a. Natural Language Processing is the use of computers to interpret or generate written and spoken language.

b. NLP is a branch of AI.

c. Natural language understanding is the interpretation of language generated by another party. Natural language generation is the creation of a response to what another party has said.

d. Examples of modern NLP applications include:
    - Voice assistants
        - OK Google
        - Siri
        - Amazon Alexa
    - Spell/Grammar checkers
        - Microsoft Office
        - Grammarly

e. The oldest approach to NLP was rules-based approaches. Rules-based approaches use hard, programmatic rules to interpret or generate language. This can involve simple regular expressions or the creation of context-free grammars to describe the structure of a language. Grammar and spell checkers in office applications are examples of rules-based NLP because they compare user input against a known set of rules about how a language should be written. The Eliza chatbot is a famous example of a rules-based NLP application that used regular expressions to generate responses to user input. Rules-based approaches are difficult to scale up to the complex and evolving nature of human language.

   Rules-based approaches were followed by statistical and probabilistic approaches. Such approaches operate on the frequency of certain words and sequences of words in relation to each other. Some classic machine learning algorithms fall under this category due to their basis in statistics. Statistical approaches work best when a medium to large amount of data is available for training. An example of a statistical approach to NLP is predictive text in search bars or messaging apps because they suggest whatever words or phrases are most likely to follow what has already been entered. Search engines also use word frequency in web pages to judge its relevance with respect to a user query.

   The third approach to NLP is deep learning. Deep learning is an extension of the basic neural network that is enabled by access to very large datasets and large amounts of computing power, which are necessities for making increasingly human-like NLP applications. Google search likely uses deep learning to inform its choice of web results for a given user query. Voice assistants such as OK Google are also trained via deep learning to give relevant responses to what users tell it.

f. I am interested in NLP because I have an interest in most things related to AI and machine learning. I want to know how applications such as voice assistants work and what would be

required to make them better. I wish to become professionally involved in the fields of AI and machine learning, and learning NLP is another way of familiarizing myself with these fields.