

# Potion Logic



Nicolas Bauer

# Potions

restoration



sleeping



invisibility

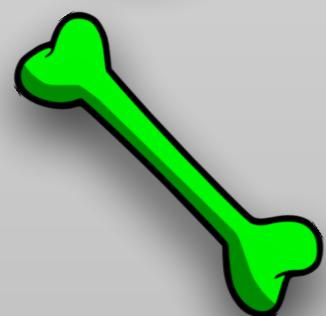


revive



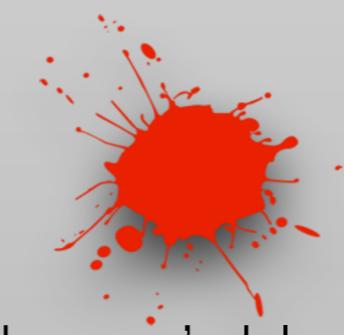
# Ingredients

eye of newt



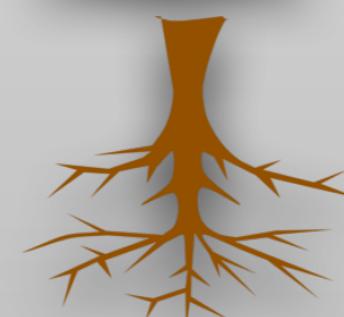
goblin's bone

lion's tail



dragon's blood

frog



root of aconite

occamy egg



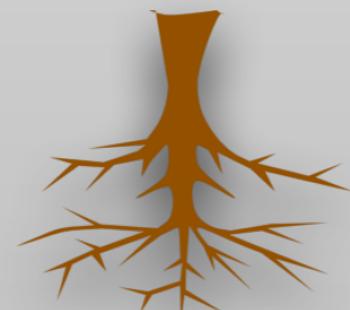
toadstool

# We discovered a recipe!

To make the sleeping potion, you need to combine  
either dragon's blood or the root of aconite with  
a toadstool or an eye of a newt.



dragon's blood



root of aconite



toadstool



eye of newt

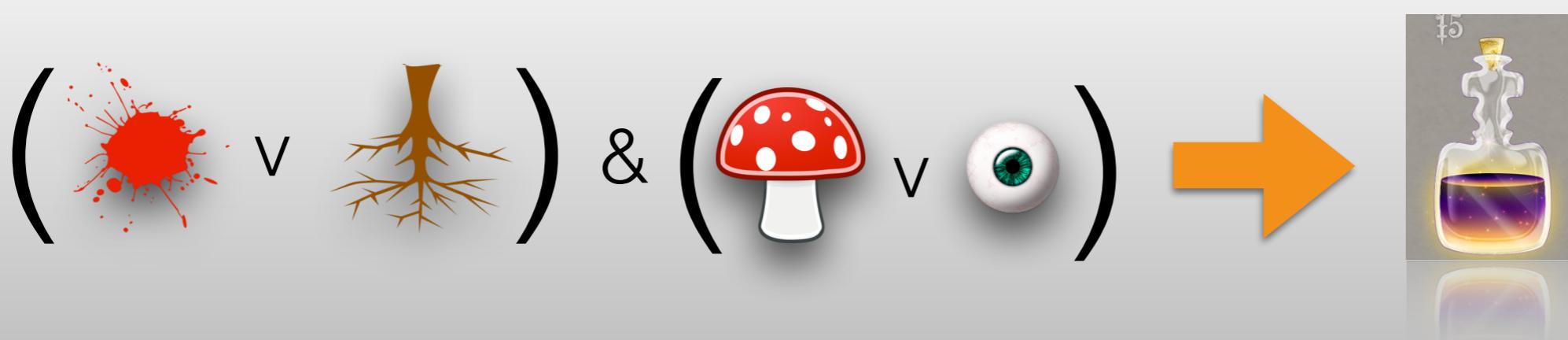


# We Discovered a recipe!

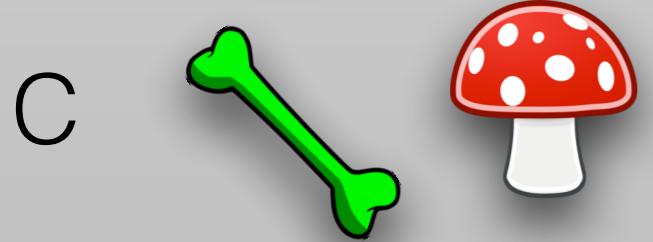
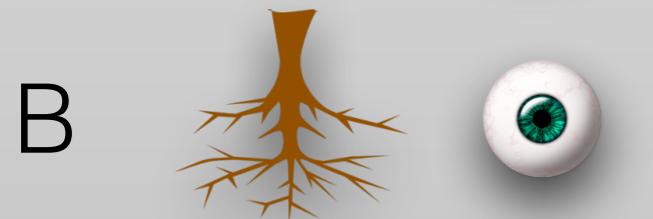
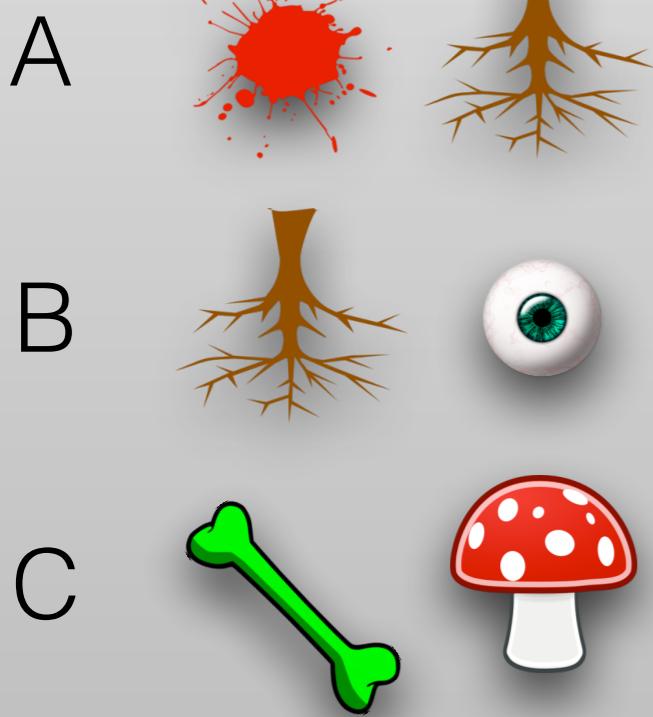
To make the sleeping potion, you need to combine  
either dragon's blood or the root of aconite with  
toadstool or an eye of a newt.



# What do we need?



What are some possible ways to make this potion?



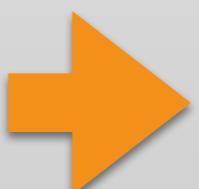
# We Found More!



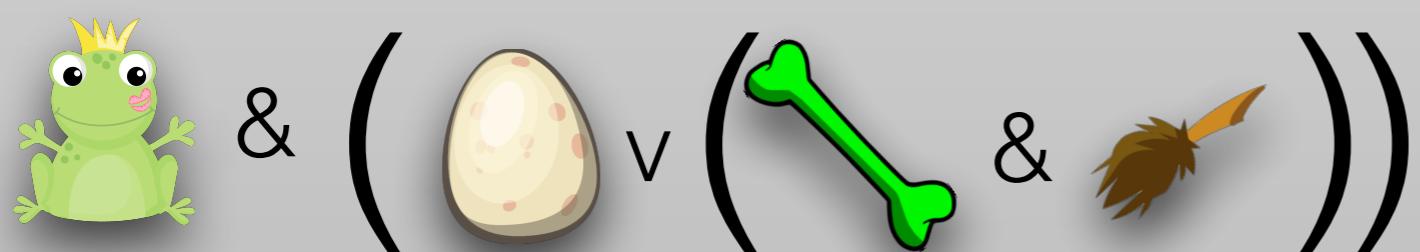
sleeping



restoration



invisibility

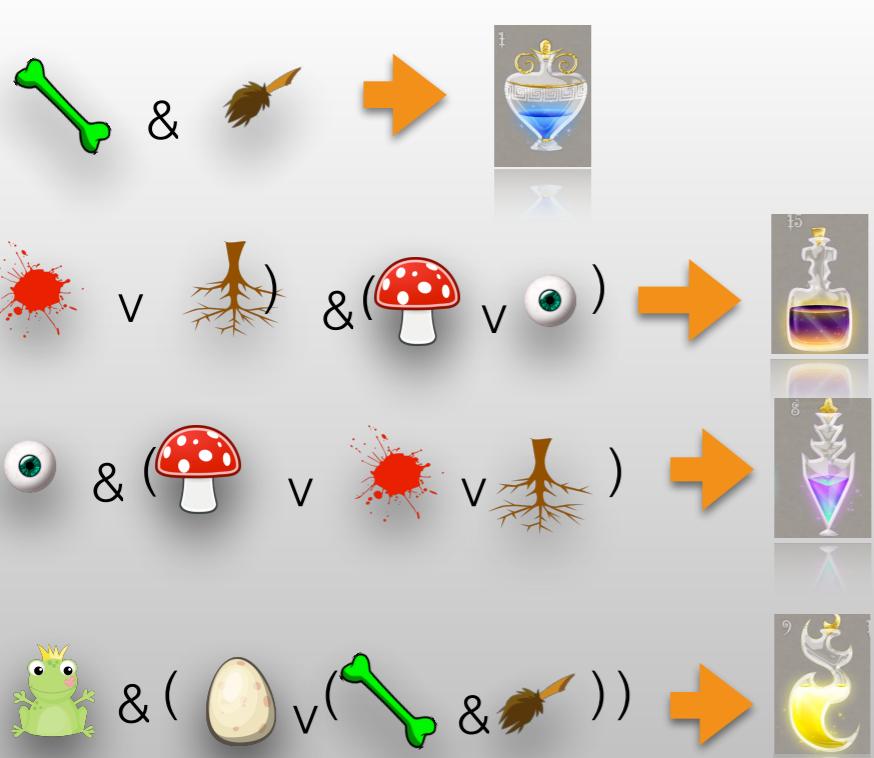


revive



# Wizard Research

What possible potions can I make?



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What possible potions can I make?



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# Wizard Research

What possible potions can I make?



?



Dear noble people, potions masters, and math wizards of the Land of Arithmetic -

'Tis I, your beloved Princess Calcula, trapped in the dungeon of the haunted Castle of Cosine. By flickering candlelight I write to beg you to find and rescue me from this gloomy cell before the clock strikes twelve on Halloween night.

The castle abounds with unsightly beasts, devilish spirits, and unknown dangers. For the success of our mission, I ask you to bring three things:

- 1) To sneak past the goblin who lurks beneath the bridge in the castle moat, we must have a sleep potion. Easily lured by food and drink, he should readily accept a somnolent brew.
- 2) The guards outside the dungeon door are brutish but dull-witted, and we should encounter no trouble from them with a simple elixir of invisibility.
- 3) Unknown are the other evils we may encounter, so lest we find ourselves in dire straits, a draft of poison we must have on hand.

Please, dear ones, make haste! My life and the future of our great land lie in your hands.

Gratefully yours,  
Princess Calcula

# *Wizard Library*

We quickly take everything,  
and run out the door!



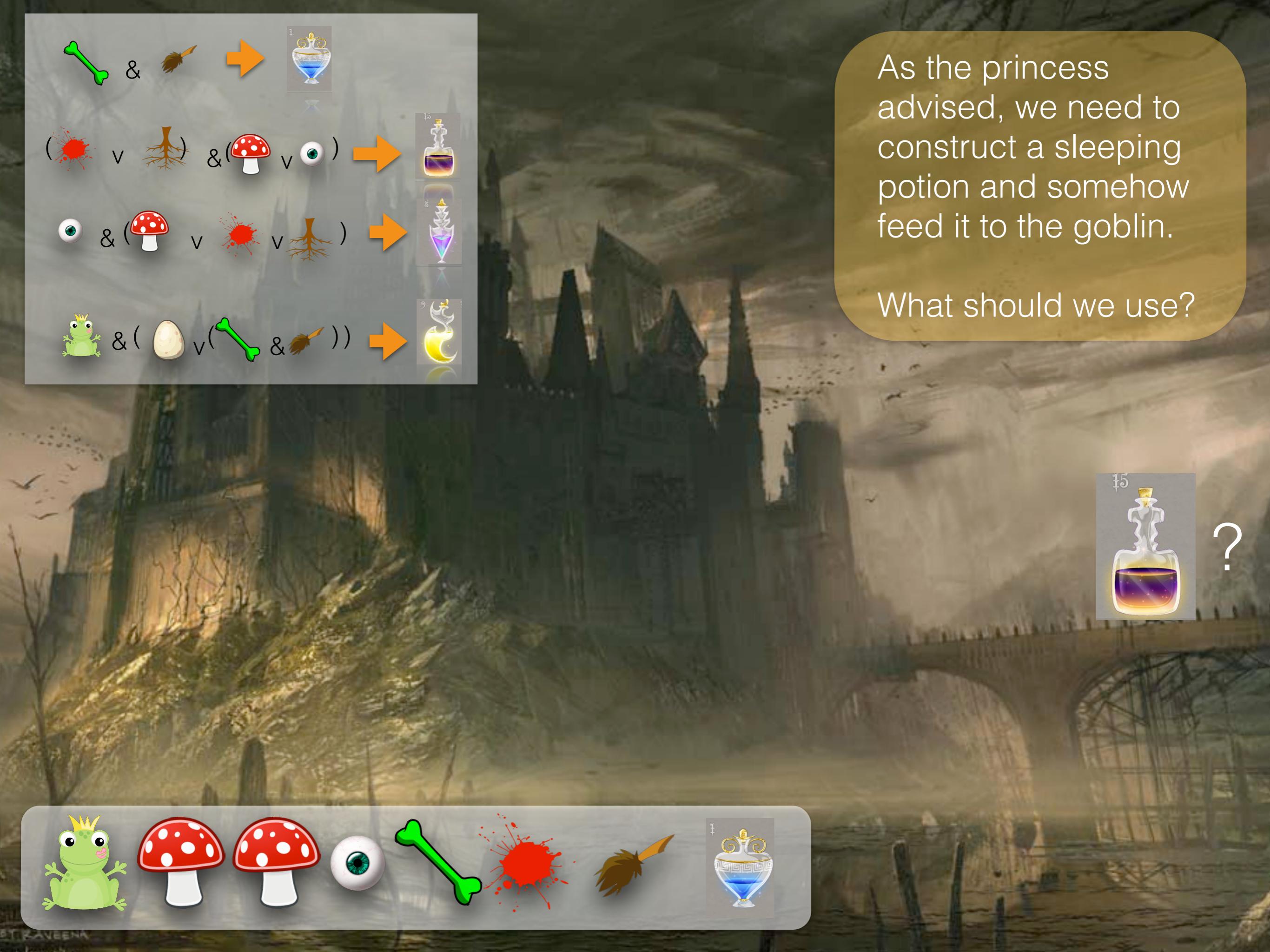


We arrive at the castle, and are about to cross the bridge when we see the goblin's eye peeking out at us...



As the princess advised, we need to construct a sleeping potion and somehow feed it to the goblin.

What should we use?



A dark, atmospheric scene showing a person climbing a stone staircase. The perspective is from above, looking down the stairs. The walls are made of large, rough-hewn stones. A wooden railing is visible on the right side. In the upper right corner, there is a yellow speech bubble containing text.

We climb the tower to where the princess's chamber is located.

As we peek around the corner, we see the guards! They look very alert, so we need an invisibility potion to sneak by them





Finally, we have arrived!  
But it looks like we are  
too late ...





Dearest Math Wizards,

You have saved my beloved  
bride Calcula. Please  
accept my humble gratitude.

Thank you for your bravery,  
cunning wit, and service!

Sincerely,

Prince Calcula

# *Logic*

We just did math!

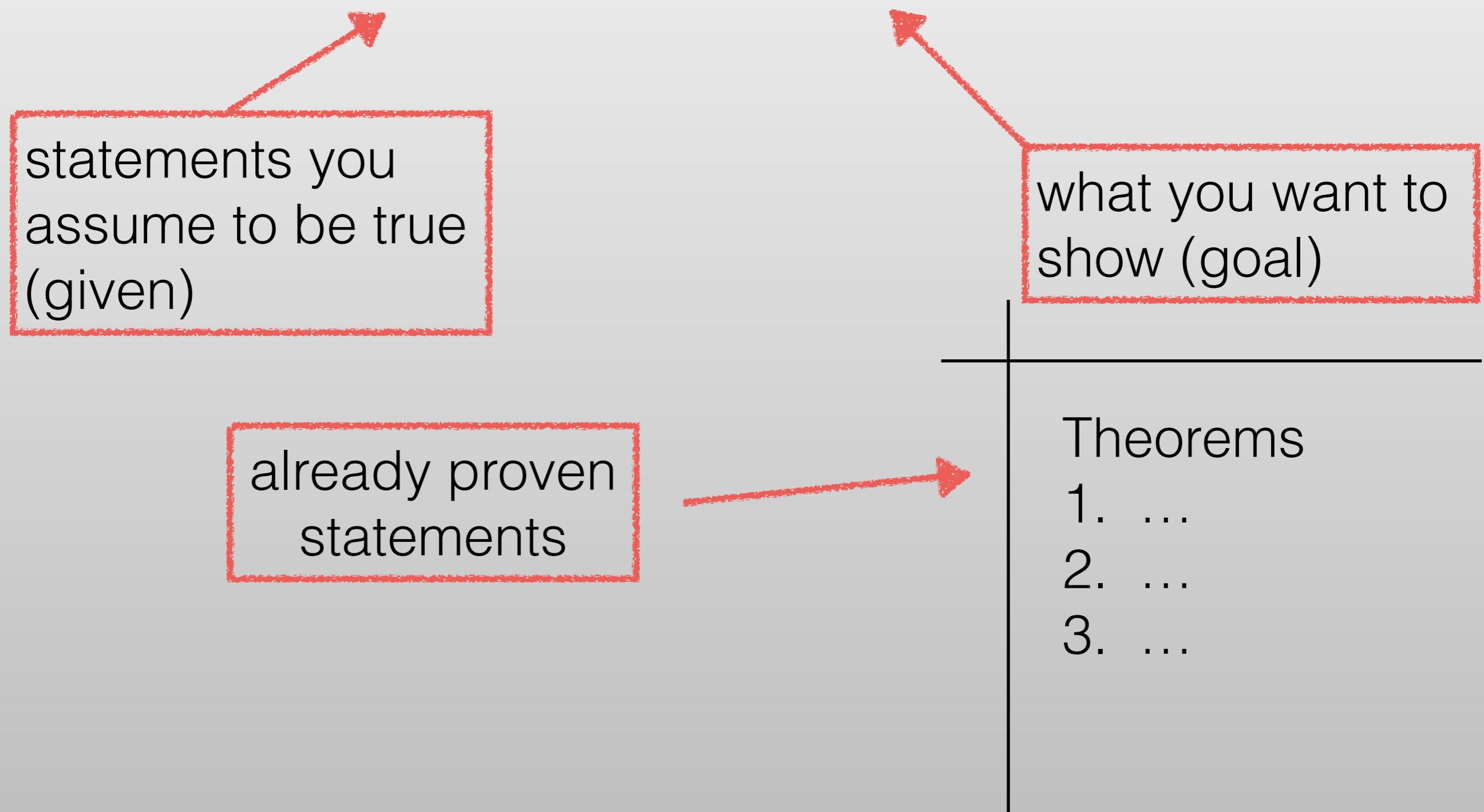
There is actually an entire formal language called

## **Predicate Logic**

which is the study of true/false math!

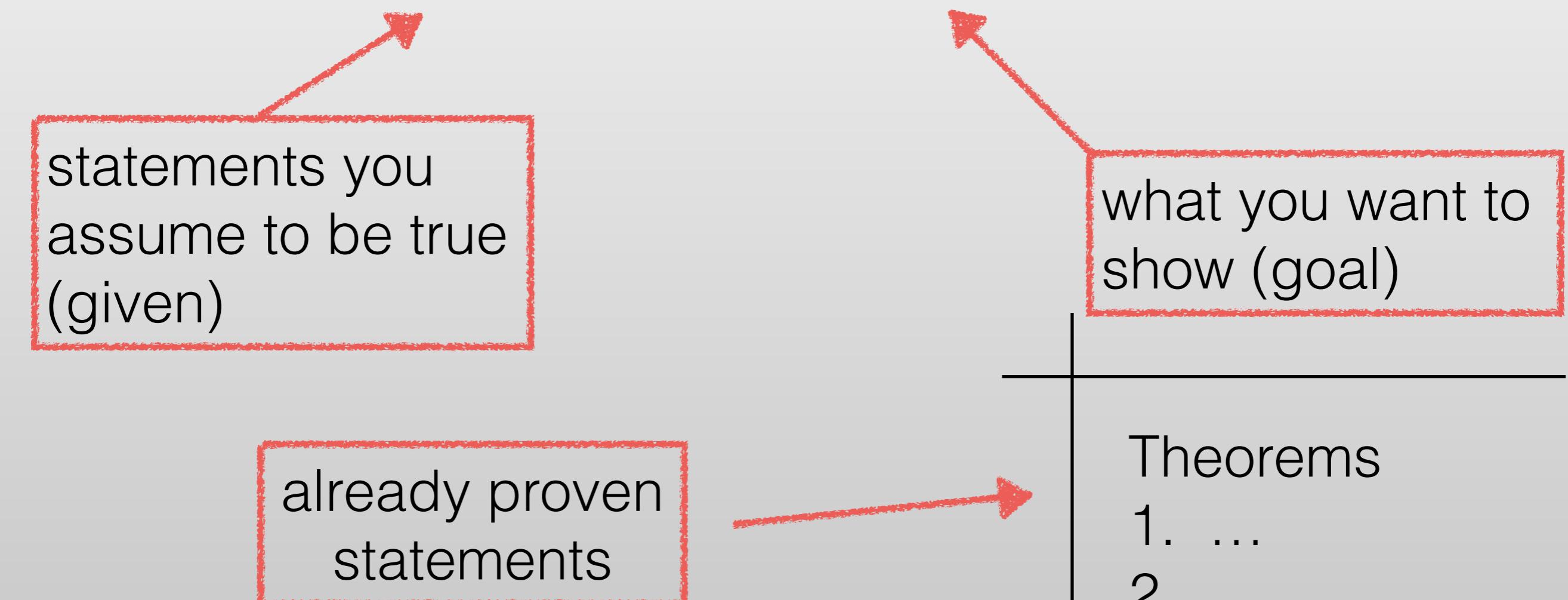
# Proofs - Conditional Strategy

If [hypothesis], then [conclusion].

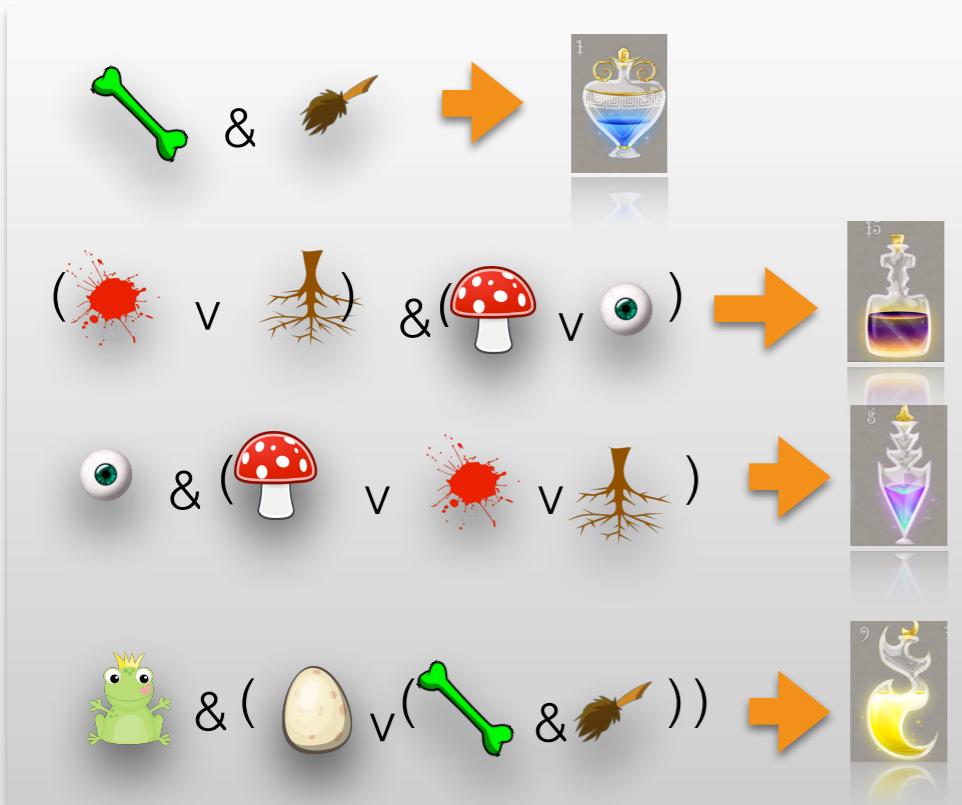


# Proofs - Conditional Strategy

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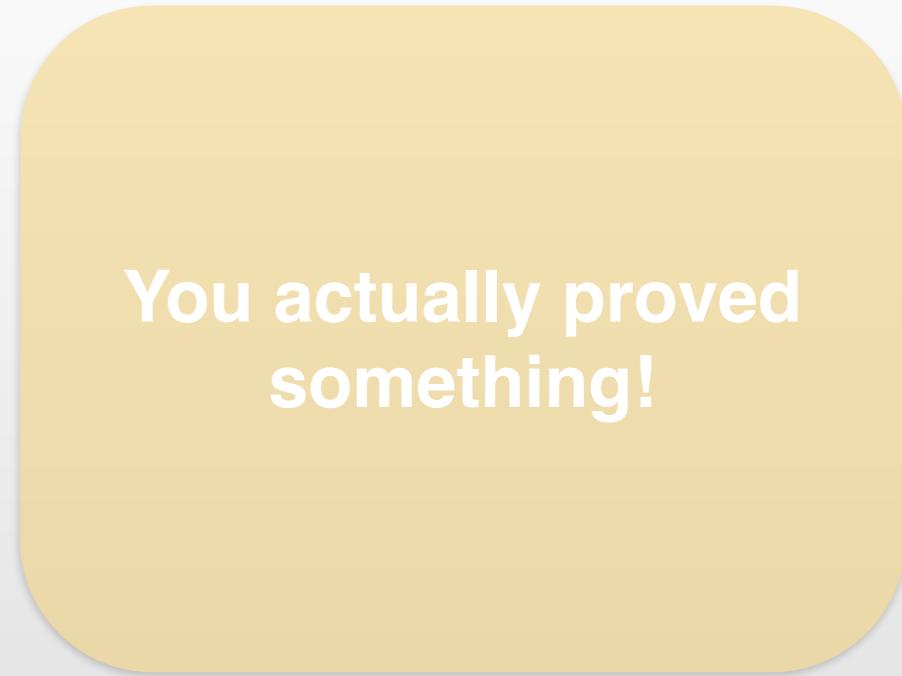


A proof is the logical connections between the given statements and the goal. The connections are made by using already proven statements

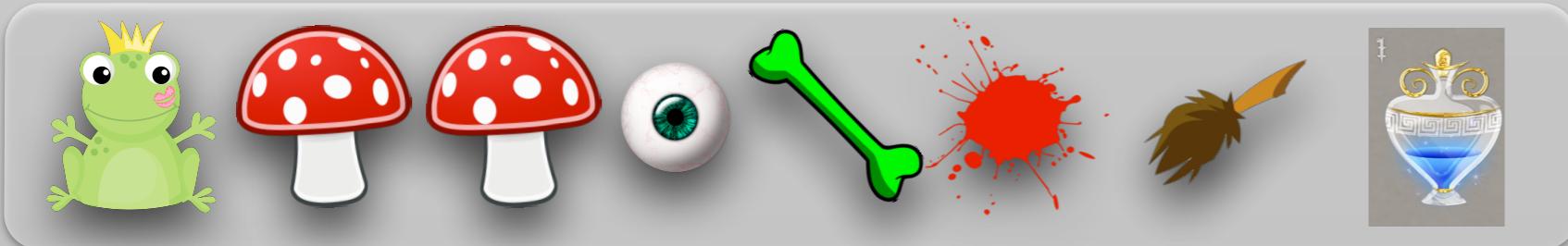


proven statements  
(relationships we know are true)

given statements

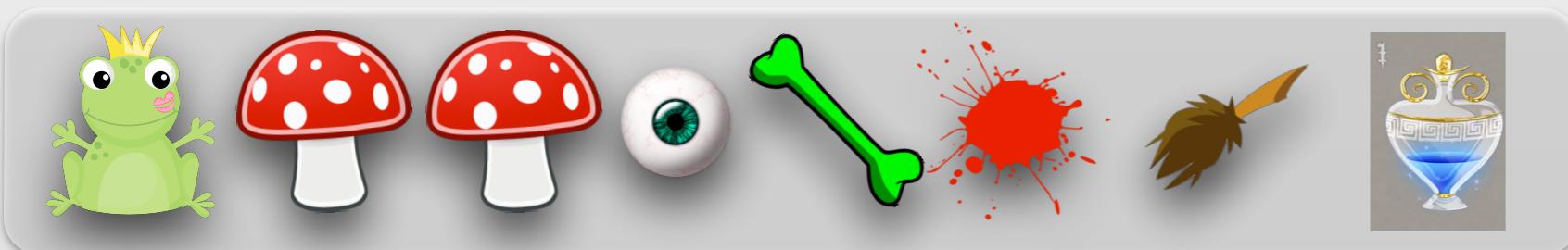


goal



# More Formally...

Prove that if we have these facts



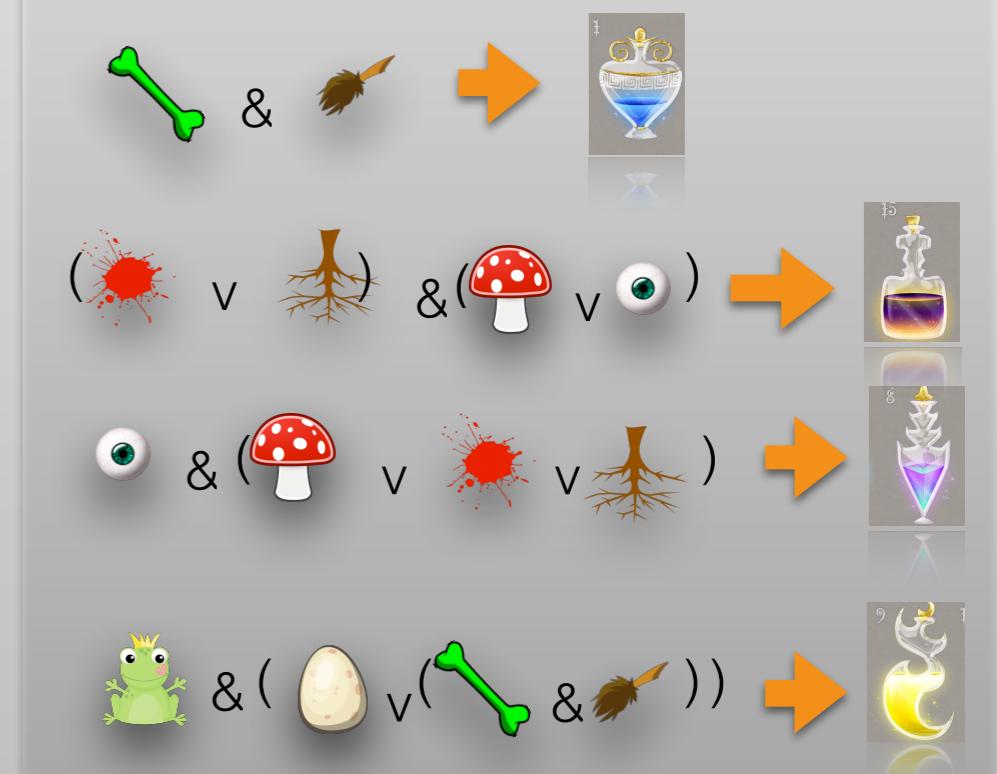
You actually proved something!

then we know



is possible.

by using proven statements



# *Logic - Implies*

$$p \rightarrow q$$

“If p, then q”

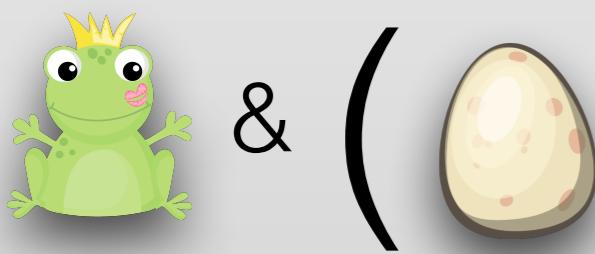
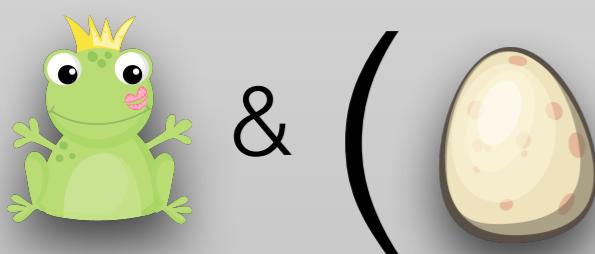
for potion logic:

“If I have this”  $\rightarrow$  “I get that”

for math logic:

“If this side is true”  $\rightarrow$  “then this side is true”

# Logic - Linking


$$\& \left( \text{egg} \vee \left( \text{bone} \& \text{duster} \right) \right)$$

$$))$$


new!

# Logic - Converse

$$((\text{red splat}) \vee (\text{brown root})) \& ((\text{red mushroom}) \vee (\text{green eye})) \rightarrow \text{elixir}$$

Can we do this?


$$\text{elixir} \rightarrow ((\text{red splat}) \vee (\text{brown root})) \& ((\text{red mushroom}) \vee (\text{green eye}))$$

# Logic - Contrapositive

$$\left( \text{Red Splatter} \vee \text{Root} \right) \& \left( \text{Mushroom} \vee \text{Eye} \right) \rightarrow \text{Potion}$$

Is this true?

$$\neg \rightarrow \neg \left( \left( \text{Red Splatter} \vee \text{Root} \right) \& \left( \text{Mushroom} \vee \text{Eye} \right) \right)$$



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take a survey!

*The End*

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about logic and proofs then you can enroll in our  
[geometry course!](#)