

1. p , if q .
Same as, If q then p , which is $q \Rightarrow p$.
2. p , only if q .
Same as, If p then q , which is $p \Rightarrow q$.
Be careful. This is not the same as English expression 1. For example,
“You can be president, only if you are at least 35 years old.”
means
“If you are president, then you are at least 35 years old.”
3. p , if and only if q .
Same as, $(q \Rightarrow p) \wedge (p \Rightarrow q)$.
Same as, $p \equiv q$.
Abbreviated in English as, p iff q .
4. p is a sufficient condition for q .
Same as, If p then q , which is $p \Rightarrow q$.
In the sentence,
“To pass the course, it is sufficient that you make an A on the final exam.”
making an A on the final exam is the sufficient condition. So, the sentence means
“If you make an A on the final exam, then you pass the course.”
5. p is a necessary condition for q .
Same as, If q then p , which is $q \Rightarrow p$.
In the sentence,
“To pass the course, it is necessary that you pass the final exam.”
passing the final exam is the necessary condition. So, the sentence means
“If you passed the course, then you passed the final exam.”
Remember 4. and 5. by sufficient \Rightarrow necessary.
6. p is a necessary and sufficient condition for q .
Same as, $p \equiv q$.
7. p , whenever q .
Same as, If q then p , which is $q \Rightarrow p$.
“Whenever” means the same thing as “if.”
8. p , provided that q .
Same as, If q then p , which is $q \Rightarrow p$.
“Provided that” means the same thing as “if.”

9. p , unless q .
Same as, If not q then p , which is $\neg q \Rightarrow p$.
For example,
“I will buy it, unless you do.”
means
“If you do not buy it, then I will buy it.”
10. p , unless not q .
Same as, If q then p , which is $q \Rightarrow p$.
For example,
“I will take another course, unless I do not pass this one.”
means
“If I pass this course, then I’ll take another.”
11. $p ; q$.
Same as, p and q , which is $p \wedge q$.
12. p , q .
Same as, p and q , which is $p \wedge q$.
13. p , but q .
Same as, p and q , which is $p \wedge q$.
For example,
“I can do that, but so can you.”
means
“I can do that, and you can do that.”