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The Seventeenth Annual

**North American
Computational
Linguistics
Open
Competition**



2023

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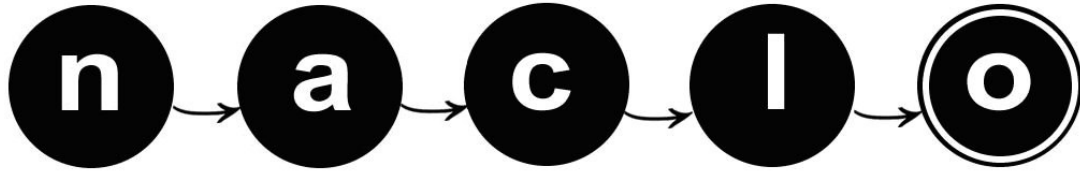


Yale University

**Invitational Round
March 16, 2023**

Serious language puzzles that are surprisingly fun!

-Will Shortz, crossword editor of The New York Times and Puzzlemaster for NPR



Welcome to the seventeenth annual North American Computational Linguistics Open Competition! We (the NACLO organizers) are excited for you to participate in this unique event. In order to be completely fair to all participants across North America, we need you to read, understand, and follow these rules completely.

Rules

1. The contest is four hours long and includes nine problems, labeled I to Q.
2. Follow the facilitators' instructions carefully.
3. If you want clarification on any of the problems, talk to a facilitator. The facilitator will consult with the jury before answering.
4. You may not discuss the problems with anyone except as described in items 3 & 10.
5. Each problem is worth a specified number of points, with a total of 100 points.
In the Invitational Round, some questions require explanations.
6. All your answers should be written clearly in the Answer Sheets at the end of this booklet. **ONLY THE ANSWER SHEETS WILL BE GRADED.**
7. Write your name and registration number on each page of the Answer Sheets.
Here is an example: Jessica Sawyer #850
8. Some problems are more difficult than others, but all can be solved using ordinary reasoning and some basic analytic skills. You don't need to know anything about linguistics or about these languages in order to solve them.
9. Don't be discouraged if you don't finish everything! If we have done our job well, very few people will solve all these problems completely in the time allotted.
10. **DO NOT DISCUSS THE PROBLEMS UNTIL THEY HAVE BEEN POSTED ONLINE! THIS MAY BE A COUPLE OF MONTHS AFTER THE END OF THE CONTEST.**

Oh, and have fun!

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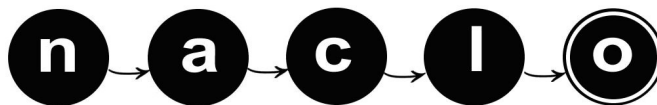
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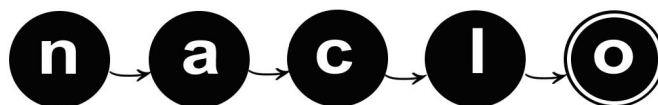
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We are grateful to our problem authors for their expertise. Any errors remain our own.

We are grateful for the support of many institutions and individuals who make this contest possible.

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(I) Show That One for the People (1/1) [5 Points]

The Iguvine Tablets are a series of inscriptions on bronze found in the Italian town of Gubbio, which is on the site of the ancient Roman town of Iguvium. These tablets are written in the ancient Umbrian language, which is closely related to Latin, the language of the ancient Romans. The original translators of the tablets used the similarity of many words to their Latin “relatives” to help them determine the meaning of many passages written in Umbrian.

I1. Below are some Umbrian words from the Iguvine tablets, their Latin equivalents, and their English translations. Fill in the blanks from the table.

Umbrian	Latin	English
sestu	sisto	place, set up
Petruniaper	pro Petronia	for Petronia
tefe	tibi	for you
Sahta	Sanctam	holy
tref	tris	three
rufra	rubra	red
katlu	catulum	puppy
iveka	iuencam	heifer
uvef	ovis	sheep (singular)
uhtur	auctor	official, authority
kanetu	canito	sing
ustetu	ostento	show
estu	istum	that one
pupluper	pro populo	for the people
fertu	ferto	carry
(a)	ito	go
(b)	frictum	roasted
(c)	pro re	for the business
(d)	tauros	bulls
(e)	forum	town square
(f)	inito	go in

Make sure you record your answers in your Answer Sheets!



(J) Marshallese Phonoloji (1/2) [15 Points]

Marshallese is an Austronesian language spoken by over 50,000 people, primarily in the Marshall Islands, where it is the official language alongside English. One notable feature of Marshallese is its vowels: It seems to have many different vowel sounds, but linguists have argued that all of these vowels can be analyzed as variants of just 4 vowels. One linguist, Mark Hale, chose to use emojis rather than more conventional symbols to represent these vowels, as they behave differently from vowels in most languages.

On the next page is a table with some Marshallese words written in standard Marshallese spelling, followed by underlying forms that have been hypothesized by linguists, as well as the words' pronunciations and English translations. (An *underlying form* is how a word is stored in a speaker's mind. This form is then modified to yield the pronunciation.) Study this table and then answer the questions below.

J1. On your Answer Sheets, fill in the blank cells from the table below. If you don't want to draw the emojis, you can use **S** instead of the soccer ball (⚽), **C** instead of the coffee mug (☕), **Y** instead of the yin-yang symbol (☯), and **P** instead of the phone (📞). If you do choose to draw the emojis, make sure it's totally clear which one you're drawing!

Spelling	Underlying Form	Pronunciation	English translation
bar	/p ^ʸ ⚽r ^ʸ /	(a)	'rock (object)'
ḷābōḷ	(b)	[l ^ʸ ɑ̃æb ^ʸ ʌl ^ʸ]	'level (tool)'
jook	(c)	[t ^ʰ ɔ:k]	'shy'
kewa	/k☯jw⚽u/	(d)	'peer'
eor	/j📞r ^w /	(e)	'bleached'

J2. Explain how the pronunciation of a Marshallese word can be determined from its spelling and/or underlying form.

J3. The sound /u/ is never pronounced in any Marshallese word. Therefore, it might seem strange that this sound is included in descriptions of the language (for example, in the underlying forms above). Explain why linguists believe that /u/ is present in the language even though it is never directly observed.

Pronunciation and spelling notes:

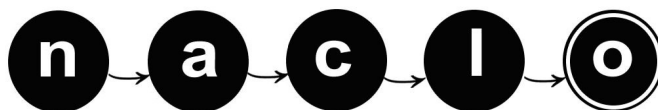
- In the spellings, note that l and ḷ are different letters (the second has a small hook under it).
- In the underlying forms and pronunciations, note that [u] and [u] are different symbols.
- [ŋ] is pronounced like the *ng* in *sing*. [j] is pronounced like the *y* in *yellow*. [u] is pronounced somewhat like the *y* in *yellow*, but it is formed farther back in the mouth.
- A superscript [i] means that the preceding sound is pronounced with the tongue raised toward the roof of the mouth (palatalized). A superscript [ʸ] means that the preceding sound is pronounced with the back of the tongue raised (velarized). A superscript [w] means that the preceding sound is pronounced with the lips rounded (labialized).
- [ɔ, ɑ, ɤ, æ, ʌ, ε] are all vowel sounds. The symbol [:] after a vowel indicates that the vowel is long.
- We will not tell you how the emojis are pronounced, nor how the letters in Marshallese spelling are pronounced—that is for you to figure out!



(J) Marshallese Phonoloji (2/2)

Marshallese examples:

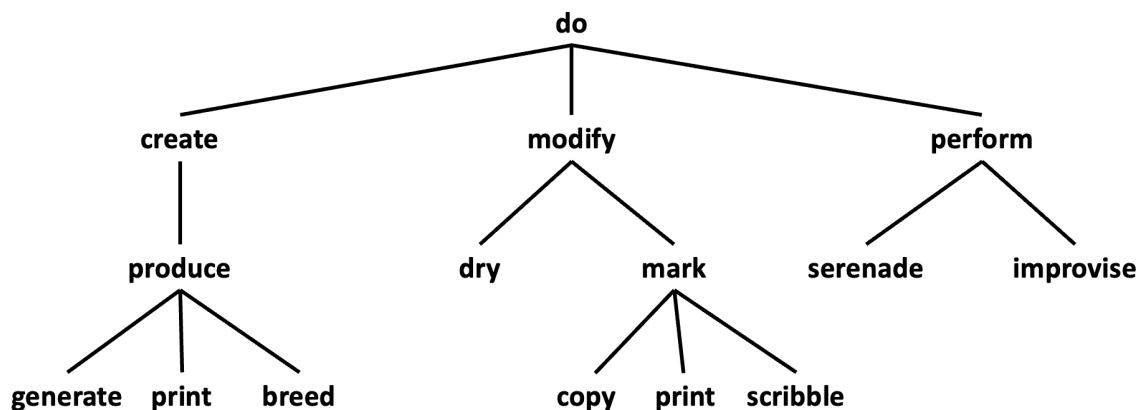
Spelling	Underlying Form	Pronunciation	English translation
doñ	/rʲ ɲʷ/	[rʲeɔŋʷ]	'hip'
kwarkor	/kʷ rʲkʷ ɲʷ rʲ/	[kʷɔarʲgʷoʷrʲ]	'to bandage'
make	/mʲ kʲ ɲʷ j/	[mʲæagʲe]	'alone'
nuknuk	/nʲ kʲ nʲ kʲ/	[nʲiugʷnʲiukʷ]	'clothing'
ɭor	/lʲ rʷ/	[lʲaɔrʷ]	'black sea anemone'
kutak	/kʷ tʲ kʲ/	[kʷuɔdʲak]	'to scratch'
kuuj	/k w tʲ/	[ku:tʲ]	'cat'
mō	/mʲ ɔ/	[mʲɛɬ]	'stretchy'
eakeak	/j kʲ kʲ/	[jæagʲæak]	'ghost'
raj	/rʲ tʲ/	[rʲaætʲ]	'whale'
keek	/k ɲʷ j ɲʷ kʲ/	[ke:k]	'cake'
tōmmelɔk	/tʲ mʲ mʲ lʲ kʷ/	[tʲɬɛmʲmʲɛɬlʲaɔkʷ]	'to smack one's lips'
piɔ	/pʲ j w/	[pʲiæɔ]	'chilly'
rom	/rʷ ɲʷ mʲ/	[rʷoemʲ]	'wink'
bɔjet	/pʲ w tʲ tʲ/	[pʲaɔzʲɛɬtʲ]	'faucet'
toɭ	/tʲ lʲ/	[tʲɬɔlʲ]	'mountain'
Majeɭ	/mʲ ɲʷ tʲ lʲ/	[mʲaɔzʲɛɬlʲ]	'Marshall Islands'
pānuk	/pʲ nʲ kʲ/	[pʲænʲiukʷ]	'to pile up'
pilim	/pʲ lʲ mʲ/	[pʲilʲiɔmʲ]	'film'
puwaɭ	/pʲ w lʲ/	[pʲiɔwɔalʲ]	'coward'
wa	/w ɲʷ/	[wɔa]	'canoe'
peɭɔk	/pʲ lʲ kʷ/	[pʲɛɬlʲaɔkʷ]	'ajar'
jouj	/tʲ w tʲ/	[tʲeouitʲ]	'kindhearted'
Qkwōj	/w kʲ tʲ/	[ɔgʷɔɛtʲ]	'August'
bokɔp	/pʲ kʲ pʲ/	[pʲɔgʷlʲaæpʲ]	'smallpox'
nebar	/nʲ pʲ rʲ/	[nʲɛɬbʲarʲ]	'praise'
eɔtōk	/j w tʲ kʲ/	[jæɔzʲɛɬk]	'shipwrecked'
naaj	/nʲ ɲʷ tʲ/	[nʲa:tʲ]	'will be'



(K) Wordnet Battleship (1/5) [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.

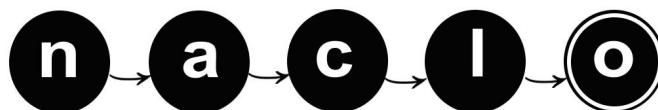


The wordnet diagram above is the right size for playing a beginner-level round of the game Wordnet Battleship. In this level of play, each player has three ships that must be strategically placed on the diagram based on a set of rules. The 3 ships are:

- 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*.



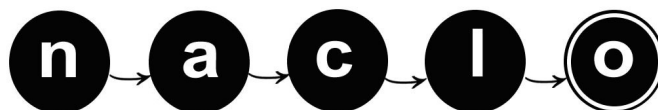
(K) Wordnet Battleship (2/5)

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.

<i>Turn</i>	<i>Player 1's guess</i>	<i>Player 2's response</i>
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

<i>Turn</i>	<i>Player 2's guess</i>	<i>Player 1's response</i>
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 (3/5)

K1. Two of Player 2's guesses are missing. On your Answer Sheet, 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).

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.

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



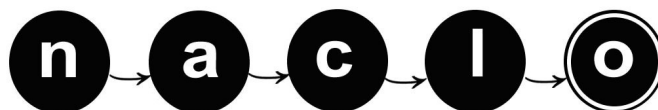
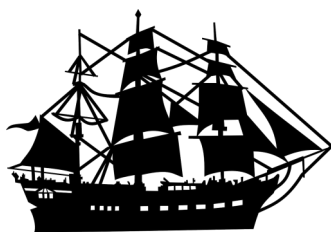
Otherwise the game proceeds just like the version seen previously.

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 4/5, and Player 4, whose guess are on Page 5/5. 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*).

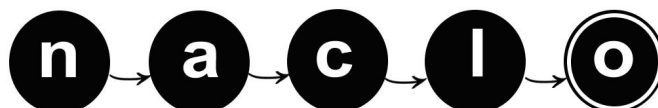
K3. Fill in the blanks indicated in the tables on the next two pages. If there are multiple correct answers, you only need to give one.



(K) Wordnet Battleship (4/5)

Record of second game—Table 1:

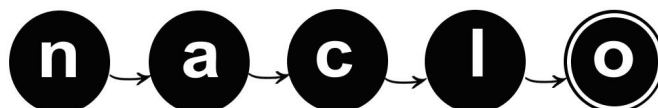
Turn	Player 3's guess	Player 4's response
1	Object: An <u>object</u> sat on the table.	Hit
2	Publication: Every <u>publication</u> on the shelf has a green cover.	Hit
3	Magazine: I tore a picture from the <u>magazine</u> .	Hit—you have sunk my cruiser.
4	Scientist: The <u>scientist</u> ran an experiment.	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 (5/5)

Record of second game—Table 2:

<i>Turn</i>	<i>Player 4's guess</i>	<i>Player 3's response</i>
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.



(L) Camp Not-So-Pleasant Hill (1/2) [10 Points]

Teal is currently at the world's most boring summer camp, Camp Pleasant Hill. She wants to tell her parents about how unpleasant it is, but she is worried that her counselor will intercept her letter. Teal's parents both work in machine translation (the field concerned with creating computers that can translate between languages), which gives Teal an idea for a code that she thinks her parents will be able to decipher without her counselor knowing what is in the letter. She sends the following piece of paper to her parents, adding the italicized phrases to trick her counselor:

Words I want to learn in Spanish:

counselor	archery
delicious	campfire
favorite	turtle
food	canoeing
home	cabins
is	tennis
kind	lake
me	basketball
me	rope course
my	postcards
shirt	crafts
short	horse
someone	friends
stole	soccer
take	food
tall	the horse
the	

A poem of all the things I love to do at Camp Pleasant Hill:

2443: canoeing, the campfire, tennis

312: cabins, food, basketball

L1. Teal's parents translated the first line in the "poem" (2443: canoeing, the campfire, tennis) as "the food is disgusting". What is the translation of the second line (312: cabins, food, basketball)? Write your answer on your Answer Sheet.



(L) Camp Not-So-Pleasant Hill (2/2)

L2. Teal sends her parents some more coded messages. The table below shows these coded messages with their translations, but some parts of the messages are missing. On your Answer Sheet, fill in the blanks.

Coded message from Teal	Translation
12443: ____ (a) ____	my counselor is mean
21453: ____ (b) ____	someone stole my favorite shirt
2213: ____ (c) ____	take me home

What does Teal's code have to do with translation? To help you see the connection, the table below gives some sentences in Wari' (a language spoken in Brazil and Bolivia) along with their English translations. For each sentence pair, there is also a mystery sequence that resembles a component of Teal's code. It is up to you to figure out what these mystery sequences mean.

L3. Some cells in the table are missing. On your Answer Sheet, fill in the missing entries. *Notes:* The symbol ' stands for a glottal stop—the sound in the middle of the expression *uh-oh*. Hatem and Topa' are women's names. 'Orowao' is a man's name. *sg* stands for *singular*.

Mystery sequence	Wari'	English
2,[1,2,3]	Querec napa'.	He saw me.
2,[1,2,4],4	Quep 'inain temem'.	I made a bow.
3,[1,2,4],4	Querec taram Hatem.	He will see Hatem.
2,[1,2,4],4	Hoc non hwam.	He cooked the fish.
2,[1,2,4],4	Querec non hwam.	She saw the fish.
2,[1,2,3],3	Cao' 'inon hwam.	I ate fish.
[3,4],[2,3,6],6,2	Morojam' nain xirim copacao'.	The jaguar walked around the house.
2,[1,2,4],4	Querec 'inam narima'.	I saw the woman.
2,[1,2,7],4,4,7	Mi' 'inon con hwam tarama'.	I gave the fish to the man.
3,[1,2,4],6,6,1	Mi' tarapa' con wom 'Orowao'.	'Orowao' will give me a dress.
2,[1,2,3],5,5,3	Mi' 'inam con hwam Hatem.	I gave Hatem the fish.
3,3,[1,2,7],5,5	Pa' mi' ron pain man.	You(sg) will open the door for him.
2,2,[1,2,6],3,3,[5,6]	Hoc mi' nonon con hwam humaxicam.	She cooked fish for her children.
3,[1,2,7],5,5,7	Mi' ram con hwam Hatem.	(a)
3,[1,2,4],6,6,4	Mi' ram con hwam Topa'.	(b)
2,2,[1,2,3],5,5,3,1	(c)	Topa' made Hatem a dress.



(M) Tongue Tied in Chukchi (1/2) [15 Points]

Chukchi is a Chukotko-Kamchatkan language spoken by about 5,000 people in Siberia, Russia. Below are some English sentences with Chukchi translations (in order) given by a speaker of a southern dialect. Study these examples and then answer the questions on the next page.

- | | |
|--|------------------------|
| 1. <i>You (pl.) tie us up</i> | nekləwtək |
| 2. <i>I am tying you (pl.) up</i> | təkəlwərkənitək |
| 3. <i>We tie him up</i> | mətəkəlwəyʔen |
| 4. <i>You (sg.) see them</i> | ləʔunet |
| 5. <i>They are tying you (sg.) up</i> | nekəlwərkəniyət |
| 6. <i>He is tying us up</i> | nekəlwərkənimək |
| 7. <i>You (sg.) see me</i> | inelʔuyʔi |
| 8. <i>I am sniffing them</i> | təjŋorkənet |
| 9. <i>You (pl.) see me</i> | inelʔutək |
| 10. <i>He sees you (pl.)</i> | nelʔutək |
| 11. <i>They sniff him</i> | nejŋoyʔen |
| 12. <i>You (pl.) are tying them up</i> | kəlwərkənitək |
| 13. <i>We are sniffing him</i> | mətəjŋorkən |
| 14. <i>We see you (pl.)</i> | mətəlʔutək |
| 15. <i>They are seeing him</i> | nelʔurkən |
| 16. <i>You (sg.) see him</i> | ləʔuyʔen |

Notes: Some forms have been slightly modified for the purposes of this problem. **ʔ**, **y**, and **ŋ** are consonants, and **ə** is the *a* in *about*. (*sg.*) and (*pl.*) refer to singular and plural. All instances of *they* and *them* are plural.



(M) Tongue Tied in Chukchi (2/2)

M1. Translate into English. For a., b., and c., only one translation is possible. Sentence d. has multiple correct translations; provide them all.

- a. **kələwnet**
- b. **mətəkləwyət**
- c. **inekəlwərkənitək**
- d. **nelʔurkənitək**

M2. Translate into Chukchi:

- a. *I tie him up*
- b. *You (sg.) are seeing us*
- c. *You (pl.) sniff him*
- d. *He is tying them up*
- e. *He sniffs me*

M3. Describe the structure of Chukchi words.

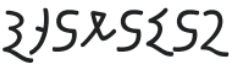
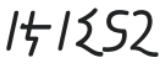

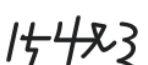




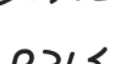


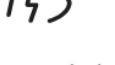
Make sure you record your answers in your Answer Sheets!



(N) A Saharan Sensation (1/1) [10 Points]

The Meroitic script was used to write the Meroitic language from the 3rd century BCE, spoken in the Kingdom of Kush (located in the area that is now northern Sudan and southern Egypt).

Below on the left are twelve words in Meroitic script. On the right are the same twelve words written in the Roman alphabet with English translations, but in scrambled order. The English translations are not necessary to solve the problem.

- | | | |
|---|---------------------|-------------------------|
| 1.  | A. <i>anata</i> | 'priest' |
| 2.  | B. <i>sema</i> | 'wife' |
| 3.  | C. <i>apote</i> | 'messenger' |
| 4.  | D. <i>pelamosa</i> | 'general' |
| 5.  | E. <i>qore</i> | 'ruler' |
| 6.  | F. <i>ata</i> | 'bread' |
| 7.  | G. <i>apedemaka</i> | (a warrior god) |
| 8.  | H. <i>sate</i> | 'tutor' |
| 9.  | I. <i>palasana</i> | 'overseer of temple' |
| 10.  | J. <i>paqara</i> | 'prince' |
| 11.  | K. <i>tewiseti</i> | 'adoration inscription' |
| 12.  | L. <i>kadite</i> | 'sister' |

N1. Determine the correct correspondences. Write your answers in your Answer Sheets.

N2. On your Answer Sheets, write the following words in the Roman alphabet:

- | | |
|---|--|
| (a)  | (b)  |
| (c)  | (d)  |



(O) Tone's Puzzle (1/1) [10 Points]

Below are some phrases in Abawiri, a Lakes Plain language spoken by several hundred people in New Guinea. Their English translations are given on the right in scrambled order.

- | | |
|------------------------------|--------------------------|
| 1. [bórú g ^w ákù] | a. <i>bird's earth</i> |
| 2. [sòkrē dúkè] | b. <i>chicken's rat</i> |
| 3. [dèβi àitè] | c. <i>child's car</i> |
| 4. [àité dèβi] | d. <i>child's father</i> |
| 5. [àjà sòkrè] | e. <i>earth's fish</i> |
| 6. [dúkè sòrì] | f. <i>father's child</i> |
| 7. [dèbí wùtù] | g. <i>fish's ear</i> |
| 8. [sòrì βórù] | h. <i>rat's bird</i> |

O1. Match the English translations to the Abawiri phrases.

O2. Translate into English:

- [àjà βórù]
- [dúkè àitè]
- [wùtù dúkè]

O3. Translate into Abawiri:

- car's earth*
- bird's car*
- father's rat*
- child's fish*
- earth's chicken*
- father's ear*

O4. Explain what you have observed about Abawiri.

Notes: A mark above a vowel indicates its tone—i.e., the pitch it is pronounced with. Specifically, ` (e.g., à) indicates low tone, ¯ (e.g., ā) indicates mid tone, and ´ (e.g., á) indicates high tone. The two letters ai function as a single vowel with a single tone; its tone is only marked on the a but applies to both the a and the i. β is pronounced like b but with the lips only lightly touching. g^w is a single consonant pronounced like gw. ε and ð are vowels.

Make sure you record your answers in your Answer Sheets!



(P) Counting in Roon (1/1) [15 Points]

Roon is an Austronesian language with approximately 1,000 speakers in Indonesia. Roon's terms for numbers have changed over the years. This problem investigates numbers in Roon at three points in time: the years 1855, 1955, and 2012. Some number terms have remained unchanged in this time:

Number	1855	1955	2012
2	nuru	nuru	nuru

Others have changed once:

Number	1855	1955	2012
10	onemerim	safur	safur

However, the majority of number terms have changed twice:

Number	1855	1955	2012
7	onemenuru	rimenuru	fik
32	arzus safur nuru	aresoyosier safur nuru	ares kior beberin nuru

P1. Below are some more numbers or expressions in Roon, representing the same value in different years. + and \times represent addition and multiplication respectively. Fill in the missing cells. Your answers should include only one number or number term, not a mathematical expression—that is, you should not use + or \times .

Number	1855	1955	2012
(a)	nuru \times η okor	rimeyosier	yosier + rim
(b)	onem \times fak	η okor \times rimi η okor	ares nuru beberin fiak
(c)	safur onem + onemefak	aresoyosier rim	(siu \times nuru) + fik
(d)	arzus di nuru yoser + safur lim	safur nuru + aresonuru fak	ares rim beberin wonem
(e)	fak	fak	fiak
3	(f)	(g)	kior
8	(h)	(i)	war
(j)	(k)	(l)	safur fik
21	(m)	(n)	(o)
79	(p)	(q)	(r)

P2. Explain the system of number terms at each of the three years.

Notes: Some numbers have been slightly simplified. η is pronounced like the *ng* in *sing*.



(Q) What to Wear? (1/2) [5 Points]

Muklom is a language spoken by a few thousand people in Northeast India, a linguistic hotspot that harbors languages from four different families: Sino-Tibetan, Austroasiatic, Tai-Kadai, and Indo-European. Muklom belongs to the Sino-Tibetan family.

The Muklom people have a rich mythology and oral history that has been transmitted from generation to generation in spoken form and in songs. The language has not historically been written. Or, according to the traditional stories, the ancestors of the Muklom people actually did once have a writing system and they wrote their stories on animal skins; however, one time, when the ancestors were very hungry, they ate all the skins so that nothing remained of the written language. Since there is no standardized writing system for Muklom, the examples below are presented using a preliminary spelling.

Below are some sentences in Muklom, with their English translations (given in order). Study these examples and then answer the questions on the next page. See the end of the problem for pronunciation notes.

	Muklom	English
1	khat sàa nang aa.	She wears a skirt.
2	níing kho pok pok aa.	She wears their hat.
3	khat sam koq i.	We give a blanket.
4	kho pok pok aa.	She wears a hat.
5	baa naa tsong tsong aa.	She wears your(singular) earrings.
6	í khat sam huq aa.	She steals our blanket.
7	naa tsong hún aa.	She makes earrings.
8	khat sam sám aa.	She wears a blanket.
9	i kho pok qhat aa.	My hat falls down.
10	khat sàa qhot ang.	I wash a skirt.
11	jàa qhòng bì íin.	You(plural) search for shoes.
12	naa tsong tsong aa.	She wears earrings.
13	nìim jàa qhòng kap aa.	She finds your(plural) shoes.
14	u khat sàa lak chak aa.	She forgets her skirt.
15	kho pok rí u.	You(singular) buy a hat.
16	jàa qhòng qhòng aa.	She wears shoes.



(Q) What to Wear? (2/2)

Q1. Fill in the blank cells in the following table.

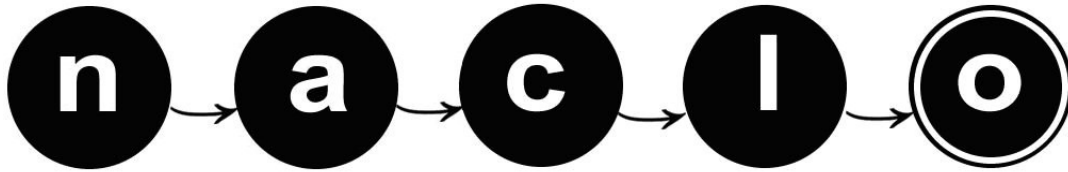
	Muklom	English
17	jàa qhòng qhòng ang.	(a)
18	u kho pok pok u.	(b)
19	í jàa qhòng kap íin.	(c)
20	baa kho pok lak chak u.	(d)
21	(e)	Your(singular) hat falls down.
22	(f)	We buy your(singular) earrings.
23	(g)	I forget our shoes.
24	(h)	I forget my shoes.

Pronunciation notes:

- The letter **q** is pronounced as a glottal stop, the sound in the middle of English *uh oh*
- The combination **qh** is pronounced like the last two letters in the name of the composer Bach in German
- The accents on the Muklom words represent different tones—put simply, the accent [´] stands for a high pitched syllable, and [`] stands for a low pitched syllable.

Make sure you record your answers in your Answer Sheets!





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Answer Sheets

REGISTRATION NUMBER					

Name: _____

Contest Site: _____

Site ID: _____

City, State/Province: _____

Grade: _____

Please also make sure to **write your registration number and your name on each page of the Answer Sheets**, and **turn in all pages of the Answers Sheets** even if you have left some blank .

SIGN YOUR NAME BELOW TO CONFIRM THAT YOU WILL NOT DISCUSS THESE PROBLEMS WITH ANYONE UNTIL THEY HAVE BEEN OFFICIALLY POSTED ON THE NACLO WEBSITE IN APRIL.

Signature: _____

YOUR NAME:

REGISTRATION #

Answer Sheets (1/9)





(I) Show That One for the People

I1. Fill in the empty cells in the table.

Umbrian	Latin	English
(a)	ito	go
(b)	frictum	roasted
(c)	pro re	for the business
(d)	tauros	bulls
(e)	forum	town square
(f)	inito	go in

(J) Marshallese Phonoloji

J1. Fill in the empty cells in the table. If you don't want to draw the emojis, you can use **S** instead of the soccer ball, **C** instead of the coffee mug, **Y** instead of the yin-yang symbol, and **P** instead of the phone. If you do choose to draw the emojis, make sure it's totally clear which one you're drawing!

Spelling	Underlying Form	Pronunciation	English translation
bar	/p ^y  r ^y /	(a)	'rock (object)'
ĵābōĵ	(b)	[l ^y ɑæb ^y ʌl ^y]	'level (tool)'
jook	(c)	[t ^h ɔ:k]	'shy'
kewa	/k ^y  jw ^y  w/	(d)	'peer'
eor	/j ^y  r ^w /	(e)	'bleached'



YOUR NAME:

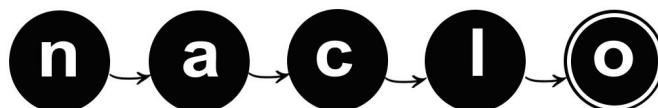
REGISTRATION #

Answer Sheets (2/9)

(J) Marshallese Phonoloji (continued)

J2. Explain how the pronunciation of a Marshallese word can be determined from its spelling and/or underlying form.

J3. Explain why linguists believe that /ɯ/ is present in Marshallese.



YOUR NAME:

REGISTRATION #

Answer Sheets (3/9)

(K) Wordnet Battleship

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.

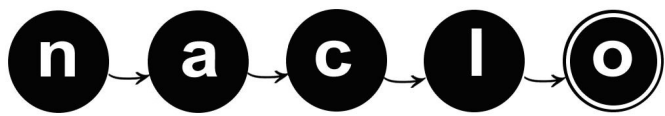
l.

m.

n.

o. p. q. r. s. t. u.

v.



YOUR NAME:

REGISTRATION #

Answer Sheets (4/9)

(L) Camp Not-So-Pleasant Hill

L1. Translate 312: *cabins, food, basketball*.

L2. Fill in the blanks in the table.

Coded message from Teal	Translation
12443: _(a)_____	my counselor is mean
21453: _(b)_____	someone stole my favorite shirt
2213: __ (c)_____	take me home

L3. Fill in the blanks in the table.

Mystery sequence	Wari'	English
3,[1,2,7],5,5,7	Mi' ram con hwam Hatem.	(a)
3,[1,2,4],6,6,4	Mi' ram con hwam Topa'.	(b)
2,2,[1,2,3],5,5,3,1	(c)	Topa' made Hatem a dress.

(M) Tongue Tied in Chukchi

M1. Write the English translation(s) for each Chukchi word.

- a. kələwnet
- b. mətəkləwyət
- c. inekəlwərkənitək
- d. nelʔurkənitək



YOUR NAME:

REGISTRATION #

Answer Sheets (5/9)

(M) Tongue Tied in Chukchi (continued)

M2. Write the Chukchi translation for each English phrase.

a. *I tie him up*

b. *You (sg.) are seeing us*

c. *You (pl.) sniff him*

d. *He is tying them up*

e. *He sniffs me*

M3. Describe the structure of Chukchi words.



YOUR NAME:

REGISTRATION #

Answer Sheets (6/9)

(N) A Saharan Sensation

N1. Write the letter of the Roman-alphabet entry that corresponds to each word in the Meroitic script.

1. 2. 3. 4. 5. 6.
 7. 8. 9. 10. 11. 12.

N2. Write the Roman-alphabet equivalent of each Meroitic-script word.

- a. b.
 c. d.

(O) Tone's Puzzle

O1. Write the letter of the English phrase that corresponds to each Abawiri phrase.

1. 2. 3. 4. 5. 6. 7. 8.

O2. Translate into English:

a. [àjà βórù]

b. [dúkè àitè]

c. [wùtù dúkè]

O3. Translate into Abawiri:

a. *car's earth*

b. *bird's car*

c. *father's rat*

d. *child's fish*

e. *earth's chicken*

f. *father's ear*



YOUR NAME:

REGISTRATION #

Answer Sheets (7/9)

(O) Tone's Puzzle (continued)

O4. Explain what you have observed about Abawiri.

(P) Counting in Room

P1. Provide entries for the missing cells from the table.

a.	<input type="text"/>	b.	<input type="text"/>	c.	<input type="text"/>	d.	<input type="text"/>	e.	<input type="text"/>
f.	<input type="text"/>			g.	<input type="text"/>				
h.	<input type="text"/>			i.	<input type="text"/>				
j.	<input type="text"/>	k.	<input type="text"/>			l.	<input type="text"/>		
m.	<input type="text"/>				n.	<input type="text"/>			
o.	<input type="text"/>				p.	<input type="text"/>			
q.	<input type="text"/>				r.	<input type="text"/>			



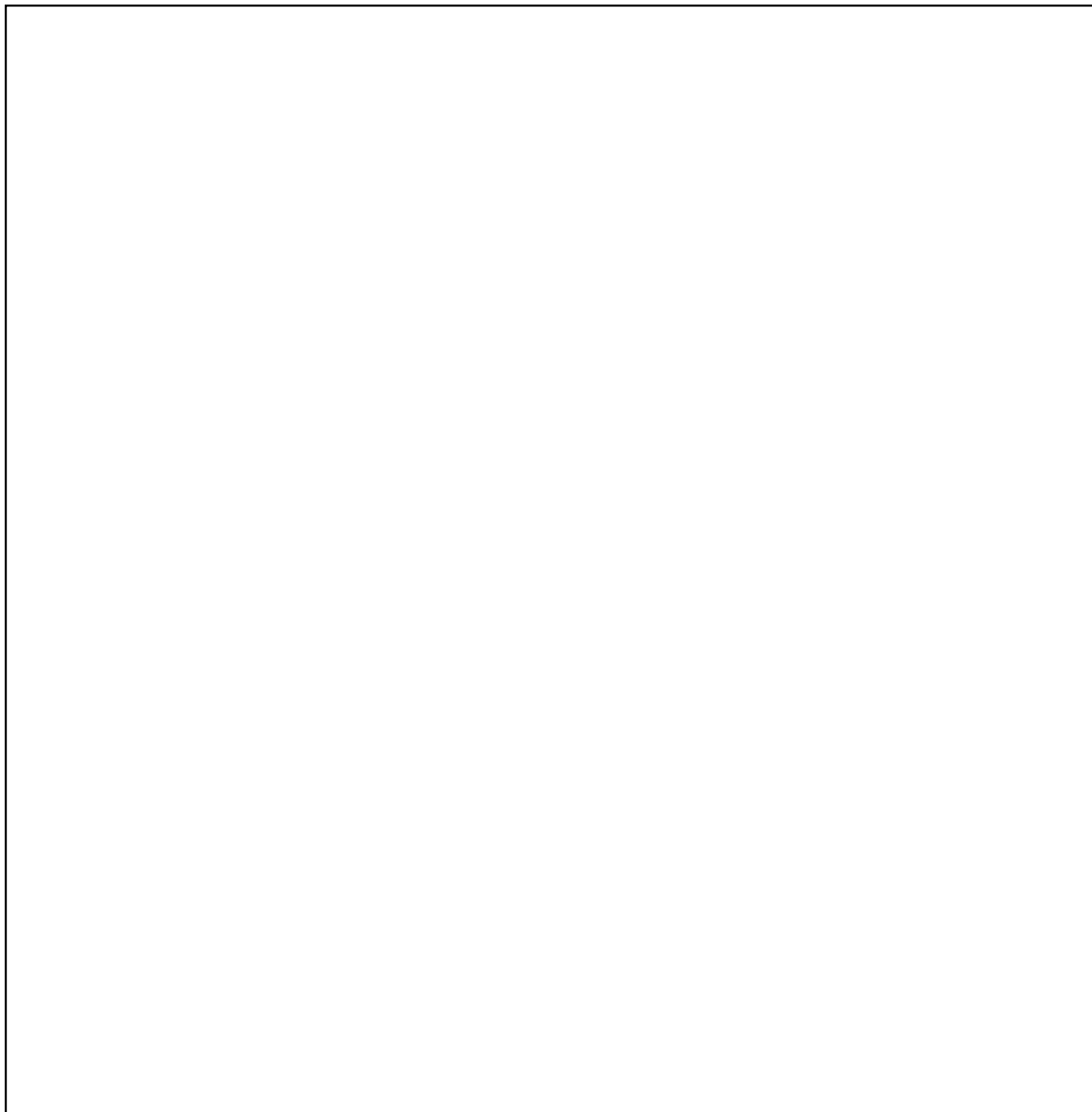
YOUR NAME:

REGISTRATION #

Answer Sheets (8/9)

(P) Counting in Roon (continued)

P2. Explain the system of number terms at each of the three years.



YOUR NAME:

REGISTRATION #

Answer Sheets (9/9)

(Q) What to Wear?

Q1. Fill in the blank cells in the following table.

	Muklom	English
17	jàa qhòng qhòng ang.	(a)
18	u kho pok pok u.	(b)
19	í jàa qhòng kap íin.	(c)
20	baa kho pok lak chak u.	(d)
21	(e)	Your(singular) hat falls down.
22	(f)	We buy your(singular) earrings.
23	(g)	I forget our shoes.
24	(h)	I forget my shoes.



YOUR NAME:

REGISTRATION #

Additional Answer Space (1/1)

If you use this additional space, please do both of the following:

- 1. On this sheet, clearly indicate which question(s) you are answering. E.g., write "Problem O4."*
- 2. In the regular answer space(s) for the question(s) you are answering, note that you are using additional answer space. E.g., at the end of the answer space for problem O4 in the regular Answer Sheets, add a note saying "See additional answer space."*

