

Logic: Syntax and Semantics

Tableaux

Dan Dougherty

September 21, 2026 – 12: 21

Example 1

- (1) Pat is at home or Pat is at work
- (2) Pat is not at home
- (3) Pat is at work

Example 1

- (1) Pat is at home or Pat is at work
- (2) Pat is not at home
- (3) not: Pat is at work

Example 1

(1) Pat is at home or Pat is at work ✓

(2) Pat is not at home

(3) not: Pat is at work

| [1]

|

(4) Pat is at home

×

|

(5) Pat is at work

×

Example 2

- (1) Pat is at home or Pat is at work
- (2) Pat is at home
- (3) Pat is not at work

Example 2

- (1) Pat is at home or Pat is at work
- (2) Pat is at home
- (3) not: Pat is not at work

Example 2

(1) Pat is at home or Pat is at work ✓

(2) Pat is at home

(3) not: Pat is not at work

| [1]

1

(4) Pat is at home

1

(5) Pat is at work

Example 2

(1) Pat is at home or Pat is at work ✓

(2) Pat is at home

(3) not: Pat is not at work ✓

| [1]

|

(4) Pat is at home

| [3]

(6) Pat is at work

OPEN

|

(5) Pat is at work

| [3]

(7) Pat is at work

OPEN

Example 3

- (1) Pat is here or Kim is here
- (2) If Kim is here then Sam is not happy
- (3) Sam is happy
- (4) Pat is here

Example 3

- (1) Pat is here or Kim is here
- (2) If Kim is here then Sam is not happy
- (3) Sam is happy
- (4) not: Pat is here

Example 3

- (1) Pat is here or Kim is here ✓
- (2) If Kim is here then Sam is not happy
- (3) Sam is happy
- (4) not: Pat is here

| [1]

|

|

(5) Pat is here

(6) Kim is here

×

Example 3

- (1) Pat is here or Kim is here ✓
- (2) If Kim is here then Sam is not happy ✓
- (3) Sam is happy
- (4) not: Pat is here

| [1]

|

(5) Pat is here

×

|

(6) Kim is here

| [2]

|

(7) Kim is not here

×

|

(8) Sam is not happy

×

Example 4

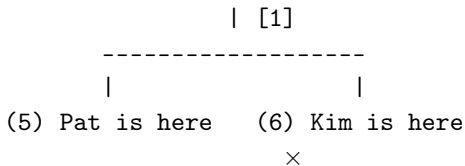
- (1) Pat is here or Kim is here
- (2) If Kim is here then Sam is not happy
- (3) Sam is not happy
- (4) Kim is here

Example 4

- (1) Pat is here or Kim is here
- (2) If Kim is here then Sam is not happy
- (3) Sam is not happy
- (4) not: Kim is here

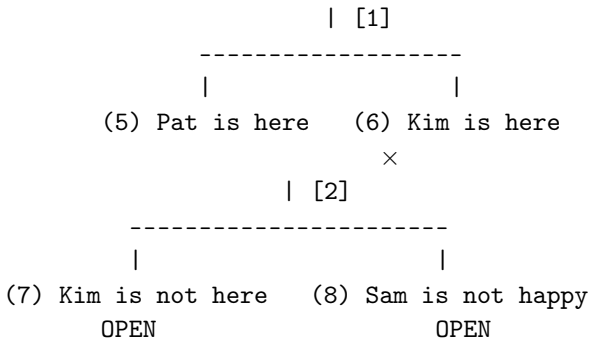
Example 4

- (1) Pat is here or Kim is here ✓
- (2) If Kim is here then Sam is not happy
- (3) Sam is not happy
- (4) not: Kim is here



Example 4

- (1) Pat is here or Kim is here ✓
- (2) If Kim is here then Sam is not happy ✓
- (3) Sam is not happy
- (4) not: Kim is here



Example 5

- (1) Pat is here and Kim is here
- (2) If Kim is here then Sam is not happy
- (3) Sam is not happy
- (4) Kim is here

Example 5

- (1) Pat is here and Kim is here
- (2) If Kim is here then Sam is not happy
- (3) Sam is not happy
- (4) not: Kim is here

Example 5

- (1) Pat is here and Kim is here ✓
- (2) If Kim is here then Sam is not happy
- (3) Sam is not happy
- (4) not: Kim is here
 - | [1]
- (5) Pat is here
- (6) Kim is here
 - ×

Example 6

- (1) If Kim is in Worcester then Kim is in Massachusetts
- (2) Kim is in Worcester
- (3) Kim is in Massachusetts

Example 6

- (1) If Kim is in Worcester then Kim is in Massachusetts
- (2) Kim is in Worcester
- (3) not: Kim is in Massachusetts

Example 6

(1) If Kim is in Worcester then Kim is in Massachusetts ✓

(2) Kim is in Worcester

(3) not: Kim is in Massachusetts

| [1]

|

|

(4) Kim is not in Worcester

(5) Kim is in Massachusetts

×

×

Example 7

- (1) If Kim is in Worcester then Kim is in Massachusetts
- (2) Kim is in Massachusetts
- (3) Kim is in Worcester

Example 7

- (1) If Kim is in Worcester then Kim is in Massachusetts
- (2) Kim is in Massachusetts
- (3) not: Kim is in Worcester

Example 7

(1) If Kim is in Worcester then Kim is in Massachusetts ✓

(2) Kim is in Massachusetts

(3) not: Kim is in Worcester

| [1]

|

(4) Kim is not in Worcester

OPEN

|

(5) Kim is in Massachusetts

OPEN

Example 8

- (1) If the dragon is awake, then the princess is hiding
- (2) The dragon is awake
- (3) The princess is hiding

Example 8

- (1) If the dragon is awake, then the princess is hiding
- (2) The dragon is awake
- (3) not: The princess is hiding

Example 8

(1) If the dragon is awake, then the princess is hiding ✓

(2) The dragon is awake

(3) not: The princess is hiding

| [1]

|

|

(4) The dragon is not awake

(5) The princess is hiding

×

×

Example 9

- (1) If the dragon is awake, then the princess is hiding
- (2) The dragon is not awake
- (3) The princess is not hiding

Example 9

- (1) If the dragon is awake, then the princess is hiding
- (2) The dragon is not awake
- (3) not: The princess is not hiding

Example 9

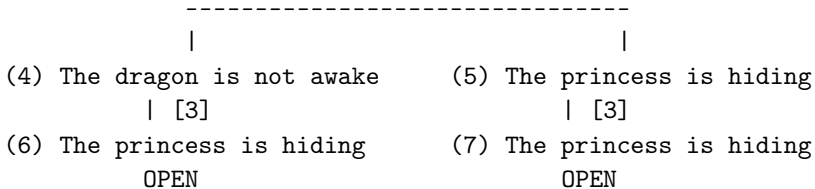
- (1) If the dragon is awake, then the princess is hiding ✓
- (2) The dragon is not awake
- (3) not: The princess is not hiding

| [1]

- (4) The dragon is not awake (5) The princess is hiding

Example 9

- (1) If the dragon is awake, then the princess is hiding ✓
- (2) The dragon is not awake
- (3) not: The princess is not hiding ✓
| [1]



Example 10

- (1) If Alice misses the bus, she will be late
- (2) If Alice is late, the professor notices her absence
- (3) Alice misses the bus
- (4) The professor notices her absence

Example 10

- (1) If Alice misses the bus, she will be late
- (2) If Alice is late, the professor notices her absence
- (3) Alice misses the bus
- (4) not: The professor notices her absence

Example 10

- (1) If Alice misses the bus, she will be late ✓
- (2) If Alice is late, the professor notices her absence
- (3) Alice misses the bus
- (4) not: The professor notices her absence

| [1]

|

|

(5) Alice does not miss the bus (6) Alice is late

×

Example 10

- (1) If Alice misses the bus, she will be late ✓
- (2) If Alice is late, the professor notices her absence ✓
- (3) Alice misses the bus
- (4) not: The professor notices her absence

| [1]

|

|

(5) Alice does not miss the bus (6) Alice is late

×

| [2]

|

|

(7) Alice is not late (8) The professor notices
her absence

×

×

Example 11

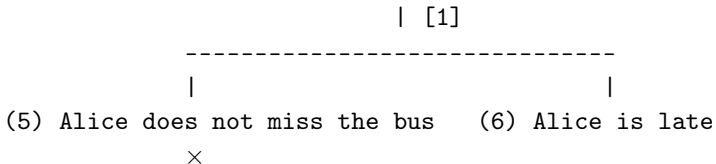
- (1) If Alice misses the bus, she will be late
- (2) If Alice is late, the professor notices her absence
- (3) The professor notices her absence
- (4) Alice misses the bus

Example 11

- (1) If Alice misses the bus, she will be late
- (2) If Alice is late, the professor notices her absence
- (3) The professor notices her absence
- (4) not: Alice misses the bus

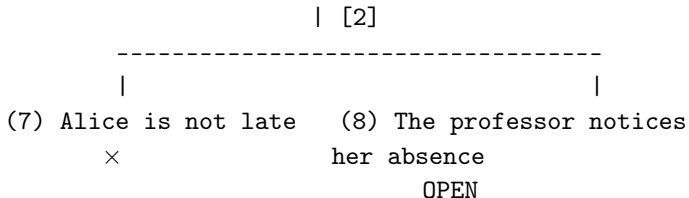
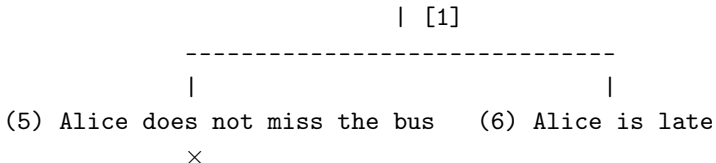
Example 11

- (1) If Alice misses the bus, she will be late ✓
- (2) If Alice is late, the professor notices her absence
- (3) The professor notices her absence
- (4) not: Alice misses the bus



Example 11

- (1) If Alice misses the bus, she will be late ✓
- (2) If Alice is late, the professor notices her absence ✓
- (3) The professor notices her absence
- (4) not: Alice misses the bus



Example 12

- (1) Elvis is in the building or Madonna is in the building
- (2) Elvis is in the building

Example 12

- (1) Elvis is in the building or Madonna is in the building
- (2) not: Elvis is in the building

Example 12

(1) Elvis is in the building or Madonna is in the building ✓

(2) not: Elvis is in the building

| [1]

| |

(3) Elvis is in the building (4) Madonna is in the building

×

OPEN

Example 13

- (1) Elvis is in the building
- (2) Elvis is in the building or Madonna is in the building

Example 13

- (1) Elvis is in the building
- (2) not: Elvis is in the building or Madonna is in the building

Example 13

- (1) Elvis is in the building
- (2) not: Elvis is in the building or Madonna is in the building ✓
| [2]
- (3) Elvis is not in the building
- (4) Madonna is not in the building
×

Example 14

- (1) It is not the case that Pat is here and Kim is here
- (2) Pat is not here or Kim is not here

Example 14

- (1) It is not the case that Pat is here and Kim is here
- (2) not: Pat is not here or Kim is not here

Example 14

(1) It is not the case that Pat is here and Kim is here ✓

(2) not: Pat is not here or Kim is not here

| [1]

|

|

(3) Pat is not here

(4) Kim is not here

Example 14

(1) It is not the case that Pat is here and Kim is here ✓

(2) not: Pat is not here or Kim is not here ✓

| [1]

|

(3) Pat is not here

| [2]

(5) It is not the case that
Pat is not here

(6) It is not the case that
Kim is not here

|

(4) Kim is not here

| [2]

(7) It is not the case that
Pat is not here

(8) It is not the case that
Kim is not here

Example 14

(1) It is not the case that Pat is here and Kim is here ✓

(2) not: Pat is not here or Kim is not here ✓

| [1]

|

(3) Pat is not here

| [2]

(5) It is not the case that
Pat is not here

(6) It is not the case that
Kim is not here

| [5]

(9) Pat is here

×

|

(4) Kim is not here

| [2]

(7) It is not the case that
Pat is not here

(8) It is not the case that
Kim is not here

Example 14

(1) It is not the case that Pat is here and Kim is here ✓

(2) not: Pat is not here or Kim is not here ✓

| [1]

|

(3) Pat is not here

| [2]

(5) It is not the case that
Pat is not here

(6) It is not the case that
Kim is not here

| [5]

(9) Pat is here

×

|

(4) Kim is not here

| [2]

(7) It is not the case that
Pat is not here

(8) It is not the case that
Kim is not here

| [7]

(10) Pat is here

| [8]

(11) Kim is here

×

Example 15

- (1) Pat is not here or Kim is not here
- (2) It is not the case that Pat is here and Kim is here

Example 15

- (1) Pat is not here or Kim is not here
- (2) not: It is not the case that Pat is here and Kim is here

Example 15

(1) Pat is not here or Kim is not here ✓

(2) not: It is not the case that Pat is here and Kim is here

| [1]

|

|

(3) Pat is not here

(4) Kim is not here

Example 15

(1) Pat is not here or Kim is not here ✓

(2) not: It is not the case that Pat is here and Kim is here ✓

| [1]

|

|

(3) Pat is not here

(4) Kim is not here

| [2]

| [2]

(5) Pat is here and Kim is here

(6) Pat is here and Kim is here

Example 15

(1) Pat is not here or Kim is not here ✓

(2) not: It is not the case that Pat is here and Kim is here ✓

| [1]

|

|

(3) Pat is not here

(4) Kim is not here

| [2]

| [2]

(5) Pat is here and Kim is here

(6) Pat is here and Kim is here

| [5]

(7) Pat is here

(8) Kim is here

×

Example 15

(1) Pat is not here or Kim is not here ✓

(2) not: It is not the case that Pat is here and Kim is here ✓

| [1]

|

|

(3) Pat is not here

(4) Kim is not here

| [2]

| [2]

(5) Pat is here and Kim is here

(6) Pat is here and Kim is here

| [5]

| [6]

(7) Pat is here

(9) Pat is here

(8) Kim is here

(10) Kim is here

×

×

Example 16

- (1) It is not the case that Pat is here or Kim is here
- (2) Pat is not here and Kim is not here

Example 16

- (1) It is not the case that Pat is here or Kim is here
- (2) not: Pat is not here and Kim is not here

Example 16

- (1) It is not the case that Pat is here or Kim is here ✓
- (2) not: Pat is not here and Kim is not here
 - | [1]
- (3) Pat is not here
- (4) Kim is not here

Example 16

(1) It is not the case that Pat is here or Kim is here ✓

(2) not: Pat is not here and Kim is not here ✓

| [1]

(3) Pat is not here

(4) Kim is not here

| [2]

(5) Pat is here

X

(6) Kim is here

X

Example 17

- (1) Pat is not here and Kim is not here
- (2) It is not the case that Pat is here or Kim is here

Example 17

- (1) Pat is not here and Kim is not here
- (2) not: It is not the case that Pat is here or Kim is here

Example 17

- (1) Pat is not here and Kim is not here ✓
- (2) not: It is not the case that Pat is here or Kim is here
| [1]
- (3) Pat is not here
- (4) Kim is not here

Example 17

- (1) Pat is not here and Kim is not here ✓
- (2) not: It is not the case that Pat is here or Kim is here ✓
 - | [1]
- (3) Pat is not here
- (4) Kim is not here
 - | [2]
- (5) Pat is here or Kim is here

Example 17

(1) Pat is not here and Kim is not here ✓

(2) not: It is not the case that Pat is here or Kim is here ✓

| [1]

(3) Pat is not here

(4) Kim is not here

1 [2]

(5) Pat is here or Kim is here ✓

| [5]

1

1

(6) Pat is here

(7) Kim is here

X

X

Example 18

- (1) It is not the case that Pat is not here
- (2) Pat is here

Example 18

- (1) It is not the case that Pat is not here
- (2) not: Pat is here

Example 18

(1) It is not the case that Pat is not here ✓

(2) not: Pat is here

| [1]

(3) Pat is here

×

Example 19

- (1) Pat is here
- (2) It is not the case that Pat is not here

Example 19

(1) Pat is here

(2) not: It is not the case that Pat is not here

Example 19

(1) Pat is here

(2) not: It is not the case that Pat is not here ✓

| [2]

(3) Pat is not here

×

Example 20

- (1) If the dragon is awake then the princess is not singing
- (2) The dragon is awake
- (3) The princess is not singing

Example 20

- (1) If the dragon is awake then the princess is not singing
- (2) The dragon is awake
- (3) not: The princess is not singing

Example 20

(1) If the dragon is awake then the princess is not singing ✓

(2) The dragon is awake

(3) not: The princess is not singing

| [1]

|

|

(4) The dragon is not awake

(5) The princess is not singing

×

Example 20

(1) If the dragon is awake then the princess is not singing ✓

(2) The dragon is awake

(3) not: The princess is not singing ✓

| [1]

|

(4) The dragon is not awake

×

|

(5) The princess is not singing

| [3]

(6) The princess is singing

×

Example 21

- (1) the squirrel stole my sandwich or the raccoon stole my sandwich
- (2) The squirrel did not steal my sandwich
- (3) The raccoon stole my sandwich

Example 21

- (1) the squirrel stole my sandwich or the raccoon stole my sandwich
- (2) The squirrel did not steal my sandwich
- (3) not: The raccoon stole my sandwich

Example 21

(1) the squirrel stole my sandwich or the raccoon stole my sandwich ✓

(2) The squirrel did not steal my sandwich

(3) not: The raccoon stole my sandwich

| [1]

|

|

(4) The squirrel stole my sandwich

(5) The raccoon stole my sandwich

×

×

Example 22

- (1) the squirrel stole my sandwich or the raccoon stole my sandwich
- (2) The squirrel stole my sandwich
- (3) The raccoon did not steal my sandwich

Example 22

- (1) the squirrel stole my sandwich or the raccoon stole my sandwich
- (2) The squirrel stole my sandwich
- (3) not: The raccoon did not steal my sandwich

Example 22

(1) the squirrel stole my sandwich or the raccoon stole my sandwich ✓

(2) The squirrel stole my sandwich

(3) not: The raccoon did not steal my sandwich

| [1]

| |

(4) The squirrel stole my sandwich (5) The raccoon stole my sandwich

Example 22

- (1) the squirrel stole my sandwich or the raccoon stole my sandwich ✓
- (2) The squirrel stole my sandwich
- (3) not: The raccoon did not steal my sandwich ✓
| [1]

- | | |
|---|--|
| ----- | |
| | |
| (4) The squirrel stole my sandwich
 [3] | (5) The raccoon stole my sandwich
 [3] |
| (6) The raccoon stole my sandwich
OPEN | (7) The raccoon stole my sandwich
OPEN |

Example 23

- (1) Pat is here and Kim is here
- (2) If Pat is here then Sam is happy
- (3) Sam is happy

Example 23

- (1) Pat is here and Kim is here
- (2) If Pat is here then Sam is happy
- (3) not: Sam is happy

Example 23

- (1) Pat is here and Kim is here ✓
- (2) If Pat is here then Sam is happy
- (3) not: Sam is happy
 | [1]
- (4) Pat is here
- (5) Kim is here

Example 23

(1) Pat is here and Kim is here ✓
(2) If Pat is here then Sam is happy ✓
(3) not: Sam is happy
 | [1]
(4) Pat is here
(5) Kim is here
 | [2]

 | |
(6) Pat is not here (7) Sam is happy
 × ×

Example 24

- (1) Pat is here
- (2) Kim is here
- (3) Pat is here and Kim is here

Example 24

- (1) Pat is here
- (2) Kim is here
- (3) not: Pat is here and Kim is here

Example 24

(1) Pat is here

(2) Kim is here

(3) not: Pat is here and Kim is here ✓

| [3]

|

|

(4) Pat is not here

(5) Kim is not here

×

×

Example 25

- (1) Pat is not here and Kim is here
- (2) Pat is not here

Example 25

- (1) Pat is not here and Kim is here
- (2) not: Pat is not here

Example 25

- (1) Pat is not here and Kim is here ✓
- (2) not: Pat is not here
| [1]
- (3) Pat is not here
- (4) Kim is here

Example 25

(1) Pat is not here and Kim is here ✓

(2) not: Pat is not here ✓

| [1]

(3) Pat is not here

(4) Kim is here

| [2]

(5) Pat is here

×

Example 26

- (1) Pat is here and Kim is not here
- (2) Kim is not here

Example 26

- (1) Pat is here and Kim is not here
- (2) not: Kim is not here

Example 26

(1) Pat is here and Kim is not here ✓

(2) not: Kim is not here

| [1]

(3) Pat is here

(4) Kim is not here

Example 26

(1) Pat is here and Kim is not here ✓

(2) not: Kim is not here ✓

| [1]

(3) Pat is here

(4) Kim is not here

| [2]

(5) Kim is here

×

Example 27

- (1) Pat is not here
- (2) Kim is not here
- (3) Pat is not here and Kim is not here

Example 27

- (1) Pat is not here
- (2) Kim is not here
- (3) not: Pat is not here and Kim is not here

Example 27

(1) Pat is not here

(2) Kim is not here

(3) not: Pat is not here and Kim is not here ✓

| [3]

|

|

(4) Pat is here

(5) Kim is here

×

×

Example 28

- (1) The dragon is asleep and the princess is singing
- (2) The dragon is asleep

Example 28

- (1) The dragon is asleep and the princess is singing
- (2) not: The dragon is asleep

Example 28

- (1) The dragon is asleep and the princess is singing ✓
- (2) not: The dragon is asleep
| [1]
- (3) The dragon is asleep
- (4) The princess is singing
×

Example 29

- (1) The butler is not in the pantry or the parrot is lying
- (2) The butler is in the pantry
- (3) The parrot is lying

Example 29

- (1) The butler is not in the pantry or the parrot is lying
- (2) The butler is in the pantry
- (3) not: The parrot is lying

Example 29

- (1) The butler is not in the pantry or the parrot is lying ✓
- (2) The butler is in the pantry
- (3) not: The parrot is lying

| [1]

| |

- (4) The butler is not in the pantry
- (5) The parrot is lying

×

×

Example 30

- (1) The moon is blue and the cow is airborne
- (2) The cow is airborne and the moon is blue

Example 30

- (1) The moon is blue and the cow is airborne
- (2) not: The cow is airborne and the moon is blue

Example 30

- (1) The moon is blue and the cow is airborne ✓
- (2) not: The cow is airborne and the moon is blue
| [1]
- (3) The moon is blue
- (4) The cow is airborne

Example 30

- (1) The moon is blue and the cow is airborne ✓
(2) not: The cow is airborne and the moon is blue ✓

| [1]

- (3) The moon is blue
(4) The cow is airborne

| [2]

|

|

(5) The cow is not airborne

(6) The moon is not blue

×

×

Example 31

- (1) The cat is on the piano
- (2) The dog is not conducting
- (3) The cat is on the piano and the dog is not conducting

Example 31

- (1) The cat is on the piano
- (2) The dog is not conducting
- (3) not: The cat is on the piano and the dog is not conducting

Example 31

- (1) The cat is on the piano
- (2) The dog is not conducting
- (3) not: The cat is on the piano and the dog is not conducting ✓
| [3]

(4) The cat is not on the piano	(5) It is not the case that
×	the dog is not conducting

Example 31

- (1) The cat is on the piano
- (2) The dog is not conducting
- (3) not: The cat is on the piano and the dog is not conducting ✓
| [3]

-
- |

(4) The cat is not on the piano
×

|

(5) It is not the case that
the dog is not conducting ✓
| [5]
(6) The dog is conducting
×

Example 32

- (1) If the cat is on the piano and the dog is asleep then the mouse is dancing
- (2) The cat is on the piano
- (3) The dog is asleep
- (4) The mouse is dancing

Example 32

- (1) If the cat is on the piano and the dog is asleep then the mouse is dancing
- (2) The cat is on the piano
- (3) The dog is asleep
- (4) not: The mouse is dancing

Example 32

- (1) If the cat is on the piano and the dog is asleep then the mouse is dancing ✓
- (2) The cat is on the piano
- (3) The dog is asleep
- (4) not: The mouse is dancing

| [1]

| |

- (5) It is not the case that the cat is on the piano and the dog is asleep
- (6) The mouse is dancing
×

Example 32

- (1) If the cat is on the piano and the dog is asleep then the mouse is dancing ✓
- (2) The cat is on the piano
- (3) The dog is asleep
- (4) not: The mouse is dancing

| [1]

| |

- (5) It is not the case that the cat is on the piano and the dog is asleep ✓
- (6) The mouse is dancing ×

| [5]

| |

- (7) The cat is not on the piano ×
- (8) The dog is not asleep ×

Example 33

- (1) If Pat is here then Kim is here and Sam is happy
- (2) Pat is here
- (3) Kim is here

Example 33

- (1) If Pat is here then Kim is here and Sam is happy
- (2) Pat is here
- (3) not: Kim is here

Example 33

(1) If Pat is here then Kim is here and Sam is happy ✓

(2) Pat is here

(3) not: Kim is here

| [1]

|

|

(4) Pat is not here

(5) Kim is here and Sam is happy

×

Example 33

(1) If Pat is here then Kim is here and Sam is happy ✓

(2) Pat is here

(3) not: Kim is here

| [1]

|

|

(4) Pat is not here

(5) Kim is here and Sam is happy ✓

×

| [5]

(6) Kim is here

(7) Sam is happy

×

Example 34

- (1) The ghost is not in the attic or the vampire is not in the cellar
- (2) The ghost is in the attic
- (3) The vampire is in the cellar
- (4) The butler is nervous and the cook is suspicious

Example 34

- (1) The ghost is not in the attic or the vampire is not in the cellar
- (2) The ghost is in the attic
- (3) The vampire is in the cellar
- (4) not: The butler is nervous and the cook is suspicious

Example 34

- (1) The ghost is not in the attic or the vampire is not in the cellar ✓
- (2) The ghost is in the attic
- (3) The vampire is in the cellar
- (4) not: The butler is nervous and the cook is suspicious

| [1]

|

|

(5) The ghost is not in the attic (6) The vampire is not in the cellar

×

×

Example 35

- (1) The penguin is wearing a hat and the walrus is not playing the tuba
- (2) the penguin is wearing a hat or the walrus is playing the tuba

Example 35

- (1) The penguin is wearing a hat and the walrus is not playing the tuba
- (2) not: the penguin is wearing a hat or the walrus is playing the tuba

Example 35

- (1) The penguin is wearing a hat and the walrus is not playing the tuba ✓
- (2) not: the penguin is wearing a hat or the walrus is playing the tuba
| [1]
- (3) The penguin is wearing a hat
- (4) The walrus is not playing the tuba

Example 35

- (1) The penguin is wearing a hat and the walrus is not playing the tuba ✓
- (2) not: the penguin is wearing a hat or the walrus is playing the tuba ✓
 - | [1]
- (3) The penguin is wearing a hat
- (4) The walrus is not playing the tuba
 - | [2]
- (5) The penguin is not wearing a hat
- (6) The walrus is not playing the tuba
 - ×