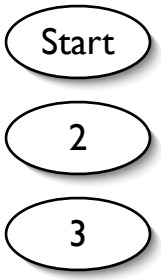
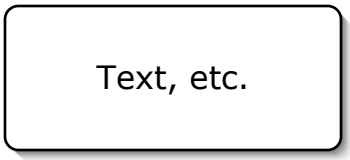
Legend:

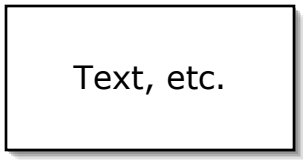
State markers:



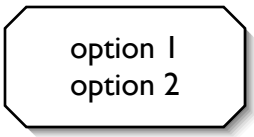
Main user visible content and interface:



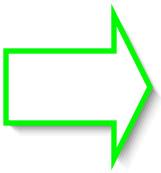
Auxiliary user visible content and interface:



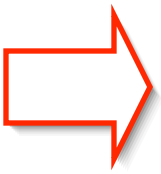
Pulldown menu:



Correct move:



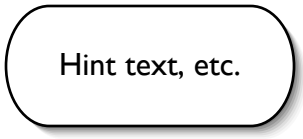
Incorrect move:



Navigational move:

Feedback content:

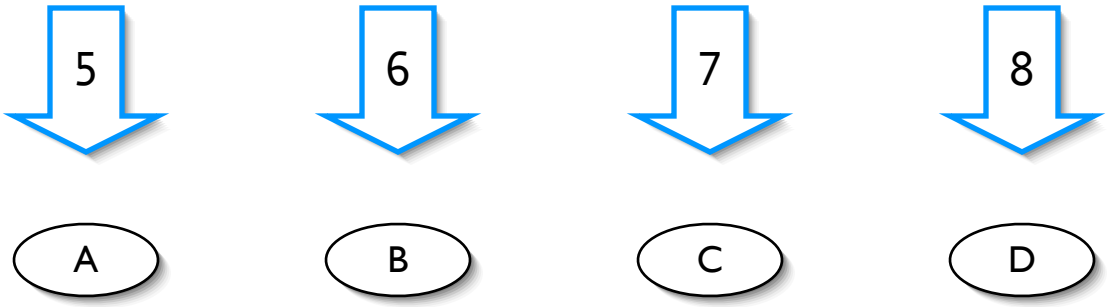
Hint content:



Start

Complete the following derivation by filling in the missing justification. To fill in the justification on a given line, just click anywhere on that line.

1. S ↔ T	Premise
2. M ↔ N	Premise
3. S & N	Premise
4. M	Premise
5. N	?
6. T & N	?
7. N ↔ M	?
8. T & M	?
9. N & (T & M)	&I: 5, 8



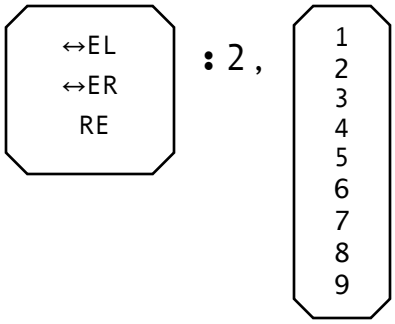
Completed derivation:

1. S ↔ T	Premise
2. M ↔ N	Premise
3. S & N	Premise
4. M	Premise
5. N	↔EL: 2, 4 *or* RE: 2, 4
6. T & N	RE: 1, 3
7. N ↔ M	Comm ↔: 2
8. T & M	RE: 7, 6
9. N & (T & M)	&I: 5, 8

* Justification on line 5 should be filled in according to the answer given by the student.

A

Complete the correct justification for line 5 using the pull-down menus below to fill in the missing components.



↔EL
RE

answered only this

Good. Now complete the justification by making a selection from the other pull-down menu.

answered both

↔EL

That's right. RE is also an acceptable answer.

RE

That's right. ↔EL is also an acceptable answer.

↔ER

For biconditional elimination, the variant corresponds to the eliminated equivalent, that is, to the equivalent appearing on the second line cited and not the formula derived. The formula on line 5 is the right-hand equivalent of the biconditional on line 2, so it was the left equivalent that was eliminated.

4

answered only this

Good. Now complete the justification by making a selection from the other pull-down menu.

answered both

That's right.

1
2
3

To apply any of the rules listed, the formula on the second line cited must be one of the equivalents of the biconditional on the first line cited.

5+

Only lines prior to the current line in the derivation can be cited as justification for a rule's application.

B

Complete the correct justification for line 6 using the pull-down menus below to fill in the missing components.

RE : 1 2 3 4 5 6 7 8 9 , 1 2 3 4 5 6 7 8 9

1 → answered only this → Good. Now complete the justification by making a selection from the other pull-down menu.

answered both → That's right.

2 → The formula T & M does not appear prior to line 6 in the derivation, so the biconditional on line 2 couldn't have been the one to justify the application of RE in this case.

3 4 5 → Only a biconditional can be cited as the first line for an application of RE.

6+ → Only lines prior to the current line in the derivation can be cited as justification for a rule's application.

3 → answered only this → Good. Now complete the justification by making a selection from the other pull-down menu.

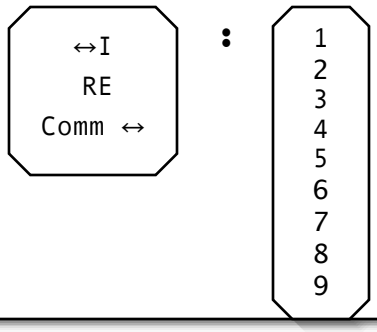
answered both → That's right.

1 2 4 5 → No biconditional in the derivation has the conjunction on line 6 as an equivalent, and they have only atomic equivalents, so the formula in which an equivalent is replaced must have the same basic form as the formula derived, i.e., it must be a conjunction.

6+ → Only lines prior to the current line in the derivation can be cited as justification for a rule's application.

C

Complete the correct justification for line 7 using the pull-down menus below to fill in the missing components.



Comm ↔

answered only this

Good. Now complete the justification by making a selection from the other pull-down menu.

answered both

That's right.

2

answered only this

Good. Now complete the justification by making a selection from the other pull-down menu.

answered both

That's right.

↔I

Recall that biconditional introduction requires two subderivations, and since there are no subderivations in this derivation, biconditional introduction couldn't be applied here. In any case, biconditional introduction takes two lines as justification, not one.

1

That formula is a biconditional, but it has no subformula in common with the derived biconditional.

3
4
5
6

The formula on that line isn't a biconditional, and the only rule listed that takes one line as justification can only be applied to biconditionals.

RE

RE takes two lines as justification, not just one.

7+

Only lines prior to the current line in the derivation can be cited as justification for a rule's application.

D

Complete the correct justification for line 8 using the pull-down menus below to fill in the missing components.

↔EL
↔ER
RE

:

1
2
3
4
5
6
7
8
9

, 6

RE

answered only this

Good. Now complete the justification by making a selection from the other pull-down menu.

answered both

That's right.

↔EL

↔EL can only be used in place of RE when it is the entire formula that is being replaced.

↔ER

In order to apply ↔ER, the biconditional on the first line cited would have to have the formula on the second line cited as its right-hand equivalent, but no biconditional in the derivation has T & N as an equivalent.

7

answered only this

Good. Now complete the justification by making a selection from the other pull-down menu.

answered both

That's right.

1
2
3

No biconditional in the derivation has the conjunction on line 8 as an equivalent, and they have only atomic equivalents, so the formula in which an equivalent is replaced must have the same basic form as the formula derived, i.e., it must be a conjunction.

8+

Only lines prior to the current line in the derivation can be cited as justification for a rule's application.

Hint sequences by state:

A

Does the formula appear as an equivalent in any biconditional? If so, can you eliminate the other equivalent of that biconditional?

N appears in the biconditional on line 2, while the other equivalent of that biconditional appears on line 4.

Remember that in order to derive the right-hand equivalent of a biconditional, you have to eliminate the left-hand equivalent using ↔EL .

B

Where biconditionals are involved, it is often useful to look for formulae containing the equivalents of those biconditionals as subformulae.

Look for other formulae in the derivation that have the same basic structure as this formula, and compare their subformulae with the biconditional premises in mind.

The only other conjunction in this derivation appears on line 3, and it contains an occurrence of S where the formula contains an occurrence of T, corresponding to the biconditional S ↔ T on line 1.

C

With the biconditional, as with conjunction and disjunction, the order of the equivalents doesn't make any difference to the truth-value of the formula.

Look for another biconditional in the derivation with the same equivalents in the opposite order.

Commuting the equivalents of the biconditional on line 2 produces the current formula.

D

Where biconditionals are involved, it is often useful to look for formulae containing the equivalents of those biconditionals as subformulae.

Look for other formulae in the derivation that have the same basic structure as this formula, and compare their subformulae with the biconditional premises in mind.

The only other conjunction in this derivation with one conjunct in common to the current formula appears on line 6, and it contains an occurrence of N where the formula contains an occurrence of M, corresponding to the biconditional N ↔ M on line 7.