1. As evoked earlier, logical agents needs a knowledge base.
2. This is a set of sentences in the formal representation
3. called logic.
4. Logics are different forms, and are formal languages
5. for representing knowledge to extract or to derive
6. other conclusions.
7. It requires two main components.
8. One is called the syntax.
9. It's actually the component that defines well-formed sentences
10. into language.
11. And it requires a second component which is semantic,
12. which defines the truth or the meaning
13. of the sentences in a word.
14. We use inference, which is a procedure
15. to derive a new sentence from another one.
16. This requires using only the syntax.
17. And we use logical entailment in terms
18. of semantics, which is a relationship between sentences.
19. It means that a sentence logically--
20. follows logically from another one.
21. And we would write that, for example,
22. that the sentence also follows logically
23. from the knowledge base.
24. In this lecture, we would focus on propositional logic,
25. which is the simplest logic.
26. The syntax of propositional logic
27. defines the allowable sentences or propositions.
28. What is a proposition?
29. It is a declarative statement or a sentence
30. that's either true or false.
31. So this defines what a proposition--
32. we distinguish between two kinds of propositions,
33. atomic propositions and compound
34. or complex propositions.
35. An atomic proposition is a single proposition or symbol.
36. The notation, usually we like to use uppercase letters
37. combined with some subscript to present those propositions.
38. A compound proposition is constructed
39. from atomic propositions using parenthesis an also logical
40. connectives.
41. OK?
42. So logical connectives represent an important way
43. to combine simple propositions or atomic propositions
44. to make larger ones.
45. Here are a few examples of atomic propositions.
46. 2 plus 2 equals 4 is a true proposition.
47. W 1, 3, where W presents Wumpus, and 1, 3 represent the room,
48. and colon and a line is a proposition.
49. It is true if there is a Wumpus in 1, 3 and false otherwise.
50. If there is a stench in 1, 2, then there is a Wumpus in 1,
51. 3 is another proposition.
52. It's a conditional.
53. How are you and hello are not propositions.
54. In general, anything that is a statement
55. or a question or comment or opinion is not the proposition.
56. Example of compound or complex propositions are as follows.
57. Suppose we have P1 and p2 propositions.
58. The negation of a proposition, noted as negation of p,
59. is also a proposition.
60. We call in propositional logic a literal,
61. either an atomic proposition or its negation.
62. We call, for example, W 1, 3 as a positive literal.
63. And we call negation of W 1, 3 as negative literal.
64. But both of them are a compound proposition
65. because they are the negation of another atomic proposition.
66. The conjuncture is when you put atomic proposition together
67. with the conjunction.
68. So if we have P1 and P2, it's the conjunction
69. of both propositions P1 and P2.
70. For example, there was a Wumpus in 1, 3,
71. and there is a pit in 3, 1.
72. Is a conjunction between the fact
73. that there is a Wumpus in 1, 3 3, 1.
74. So if there is truly a Wumpus in 1, 3, and there is a pit in 3,
75. 1, then the conjunction of this proposition is true.
76. This junction is P1 or P2, so just putting the or between
77. the two propositions-- for example,
78. there is a Wampus in 1, 3 or there is the pit in 3, 1.
79. The implication is P1 implies P2.
80. So we use this symbol.
81. For example, there is a Wumpus in 1, 3
82. and there is a pit and 3, 1 implies that there
83. is no Wumpus in 2, 2.
84. So we are going--
85. here we are using a composition of different propositions
86. through the implication and the conjunction.
87. And we also have the negation for this term
88. here, or for those atomic propositions.
89. Finally, if and only if.
90. P1 if and only if P2 means that actually
91. we have P1 true if and only if P2 is true.
92. For example, W1, 3 there is a Wumpus in 1,
93. 3 if and only if there is no Wumpus in 2, 2.
94. So we are able with this connectives,
95. actually, to build larger and more complex
96. propositions to express interesting facts
97. about the world.
98. So how about the semantics?
99. The semantics define the rules to determine
100. the truth of a sentence.
101. Semantics can be specified in propositional logic
102. by what we call truth tables.
103. These are very important ingredient
104. in propositional logic in which we
105. have a table of true and false.
106. This is the domain.
107. A table is a set of an n-tuples.
108. These n-tuples have the n values.
109. These n values are in true or false.
110. We also define an operator on the n-tuples.
111. It's called g-- that actually outputs a Boolean
112. value for combinations of truth or true and false
113. for the possible propositions.
114. Then a definition for truth table
115. is an operator g on the n-tuples by specifying one Boolean value
116. for each tuple.
117. The number of rows in the truth table
118. **is 2 to the n, where n is a number of atomic propositions.**