I. Aristotle on Fatalism
   A. Chapter 9 of *De Interpretatione*:

      [T]here are no real alternatives, but … all that is or takes place is the outcome of necessity. There would be no need to deliberate or to take trouble, on the supposition that if we should adopt a certain course, a certain result would follow, while, if we did not, the result would not follow. For a man may predict an event ten thousand years beforehand, and another may predict the reverse; that which was truly predicted at the moment in the past will of necessity take place in the fullness of time.

   B. Fatalism has at least two components.
      1. First, it claims that all events, whether in the past or in the future, take place necessarily, so that there are no genuine alternatives. This claim is the doctrine of determinism.
      2. Second, fatalism claims that if determinism is true, there is no reason to think about what one should do, because thinking about what one should do is thinking about which action among alternative actions one should choose, and so would be pointless if there are no genuine alternatives. This is called practical fatalism.

II. The Logical Argument for Determinism
   A. Suppose that one adopts the principle of bivalence with respect to propositions about the future.
   B. Then any statement made now about the future would have to be either true or false now, just as, a present statement about the past is now either true or false, regardless of whether we are now in a position to know its truth-value.
   C. This seems to imply that the truth-value of a proposition about any future event is already fixed before that event takes place. Aristotle’s famous example is that of a sea-battle taking place tomorrow.
   D. Thus, in order for the statement, “a sea-battle will take place tomorrow” to be true, there has to be a sea-battle tomorrow; similarly, in order for it to be false, there cannot be a sea-battle tomorrow.
   E. Since these two statements are mutually contradictory, they can’t both be true. Given our assumption that bivalence applies to them, at least one has to be true already today.
   F. So, we can conclude today that either there has to be a sea-battle tomorrow or there cannot be a sea-battle tomorrow. In other words, one of these two events is already necessarily going to take place.

III. Aristotle’s Critique of Fatalism: necessity of disjunction vs necessity of disjuncts
   A. Aristotle distinguishes, first, “between saying that that which is, when it is, must needs be, and simply saying that all that is must needs be, and similarly in the case of that which is not.” This is not easy to understand. Aristotle goes on immediately to clarify this claim; he says, “In the case, also, of two contradictory propositions this holds good. Everything must either be or not be, whether in the present or in the future, but it is not always possible to distinguish and state determinately which of these alternatives must necessarily come about.”
B. This claim may be formulated more clearly by using the necessity operator ‘□’. Aristotle is saying that although, for any proposition \( p \), it necessary that either it or its negation is true, i.e.,

\[ □(p ∨ ¬p) \]

it doesn’t follow that either \( p \) is necessarily true or not-\( p \) is necessarily true:

\[ (□p) ∨ (□¬p) \]

C. The claim that this implication fails is especially easy to see if we understand necessity as logical necessity.

1. For, remember that on this interpretation, a statement is necessary just in case its schema is valid.
2. And now remember that a disjunction can be valid and yet neither disjunct is valid, because it may be that in any interpretation one or the other of the disjuncts is , and yet each disjunct is false is some interpretation.

IV. Bivalence vs Excluded Middle

A. Aristotle’s point depends on a fairly natural view of the future as essentially unlike the past and the present in being open rather than fixed.

B. This view does have the consequence that the principle of bivalence does not hold of statements about future events. Aristotle puts it this way: “the affirmation [about the future event] is no more true and no more false than the denial,” and so “it is not necessary that of an affirmation and a denial one should be true and the other false.”

C. Since at present the future event neither exists nor fails to exist, a present statement about the future is not either true or false; it doesn’t, now, have one of these two truth-values. Let’s call such statements “indeterminate” in truth-value.

D. So Aristotle has to distinguish for statements about the future, between the principle of bivalence, which is about the truth values of all statements, and the logical law of excluded middle, which claims that any statement of the form \( p ∨ ¬p \) is true.

V. Truth conditions for Statements about the Future

A. The basic idea is that the notion of truth as it applies to statements about the future, is a lot like the notion of validity in logic as we have been using it.

B. We are thinking, as I said, that there are a number of alternatives for the future; more fully, there are a number of alternative future states of the world.

C. A statement about the future is true now just in case it is true in all alternative future states of the world, just as a schema is valid just in case it is true in all interpretations.

D. Where this account of future truth differs from validity is that we take a statement about the future to be false now just in case it is false in all future alternatives, not just in case it is not true in all future alternative. That is, falsity for future statements is like unsatisfiability, not like invalidity, of schemata.

E. A disjunction of future statements, then, is true just in case at least one disjunct is true in every alternative future state of the world. But from this it doesn’t follow that at least one disjunct is true in all future alternatives.

F. Moreover, since in all future states, either \( p \) or not-\( p \) holds, \( p ∨ ¬p \) is true now; but, this is compatible with \( p \) holding in some but not all future alternative and not-\( p \) holding in the remainder alternatives. In that case \( p \) is neither true nor false.
VI. Three-Valued Logic

A. The logic of statement with such truth conditions is called three-valued logic, since every statement can be in 3 states, true, false, or indeterminate. It should be clear that it is rather more complicated than truth-functional logic. I want mention a couple of complications.

B. First of all, the notion of implication and valid argument has to be more complicated. In truth-functional logic implication holds whenever there’s no interpretation in which all the premises are true and the conclusion false. With 3 truth-values, this definition would make all arguments with an indeterminate conclusion valid. But that’s highly implausible. What about

1. Either there will be a sea-battle tomorrow or there will not be a sea-battle tomorrow.
2. There will be a sea-battle tomorrow
3. Therefore, there will not be a sea-battle tomorrow.

Intuitively this is not a good argument, yet our criterion would make it valid.

C. Second, what are we to say of the truth-values of compound statements in which some sub-statements are about the present or past and others are about the future? Consider the following two statements:

1. There will be a sea-battle tomorrow only if yesterday the Athenians did not sign a treaty with the Persians.
2. If yesterday the Athenians did not sign the treaty a treaty with the Persians, then there will be a sea-battle tomorrow

Suppose that yesterday the Athenians did in fact sign a treaty with the Persians, what are we to say of the truth-values of these statements?