

'Today is Groundhog Day.' - t

'Winter is here.' - w

'Spring is here.' - p

'Today is a day for questions.' - q

Translate the following into and from symbols using the above:

1. $t \bar{p}$

2. If today's Groundhog day and it's a day for questions, then winter is here.

3. $pq \rightarrow t \leftrightarrow w$

4. How can you write ' $p \rightarrow q$ ' using only conjunction and negation?

5. How can you write ' $p \rightarrow q$ ' using only alternation and negation?

6. Show two other ways of writing the biconditional ' $p \leftrightarrow q$ '.

6a. _____

6b. _____

Rewrite ' $\bar{r \bar{p}}$ ' [You may use parentheses or dots for scope or grouping] using only the conditional and negation:

7. _____

Rewrite it again, using only alternation and negation

8. _____