

The premises being true,	↯ These are all invalid.
make it very probable that the conclusion will be true.	inductively strong
...	
make it somewhat probable that the conclusion will be true.	inductively medium
...	
do not make it very likely that the conclusion will be true.	inductively weak

Table 2.1: Every argument is valid or invalid. Invalid arguments can have any degree of inductive strength, depending on how likely the conclusion is to be true given the premises.

Reliable

An argument is **RELIABLE** when (and only when) it is inductively strong and has all true premises.

In this textbook, however, we will set aside the analysis of inductively strong arguments and focus on just valid versus invalid ones.

### Practice exercises

A. Determine if each of the following arguments is valid or invalid.

- (1)

1. Socrates is a man.

2. All men are carrots.

3. Therefore, Socrates is a carrot.
- (2)

1. Either today is Labor Day, or the building is full.

2. The building isn't full.

3. Therefore, today is Labor Day.
- (3)

1. If the green van is missing, then Claire is at the beach.

2. The green van is missing.

3. Therefore, Claire is at the beach.

- (4) If Jones decided that she is going to get divorced, then she called a lawyer. Jones just called a lawyer. Hence, she has decided that she's going to get divorced.
- (5)
  - 1. Jeff is playing basketball, or Mary is watching television.
  - 2. Mary is watching television.
  - 3. Therefore, Jeff is playing basketball.
- (6)
  - 1. 160 12th graders at Central High School were asked if they planned to go to college next year.
  - 2. 75 percent said that they were planning to go to college the following year.
  - 3. Therefore, about 75 percent of all the 12th graders at Central High School are probably going to college next year.
- (7)
  - 1. If Mary stole the painting, then Jeff is in New Jersey.
  - 2. Therefore, if Jeff is in New Jersey, then Mary stole the painting.
- (8)
  - 1. As vacation destinations, Florence and Lisbon have many similarities: nice weather, historical attractions, and great restaurants.
  - 2. Sarah enjoyed visiting Florence.
  - 3. Therefore, Sarah will probably enjoy visiting Lisbon.
- (9)
  - 1. If Mary stole the painting, then Jeff is in New Jersey.
  - 2. Therefore, if Jeff is not in New Jersey, then Mary did not steal the painting.
- (10)
  - 1. Amy is on campus.
  - 2. Therefore, Amy is on campus, or she is on the moon.
- (11)
  - 1. Jack is taking a nap.
  - 2. Therefore, Jack is taking a nap, and Kate is reading.
- (12)
  - 1. If Roger is in the bank, then Steven is waiting in the apartment.
  - 2. Roger is not in the bank.
  - 3. Therefore, Steven is not waiting in the apartment.
- (13)
  - 1. If Joan is at work, then Kate is sleeping.
  - 2. Therefore, if Kate is not sleeping, then Joan is not at work.

- (14)
  - 1. If Mary is in the library, then Jeff is watching tv.
  - 2. If Jeff is watching tv, then Claire is taking a nap.
  - 3. Therefore, if Claire is taking a nap, then Mary is in the library.
- (15)
  - 1. If Mary is in the library, then Jeff is watching tv.
  - 2. If Jeff is watching tv, then Claire is taking a nap.
  - 3. Therefore, if Mary is in the library, then Claire is taking a nap.
- (16)
  - 1. If Mary is in the library, then Jeff is watching tv.
  - 2. If Jeff is watching tv, then Claire is taking a nap.
  - 3. Therefore, if Claire is not taking a nap, then Mary is not in the library.
- (17)
  - 1. George is an architect, or Susan is a lawyer.
  - 2. George is not an architect.
  - 3. Therefore, Susan is a lawyer.
- (18)
  - 1. Amy is walking in the park, or Sarah is playing basketball.
  - 2. Amy is walking in the park.
  - 3. Therefore, Sarah is not playing basketball.
- (19)
  - 1. George is mowing the lawn.
  - 2. Therefore, George is mowing the lawn, and Fred is looking for his coat.
- (20)
  - 1. Almost all sea lions live in the Atlantic Ocean around New York and New Jersey.
  - 2. Sammy is a sea lion.
  - 3. Therefore, Sammy lives in the Atlantic Ocean around New York and New Jersey.
- (21)
  - 1. All sea lions live in the Atlantic Ocean around New York and New Jersey.
  - 2. Sammy is a sea lion.
  - 3. Therefore, Sammy lives in the Atlantic Ocean around New York and New Jersey.

**B.** For each statement, determine if it is possible or not. If it is possible, given an example as illustration. If it is not possible, then explain why it isn't.

1. A valid argument that has one false premise and one true premise
2. A valid argument that has a false conclusion
3. A valid argument that has only false premises
4. A valid argument with only false premises and a false conclusion
5. An invalid argument that can be made valid by the addition of a new premise
6. A valid argument that can be made invalid by the addition of a new premise

## 2.3 Answers

**A.**

- (1)
1. Socrates is a man.
  2. All men are carrots.
  3. Therefore, Socrates is a carrot.

This argument is valid.

- (2)
1. Either today is Labor Day, or the building is full.
  2. The building isn't full.
  3. Therefore, today is Labor Day.

This argument is valid.

- (3)
1. If the green van is missing, then Claire is at the beach.
  2. The green van is missing.
  3. Therefore, Claire is at the beach.

This argument is valid.

- (4)
- If Jones decided that she is going to get divorced, then she called a lawyer. Jones just called a lawyer. Hence, she has decided that she's going to get divorced.

This argument is invalid.

- (5)    1. Jeff is playing basketball, or Mary is watching television.  
       2. Mary is watching television.  
       3. Therefore, Jeff is playing basketball.

This argument is invalid.

- (6)    1. 240 12th graders at Central High School were asked if they  
         planned to go to college next year.  
       2. 75 percent said that they were planning to go to college the  
         following year.  
       3. Therefore, about 75 percent of all the 12th graders at Central  
         High School are probably going to college next year.

This argument is invalid.

- (7)    1. If Mary stole the painting, then Jeff is in New Jersey.  
       2. Therefore, if Jeff is in New Jersey, then Mary stole the painting.

This argument is invalid.

- (8)    1. As vacation destinations, Florence and Lisbon have many similar-  
         ities: nice weather, historical attractions, and great restaurants.  
       2. Sarah enjoyed visiting Florence.  
       3. Therefore, Sarah will probably enjoy visiting Lisbon.

This argument is invalid.

- (9)    1. If Mary stole the painting, then Jeff is in New Jersey.  
       2. Therefore, if Jeff is not in New Jersey, then Mary did not steal  
         the painting.

This argument is valid.

- (10)   1. Amy is on campus.  
       2. Therefore, Amy is on campus, or she is on the moon.

This argument is valid.

- (11)   1. Jack is taking a nap.  
       2. Therefore, Jack is taking a nap, and Kate is reading.

This argument is invalid.

- (12)    1. If Roger is in the bank, then Steven is waiting in the apartment.  
          2. Roger is not in the bank.  
          3. Therefore, Steven is not waiting in the apartment.

This argument is invalid.

- (13)    1. If Joan is at work, then Kate is sleeping.  
          2. Therefore, if Kate is not sleeping, then Joan is not at work.

This argument is valid.

- (14)    1. If Mary is in the library, then Jeff is watching tv.  
          2. If Jeff is watching tv, then Claire is taking a nap.  
          3. Therefore, if Claire is taking a nap, then Mary is in the library.

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- (15)    1. If Mary is in the library, then Jeff is watching tv.  
          2. If Jeff is watching tv, then Claire is taking a nap.  
          3. Therefore, if Mary is in the library, then Claire is taking a nap.

This argument is invalid.

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This argument is valid.

- (17)    1. George is an architect, or Susan is a lawyer.  
          2. George is not an architect.  
          3. Therefore, Susan is a lawyer.

This argument is valid.

- (18)    1. Amy is walking in the park, or Sarah is playing basketball.  
          2. Amy is walking in the park.  
          3. Therefore, Sarah is not playing basketball.

For the way that we will define 'or' in the logic system that is developed in this textbook, this argument is invalid.

- (19)    1. George is mowing the lawn.  
          2. Therefore, George is mowing the lawn, and Fred is looking for his coat.

This argument is invalid.

- (20)    1. Almost all sea lions live in the Atlantic Ocean around New York and New Jersey.  
          2. Sammy is a sea lion.  
          3. Therefore, Sammy lives in the Atlantic Ocean around New York and New Jersey.

This argument is invalid.

- (21)    1. All sea lions live in the Atlantic Ocean around New York and New Jersey.  
          2. Sammy is a sea lion.  
          3. Therefore, Sammy lives in the Atlantic Ocean around New York and New Jersey.

This argument is valid.

**B.**

- (1) A valid argument that has one false premise and one true premise  
Yes, this is possible.

1. All whales are mammals. (*true*)
2. All mammals are plants. (*false*)
3. Therefore, all whales are plants.

- (2) A valid argument that has a false conclusion  
Yes, this is possible. See example from previous exercise.