

Logic Link Lab

Practice, apply, and challenge your symbol skills.

HIGH SCHOOL • MA.912.LT.4.1

MA.912.LT.4.1 "Translate propositional statements into logical arguments using propositional variables and logical connectives."

NAME _____

DATE _____

PART 1: PRACTICE

Choose a letter for each simple statement. Use $\neg$ for not, $\wedge$ for and, $\vee$ for or, $\rightarrow$ for if...then, and $\leftrightarrow$ for if and only if. In logic, or means one or both statements can be true.

WORKED EXAMPLE

Let p: "The library is open" and q: "I can print." Translate: "If the library is open, then I can print."

1. The first statement is p.
2. The second statement is q.
3. "If..., then..." uses $\rightarrow$.
4. Write $p \rightarrow q$.

Answer: $p \rightarrow q$

PRACTICE 5 problems

- 1** Let p: "It is Friday" and q: "We have a quiz."
Translate: "It is Friday and we have a quiz."

ANSWER _____

- 2** Let p: "I study" and q: "I pass the test."
Translate: "If I study, then I pass the test."

ANSWER _____

- 3** Let p: "The bus is late." Translate: "The bus is not late."

ANSWER _____

- 4** Let p: "I bring a snack" and q: "I buy lunch."
Translate: "I bring a snack or I buy lunch."

ANSWER _____

- 5** Let p: "A shape is a square" and q: "A shape has four equal sides and four right angles."
Translate: "A shape is a square if and only if it has four equal sides and four right angles."

ANSWER _____

APPLY IT Show your work

- 1** Part 2: Apply. Let p: "Maya registers by Friday," q: "Maya brings her ID," and r: "Maya may play in the game tournament." Translate: "Maya may play in the game tournament only if she registers by Friday and brings her ID."

WORK SPACE

ANSWER _____

- 2** Let p: "The video uploads," q: "The audio is clear," and r: "The project is accepted." Translate: "The project is accepted if the video uploads and the audio is clear."

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Part 3: Challenge. Let p: "A student finishes the coding task," q: "A student passes the safety quiz," and r: "A student earns the lab badge." Translate: "A student earns the lab badge if and only if the student finishes the coding task and passes the safety quiz." Explain why parentheses are needed.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Let p: "It is Friday" and q: "We have a quiz." Translate: "It is Friday and we have a quiz."	$p \wedge q$
2	Let p: "I study" and q: "I pass the test." Translate: "If I study, then I pass the test."	$p \rightarrow q$
3	Let p: "The bus is late." Translate: "The bus is not late."	$\neg p$
4	Let p: "I bring a snack" and q: "I buy lunch." Translate: "I bring a snack or I buy lunch."	$p \vee q$
5	Let p: "A shape is a square" and q: "A shape has four equal sides and four right angles." Translate: "A shape is a square if and only if it has four equal sides and four right angles."	$p \leftrightarrow q$

PART 2 • APPLY IT

1. $r \rightarrow (p \wedge q)$ "Only if" puts the condition after the arrow. Both p and q are required, so they are grouped with $\wedge$.
2. $(p \wedge q) \rightarrow r$ The word "if" makes the upload-and-audio condition the first part of the conditional. Both conditions must occur together.

CHALLENGE

$r \leftrightarrow (p \wedge q)$. The parentheses show that finishing the task and passing the quiz are one combined condition.

Accept equivalent variable order for $\wedge$ and $\vee$, such as $q \wedge p$. Require parentheses when a conditional or biconditional uses a compound condition.