Practice Question

1. **Translate the following sentences into propositional logic.**

    a. Three lefts make a right.

    b. x is greater than y, but y is not greater than x.

    c. If y is a rational number, then y is finite.

    d. $x \neq y$ when $y = 1$ and $x = 0$.

    e. I am problematic, but I try hard and I will get better.

    f. Even though $x = y$ for some values, $x = y$ is not always true.

Solutions

1. Translate the following sentences into propositional logic.

   a. T $T =$ Three lefts make a right.

   b. $A \wedge \neg B$ $A =$ "x is greater than y"

   $B =$ "y is greater than x"

   Propositions should always be positive statements. That's why we negate our second proposition B in our translation.

   c. $R \rightarrow F$ $R =$ "y is a rational number"

   $F =$ "y is finite"

   Because this is an "if... then..." statement, the proposition after "if" is to the left of the arrow, and the proposition after "then" is to the right of the arrow.

   d. $(Y \wedge X) \rightarrow \neg E$ $Y =$ "$y = 1$"

   $X =$ "$x = 0$"

   $E =$ "$x = y$"

   Because this is a "when" statement, everything after "when", before the comma, is treated just like "if" and becomes the antecedent.

   e. $P \wedge T \wedge G$ $P =$ "I am problematic"

   $T =$ "I try hard"

   $G =$ "I will get better"

   In this sentence, "and" and "but" are translated in the same manner. We don't need to put brackets around our propositions because they all are linked with the conjunction.

   f. $E \wedge \neg T$ $E =$ "$x = y$ for some values"

   $T =$ "$x = y$ is always true"

   We have a negative complex proposition in our sentence, so it must be split up into a positive proposition T and modified by the negation $\neg$ in our translation.