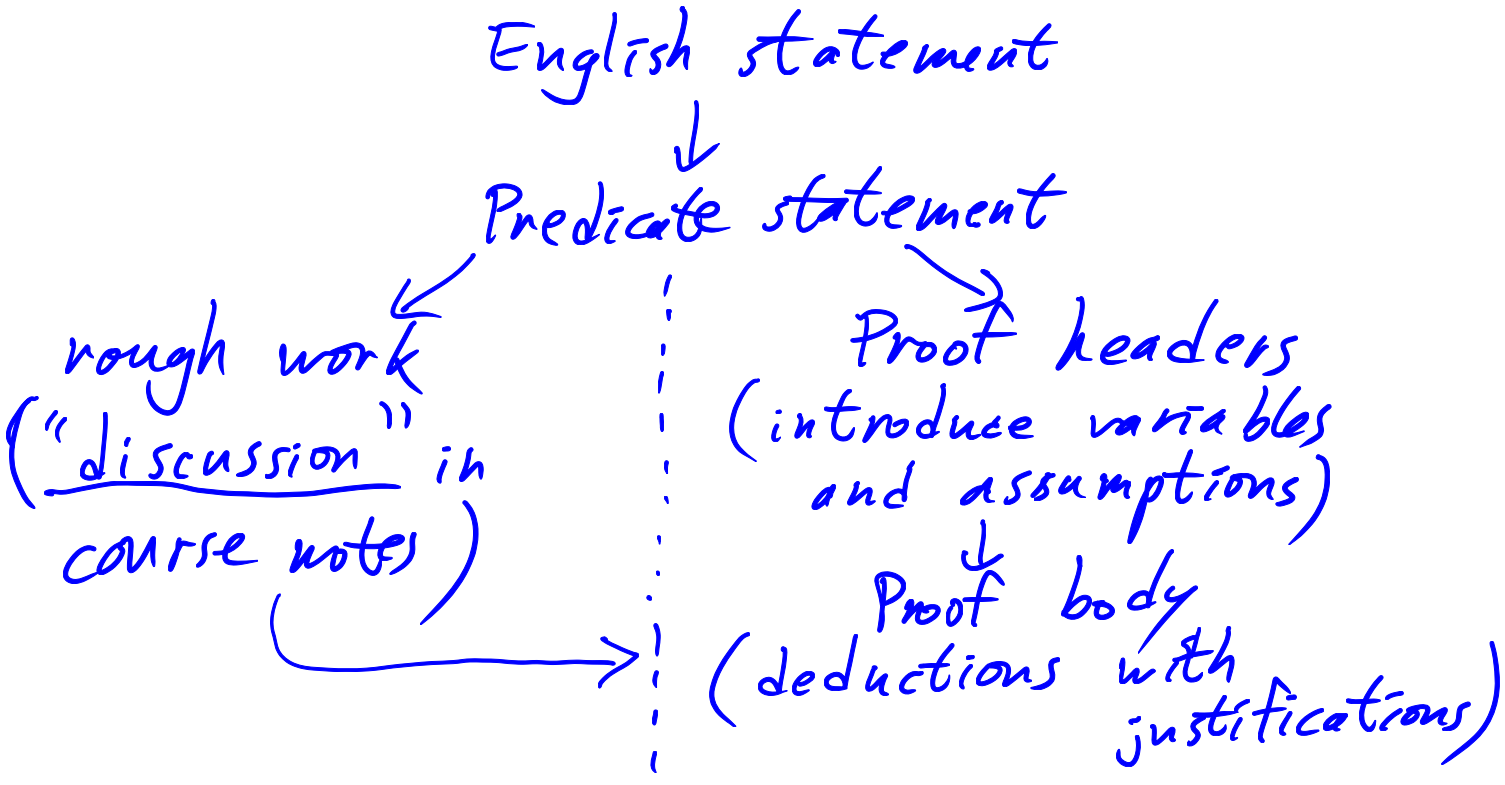
Def: Prime(x): "$x > 1 \wedge$
where $x \in \mathbb{N}$ $\forall d \in \mathbb{Z}^+, d \mid x \Rightarrow d = 1 \vee d = x$"

- $\forall d \in \mathbb{Z}^+, d \neq 1 \wedge d \neq x \Rightarrow d \nmid x$ ← contrapositive
- also equivalent: $\neg \exists d \in \mathbb{Z}^+, d \mid x \wedge d \neq 1 \wedge d \neq x$

This Week: Proofs

- Proof = any convincing argument
- Generally ...



General forms for proof headers

...

statement	proof header
$\forall x \in D,\ P(x)$	**Let $x \in D$.** (let x be arbitrary, but fixed)
want to prove ↑	now prove $P(x)$ for that x
$\exists x \in D,\ P(x)$	**Let $x =$ _____** (pick a specific value) make sure $x \in D$ ←
	now prove $P(x)$ for that x
$P \Rightarrow Q$	**Assume P**
	now prove Q

Ex 1: Prove that every natural number n greater than 20 satisfies $1.5n - 4 \geq 3$.

Step 1: Predicate statement

$\forall n \in \mathbb{N}, \; n > 20 \Rightarrow \boxed{1.5n - 4 \geq 3}$

~~$P(n)$ $P: \mathbb{N} \to \mathbb{R}$~~

not necessary

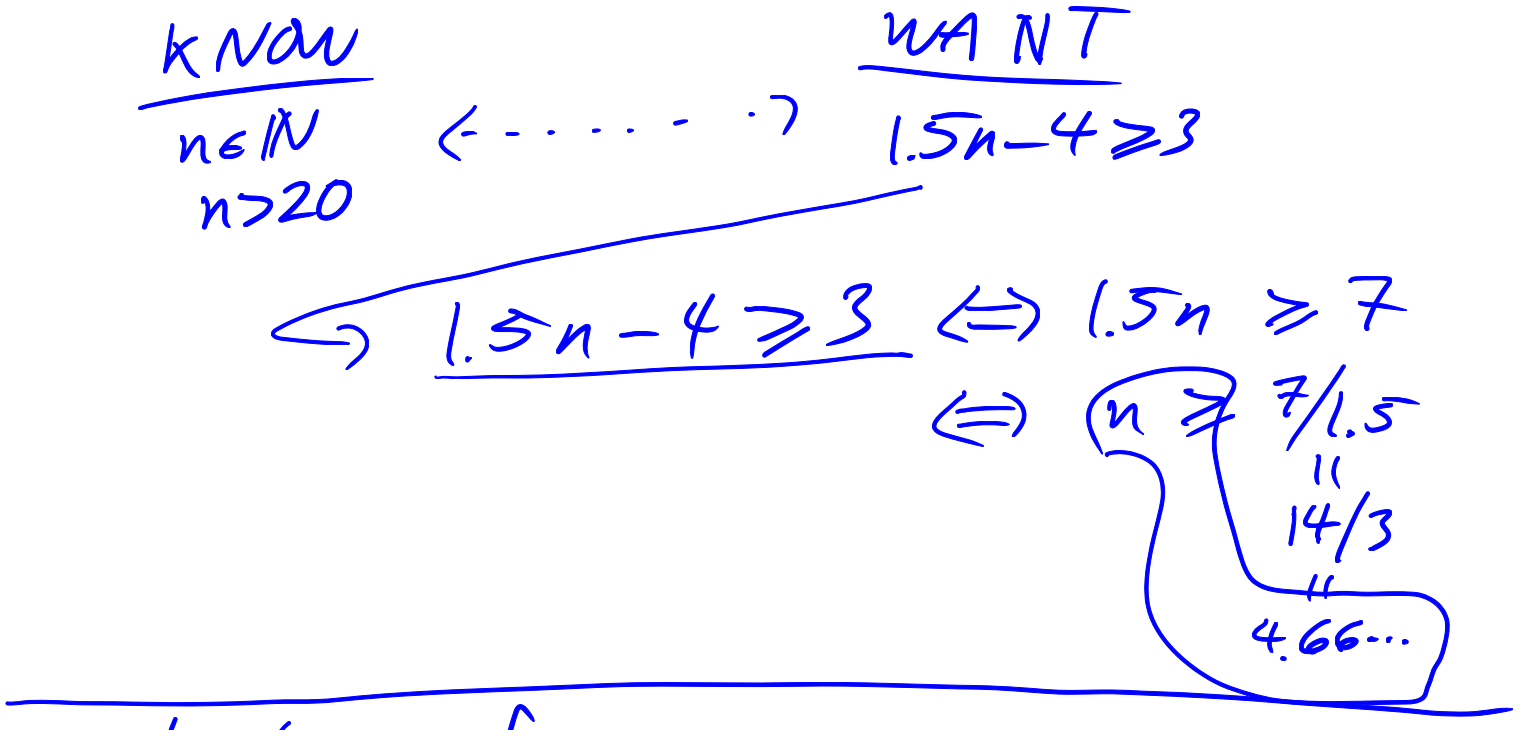
Step 2:

Let $n \in \mathbb{N}$.

Assume $n > 20$.

WTP: $1.5n - 4 \geq 3$ → "Want To Prove"

ROUGH WORK — NOT PART OF PROOF!



Back to proof:

Let $n \in \mathbb{N}$, and assume $n > 20$.

Then, $n \geq 4.666\ldots$

So $1.5n \geq 7$

So $1.5n - 4 \geq 3$. □ (QED, end of proof)