CHAPTER 1

BASIC CONCEPTS OF LOGIC

1.1 Arguments

3. Since we take an average of 45,000 car trips over the course of a lifetime, say statisticians, the chance of being in a serious accident is nearly one in two. (Jane Stein) Argument. Conclusion: The chance of being in a serious accident is nearly one in two.

6. One has to belong to the intelligensia to believe things like that; no ordinary man could be such a fool. (George Orwell) Argument. Conclusion: One has to belong to the intelligensia to believe things like that.

9. Every luxury must be paid for, and everything is a luxury…. (Cesare Pavese) Not an argument, as stated, since there is no conclusion or relation of intended support, but implies an unstated conclusion, “Everything must be paid for.”

12. It is absurd to bring back a runaway slave. If a slave can survive without a master, is it not awful to admit that the master cannot live without the slave? (Diogenes of Sinope) Not an argument, as stated, since “is it not awful to admit that the master cannot live without the slave?” is not a statement. But the question seems rhetorical, i.e., tantamount to the statement “It is awful to admit
that the master cannot live without the slave.” So interpreted, there is an argument, with the conclusion “It is absurd to bring back a runaway slave.”

15. … astrology was progressive. Astrology differed in asserting the continuous, regular force of a power at a distance. The influences of heavenly bodies on the events on earth it described as periodic, repetitious, invisible forces like those that would rule the scientific mind. (Daniel J. Boorstin) Argument. Conclusion: Astrology was progressive.

Write each of the following arguments in standard form. If there are several arguments in a passage, write each separately.

18. Few contemporary novels deal explicitly with political themes. Therefore, the study of contemporary literature is largely independent of the study of political culture.

21. The building will generate large tax write-offs. Therefore, it will be a good investment even if it yields little direct profit.

24. Swedish is an Indo-European language, but Finnish isn't. Therefore, Finnish is more difficult for English-speakers to learn than Swedish.

27. Extended argument. (1) During this period of infancy and childhood [the first six or eight years of life], we select and develop the techniques which gain us satisfaction, defend us against threats, and become the tools in coping with the endless variety of problems situations that will be encountered later in life. It is during this time that we develop our methods of relating ourselves to other people and undergo the experiences which determine the strengths and weaknesses within our personalities. As adults we are
not able to remember the details of these formative years. Therefore, the personality and character-- which are really synonymous-- take their form during the first six or eight years of life. (2) The personality and character-- which are really synonymous-- take their form during the first six or eight years of life. Therefore, we cannot understand our own behavior fully. (William Menninger)

30. If the American national purpose is redefined-- or even subject to redefinition-- with every change of administration in Washington, the United States risks becoming a factor of inconstancy in the world. The national tendency to oscillate between exaggerated belligerence and unrealistic expectation will be magnified. Other nations—friends or adversaries—unable to gear their policies to American steadiness will go their own way, dooming the United States to growing irrelevance. Therefore, the American national purpose must at some point be fixed. (Henry Kissinger and Cyrus Vance)

33. Being good liberals themselves, they had no ground in principle by which to justify indefinite Israeli rule over a rebellious Palestinian population. Nor could they answer the contention that continued Israeli occupation of the territories would ultimately erode the Jewishness of the state or transform it from a democracy into another South Africa. Therefore, the only argument they could rely on was security: the argument that Israeli withdrawal in favor of a Palestinian state run by the PLO posed so great a danger to the "body" of Israel that, for the time being and for the foreseeable future, it had to take precedence over the danger to Israel's "soul" admittedly posed by continued occupation. (Norman Podhoretz)

36. Extended argument. (1) The lady had been quite willing to undergo the wedding ceremony. She had repented of it within a few minutes of returning home. Therefore
something had occurred during the morning to cause her to change her mind. (2)

Something had occurred during the morning to cause her to change her mind. She could not have spoken to anyone when she was out, for she had been in the company of the bridegroom. Therefore, she might have seen someone. (3) She had spent so short a time in this country that she could hardly have allowed anyone to acquire so deep an influence over her that the mere sight of him would induce her to change her plans so completely. (Earlier, she had been in America.) Therefore, if she had seen someone, it must be someone from America. (4) She might have seen someone. If she had seen someone, it must be someone from America. Therefore, she might have seen an American. (5) Seeing the American caused her to change her mind about the wedding. Therefore, this American possessed much influence over her. (6) This American possessed much influence over her. Therefore, he was a lover or a husband. (7) Her young womanhood had been spent in rough scenes, and under strange conditions. There was a man in a pew, a change in the bride’s manner, so transparent a device for obtaining a note as the dropping of a bouquet, her resort to her confidential maid, and her very significant allusion to claim-jumping, which in miners’ parlance means taking possession of that which another person has a prior claim to. Therefore, she had gone off with a man. (8) That man was the one she had seen. She had seen a lover or a previous husband. Therefore, the man was either a lover or was a previous husband, the chances being in favor of the latter. (Sir Arthur Conan Doyle)

39. Extended argument. (1) Something can be thought to exist that cannot be thought not to exist, and this is greater than whatever can be thought not to exist. Therefore, if that, the greater than which cannot be thought, can be thought not to exist, then that, the
greater than which cannot be thought, is not the same as that, the greater than which
cannot be thought. (2) That is absurd. Therefore, that, the greater than which cannot be
thought, cannot be thought not to exist. (2) That, the greater than which cannot be
thought, cannot be thought not to exist. Therefore, something, the greater than which
cannot be thought, exists so truly that it cannot even be thought not to exist. (St. Anselm
of Canterbury)

42.  (1) If we were to observe something causing itself, this would mean it preceded
itself, and this is impossible. Therefore, we never observe, or even could observe,
something causing itself. (2) We never observe, or even could observe, something
causing itself. Therefore, in the observable world causes are to be found ordered in
series. (3) In all series of causes, an earlier member causes an intermediate, and the
intermediate a last (whether the intermediate be one or many). If you eliminate a cause
you also eliminate its effects. Therefore there can be neither a last nor an intermediate
cause unless there is a first. (4) If the series of causes goes on to infinity, and there is no
first cause, there would be neither intermediate causes nor a final effect. But that is
patently false. Therefore, such a series of causes must stop somewhere. (5) In the
observable world causes are to be found ordered in series. Such a series of causes must
stop somewhere. Therefore, it is necessary to posit a first cause, which all call 'God'. (St.
Thomas Aquinas)

45. The behavior of bodies obeying natural laws hardly ever varies, and will
practically always turn out well. Therefore, they truly tend toward a goal, and do not
merely hit it by accident. (2) The ordering of actions toward an end is observed in all
bodies obeying natural laws, even when they lack awareness. Nothing, however, that
lacks awareness tends toward a goal, except under the direction of someone aware and
intelligent. The arrow, for example, requires an archer. Therefore, all things in nature
are directed toward a goal by someone intelligent, and this we call 'God'. (St. Thomas
Aquinas)

48. … nothing happens without a sufficient reason; that is to say, that nothing
happens without its being possible for him who should sufficiently understand things, to
give a reason sufficient to determine why it is so and not otherwise. Matter being
indifferent in itself to motion and to rest, and to this or another motion, we cannot find
the reason of motion in it, and still less of a certain motion. And although the present
motion which is in matter, comes from the preceding motion, and that from still another
preceding, yet in this way we make no progress, try as we may; for the same question
always remains. Therefore, this sufficient reason for the existence of the universe cannot
be found in the series of contingent things, that is, of bodies and of their representation in
souls. (2) This sufficient reason for the existence of the universe cannot be found in the
series of contingent things, that is, of bodies and of their representation in souls. If the
sufficient reason were not outside this series of contingent things and were not found in a
substance which is the cause, or which is a necessary being, carrying the reason of its
existence within itself, we still should not have a sufficient reason in which we could rest.
Therefore, the sufficient reason, which has no need of another reason, must be outside
this series of contingent things and be found in a substance which is the cause, or which
is a necessary being, carrying the reason of its existence within itself, and this final
reason of things is called God. (G. W. F. Leibniz)
1.2 Validity

3. If the rain continues, there will be a real danger of floods. The rain will continue.
   Therefore, flooding will be a real danger. Valid.

6. I have already said that he must have gone to King’s Pyland or to Mapleton. He is not at King’s Pyland, therefore he is at Mapleton. (Sir Arthur Conan Doyle) Valid.

9. If Socrates died, he died either while he was living or while he was dead. But he did not die while living; moreover, he surely did not die while he was already dead. Hence, Socrates did not die. (Sextus Empiricus) Valid.

12. If Lynn testifies against the mobsters, she'll endanger her life. So, she won't testify against them, since she won't put her own life in danger. Valid.

15. Jerry will take the job unless we match the salary offer. Since we won't match the offer, Jerry will take the job. Valid.

18. Marilyn will finish the brief on time only if she gets an extension on the Morley case. Therefore, if Marilyn gets an extension on the Morley case, she will finish the brief on time. Not valid. She might get the extension and fail to meet the deadline for some other reason.

21. Some illegal acts go unpunished. All blatantly wrong acts are punished.
   Therefore, some illegal acts are not blatantly wrong. Valid.

24. Anyone who is not an idiot can see that Jake is lying. Some people in this room can't tell that Jake is lying. Hence, some people in this room are idiots. Valid.
27. Some politicians are demagogues, but no demagogues are good leaders. Hence, some politicians are not good leaders. Valid.

30. Corporate taxes result in higher prices for consumer goods, increases in interest rates, reduced employment at lower wages, and reduced levels of savings and investment, depending on whether corporations pass along the cost of taxation to the consumer, borrow to replace these funds, take steps to reduce labor costs, or reduce the return they offer to shareholders. Consequently, corporate taxes should be repealed. Not valid. These considerations all weigh against corporate taxes, but there might be other considerations that weigh in their favor.

33. 1. You had chalk between your left finger and thumb when you returned from the club last night. 2. You put chalk there when you play billiards to steady the cue. 3. You never play billiards except with Thurston. 4. You told me four weeks ago that Thurston had an option on some South African property which would expire in a month, and which he desired you to share with him. 5. Your cheque-book is locked in my drawer, and you have not asked for the key. 6. You do not propose to invest your money in this manner. (Sir Arthur Conan Doyle) Not valid. The chalk might have got there in some other way; you (Watson) might have obtained the money to invest in some way other than writing a check.

1.3 Implication and Equivalence
3. (a) Pittsburgh will face Dallas or New York in the championship game. (b) Either Pittsburgh will face Dallas in the championship game, or Pittsburgh will face New York. Equivalent.

6. (a) Not both whales and dolphins are fish. (b) Whales are not fish, and dolphins aren't either. (b) implies (a).

9. (a) Either the Babylonians or the Assyrians employed the *lex talionis*. (b) If the Assyrians employed the *lex talionis*, the Babylonians didn't. Independent.

12. (a) If Elizabeth did not sign this letter, then her assistant did. (b) If Elizabeth had not signed this letter, her assistant would have. Independent.

15. (a) Several cities with populations over 700,000 have no baseball franchises. (b) Several cities without baseball franchises have populations over 700,000. Equivalent.

Consider the statement: *If a fetus is a person, it has a right to life*. Which of the following sentences follow from this? Which imply it?

18. If a fetus has a right to life, then it's a person. Independent.

21. If a fetus isn't a person, it doesn't have a right to life. Independent.

24. A fetus isn't a person only if it doesn't have a right to life. Independent.

27. A fetus isn't a person unless it has a right to life. Equivalent to *If a fetus is a person, it has a right to life*.

Consider the statement: The patient will die unless we operate immediately. What follows from this, together with the information listed?
30. The patient will die. Nothing follows.

33. We won't operate immediately. It follows that the patient will die.

*If you are single, you must file a return if you had gross income of $3,560 or more for the year.* What follows from this, together with the information listed?

36. You are single with an income of $25,000. It follows that you must file a return.
39. You are married, but do not have to file a return. Nothing follows.
42. As traditionally conceived in logic, these statements are equivalent. Both mean that no words are both real and vain. (Some recent approaches to them, however, would count them subtly different. ‘Real words are not vain’, on such views, has the force, roughly, of ‘Real words *normally* are not vain’; it speaks of normal real words. ‘Vain words are not real’ similarly speaks of normal vain words. So the former could be true while the latter was false if no normal real words are vain, but some normal vain words are (abnormal) real words.)

### 1.4 Logical Properties of Sentences

3. …what we are, we are…. (Alfred, Lord Tennyson) Tautologous.
6. … if it does not work, it does not work. (Prince Charles) Tautologous.
9. I am who I am. Tautologous.
12. Some cars are red. Contingent.
15. Some people are friendly, and other's aren't. Contingent.
21. No batter ever made a hit with the bat on his shoulder. (John McGraw)

Contingent.
24. Our past has gone into history.  (William McKinley)  Tautologous.

27. Nobody goes there anymore; it's too crowded.  (Yogi Berra)  Contradictory.

(Though, as usual, we can reinterpret the sentence so that it makes sense; we know what he means. Nobody in our crowd goes there anymore, because it’s too crowded.)

30. I am never less alone than when I am alone, nor less at leisure than when I am at leisure.  (Scipio Africanus)  Contingent.  (Imagine that I’m always alone and at leisure.)

33. Say that a sentence A implies another sentence B.  What can we conclude about B, if A is (a) logically true?  (b) contingent?  (c) satisfiable?  (d) contradictory?

(a) B is logically true; (b) B is satisfiable; (c) B is satisfiable; (d) nothing.

1.5 Satisfiability

3. John is a good guitarist.  John is also an accountant, but not a good one.

Satisfiable.

6. I like this painting, even though I don't think it's very good.  I like everything that Elmer likes, and Elmer likes every painting that's good.  Satisfiable.

9. Stocks of companies with high debt-equity ratios are fairly risky.  If a stock is fairly risky, it must reward investors with better-than-average returns, or they will eschew the risk.  But many stocks that fail to reward investors with better-than-average returns are those of companies with high debt-equity ratios.  Satisfiable.

Perhaps those companies with high debt-equity ratios who fail to reward investors
with above-average returns are eschewed by investors, thus having low stock prices.

12. Many football stars never graduate from the colleges where they first become famous. Most of these colleges insist that almost all their football players receive degrees. These schools are telling the truth. Satisfiable. Perhaps the stars are the rare exceptions.

15. My barber, who lives and works in town, shaves every man in town who doesn't shave himself. Furthermore, my barber doesn't shave anyone in town who does shave himself. Contradictory. Bertrand Russell originally formulated this paradox. Who shaves the barber?

18. Some satisfiable sets of sentences imply contradictions. False. Satisfiable sets can all be true, but contradictions are always false. So, it would be possible for the set to be true while the contradiction is false.


24. If the set consisting of just A together with B is contradictory, then A implies that B is false. True. A and B cannot be true at the same time, so, in any circumstance in which A is true, B must be false.

27. Every satisfiable set of sentences contains at least one true sentence. False. It must be possible for the set to be entirely true, but it might be entirely false in the actual world. (Consider, for example, the set {The telephone book has a purple cover}.)}
30. Any set consisting of all contingent sentences is satisfiable. False. Consider \{It’s raining, it’s not raining\}. Both are contingent, but they can’t be true at the same time.

33. Whatever follows from the conclusion of a valid argument follows from its premises. True. The premises imply the conclusion of a valid argument, so, if the premises are true, the conclusion must be true. Say the conclusion implies A. Then, if the conclusion is true, A must be true. So, in any case where the premises are all true, and conclusion and A must be true as well. So, the premises imply A.

36. Whatever is inconsistent with the conclusion of a valid argument is also inconsistent with the argument's premises. True. If the premises of a valid argument are all true, the conclusion must be true. Suppose that A is inconsistent with the conclusion. Then, whenever the conclusion is true, A must be false. But whenever the premises are all true, the conclusion is true. So, whenever the premises are all true, A must be false. Thus, A is inconsistent with the premises.

39. Anything whatsoever follows from the contradictory. True. A sentence or set of sentences that is contradictory can never be true. So, it can never be true while something else is false.