

UNIT 1A

TIME OUT TO THINK

Pg. 7. Not guilty does not mean innocent; it means not enough evidence to prove guilt. If defendants were required to prove innocence, there would be many cases where they would be unable to provide such proof even though they were, in fact, innocent. This relates to the fallacy of appeal to ignorance in the sense that lack of proof of guilt does not mean innocence, and lack of proof of innocence does not mean guilt.

Pg. 9. Opinions will vary. One argument is that character questions should be allowed in court if answers to those questions may show bias or ulterior motives for testimony given by a witness. This would be a good topic for a discussion either during or outside of class.

QUICK QUIZ

- By the definition used in this book, an argument always contains at least one premise and a conclusion.
 - By definition, a fallacy is a deceptive argument.
 - An argument must contain a conclusion.
- Circular reasoning is an argument where the premise and the conclusion say essentially the same thing.
- Using the fact that a statement is unproved to imply that it is false is appeal to ignorance.
- “I don’t support the President’s tax plan” is the conclusion because the premise “I don’t trust his motives” supports that conclusion.
- This is a personal attack because the premise (I don’t trust his motives) attacks the character of the President, and says nothing about the substance of his tax plan.
- This is limited choice because the argument does not allow for the possibility that you are a fan of, say, boxing.
- Just because *A* preceded *B* does not necessarily imply that *A* caused *B*.
- By definition, a straw man is an argument that distorts (or misrepresents) the real issue.

DOES IT MAKE SENSE?

- Does not make sense. Raising one’s voice has nothing to do with logical arguments.
- Does not make sense. Logical arguments always contain at least one premise and a conclusion.

- Makes sense. A logical person would not put much faith in an argument that uses premises he believes to be false to support a conclusion.
- Makes sense. There’s nothing wrong with stating the conclusion of an argument before laying out the premises.
- Does not make sense. One can disagree with the conclusion of a well-stated argument regardless of whether it is fallacious.
- Makes sense. Despite the fact that an argument may be poorly constructed and fallacious, it still may have a believable conclusion.

BASIC SKILLS AND CONCEPTS

- Premise:* Apple’s iPhone outsells all other smart phones. *Conclusion:* It must be the best smart phone on the market.
 - The fact that many people buy the iPhone does not necessarily mean it is the best smart phone.
- Premise:* I became sick soon after eating at Burger Hut. *Conclusion:* Burger Hut food made me sick.
 - The argument doesn’t prove that Burger Hut food was the cause of the sickness.
- Premise:* Decades of searching have not revealed life on other planets. *Conclusion:* Life in the universe must be confined to Earth.
 - Failure to find life does not imply that life does not exist.
- Premise:* I saw three people use food stamps to buy expensive steaks. *Conclusion:* Abuse of food stamps is widespread.
 - The conclusion is based on relatively little evidence.
- Premise:* He refused to testify. *Conclusion:* He must be guilty.
 - There are many reasons that someone might have for refusing to testify (being guilty is only one of them), and thus this is the fallacy of limited choice.
- Premise:* Thousands of unarmed people, many of them children, are killed by firearms every year. *Conclusion:* The sale of all guns should be banned.
 - The conclusion is reached on the basis of an emotional statement.

37. *Premise:* The Republicans favor repealing the estate tax, which falls most heavily on the wealthy. *Conclusion:* Republicans think the wealthy aren't rich enough. (Implied here is that you should vote for Democrats). The argument distorts the position of the Republicans; this is a **straw man**.
38. *Premise:* The Wyoming toad has not been seen outside of captivity since 2002. *Conclusion:* It is extinct in the wild. **Appeal to ignorance** is used here – the lack of proof of the existence of the woodpecker does not imply it is extinct.
39. *Premise:* My boy loves dolls, and my girl loves trucks. *Conclusion:* There's no truth to the claim that boys prefer mechanical toys while girls prefer maternal toys. Using one child of each gender to come up with a conclusion about all children is **hasty generalization**. It can also be seen as an **appeal to ignorance**: the lack of examples of boys enjoying mechanical toys (and girls maternal toys) does not mean that they don't enjoy these toys.
40. *Premise:* The Democrats want to raise gas mileage requirements on new vehicles. *Conclusion:* Democrats think the government is the solution to all of our problems. The argument distorts the position of the Democrats; this is a **straw man**.

UNIT 1B

TIME OUT TO THINK

Pg. 18. We needed 8 rows for 3 propositions; adding a fourth proposition means two possible truth values for each of those 8 rows, or 16 rows total. The conjunction is true only if all four propositions are true.

Pg. 20. The precise definitions of logic sometimes differ from our "everyday" intuition. There is no possible way that Jones could personally eliminate all poverty on Earth, regardless of whether she is elected. Thus, at the time you heard her make this promise, you would certainly conclude that she was being less than truthful. Nevertheless, according to the rules of logic, the only way her statement can be false is if she is elected, in which case she would be unable to follow through on the promise. If she is not elected, her claim is true (at least according to the laws of logic).

QUICK QUIZ

- c. This is a proposition because it is a complete sentence making a claim, which could be true or false.
- a. The truth value of a proposition's negation (*not p*) can always be determined by the truth value of the proposition.
- c. Conditional statements are, by definition, in the form of *if p, then q*.
- c. The table will require eight rows because there are two possible truth values for each of the propositions *x*, *y*, and *z*.
- c. Because it is not stated otherwise, we are dealing with the inclusive *or* (and thus either *p* is true, or *q* is true, or both are true).

- a. The conjunction *p and q* is true only when both are true, and since *p* is false, *p and q* must also be false.
- b. This is the correct rephrasing of the original conjunction.
- c. This is the *contrapositive* of the original conjunction.
- b. Statements are logically equivalent only when they have the same truth values.
- a. Rewriting the statement in *if p, then q* form gives, "if you want to win, then you've got to play."

DOES IT MAKE SENSE?

- Does not make sense. Propositions are never questions.
- Makes sense. The Mayor's stance on banning guns indicates he supports gun control.
- Makes sense. If restated in *if p, then q* form, this statement would read, "If we catch him, then he will be dead or alive." Clearly this is true, as it covers all the possibilities. (One could argue semantics, and say that a dead person is not caught, but rather discovered. Splitting hairs like this might lead one to claim the statement does not make sense).
- Does not make sense. The first statement is in the *if p, then q* form, and the second is the converse (i.e. *if q, then p*). Since the converse of an *if...then* statement is not logically equivalent to the original statement, this doesn't make sense.
- Does not make sense. Not all statements fall under the purview of logical analysis.
- Does not make sense. The converse of a statement is not always false if the original statement is true.

BASIC SKILLS AND CONCEPTS

13. Since it's a complete sentence that makes a claim (whether true or false is immaterial), it's a proposition.
14. No claim is made with this statement, so it's not a proposition.
15. No claim is made with this statement, so it's not a proposition.
16. This is a complete sentence that makes a claim, so it's a proposition.
17. Questions are never propositions.
18. This is a proposition as we can assign a truth value to it, and it's a complete sentence.
19. Asia is not in the northern hemisphere. The statement is false; the negation is true.
20. Spain is not in North America. The statement is false; the negation is true.
21. The Beatles were not a German band. The statement is false; the negation is true.
22. Brad Pitt is an American actor. The statement is false; the negation is true.
23. Sarah did go to dinner.
24. The Senator appears to approve of the demonstrations. Whether he approves of them is debatable, given the limited information.
25. The Congressman voted in favor of discrimination.
26. The Senate failed to push the bill through to stop logging (it did not overturn the President's veto), so logging will continue.
27. Paul appears to support building the new dorm.
28. Since the mayor was trying to strike down a law prohibiting cell phones in public meetings, the mayor appears to support the use of cell phones in public meetings.
29. This is the truth table for the conjunction q and r .

q	r	q and r
T	T	T
T	F	F
F	T	F
F	F	F

30. This is the truth table for the conjunction p and s .

p	s	p and s
T	T	T
T	F	F
F	T	F
F	F	F

31. "Cucumbers are vegetables" is true. "Apples are fruit" is true. Since both propositions are true, the conjunction is true.
32. " $12 + 6 = 18$ " is true, but " $3 \times 5 = 8$ " is false. The conjunction is false because both propositions in a conjunction must be true for the entire statement to be true.
33. "The Mississippi River flows through Louisiana" is true. "The Colorado River flows through Arizona" is true. Since both propositions are true, the conjunction is true.
34. "Bach was a composer" is true, but "Bono is a violinist" is false. The conjunction is false because both propositions in a conjunction must be true for the entire statement to be true.
35. "Some people are happy" is true (in general), as is "Some people are short," so the conjunction is true.
36. "Not all dogs are black" is true. "Not all cats are white" is also true, so the conjunction is true.
37. This is the truth table for q and r and s .

q	r	s	q and r and s
T	T	T	T
T	T	F	F
T	F	T	F
T	F	F	F
F	T	T	F
F	T	F	F
F	F	T	F
F	F	F	F

38. This is the truth table for p and q and r and s .

p	q	r	s	p and q and r and s
T	T	T	T	T
T	T	T	F	F
T	T	F	T	F
T	T	F	F	F
T	F	T	T	F
T	F	T	F	F
T	F	F	T	F
T	F	F	F	F
F	T	T	T	F
F	T	T	F	F
F	T	F	T	F
F	T	F	F	F
F	F	T	T	F
F	F	T	F	F
F	F	F	T	F
F	F	F	F	F

39. *Or* is used in the exclusive sense because you probably can't wear both a skirt and a dress.
40. *Or* is used in the exclusive sense because you probably can't have both the salad and soup.
41. The exclusive *or* is used here as it is unlikely that the statement means you might travel to both countries during the same trip.
42. Oil changes are good for either 3 months or 5,000 miles, whichever comes first, so this is the exclusive use of *or*.
43. *Or* is used in the inclusive sense because you probably would be thrilled to attend both concerts or the theater while in New York.
44. Most insurance policies that cover "fire or theft" allow for the coverage of both at the same time, so this is the inclusive *or*.
45. This is the truth table for the disjunction r or s .

r	s	r or s
T	T	T
T	F	T
F	T	T
F	F	F

46. This is the truth table for the disjunction p or r .

p	r	p or r
T	T	T
T	F	T
F	T	T
F	F	F

47. This is the truth table for p and (*not* p).

p	<i>not</i> p	p and (<i>not</i> p)
T	F	F
F	T	F

48. This is the truth table for q or (*not* q).

q	<i>not</i> q	q or (<i>not</i> q)
T	F	T
F	T	T

49. This is the truth table for p or q or r .

p	q	r	p or q or r
T	T	T	T
T	T	F	T
T	F	T	T
T	F	F	T
F	T	T	T
F	T	F	T
F	F	T	T
F	F	F	F

50. This is the truth table for p or (*not* p) or q .

p	(<i>not</i> p)	q	p or (<i>not</i> p) or q
T	F	T	T
T	F	F	T
F	T	T	T
F	T	F	T

51. "Oranges are vegetables" is false. "Oranges are fruits" is true. The disjunction is true because a disjunction is true when at least one of its propositions is true.
52. Both " $3 \times 5 = 15$ " and " $3 + 5 = 8$ " are true, and thus the disjunction is true, as all you need is one proposition or the other to be true for the statement to be true.
53. "The Nile River is in Africa" is true. "China is in Europe" is false. The disjunction is true because a disjunction is true when at least one of its propositions is true.
54. "Bachelors are married" is false. "Bachelors are single" is true. The disjunction is true because at least one of the propositions is true.
55. "Trees walk" is false. "Rocks run" is also false. Since both are false, the disjunction is false.
56. "France is a country" is true. "Paris is a continent" is false. The disjunction is true because at least one of the propositions is true.
57. This is the truth table for *if* p , *then* r .

p	r	<i>if</i> p , <i>then</i> r
T	T	T
T	F	F
F	T	T
F	F	T

58. This is the truth table for *if* q , *then* s .

q	s	<i>if</i> q , <i>then</i> s
T	T	T
T	F	F
F	T	T
F	F	T

59. *Hypothesis*: Eagles can fly. *Conclusion*: Eagles are birds. Since both are true, the implication is true, because implications are always true except in the case where the hypothesis is true and the conclusion is false.
60. *Hypothesis*: London is in England. *Conclusion*: Chicago is in America. Since both are true, the implication is true.

61. *Hypothesis:* London is in England. *Conclusion:* Chicago is in Bolivia. Since the hypothesis is true, and the conclusion is false, the implication is false (this is the only instance when a simple *if p, then q* statement is false).
62. *Hypothesis:* London is in Mongolia. *Conclusion:* Chicago is in America. Since the hypothesis is false, the implication is true, no matter the truth value of the conclusion (which, in this case, is true).
63. *Hypothesis:* Pigs can fly. *Conclusion:* Fish can brush their teeth. Since the hypothesis is false, the implication is true, no matter the truth value of the conclusion (which, in this case, is false).
64. *Hypothesis:* $2 \times 3 = 6$ *Conclusion:* $2 + 3 = 6$. Since the hypothesis is true, and the conclusion is false, the implication is false.
65. *Hypothesis:* Butterflies can fly. *Conclusion:* Butterflies are birds. Since the hypothesis is true, and the conclusion is false, the implication is false (this is the only instance when a simple *if p, then q* statement is false).
66. *Hypothesis:* Butterflies are birds. *Conclusion:* Butterflies can fly. Since the hypothesis is false, the implication is true, no matter the truth value of the conclusion (which, in this case, is true).
67. If it rains (*p*), then I get wet (*q*).
68. If a person is a resident of Tel Aviv (*p*), then that person is a resident of Israel (*q*).
69. If you are eating (*p*), then you are alive (*q*).
70. If you are alive (*p*), then you eat (*q*).
71. If you are bald (*p*), then you are a male (*q*).
72. If she is an art historian (*p*), then she is educated (*q*).
73. *Converse:* If José owns a Mac, then he owns a computer. *Inverse:* If José does not own a computer, then he does not own a Mac. *Contrapositive:* If José does not own a Mac, then he does not own a computer. The converse and inverse are always logically equivalent, and the contrapositive is always logically equivalent to the original statement.
74. *Converse:* If the patient is breathing, then the patient is alive. *Inverse:* If the patient is not alive, then the patient is not breathing. *Contrapositive:* If the patient is not breathing, then the patient is not alive. The converse and inverse are always logically equivalent, and the contrapositive is always logically equivalent to the original statement.
75. *Converse:* If Teresa works in Massachusetts, then she works in Boston. *Inverse:* If Teresa does not work in Boston, then she does not work in Massachusetts. *Contrapositive:* If Teresa does not work in Massachusetts, then she does not work in Boston. The converse and inverse are always logically equivalent, and the contrapositive is always logically equivalent to the original statement.
76. *Converse:* If the lights are on, then I am using electricity. *Inverse:* If I am not using electricity, then the lights are not on. *Contrapositive:* If the lights are not on, then I am not using electricity. The converse and inverse are always logically equivalent, and the contrapositive is always logically equivalent to the original statement.
77. *Converse:* If it is warm outside, then the sun is shining. *Inverse:* If the sun is not shining, then it is not warm outside. *Contrapositive:* If it is not warm outside, then the sun is not shining. The converse and inverse are always logically equivalent, and the contrapositive is always logically equivalent to the original statement.
78. *Converse:* If the oceans rise, then the polar ice caps will have melted. *Inverse:* If the polar ice caps do not melt, then the oceans will not rise. *Contrapositive:* If the oceans do not rise, then the polar ice caps will not have melted. The converse and inverse are always logically equivalent, and the contrapositive is always logically equivalent to the original statement.

FURTHER APPLICATIONS

79. If you die young, then you are good.
80. If a man hasn't discovered something that he will die for, then he isn't fit to live.
81. If a free society cannot help the many who are poor, then it cannot save the few who are rich.
82. If you don't like something, then you should change it. If you can't change it, then you should change your attitude.
83. "If Sue lives in Cleveland, then she lives in Ohio," where it is assumed that Sue lives in Cincinnati. (Answers will vary.) Because Sue lives in Cincinnati, the hypothesis is false, while the conclusion is true, and this means the implication is true. The converse, "If Sue lives in Ohio, then she lives in Cleveland," is false, because the hypothesis is true, but the conclusion is false.

84. “If $2 + 2 = 4$, then $3 + 3 = 6$.” (Answers will vary.) The implication is true, because the hypothesis is true and the conclusion is true. The converse, “If $3 + 3 = 6$, then $2 + 2 = 4$ ” is also true for the same reason.
85. “If Ramon lives in Albuquerque, then he lives in New Mexico” where it is assumed that Ramon lives in Albuquerque. (Answers will vary.) The implication is true, because the hypothesis is true and the conclusion is true. The contrapositive, “If Ramon does not live in New Mexico, then he does not live in Albuquerque”, is logically equivalent to the original conditional, so it is also true.
86. “If Delaware is in America, then Maryland is in Canada.” (Answers will vary.) The hypothesis is true, while the conclusion is false, and this means the implication is false. In the inverse, “If Delaware is not in America, then Maryland is not in Canada,” the hypothesis is false, while the conclusion is true, and this means the implication is true.
87. “If it is a fruit, then it is an apple.” (Answers will vary.) The implication is false because, when the hypothesis is true, the conclusion may be false (it could be an orange). In the converse, “If it is an apple, then it is a fruit.”, when the hypothesis is true, the conclusion is true, and this means the implication is true.
88. (1) If the payer does not know that you remarried, then alimony you receive is taxable.
 (2) If the payer knows that you remarried, then alimony you receive is not taxable.
 (3) If you pay alimony to another party, then it is not deductible on your return.
89. Believing is sufficient for achieving. Achieving is necessary for believing.
90. Our species being alone in the universe is sufficient for the universe having aimed rather low. The universe having aimed rather low is necessary for our species being alone in the universe.
91. Forgetting that we are One Nation Under God is sufficient for being a nation gone under. Being a nation gone under is a necessary result of forgetting that we are One Nation Under God.
92. Needing both of your hands for whatever it is you’re doing is sufficient for your brain being in on it too. Your brain being in on it too is necessary for needing both of your hands for whatever it is you’re doing.

93. Following is a truth table for both *not* (p and q) and *(not p) or (not q)*.

p	q	p and q	<i>not</i> (p and q)	<i>(not p) or</i> (<i>not q</i>)
T	T	T	F	F
T	F	F	T	T
F	T	F	T	T
F	F	F	T	T

Since both statements have the same truth values (compare the last two columns of the table), they are logically equivalent.

94. Following is a truth table for both *not* (p or q) and *(not p) and (not q)*.

p	q	p or q	<i>not</i> (p or q)	<i>(not p) and</i> (<i>not q</i>)
T	T	T	F	F
T	F	T	F	F
F	T	T	F	F
F	F	F	T	T

Since both statements have the same truth values (compare the last two columns in the table), they are logically equivalent.

95. Following is a truth table for both *not* (p and q) and *(not p) and (not q)*.

p	q	p and q	<i>not</i> (p and q)	<i>(not p) and</i> (<i>not q</i>)
T	T	T	F	F
T	F	F	T	F
F	T	F	T	F
F	F	F	T	T

Note that the last two columns in the truth table don’t agree, and thus the statements are not logically equivalent.

96. Following is a truth table for *not* (p or q) and *(not p) or (not q)*.

p	q	p or q	<i>not</i> (p or q)	<i>(not p) or</i> (<i>not q</i>)
T	T	T	F	F
T	F	T	F	T
F	T	T	F	T
F	F	F	T	T

Note that the last two columns in the truth table don’t agree, and thus the statements are not logically equivalent.

97. Following is a truth table for $(p \text{ and } q) \text{ or } r$ and $(p \text{ or } r) \text{ and } (p \text{ or } q)$.

p	q	r	$p \text{ and } q$	$(p \text{ and } q) \text{ or } r$	$p \text{ or } r$	$p \text{ or } q$	$(p \text{ or } r) \text{ and } (p \text{ or } q)$
T	T	T	T	T	T	T	T
T	T	F	T	T	T	T	T
T	F	T	F	T	T	T	T
T	F	F	F	F	T	T	T
F	T	T	F	T	T	T	T
F	T	F	F	F	F	T	F
F	F	T	F	T	T	F	F
F	F	F	F	F	F	F	F

Since the fifth and eighth column of the table don't agree, these two statements are not logically equivalent.

98. Following is a truth table for $(p \text{ or } q) \text{ and } r$ and $(p \text{ and } r) \text{ or } (q \text{ and } r)$.

p	q	r	$p \text{ or } q$	$(p \text{ or } q) \text{ and } r$	$p \text{ and } r$	$q \text{ and } r$	$(p \text{ and } r) \text{ or } (q \text{ and } r)$
T	T	T	T	T	T	T	T
T	T	F	T	F	F	F	F
T	F	T	T	T	T	F	T
T	F	F	T	F	F	F	F
F	T	T	T	T	F	T	T
F	T	F	T	F	F	F	F
F	F	T	F	F	F	F	F
F	F	F	F	F	F	F	F

Since the fifth and eighth columns agree, the statements are logically equivalent.

99. Given the implication *if p, then q*, the contrapositive is *(not q) then (not p)*. The converse is *if q, then p* and the inverse of the converse is *if (not q) then (not p)*, which is the contrapositive. Similarly, the contrapositive is also the converse of the inverse.

UNIT 1C

TIME OUT TO THINK

- Pg. 26. The set of students in the mathematics class could be described by writing each student's name within the braces, separated by commas. The set of countries you have visited would be written with the names of the countries within the braces. Additional examples will vary.
- Pg. 32. The student should see that the statement some teachers are not men leaves both questions posed in the Time Out unanswered. Thus, from the statement given, it is not possible to know whether some teachers are men. From this, it also follows that we cannot be sure that none of the teachers are men.
- Pg. 33. Changing the circle for boys to girls is fine, since a teenager is either one or the other. It would also be fine to change the circle for employed to unemployed. But the set girls, boys, and unemployed does not work because it offers no place to record if the teenager is an honor student.

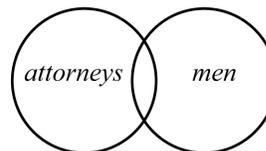
Pg. 34. This question should convince the student that the variety of colors on TVs and monitors is made from just red, green, and blue. Higher-resolution monitors use smaller or more densely packed pixels (or both).

Pg. 35. The two sets in this case are the opposites of the two sets chosen for Figure 1.24, so they work equally well.

QUICK QUIZ

- b.** The ellipsis is a convenient way to represent all the other states in the U.S. without having to write them all down.
- c.** $3\frac{1}{2}$ is a rational number (a ratio of two integers), but it is not an integer.
- a.** When the circle labeled C is contained within the circle labeled D, it indicates that C is a subset of D.

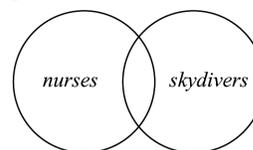
4. **b.** Since the set of boys is disjoint from the set of girls, the two circles should be drawn as non-overlapping circles.
5. **a.** Because all apples are fruit, the set A should be drawn within the set B (the set of apples is a subset of the set of fruits).
6. **c.** Some cross country runners may also be swimmers, so their sets should be overlapping.
7. **a.** The X is placed in the region where *business executives* and *working mothers* overlap to indicate that there is at least one member in that region.
8. **c.** The region X is within both *males* and *athletes*, but not within *Republicans*.
9. **a.** The central region is common to all three sets, and so represents those who are male, Republican, and an athlete.
10. **c.** The sum of the entries in the column labeled Low Birth Weight is 32.
19. π is a real number.
20. $\sqrt{8}$ is a real number.
21. -34.45 is a rational number.
22. $\sqrt{98}$ is a real number.
23. $\pi/4$ is a real number.
24. $123/456$ is a rational number.
25. $-13/3$ is a rational number.
26. -145.01 is a rational number.
27. $\pi/129$ is a real number.
28. 13,579,023 is a natural number.
29. {January, February, March, ..., November, December}
30. {14, 16, 18, ..., 96, 98}
31. {New Mexico, Oklahoma, Arkansas, Louisiana}
32. {4, 7, 10, 13, 16, 19}
33. {9, 16, 25}
34. The set has no members.
35. {3, 9, 15, 21, 27}
36. {a, e, i, o, u}
37. Because some men are attorneys, the circles should overlap.



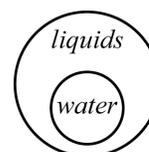
DOES IT MAKE SENSE?

7. Does not make sense. More likely than not, the payments go to two separate companies.
8. Does not make sense. The set of jabbers is a subset of the set of wocks, but this does not mean there could be no wocks outside the set of jabbers.
9. Does not make sense. The number of students in a class is a whole number, and whole numbers are not in the set of irrational numbers.
10. Makes sense. The students that ate breakfast could be represented by the inside of the circle and those that did not eat breakfast would be represented by the area outside of the circle, but inside the rectangle, or vice versa.
11. Does not make sense. A Venn diagram shows only the relationship between members of sets, but does not have much to say about the truth value of a categorical proposition.
12. Does not make sense. A Venn diagram is used to show the relationship between members of sets, but it is not used to determine the truth value for an opinion.

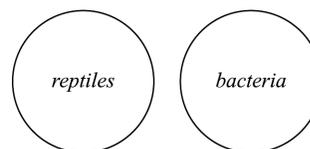
38. Because some nurses are skydivers, the circles should overlap.



39. Water is a liquid, and thus the set of water is a subset of the set of liquids. This means one circle should be contained within the other.



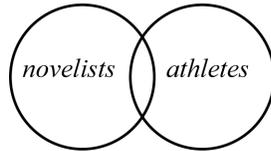
40. No reptile is a bacteria, so these sets are disjoint, and the circles should not overlap.



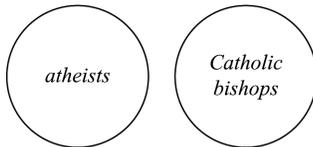
BASIC SKILLS AND CONCEPTS

13. 23 is a natural number.
14. -45 is an integer.
15. $2/3$ is a rational number.
16. $-5/2$ is a rational number.
17. 1.2345 is a rational number.
18. 0 is a whole number.

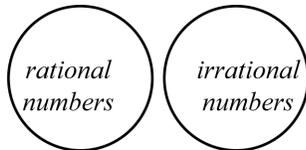
41. Some novelists are also athletes, so the circles should overlap.



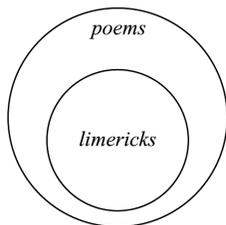
42. No atheist is a Catholic bishop, so these sets are disjoint, and the circles should not overlap.



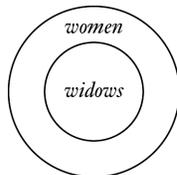
43. No rational number is an irrational number, so these sets are disjoint, and the circles should not overlap.



44. All limericks are poems, so one circle should be placed within the other.

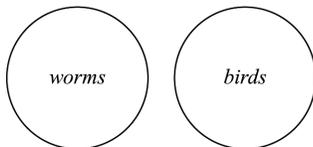


45. b. The subject is *widows*, and the predicate is *women*.
c.



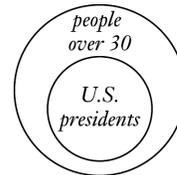
- d. No, the diagram does not show evidence that there is a woman that is not a widow.

46. b. The subject is *worms*, and the predicate is *birds*.
c.



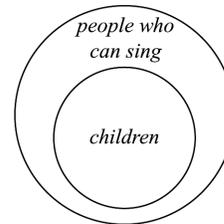
- d. No, since the sets are disjoint, they would have no common members.

47. a. All U.S. presidents are people over 30 years old.
b. The subject is *U.S. presidents*, and the predicate is *people over 30 years old*.
c.



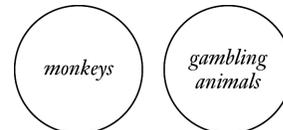
- d. Yes, no U.S. presidents are outside the set of people over 30.

48. a. All children are people that sing.
b. The subject is *children*, and the predicate is *people who can sing*.
c.



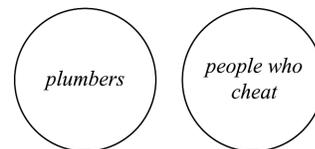
- d. No, adults are not addressed.

49. a. No monkey is a gambling animal.
b. The subject is *monkeys*, and the predicate is *gambling animals*.
c.



- d. No, since the sets are disjoint, they would have no common members.

50. a. No plumbers are people who cheat.
b. The subject is *plumbers*, and the predicate is *people who cheat*.
c.

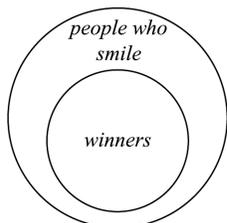


- d. No, since the sets are disjoint, they would have no common members.

51. a. All winners are people who smile.
b. The subject is *winners*, and the predicate is *people who smile*.

51. (continued)

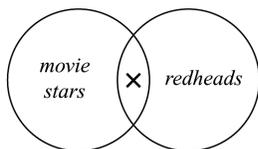
c.



d. Yes, since all winners are inside the set of people that smile, no frowner can be a winner.

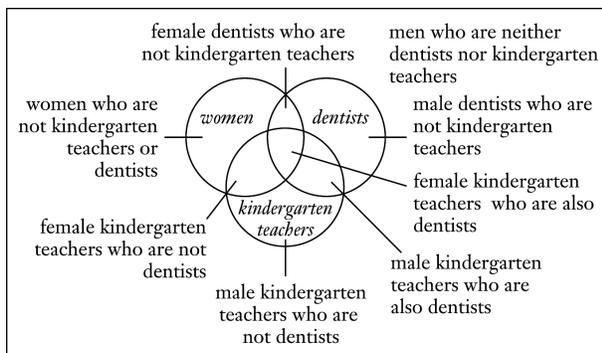
52. b. The subject is *movie stars*, and the predicate is *redheads*.

c.

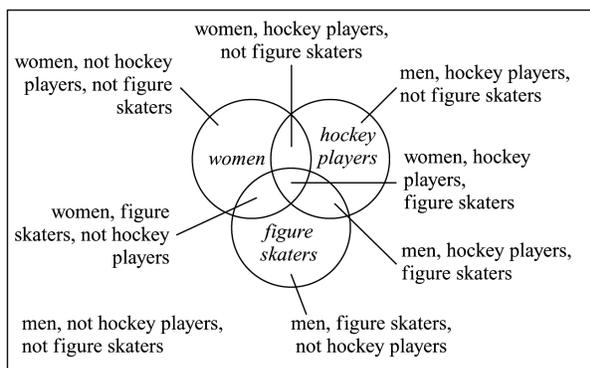


d. No, the diagram gives no evidence that there are blonde movie stars.

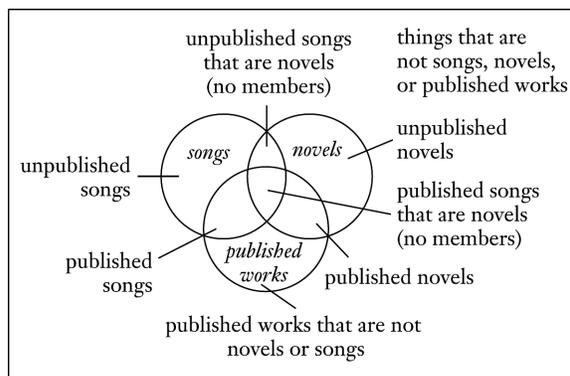
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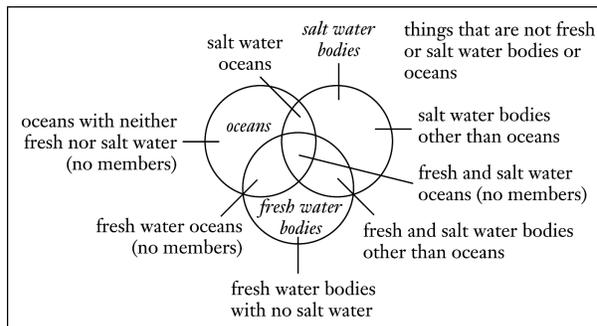
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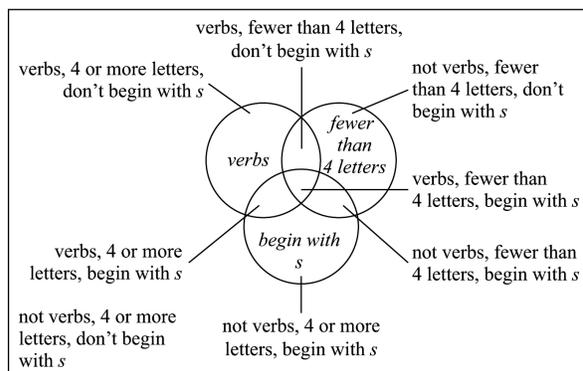
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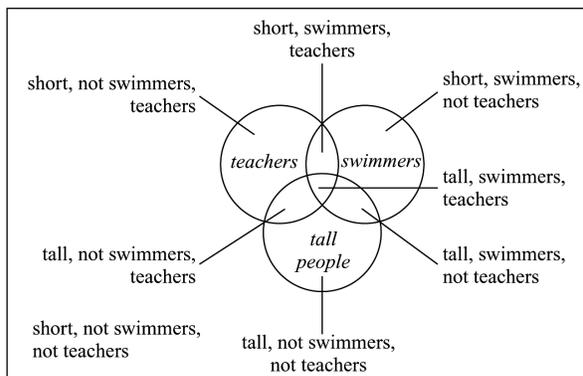
56.



57.

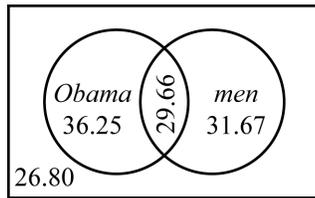


58.

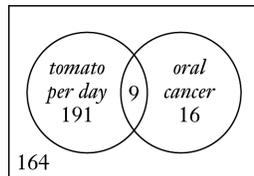


59. a. There are 16 women at the party that are under 30.
 b. There are 22 men at the party that are not under 30.
 c. There are 44 women at the party.
 d. There are 81 people at the party.
60. a. There are 15 men at the party that are under 30.
 b. There are 28 women at the party who are over 30.
 c. There are 37 men at the party.
 d. There are 50 people at the party that are not under 30.

61.

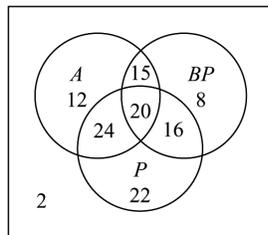


62.



63. a. There are 20 people at the conference that are unemployed women with a college degree.
 b. There are 22 people at the conference that are employed men.
 c. There are 8 people at the conference that are employed women without a college degree.
 d. There are 34 people at the conference that are men.
64. a. There are 6 people at the conference that are employed men without a college degree.
 b. There are 24 people at the conference that are unemployed women.
 c. There are 3 people at the conference that are unemployed men without a college degree.
 d. There are 77 people at the conference.

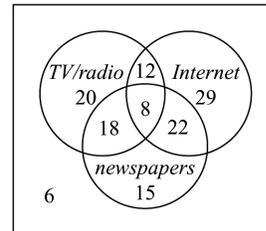
65. a.



b. Add the numbers in the regions that are contained in the *A* and *BP* circles, to find that 95 people took antibiotics or blood pressure medication.

- c. Add the number of people that are in the *BP* circle, but outside the *P* circle, to arrive at 23 people.
 d. Add the number of people that are in the *P* circle. There are 82 such people.
 e. Use the region that is common to the *A* and *BP* circles, but not contained in the *P* circle, to find that 15 people took antibiotics and blood pressure medicine, but not pain medication.
 f. Add the numbers in the regions that are in at least one of the three circles, to find that 117 people took antibiotics or blood pressure medicine or pain medicine.

66. a.



- b. The region common to both *TV/radio* and *newspapers* shows that 26 people use at least *TV/radio* and *newspapers* (some of these also use the *Internet*).
 c. Add the number of people that are in any of the regions contained within the two circles *TV/Radio* and *Internet*. There are 109 such people.
 d. Use the regions that are contained in the *TV/radio* or *Internet* circles, but not contained in the *newspapers* circle. There are 61 such people.
 e. Add the number of people that are in the *Internet* circle, but outside of the *TV/radio* circle, to arrive at 51 people.
 f. Add the number of people that are in the *TV/radio* circle, but outside of the *newspaper* circle, to arrive at 32 people.

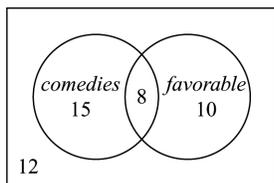
FURTHER APPLICATIONS

67. a.

	Favorable Review	Non-favorable Review	Total
Comedy	8	23 - 8 = 15	23
Non-comedy	22 - 12 = 10	12	45 - 23 = 22
Total	8 + 10 = 18	15 + 12 = 27	45

67. (continued)

b.

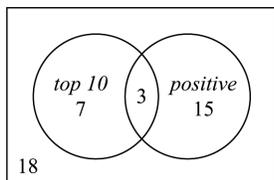


- c. 15 comedies received unfavorable reviews.
- d. 10 non-comedies received favorable reviews.

68. a.

	Tested Positive	Tested Negative	Total
Top 10	3	$10 - 3 = 7$	10
Not top 10	$18 - 3 = 15$	$25 - 7 = 18$	$43 - 10 = 33$
Total	18	25	$18 + 25 = 43$

b.

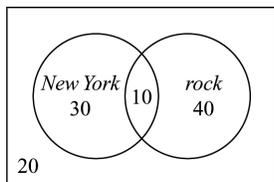


- c. 18 cyclists that tested negative did not finish in the top 10.
- d. 43 cyclists were tested.

69. a.

	Hip-hop	Rock	Total
NY	30	$40 - 30 = 10$	$100 - 60 = 40$
LA	20	40	$20 + 40 = 60$
Total	$30 + 20 = 50$	$10 + 40 = 50$	100

b.

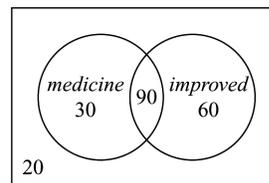


- c. 10 New Yorkers preferred rock.

70. a.

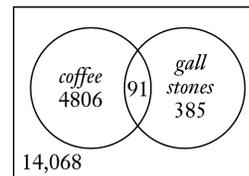
	Improve	Did not improve	Total
Medicine	90	$120 - 90 = 30$	120
Placebo	$80 - 20 = 60$	20	80
Total	$90 + 60 = 150$	$200 - 150 = 50$	$120 + 80 = 200$

b.



- c. 30 people who received medicine did not improve.
- d. 60 who received the placebo improved.

71.



72. The two-way table should look like this:

	Women	Men	Total
No claims	30	20	50
At least one claim	20	40	60
Total	50	60	110

73. The two-way table should look like this:

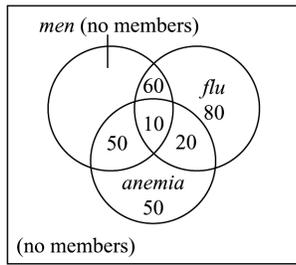
	Vegetarian	Meat/Fish	Total
Wine	20	40	60
No wine	45	15	60
Total	65	55	120

74. a.

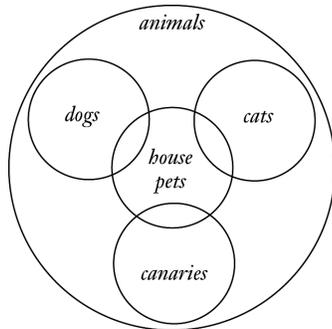
	Women	Men
Flu	80	60
Anemia	50	50
Both	20	10
Total	150	120

74. (continued)

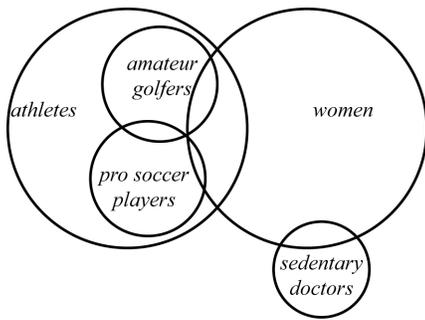
b.



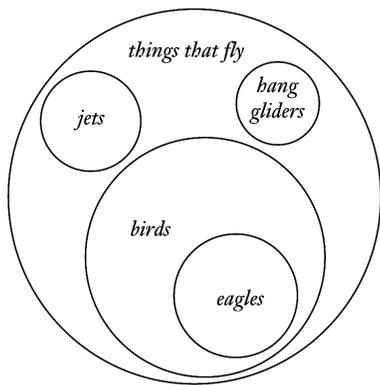
75.



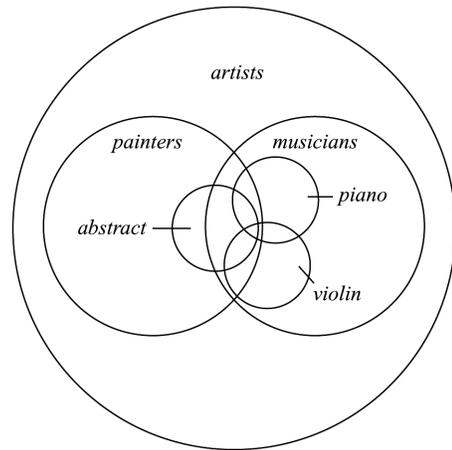
76.



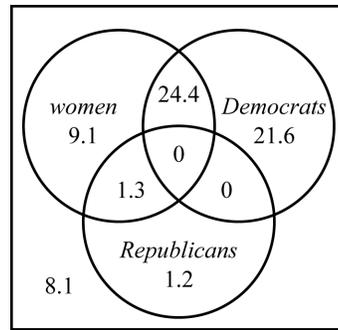
77.



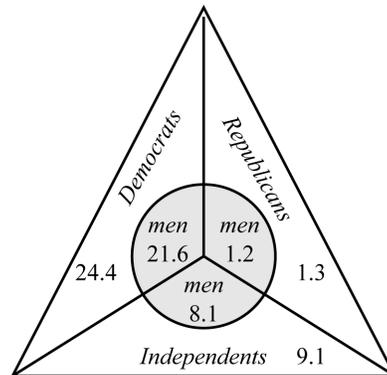
78.



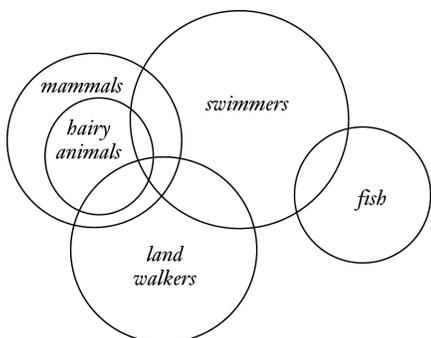
79. a.



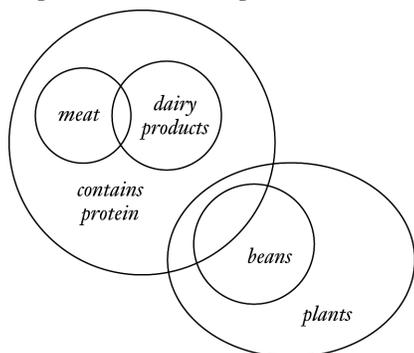
b.



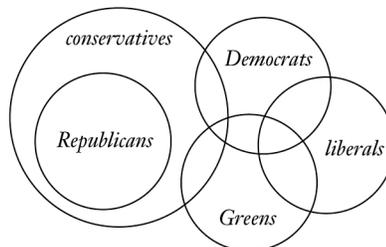
80. As shown in the diagram, the sets *hairy animals* and *fish* do not overlap (because all hairy animals are mammals, and no mammal is a fish). Since some mammals can swim, and hairy animals are mammals, there may be hairy animals that swim. There is nothing in the propositions that excludes the possibility of walking mammals, and thus there may be walking mammals, and for the same reason, there may be hairy animals that walk on land.



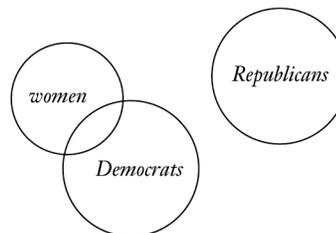
81. Since beans are contained within the set of plants, and meat and dairy products are outside of the set of plants, beans and dairy products are disjoint sets, and thus no bean is a dairy product. There is nothing in the propositions that prohibits the overlap of meat and dairy products, so there could be a meat that is a dairy product. No dairy product is a plant, because it is disjoint from that set. There could be plants that contain protein.



82. There could be conservative Democrats, and there could be liberal Green Party members, because there is nothing in the propositions to prohibit this. No liberal is a Republican, because the set of Republicans is a subset of the set of conservatives, and no liberal is a conservative (which means those sets are disjoint).

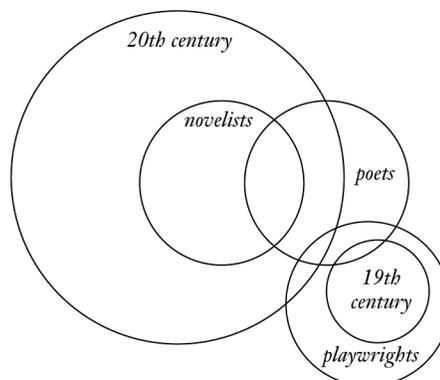


83. a. It is implied here that no Democrat is a Republican, and thus those sets are disjoint, as shown in the diagram.



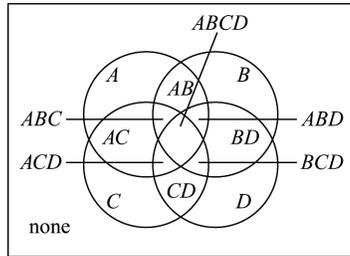
- b. Yes, it is possible to meet such a woman, as there is nothing in the propositions to exclude that possibility.
 c. Yes, there may be men who are Republicans (if there are any Republicans in attendance, they must be men).

84. a.



- b. No, all of the novelists were born in the 20th century.
 c. There is nothing in the facts you noticed that excludes the possibility of a poet born in the 19th century, so, yes, you may have studied such a poet.
 d. Yes, there's nothing stated that excludes this possibility.

85. a. There are 16 different sets of options: choose nothing, A, B, C, D, AB, AC, AD, BC, BD, CD, ABC, ABD, ACD, BCD, and ABCD.
 b.



- c. There are no regions for A and D only, and for B and C only.
 d. There are 32 different sets of options: choose nothing, A, B, C, D, E, AB, AC, AD, AE, BC, BD, BE, CD, CE, DE, ABC, ABD, ABE, ACD, ACE, ADE, BCD, BCE, BDE, CDE, ABCD, ABCE, ABDE, ACDE, BCDE, and ABCDE.
 e. Notice that with four options, there are $2^4 = 16$ different sets of options, and that with five options, there are $2^5 = 32$ different sets of options. It turns out that this pattern continues so that with N options, there are 2^N different sets of options.

UNIT 1D

TIME OUT TO THINK

- Pg. 42. Clear market research would be the best evidence on which to build the case. For example, use focus groups to react to the story, or show sample movie clips to groups of typical viewers.
 Pg. 43. Answers will vary. Recall that inductive arguments make a case for a general conclusion from more specific premises, while deductive arguments make a case for a specific conclusion from more general premises. This would be a good topic for a discussion either during or outside of class.
 Pg. 46. Changing John Kennedy to a person that was not president does not affect the argument's structure or the truth of the premises. Since the conclusion is now false, it is invalid.
 Pg. 48. Changing from heroin to aspirin does not affect the argument's structure, so it is still valid. It is now also sound, because this change makes both premises true.

the X should fall within or outside the *knights* circle, so it belongs on the border.

- c. Diagram *a* in question 4 is the correct diagram for its argument, and since X lies on the border of the *knights* circle, Paul may or may not be a knight.
- b. The argument is of the form *denying the conclusion*, and one can always conclude p is not true in such arguments. (Whether the argument is sound is another question).
- c. This argument is of the form *affirming the conclusion*, and it is always invalid, which means we can conclude nothing about p .
- c. A chain of conditionals from a to d is necessary before we can claim the argument is valid.
- b. The side opposite the right angle in a right triangle is always the longest, and it's called the hypotenuse.
- b. The Pythagorean theorem states that $c^2 = 4^2 + 5^2 = 16 + 25 = 41$.

QUICK QUIZ

- b. The only way to prove a statement true beyond all doubt is with a valid and sound deductive argument.
- c. A deductive argument that is valid has a logical structure that implies its conclusion from its premises.
- c. If a deductive argument is not valid, it cannot be sound.
- a. Premise 1 claims the set of *knights* is a subset of the set of *heroes*, and Premise 2 claims Paul is a hero, which means the X must reside within the *hero* circle. However, we cannot be sure whether

DOES IT MAKE SENSE?

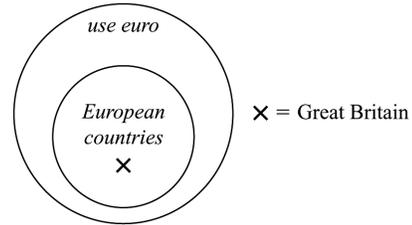
- Does not make sense. One cannot prove a conclusion beyond all doubt with an inductive argument.
- Makes sense. An inductive argument is judged on its strength.
- Makes sense. As long as the logic of a deductive argument is valid, if one accepts the truth (or soundness) of the premises, the conclusion necessarily follows.
- Does not make sense. A deductive argument which is valid is not necessarily sound, and therefore the conclusion may not be true.

- 13. Does not make sense. This argument is of the form *affirming the conclusion*, and it is always invalid.
- 14. Does not make sense. Mathematicians generally do not claim a theorem to be true until it is proved with a valid and sound deductive argument.

BASIC SKILLS AND CONCEPTS

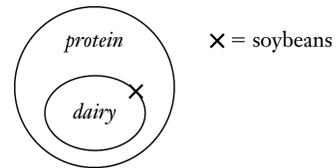
- 15. This is an inductive argument because it makes the case for a general conclusion based on many specific observations.
- 16. This is a deductive argument because a specific conclusion is deduced from more general premises.
- 17. This is an inductive argument because it makes the case for a general conclusion based on many specific observations.
- 18. This is a deductive argument because a specific conclusion is deduced from more general premises.
- 19. This is an inductive argument because it makes the case for a general conclusion based on many specific observations.
- 20. This is a deductive argument because a specific conclusion is deduced from more general premises.
- 21. This is an inductive argument because it makes the case for a general conclusion based on several specific observations.
- 22. This is a deductive argument because a specific conclusion is deduced from more general premises.
- 23. The premises are true and the argument is moderately strong. The conclusion is correct.
- 24. The premises are generally true, and the argument is weak. The conclusion may not be true (it is possible to pay more and not receive quality).
- 25. The premises are true, the argument seems moderately strong, and the conclusion is false.
- 26. The premises are true, the argument seems moderately strong, and the conclusion is true.
- 27. The premises are true, and the argument is moderately strong. The conclusion is true.
- 28. The premises are true, though the argument is weak (it speaks to only four of many composers). The conclusion is false.

- 29. a. Premise: All European countries are countries that use the euro as currency.
b.



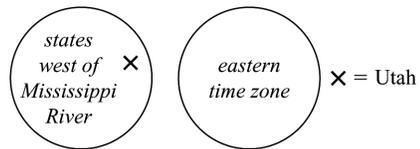
- c. The diagram shows the argument is valid. However, it is not sound as the first premise is false.

- 30. a. All dairy products are foods containing protein.
b.



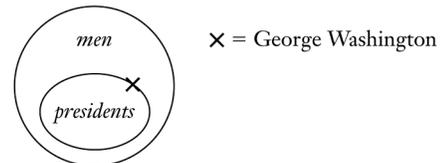
- c. The diagram shows the argument is invalid, even though the premises are true. Because it is invalid, the argument cannot be sound.

- 31. a. All states west of the Mississippi River are not in the eastern time zone.
b.



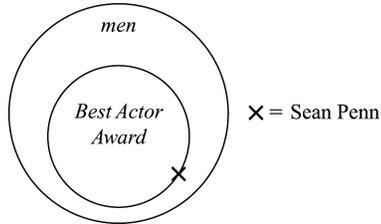
- c. The argument is valid, and the premises are true, so the argument is also sound.

- 32. b.



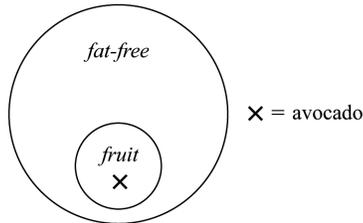
- c. As shown in the diagram, the argument is not valid because we cannot place the X within the *presidents* circle based on the second premise alone. Though the premises are true, the argument is not sound.

33. b. As shown in the diagram, the argument is not valid because we cannot place the X within the *Best Actor Award* circle based on the second premise alone.



c. Though the premises are true, the argument is not sound.

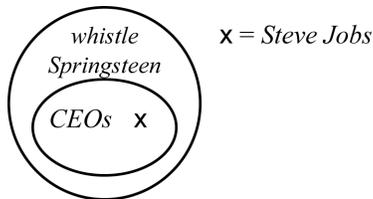
34. b. The argument is valid.



c. Since the first premise is not true, the argument is not sound.

35. a. All CEOs are people who can whistle a Springsteen tune.

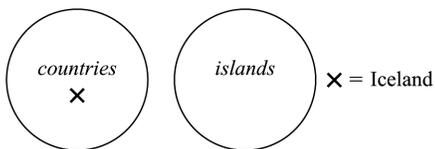
b. The argument is valid



c. The premises could be true, in which case the argument is sound.

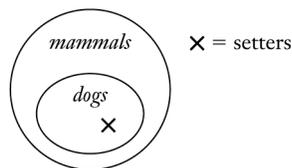
36. a. All countries are non-islands.

b. The argument is valid.



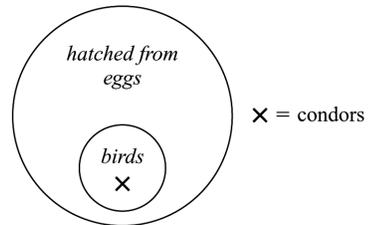
c. The first premise is not true, so the argument is not sound.

37. b. Affirming the hypothesis – this form is always valid, as confirmed by the diagram.



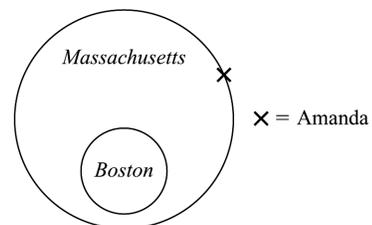
c. The premises are true, and thus the argument is sound.

38. b. Affirming the hypothesis – this form is always valid, as confirmed by the diagram.



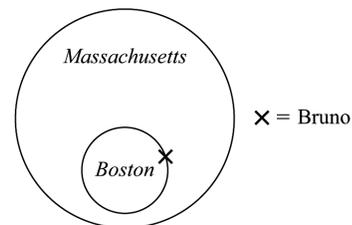
c. The premises are true, and thus the argument sound.

39. b. Denying the hypothesis – this form is always invalid, as confirmed by the diagram.



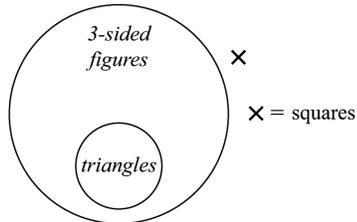
c. Since it is invalid, it cannot be sound.

40. b. Affirming the conclusion – this form is always invalid, as confirmed by the diagram.



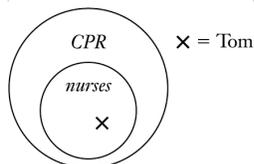
c. Since it is invalid, it cannot be sound.

41. b. Denying the conclusion – this form is always valid, as confirmed by the diagram.

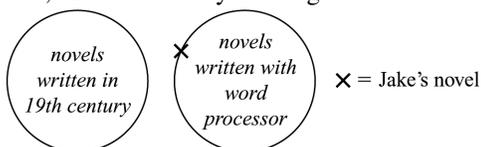


c. Since the argument is valid and the premises are true, this is a sound argument.

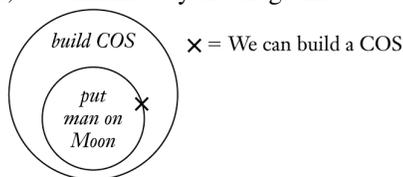
42. a. If you are a nurse, then you must know CPR.
 b. Affirming the hypothesis – this form is always valid, as confirmed by the diagram.



- c. To the extent that the premises are true, the argument is sound.
 43. a. If a novel was written in the 19th century, then it was not written on a word processor.
 b. Denying the hypothesis – this form is always invalid, as confirmed by the diagram.



- c. Since it is invalid, it cannot be sound.
 44. b. Affirming the conclusion – this form is always invalid, as confirmed by the diagram.



- c. Since it is invalid, it cannot be sound.
 45. The argument is in standard form, and it is valid as there is a clear chain of implications from the first premise to the conclusion.
 46. The argument is in standard form, but it is invalid as there is no chain of implications from the premises to the conclusion.
 47. The second premise and conclusion should be written as follows to put the argument in standard form. Premise: If taxpayers have less disposable income, the economy will slow down. Conclusion: If taxes are increased, then the economy will slow down. The argument is valid as there is a clear chain of implications from premises to conclusion.
 48. The conclusion should be written as: “If taxes are cut, then the deficit will increase.” The argument is valid as there is a clear chain of conditionals from premises to conclusion.
 49. The statement is true.
 50. The statement is not true. Counterexamples will vary. One possibility is:

$$\frac{1}{2+2} = \frac{1}{4}; \frac{1}{2} + \frac{1}{2} = 1; \text{ but}$$

$$\frac{1}{4} \neq 1.$$

51. The statement is not true. Counterexamples will vary. One possibility is: $\sqrt{9+16} = \sqrt{25} = 5$; $\sqrt{9} + \sqrt{16} = 3 + 4 = 7$; but $5 \neq 7$.

52. The statement is true.

FURTHER APPLICATIONS

53. It is possible
 Answers will vary. An example:
 Premise: All living mammals breathe.
 Premise: All monkeys are mammals.
 Conclusion: All living monkeys breathe.
 54. A sound argument must be valid, so this combination is impossible.
 55. It is possible
 Answers will vary. An example:
 Premise: All mammals fly. (false)
 Premise: All monkeys are mammals. (true)
 Conclusion: All monkeys fly. (false)
 56. It is possible
 Answers will vary. An example:
 Premise: All mammals swim. (false)
 Premise: All fish are mammals. (false)
 Conclusion: All fish swim. (true)
 57. It is possible
 Answers will vary. An example:
 Premise: All mammals breathe. (true)
 Premise: All mammals have hair. (true)
 Conclusion: All hairy animals breathe. (true)
 58. An example of *affirming the hypothesis* (valid):
 Premise: If I am in Phoenix, then I am in Arizona.
 Premise: I am in Phoenix.
 Conclusion: I am in Arizona.
 59. An example of *affirming the conclusion* (invalid):
 Premise: If I am in Phoenix, then I am in Arizona.
 Premise: I am in Arizona.
 Conclusion: I am in Phoenix.
 60. An example of *denying the hypothesis* (invalid):
 Premise: If I am in Phoenix, then I am in Arizona.
 Premise: I am not in Phoenix.
 Conclusion: I am not in Arizona.
 61. An example of *denying the conclusion* (valid):
 Premise: If I am in Phoenix, then I am in Arizona.
 Premise: I am not in Arizona.
 Conclusion: I am not in Phoenix.
 62. Answers will vary, though it's unlikely you'll discover any counterexamples, and thus a strong inductive argument can be made.

63. a. Someone has a huge hole in his portfolio.
 b. Lehman Brothers was able to pay out on its losing bets.
 c. No conclusion can be made since this scenario is not covered by the premises.
64. a. People who live on flood plains are far less likely to purchase flood insurance.
 b. There were floods in the immediate past.
 c. No conclusion can be made since this scenario is not covered by the premises.
65. a. That individual expresses righteous indignation.
 b. No obsessive individual got emotional.
 c. No conclusion can be made since this scenario is not covered by the premises.

UNIT 1E

TIME OUT TO THINK

- Pg. 55. The pre-election polls suggest that the confusion affected the two sides differently, since the outcome was different from what polls suggested. Of course, the polls may not have been valid.
- Pg. 58. Selling tickets in advance guarantees the airline that the seats are sold, so it is worthwhile to provide an incentive for advance sales. The cancellation penalty helps prevent the airline from losing what it thought were sold seats.
- Pg. 59. Answers will vary. Possible topics could include that the United States and the Soviet Union have had proxy conflicts in other countries and the economic interdependency of countries in the modern world. This would be a good topic for a discussion either during or outside of class.

QUICK QUIZ

- b.** A vote for C implies a property tax reduction.
- c.** An argument that doesn't clearly spell out all of its premises is weak in logical structure.
- c.** With unknown application fees, it's not clear which bank has the better offer.
- b.** It's a good deal if you get six haircuts at this shop within a year (and that you remember to get your card punched), but it's a bad deal otherwise.
- c.** $\$20/100 \text{ min} = 20\text{¢}/\text{min}$.
- a.** As long as you remember to get the 50% refund coming to you, you'll spend \$200.
- c.** Both Jack's argument and this one make a huge leap from premises to conclusion: here's a few examples when A happened, so A must happen all the time.
- b.** You can't compute how much you'll spend with each policy without knowing the number and cost of collisions over the span of a year.

- a.** The teacher is assuming that students will do fine without spell checkers, which implies that traditional methods of teaching spelling are effective.
- c.** If it did not rain, and today is a Saturday, the Smiths would have a picnic. Since they did not, it must not be a Saturday.

DOES IT MAKE SENSE?

- Makes sense. The double negative means the insurance company accepted his claim.
- Does not make sense. Survivors are not typically buried after plane crashes.
- Does not make sense. If Sue wants to save time, she should take the Blue Shuttle, and save ten minutes.
- Does not make sense. With a 10% surcharge, Alan will spend \$36.30 through Ticketmaster, which is a worse deal than \$35 through the box office.
- Makes sense. Both the duration and mileage of the first warranty is the better deal.
- Does not make sense. There are other factors besides collision insurance that one must consider when purchasing auto insurance.

BASIC SKILLS AND CONCEPTS

- He has 4 bagels left as he ate all but 4.
- No, it's not possible, as a man who has a widow is dead.
- Neither person, roosters don't lay eggs.
- You must choose 9 pieces of fruit, once you have chosen eight, the next must be the same kind as one already chosen.
- You must meet 22 people, as the first twenty might all be Canadians.
- You must meet 21 people, as the first twenty might be all Canadians or Norwegians.

17. You must meet three people, as the first two might be different nationalities.
18. The surgeon is the boy's mother.
19. Suzanne might go bowling 1, 2, 3, or 4 days per week.
20. One minute and forty seconds is 100 seconds.
21. No, it does not follow. All of the chocolate lovers may be men.
22. Yes, it does follow that one quarter of the exports consist of corn from Caldonia.
23.
 - a. A person can serve for three consecutive terms of four years, or 12 years.
 - b. The councilmember would have to wait 8 years.
 - c. No; the councilmember must only wait 8 years if he or she has served for three consecutive terms.
 - d. The councilmember could serve for three more consecutive terms since this is not prohibited by the charter.
24.
 - a. Yes, if it has a picture.
 - b. No, it doesn't have a picture.
 - c. Apply for a voter ID or sign a sworn statement and cast a provisional ballot.
 - d. The initiative does not explain how to get a voter ID.
25. (1) Buying a house will continue to be a good investment. (2) You will spend less out-of-pocket on your home payments than you would on rent.
26. (1) The money you give is spent on worthwhile causes and not on overhead. (2) There are not other perhaps more worthwhile causes.
27. (1) The Governor will keep his promise on tax cuts. (2) you consider tax cuts to be more important than other issues.
28. (1) A stronger military means a stronger America. (2) More military spending will mean a stronger military. (Answers will vary).
29. We are looking for possible unstated motives that may be the unstated "real reason" for opposition to the spending proposal. Among the possibilities is that the speaker may have a fundamental ideological opposition to paying taxes.
30. We are looking for possible unstated motives that may be the unstated "real reason" for support of eating meat. Among the possibilities is that the speaker may work for the meat industry.
31.
 - a. Maria must file a return since her earned income is greater than \$5950.
 - b. Van must file a return since his gross income of \$3500 is greater than his earned income plus \$300 ($\$3500 > \$3000 + \300).
 - c. Walt need not file a return since his income does not meet any of the criteria.
 - d. Helena must to file a return since her gross income of \$6000 is greater than her earned income (up to \$5650) plus \$300 ($\$6000 > \$5650 + \$300$).
32.
 - a. You can claim your stepdaughter as all criteria are met.
 - b. You cannot claim your son as a dependent since he supports himself.
 - c. You can claim your nephew as a dependent as all criteria are met.
 - d. You can claim your half-brother as a dependent as all criteria are met.
33.
 - a. The landlord has one month after June 5 to return the deposit, so the terms have been met.
 - b. The landlord has one month after June 5 to return the deposit, so the terms have been met.
 - c. The landlord has one month after June 5 to return the deposit, so the terms have not been met.
34. Plan A costs \$2200 if you go and \$0 if you cancel. Plan B costs \$1200 if you go and \$300 if you cancel. Plan A costs \$1000 more if you go. Plan B costs \$300 more if you cancel. If the likelihood of cancellation is low then Plan B is better, but if the likelihood of cancellation is high then Plan A is better.
35.
 - a. Since you will probably pay for service and insurance with either plan, those costs should not determine which option you choose.
 - b. Yes; the total cost of the car at the end of the lease is $\$1000 + \$240 \times 36 + \$9000 = \$18,640$, which is greater than the purchase price of \$18,000.
 - c. If you lease the care, you have years to decide if you want to buy it, don't need to worry about selling the car, and the dealer may offer special servicing prices with a lease. Leasing may also be better if you do not plan to keep the car for a long period of time.
36. A legitimate sweepstakes would not ask you to pay a processing fee in order to claim your prize. Note also that the notice never says your vacation will be fully paid for. In addition, the notice is asking for your credit card number, which should raise a "red flag" that should cause you to delete the message as spam.

FURTHER APPLICATIONS

37. Were there more than 350 people on each jet, or both jets combined? Was there any damage or injuries?
38. Who was fed the red meat?
39. Is the elephant in your pajamas or were you wearing the pajamas?
40. Who or what was arrested?
41.
 - a. They could be consistent, because Alice does not specify the time period for her 253 cases, and it's possible Zack is being selective about the cases he chooses to discuss (that is, he may not be talking about all the cases Alice tried).
 - b. They could be consistent if Alice obtained many convictions through plea agreements without going to trial.
42.
 - a. The minimum payment will be \$45, the total of the \$35 in unpaid late fees and \$10, since it is greater than 5% of your new balance.
 - b. Yes, to avoid a finance charge, you must pay within 25 days of the statement closing date.
 - c. You will be assessed a finance charge since you still have an unpaid balance more than 25 days after the statement closing date.
43.
 - a. New conditions go into effect without user approval.
 - b. No, continued use of the software implies user acceptance.
 - c. New conditions that affect the user could go into effect without user knowledge or approval.
 - d. It is impossible to distinguish a typographical error from a deliberate attempt to take advantage of users.
44.
 - a. Accepting a contribution from someone you have never met conforms with the law.
 - b. Accepting a contribution from a government campaign fund would conform with the law. Accepting money from a CEO who will benefit from a bill you are sponsoring would violate the law.
45. Under your current policy (and over the span of a nine-month pregnancy), you'll spend \$115 per month, plus \$4000 for prenatal care and delivery, for a total of \$5035. Under the upgraded policy, you'll spend \$275 per month, for a total of \$2475. Thus, considering only these costs (we aren't told, for example, what happens if the mother requires an extensive hospital stay due to a C-section or other complications arising from delivery, or what happens if the baby is born prematurely and requires neo-natal care), the upgraded policy is best.
46. Painting with your nephew will involve no labor cost, but you'll lose $4 \times \$40 = \160 in wages. If the painter does the job, you will get the \$160 in wages while paying him $6 \times \$30 = \180 , for a net cost to you of \$20. So the painter costs \$20 more, and your decision will depend on whether it's worth \$20 to you to avoid painting yourself.
47. If you fly nine times with Airline A, at a cost of \$3150, your tenth flight will be free (because you will have flown 27,000 miles at that point). If you fly ten times with Airline B, your cost will be \$3250. Thus if you plan to fly ten times (or a multiple of ten times), Airline A is cheaper than Airline B.
48. Assuming your accident rate (and the costs of those accidents) remains the same for the next ten years, you should choose the policy with the lower premium of \$200 per year. Under that plan, you'll spend \$2900 over the next decade (\$2000 for the premiums, and \$900 for claims, as your \$1000 deductible will not come into effect for any of the claims). Under the other plan, you'll spend \$5000 (\$4500 for premiums, and \$500 for claims minus the \$200 deductible would save you \$400 on a \$600 claim).
49. Winning four of six games is only one more win than the three wins that would be expected by pure chance.
50. The parrot is extinct in the wild.
51. People convicted of violent crimes were given longer prison sentences.
52. Watching TV and playing video games increased independently because of lifestyle changes.
53. If the population increases quickly enough, then the death *rate* can decrease even though the number of deaths increases.
54. Fewer assaults are reported than in the past.
55. Country Y has a high gun suicide rate.
56. The population can be decreasing if the death rate remains higher than the birth rate.
- 57–65. Answers will vary.
66. One interpretation of the poem is that the poet was 20 years old when he wrote the poem, and he expects to live to age 70.