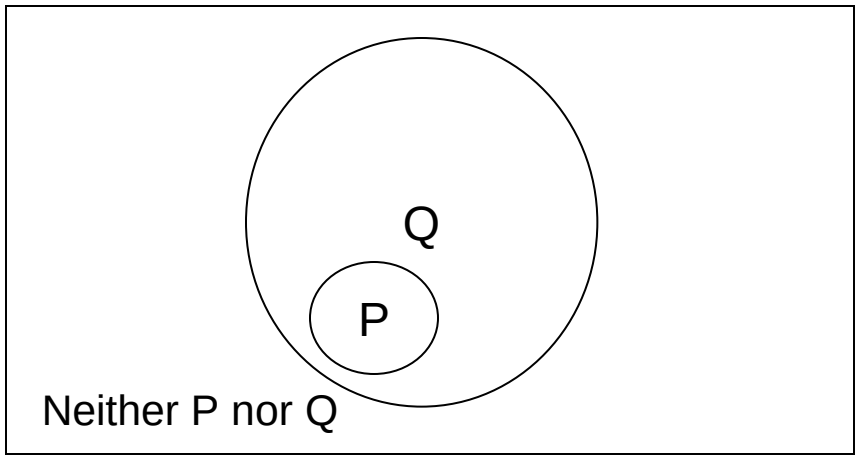
Identifying the Hidden “If-Then” Statements

Finding the Hidden "If-then" Statement

- The GMAT uses nothing but basic logic. If we can identify all of the "if then" statements, the analysis of the argument is usually pretty straightforward.
- Unfortunately, basic "If-then" statements are camouflaged in GMAT passages by something called "English" – i.e., the passages express the simple statement "If P then Q" in a dozen different ways. This is often accompanied by extraneous words ("noise") which only serve to further obfuscate the basic underlying logic.
- You must be able to identify the hidden "If-then" statements by its many equivalent forms. Once you do, the problem usually becomes much easier.
- There are a few expressions where it is difficult, at first glance, to determine whether "if P then Q" or "if Q then P" applies. If you mistakenly use "if P then Q" when "if Q then P" applies, your chances of getting the problem wrong increase significantly.
- I have created a few slides that allow you to see the equivalent forms both in words and pictorially. I firmly believe that if you can visualize the relationship between P and Q for all of the forms, you are a long way towards truly understanding what each of the various statements represent logically.
- For each slide, look at the various forms of equivalent statements, compare them to the representative diagram, then take the time to *CONVINCE YOURSELF* that each equivalence is valid. Do NOT move on unless you are thoroughly convinced. Once you know this by heart, I predict with extreme confidence that analyzing and solving Critical Reasoning problems will become much, much easier for you.

If P Then Q

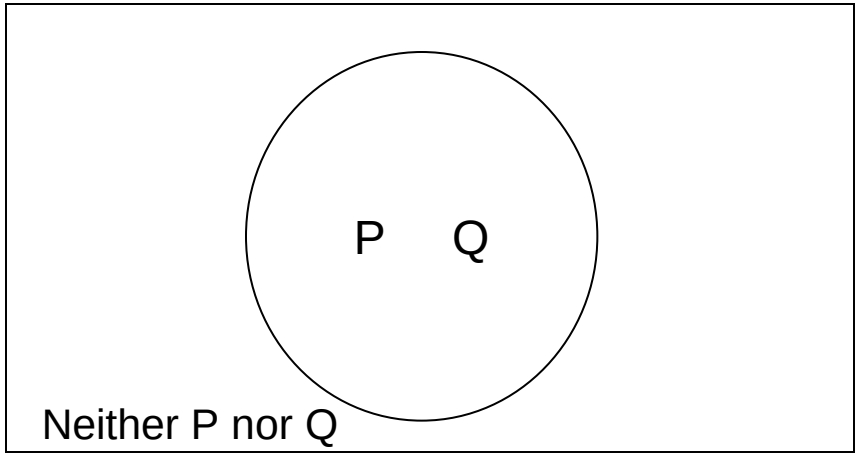
- Statements that imply the above:
  - All P are Q
  - Q if P
  - P is sufficient for Q
  - P implies Q
  - Q is necessary for P
  - One must Q in order for P
  - P only if Q
  - Only Q are P
  - None but Q are P
  - If not Q then not P
  - Caveat:
    - Note that “sufficient” and “necessary” are quite different
- Symbolic (~ = NOT)
  - $P \Rightarrow Q$
  - $\sim Q \Rightarrow \sim P$



- Notes:
  - If P, must be Q
  - If not Q must not be P
  - If Q, may or may not be P
  - If not P, may or may not be Q

P if and only if Q (or Q if and only if P)

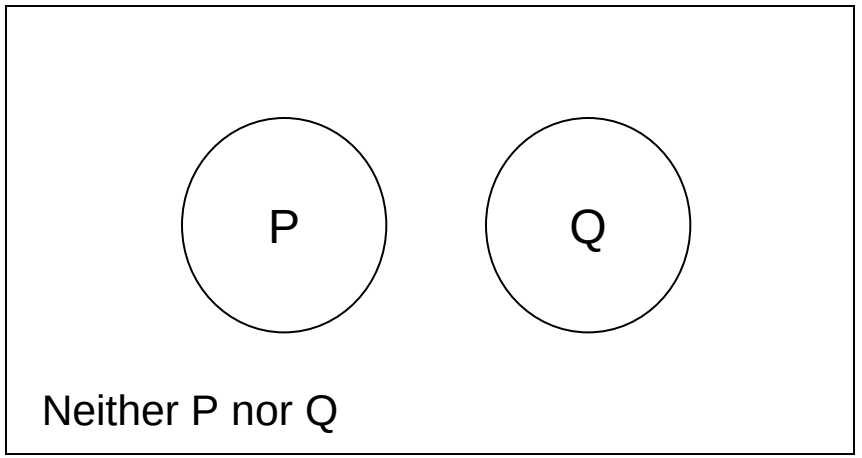
- Statements that imply the above:
  - P and Q are the same
  - P and Q go hand in hand
  - There are no P but Q
  - P is both a sufficient and necessary condition for Q
  - If P then Q AND if Q then P
  - Caveat:
    - “P if and only if Q” is NOT the same as “P only if Q” (see previous slide)
- Symbolic
  - $P \Leftrightarrow Q$ ($P \Rightarrow Q$ AND $Q \Rightarrow P$)
  - $\sim P \Leftrightarrow \sim Q$ ($\sim P \Rightarrow \sim Q$ AND $\sim Q \Rightarrow \sim P$)



- Notes:
  - If P, must be Q
  - If Q, must be P
  - If not P, must not be Q
  - If not Q, must not be P

If P then NOT Q (or if Q then NOT P)

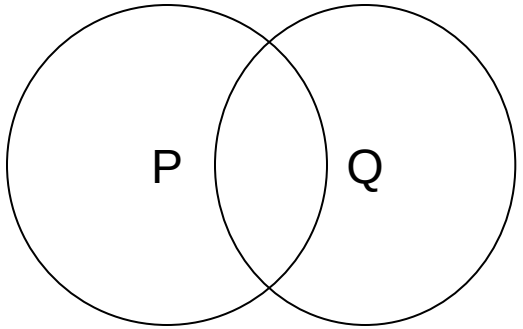
- Statements that imply the above:
  - Q and P are mutually exclusive
  - No P is a Q
  - Cannot be both P and Q
  - P and Q contradict each other
  - P is inconsistent with Q
  - There is/are no P in Q
- Symbolic
  - $P \Rightarrow \sim Q$
  - $Q \Rightarrow \sim P$



- Notes:
  - If P, must not be Q
  - If Q, must not be P
  - If not P, may or may not be Q
  - If not Q, may or may not be P

If Not P then Q

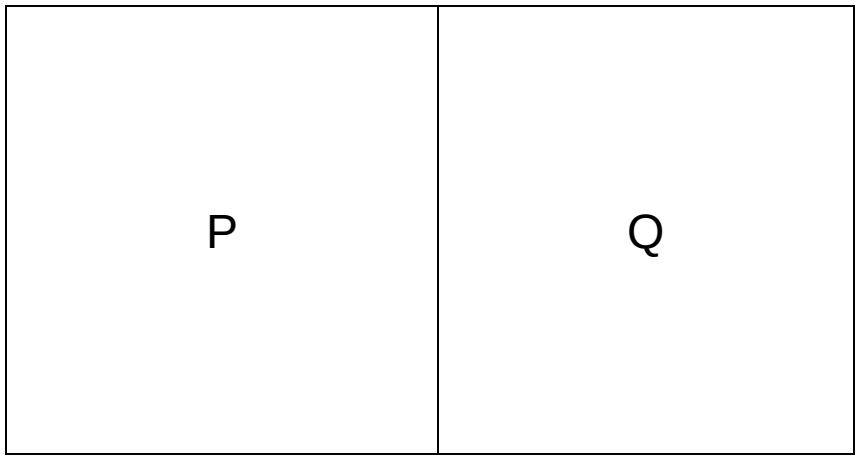
- Statements that imply the above
  - Q unless P
  - P unless Q
  - Caveat:
    - "unless" has a specific meaning in logic. "I will die unless I get surgery" means "if I don't get surgery, I will die", but it doesn't mean "if I get surgery, I will not die", i.e., I can still die even if I get the surgery.
- Symbolic
  - ~ Q $\Rightarrow$ P
  - ~ P $\Rightarrow$ Q



- Notes:
  - If not P, must be Q
  - If not Q, must be P
  - If P may or may not be Q
  - If Q may or may not be P

P if and only if NOT Q (or Q if and only if NOT P)

- Statements that imply the above:
  - P or Q (but not both)
  - Either P or Q
  - If P then NOT Q and if Q then NOT P
  - If NOT P then Q and if NOT Q then P
- Symbolic
  - $P \Leftrightarrow \sim Q$
  - $Q \Leftrightarrow \sim P$



- Notes:
  - If P, must not be Q
  - If Q, must not be P
  - If not P, must be Q
  - If not Q, must be P