Kernel Sentences and Complex Sentences

In the 1950's, the linguist Zellig Harris proposed that complex sentences could be derived from "kernel" sentences. Some examples of kernel sentences and complex sentences are shown below.

Kernel sentences

- The bear ate a sandwich.
- The bear yawned.
- It was likely that S (where S is a sentence)
- X persuaded Y that S (where X and Y are sentient beings and S is a sentence)

Complex sentences

- A sandwich was eaten by the bear.
- The bear that ate the sandwich yawned.
- It was likely that the bear ate a sandwich.
- The bear was likely to eat a sandwich.

In order to turn kernel sentences into complex sentences, there must be a set of operations for combining and transforming sentences. Following are some operations that you can practice.

Operation 1: Passive Voice

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Input: S1: X verb Y rest-of-S1
Output: Y was verb-past-participle by X rest-of-S1

Example:
Input: The bear (X) ate (verb) a sandwich (Y) in the park (rest-of-S1).
Output: A sandwich was eaten by the bear in the park.
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Task 1: Perform the Passive Voice Operation on the sentence: *Five students took the test on Tuesday.*

1. In the input to the operation, what is X?
2. What is Y?
3. What is the verb?
4. What is rest-of-S1?
5. What is the output of the Passive Voice Operation?

Operation 2: Relative Clause

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Input: S1: X verb-1 rest-of-S1
       S2: X verb-2 rest-of-S2
Output: X that verb-2 rest-of-S2 verb-1 rest-of-S1

Example:
Input: S1: The bear (X) ate (verb-1) a sandwich (rest-of-S1)
       S2: The bear (X) yawned (verb-2)
Output: The bear (X) that yawned (verb-2) ate (verb-1) a sandwich (rest-of-S1).
        (Note that rest-of-S2 is empty because S2 ends with verb-2.)
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Task 2: Perform the Relative Clause Operation where S1 is *The student passed the test* and S2 is: *The student saw a movie*.

1. In the input to the operation, what is X?
2. What is verb-1?
3. What is rest-of-S1?
4. What is verb-2?
5. What is rest-of-S2?
6. What is the output of the Relative Clause Operation?

Operation 3: substitution

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Example:  Input: X persuaded Y that S1
                 X=Pat
                 Y=Kim
                 S1=the sandwich rotted.

           Output: Pat persuaded the bear that the sandwich rotted.


Example: Input: It was likely that S1
                S1=The bear yawned.
         Output: It was likely that the bear yawned.
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Task 3: Perform substitution operations:

1. What is the output of this substitution:

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   Input: X persuaded Y that S1
          X=Chris
          Y=the teacher
          S1=the student passed the test
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2. What is the output of this substitution:

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   Input: It was likely that S1
          S1=the student passed the test
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Operation 4: Infinitive Operation for "likely"

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Input: It was likely that S1
       S1: X verb-1 rest-of-S1
Output: X was likely to verb-1-infinitive

Example:
Input: It was likely that S1
       S1: The bear (X) ate (verb-1) a sandwich (rest-of-S1)
Output: The bear (X) was likely to eat (verb-1-infinitive) a sandwich(rest-of-S1).
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Operation 5: Infinitive Operation for "persuade"

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Input: X persuaded Y that S1
       S1: Y verb rest-of-S1.
Output: X persuaded Y to verb-infinitive rest-of-S1.

Example:
Input: X persuaded Y that S1
       X=the bear
       Y=the butterfly
       S1: The butterfly flies away.
Output: The bear (X) persuaded the butterfly (Y) to fly
        (verb-infinitive) away (rest-of-S1)

        (Note that this operation slightly changed the meaning of the
        kernel sentences.)
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Task 4: Perform the following infinitive operations:

1. Infinitive Operation for "likely" where S1 is *The student passed the test*.
   (a) In the input to the infinitive operation, what is X?
   (b) What is verb-1?
   (c) What is rest-of-S1?
   (d) What is the output of the infinitive operation?
2. Infinitive Operation for "persuade" where X is *the teacher*, Y is *the student* and S1 is *The student does the homework*.
   (a) What is the output of the operation?

Combining Operations: The following sentences can be derived from kernel sentences by a sequence of the operations described above. For each sentence give the kernel sentences that it is derived from and list the operations that apply. One example is done for you: *The bear was persuaded by the students to yawn.*

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Kernel Sentences: S1: The bear yawned.
                  X persuaded Y that S1

Operations:
1.  Infinitive Operation for ‘‘persuade’’
    Input: The students persuaded the bear that the bear yawned.
    Output: The students persuaded the bear to yawn.

2.  Pasive Operation:
    Input: The students (X) persuaded (verb) the bear (Y) to yawn (rest-of-S).
    Output: The bear (Y) was persuaded (verb-past-participle)
            by the students (X) to yawn (rest-of-S).
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Task 5: Provide derivations for the following sentences including kernel sentences and operations.

1. The bear that was likely to eat a sandwich yawned.
2. The sandwich was eaten by the bear that was persuaded to yawn.