LAW OF SYLLOGISM

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Now we know the in's and out's of logic. Let's see if we can make a good argument. We need to make a string of implications, so that they tie all together to make a conclusion.

The Law of Syllogism can be described as the transitive property of implication.
If

$$p \implies q$$

and

$$q \implies r$$

then

$$p \implies r$$

Let us look at an example

Example 1. Look at the following two conditional sentences.

If I am over 30, then I am too old to go to Disneyland.
If I am too old to go to Disneyland, then I am boring.

If I assume both statements to be true, then I can **conclude** that
If I am over 30*, then I am boring is a true statement.*

Now using the Law of Syllogism, we can conclude that since Mrs. Bailey is over 30, then she is boring.

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Here are some more examples, that illustrate the use of the Law of Syllogism.

Example 2. Look at the two sentences below and answer the questions below.

If we find his fingerprints on the counter, then he was at the murder scene.
If he was at the murder scene, he is our prime suspect.

(A) From these two sentences I can conclude that:

(B) We found his finger prints on the counter. What can you conclude?

(C) He is our prime suspect. What can you conclude?

(D) We didn't find his fingerprints? What can you conclude?

Example 3. If he is fails the lie detector test, then the lawyer will not defend him.
If he hears that his mother is in the hospital, he will fail his lie detector test.
What can you conclude from the sentence above?

Example 4. If we go to the store, we will spend too much money.
If we don't spend too much money, we will go on vacation.
I went to the store. What can you conclude from this?

Below are some famous logical fallicies. See if you can find the error in the argument. This is for fun.

Example 5. Proof that $1 = -1$.

$$\begin{aligned}
-1 &= -1 && \text{By reflexivity of equality}\\
\frac{1}{-1} &= \frac{-1}{1} && \text{Converting into fractions}\\
\sqrt{\frac{1}{-1}} &= \sqrt{\frac{-1}{1}} && \text{Taking square root of both sides}\\
\frac{\sqrt{1}}{\sqrt{-1}} &= \frac{\sqrt{-1}}{\sqrt{1}} && \text{Distributing square roots}\\
\sqrt{1}\sqrt{1} &= \sqrt{-1}\sqrt{-1} && \text{Clearing Fractions}\\
1 &= -1 && \text{Square root is inverse of square}
\end{aligned}$$

Example 6. Proof that $2 = 1$.

Let $x = y$.
Then

$$\begin{aligned}
2x &= x + y\\
2x - 2y &= x - y\\
2(x - y) &= x - y\\
2 &= \frac{x - y}{x - y}\\
2 &= 1
\end{aligned}$$

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