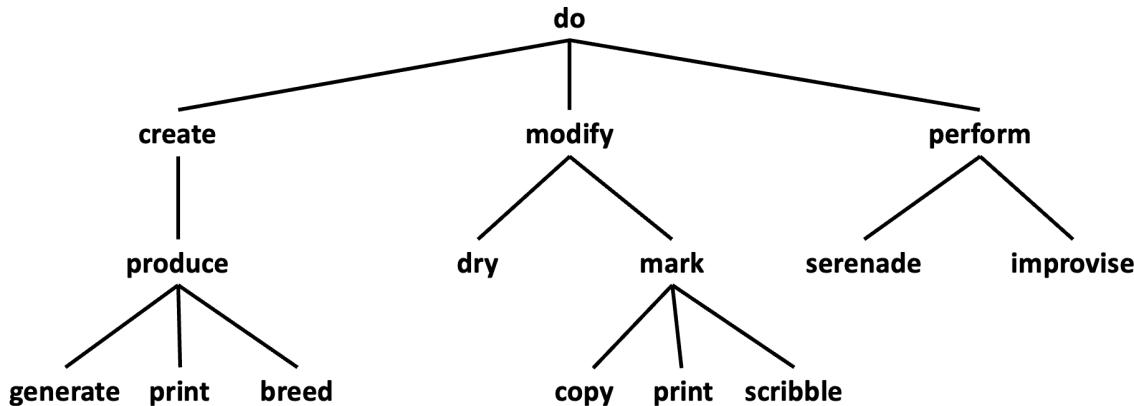


(K) Wordnet Battleship (1/6) [15 Points]

A new board game craze is sweeping the globe: Wordnet Battleship! This game is similar to the strategy guessing game Battleship where two players try to guess where the other one has placed a fleet of ships on a ruled grid. But unlike the traditional Battleship game, Wordnet Battleship replaces the ruled grid with a tree diagram of words that are hierarchically associated to each other based on their meaning. The diagram works like this: The word at the top of the diagram has the most general meaning. The diagram then splits into a set of words that are a bit more specific in meaning than the word at the top. Each of those words splits into more words that are more specific than the word above them, and so on.

For example, in the wordnet diagram below, the verb *do* splits into *create*, *modify*, and *perform*, which are more specific types of doing. The verb *perform* then splits into the verbs *serenade* and *improvise*, which are two specific ways to perform. Since the diagram is based on word meaning, words with multiple meanings appear in multiple different locations in a wordnet based on their individual separate meanings.



The wordnet diagram above is the right size for playing a beginner-level round of the game Wordnet Battleship. In this level of play, each player has three ships that must be strategically placed on the diagram based on a set of rules. The 3 ships are:

- A **frigate**, which takes up 3 positions on a wordnet diagram
- A **yacht**, which takes up 2 positions on a wordnet diagram
- A **rowboat**, which takes up 2 positions on a wordnet diagram

The rules for concealing ships within a wordnet diagram are:

1. Each ship must be placed on a chain of directly connected words in the wordnet diagram. The chain may not use two words on the same level. For example, a frigate can be placed on *scribble-mark-modify*, but it cannot be placed on *copy-print-scribble*, *do-mark-copy*, or *copy-mark-scribble*.
2. A player's ships cannot overlap. For example, if a player places their frigate on *generate-produce-create* on their wordnet diagram, they can't also place their yacht on *breed-produce*.
3. The two players have distinct copies of the same wordnet diagram on which to conceal their ships. It is therefore entirely possible for them to place their ships on the same positions as their opponent. For example, both players might coincidentally place their yacht on *print-produce*.



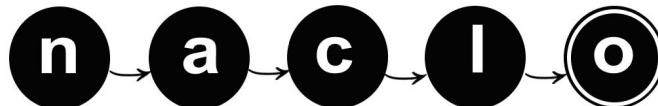
(K) Wordnet Battleship (2/6)

Once both players have placed their ships, they begin the game. The players take turns trying to guess the specific positions in their opponent's wordnet diagram where a ship is hiding. To make a guess, a player says the relevant word out loud and uses that word in a sentence that indicates the meaning of the word. Their opponent follows up with either the reply "Miss" (if no part of a ship is covering the word with that meaning on their own wordnet diagram) or "Hit" (if part of a ship is covering the word with that meaning on their own wordnet diagram). When the final part of a ship is hit for a given ship, the opponent says, "Hit—you have sunk my [NAME OF SHIP]."

Two players have just finished playing a round of the beginner level of Wordnet Battleship using the wordnet diagram shown on the previous page. Below are two tables listing all the guesses and responses that transpired during this game. To make it easy for you to keep track of who guessed what, we have grouped together all of Player 1's guesses with the corresponding responses from Player 2 in one table, and all of Player 2's guesses with the corresponding responses from Player 1 in another table.

Turn	Player 1's guess	Player 2's response
1	Dry: Can you tell me how to <u>dry</u> tomatoes?	Miss
2	Print: Please <u>print</u> your name on your exam.	Miss
3	Modify: You cannot <u>modify</u> your apartment	Hit
4	Do: You need to <u>do</u> something!	Hit
5	Mark: I will <u>mark</u> the door with a secret symbol.	Hit—you have sunk my frigate.
6	Print: The publisher will <u>print</u> 3 million books.	Miss
7	Produce: What will the new factory <u>produce</u> ?	Hit
8	Perform: Many students <u>perform</u> at the talent show.	Hit
9	Serenade: The musician will <u>serenade</u> the diners.	Hit—you have sunk my yacht.
10	Create: I want to <u>create</u> a new type of microscope.	Miss
11	Breed: My neighbors <u>breed</u> poodles.	Miss

Turn	Player 2's guess	Player 1's response
1	Generate: The device can <u>generate</u> electricity.	Miss
2	Modify: I would like to <u>modify</u> my car.	Hit
3	Mark: Please do not <u>mark</u> your library books.	Hit
4	Do: What does this machine <u>do</u> ?	Miss
5	Scribble: My niece likes to <u>scribble</u> on the walls.	Hit—you have sunk my rowboat.
6	Perform: Will you <u>perform</u> on this stage?	Miss
7	Produce: Both countries <u>produce</u> dairy products.	Hit
8	Breed: They <u>breed</u> goldfish.	Miss
9	Create: The company must <u>create</u> a new product.	Hit
10	(a)	Hit—you have sunk my frigate.
11	(b)	Hit—you have sunk my yacht.



(K) Wordnet Battleship (3/6)

K1. Two of Player 2's guesses are missing. Fill in examples of what these guesses might have been. Your answer should include both the word and an example sentence that clearly illustrates the meaning of that word given its position in the wordnet diagram (there are many possible example sentences). You can write your answers on page 6.

K2. Where are Player 2's ships (that is, where are the ships that Player 1 is trying to sink)? Your answer should simply list the words without example sentences. When listing the words, order does not matter. You can write your answers on page 6.

The advanced level of Wordnet Battleship requires a different and larger wordnet diagram with nouns instead of verbs. In this level of play, each player has the following fleet of 6 ships:

- An **aircraft carrier**, which takes up 5 positions
- A **battleship**, which takes up 4 positions
- A **cruiser**, which takes up 3 positions
- A **submarine**, which takes up 3 positions
- A **destroyer**, which takes up 2 positions
- A **patrol boat**, which takes up 2 positions



Otherwise the game proceeds just like the version seen previously.

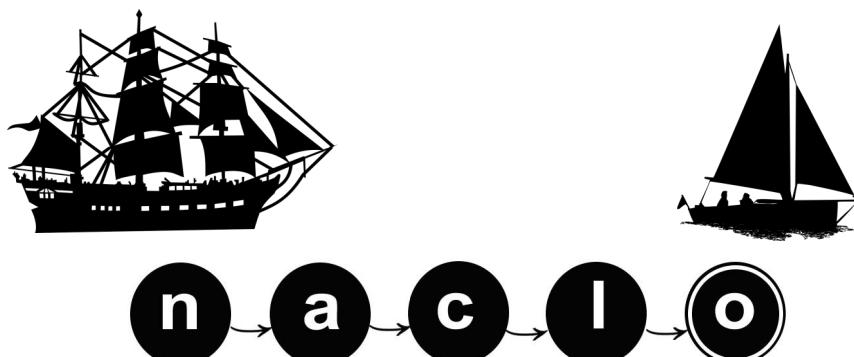
The next two pages contain the record of a game of advanced Wordnet Battleship. This game was played between Player 3, whose guesses are on Page 4/6, and Player 4, whose guess are on Page 5/6. Although you have access to this game record, you do not have access to the wordnet diagram that the players were referring to. Instead, you must figure out the structure of this diagram based on the record of the game.

For this game, you can assume the following:

- Every position in the wordnet diagram is guessed by at least one of the players.
- Answers (k) appears twice—as the final answer in the first table and the final answer in the second table. This answer should be exactly the same in both positions, using the same word and the same example sentence.
- All of the blanks in the rightmost column should be filled with a single word (either *Hit* or *Miss*).

K3. Fill in the blanks indicated in the tables on the next two pages. If there are multiple correct answers, you only need to give one. You can write your answers on page 6.

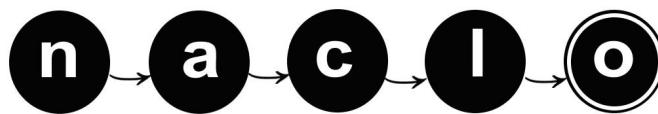
Note: This problem is based on the WordNet project. You can learn more about WordNet at <https://wordnet.princeton.edu>.



(K) Wordnet Battleship (4/6)

Record of second game—Table 1:

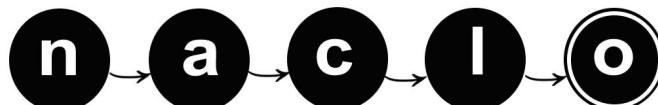
Turn	Player 3's guess	Player 4's response
1	Object: An <u>object</u> sat on the table.	Hit
2	Publication: Every <u>publication</u> on the shelf has a green cover.	Hit
3	Magazine: I tore a picture from the <u>magazine</u> .	Hit—you have sunk my cruiser.
4	Scientist: The <u>scientist</u> ran an experiment.	Miss
5	Containerful: I used one <u>containerful</u> of cocoa powder.	Hit
6	Spoonful: A <u>spoonful</u> of sugar helps the medicine go down.	Hit—you have sunk my destroyer.
7	Queen: The <u>queen</u> rules over her country with compassion.	(a)
8	Physical entity: Anything made out of matter is a <u>physical entity</u> .	(b)
9	Thrower: Many sports require you to be a <u>thrower</u> .	(c)
10	Prime minister: The <u>prime minister</u> will lower taxes.	Miss
11	Person: I know a <u>person</u> who can juggle seven pineapples.	(d)
12	Centimeter: The acorn was about one <u>centimeter</u> in diameter.	(e)
13	Ruler: _____ (f) _____	Hit—you have sunk my battleship
14	Ball: The <u>ball</u> rolled across the field.	Miss
15	Pitcher: The <u>pitcher</u> threw the ball.	Miss
16	Instrument: An <u>instrument</u> is a device that require skill.	Hit
17	Book: Every <u>book</u> by Charles Dickens is entertaining.	Miss
18	Written communication: Literature is a form of <u>written communication</u> that lasts through the centuries.	(g)
19	Communication: I am expecting a <u>communication</u> from her.	(h)
20	Play: _____ (i) _____	Hit—you have sunk my submarine
21	Event: Please add this <u>event</u> to your calendar.	Hit
22	Social event: Many of my friends will attend the <u>social event</u> .	Hit
23	Ruler: _____ (j) _____	Hit—you have sunk my patrol boat.
24	Ball: Everyone who was invited to the <u>ball</u> wore elegant outfits.	Hit
25	Abstract entity: A concept is an <u>abstract entity</u> .	Hit
26	(k)	Hit—you have sunk my aircraft carrier.



(K) Wordnet Battleship (5/6)

Record of second game—Table 2:

Turn	Player 4's guess	Player 3's response
1	Event: An important <u>event</u> occurred yesterday.	Hit
2	Business event: A <u>business event</u> can be anything that happens in a business context.	Hit
3	Construction: The <u>construction</u> of the bank took two days.	Miss
4	Publication: _____ (l) _____	Hit—you have sunk my submarine.
5	Quantity: You will need a <u>quantity</u> of yarn.	Hit
6	Abstract entity: An <u>abstract entity</u> cannot be touched.	Hit
7	Containerful: Please add a <u>containerful</u> of orange juice.	Hit
8	Envelope: The <u>envelope</u> contains a letter.	Miss
9	Magazine: I tore a picture from the <u>magazine</u> .	Miss
10	Pitcher: On the table, there is a glass <u>pitcher</u> holding flowers.	Hit
11	Concert: I am excited to go to the <u>concert</u> .	Miss
12	Container: The <u>container</u> for these toys is made of wood.	Hit—you have sunk my destroyer.
13	Pitcher: _____ (m) _____	Hit—you have sunk my battleship.
14	Social event: My schedule has room for one more <u>social event</u> .	Hit
15	Feast: The <u>feast</u> lasted for over nine hours.	Hit
16	Show: The <u>show</u> is scheduled for Saturday.	Hit
17	Play: _____ (n) _____	Hit—you have sunk my cruiser.
18	Publication: Each <u>publication</u> in the bin had a bar code on it.	(o)
19	Entity: An <u>entity</u> can be physical or abstract.	(p)
20	Length: Please bring me a <u>length</u> of string.	(q)
21	Physical entity: Happiness is not a <u>physical entity</u> .	(r)
22	Object: Every <u>object</u> needs to be cleared from the path.	(s)
23	Microscope: The biologist peered into the <u>microscope</u> .	(t)
24	Equipment: Many facilities have places to store <u>equipment</u> .	(u)
25	Book: _____ (v) _____	Hit—you have sunk my aircraft carrier.
26	(k)	Hit—you have sunk my patrol boat.



(K) Wordnet Battleship (6/6)

K1. Write examples of what Player 2's guesses might have been.

- a.
- b.

K2. Where are Player 2's ships? Next to each ship name, write the appropriate words.

- yacht rowboat
frigate

K3. Provide entries for the empty cells in the record of Player 3 and Player 4's game.

- a. b. c. d. e.
f.
g. h.
i.
j.
k.
l.
m.
n.
o. p. q. r. s. t. u.
v.

