

IMPORTANT RULES

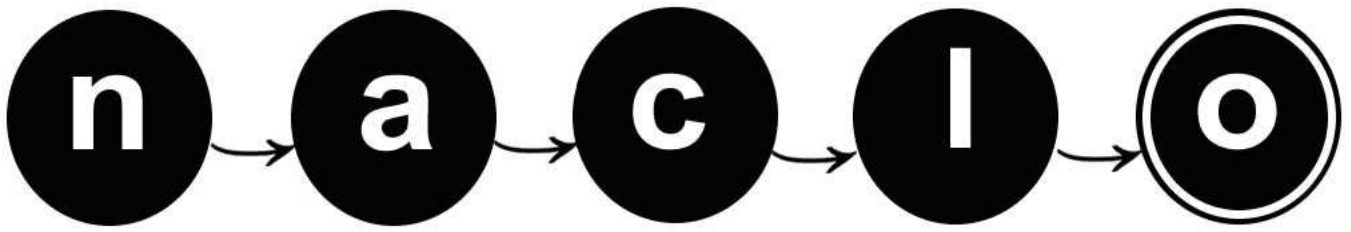
To ensure the integrity of the contest:

1. Do not discuss the contents of this booklet with anyone during and after the contest (until it has been posted on the NACLO website in late March). If you have any questions during the contest, talk quietly to the local facilitators, who will relay your questions to the jury and then give you the official jury answer.
2. Students are not allowed to keep any pages of the booklet after the contest is over.

THE ACTUAL CONTEST BOOKLET STARTS ON PAGE 3

Open Round
February 2, 2012

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The Association for Computational Linguistics
North American Chapter

Carnegie Mellon

M UNIVERSITY OF MICHIGAN

YAHOO!



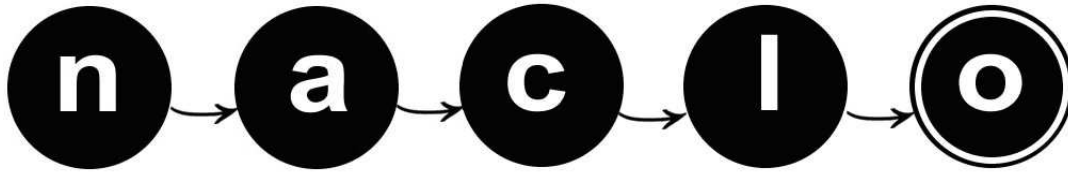
***The Sixth
Annual***

**North American
Computational
Linguistics
Olympiad**

2012

www.naclo.cs.cmu.edu

**Open Round
February 2, 2012**



The North American Computational Linguistics Olympiad
www.naclo.cs.cmu.edu

Contest Booklet

REGISTRATION NUMBER			

Name: _____

Contest Site: _____

City, State: _____

Grade: _____

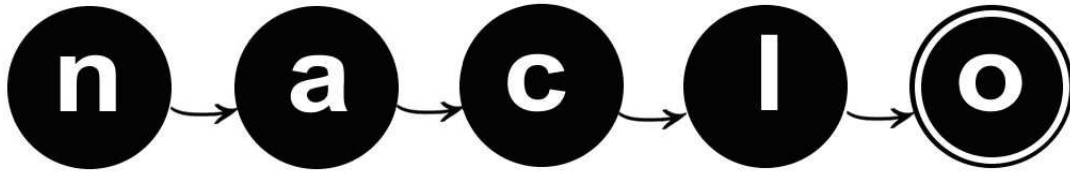
Start Time: _____

End Time: _____

Please also make sure to **write your registration number and your name on each page** that you turn in.

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 LATE MARCH.

Signature: _____



Welcome to the sixth annual North American Computational Linguistics Olympiad! You are among the few, the brave, and the brilliant, 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 three hours long and includes eight problems, labeled A to H.
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 & 12.
5. Each problem is worth a specified number of points, with a total of 100 points. In this year's open round, no points will be given for explanations. Instead, make sure to fill out all the answer boxes properly.
6. We will grade only work in this booklet. All your answers should be in the spaces provided in this booklet. **DO NOT WRITE ON THE BACK OF THE PAGES.**
7. Write your name and registration number on each page:
Here is an example: Jessica Sawyer #850
8. The top 100 participants (approximately) across the continent in the open round will be invited to the second round on Tuesday, March 13.
9. Each problem has been thoroughly checked by linguists and computer scientists as well as students like you for clarity, accuracy, and solvability. 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.
10. If we have done our job well, very few people will solve all these problems completely in the time allotted. So, don't be discouraged if you don't finish everything.
11. If you have any comments, suggestions or complaints about the competition, we ask you to remember these for the web-based evaluation. We will send you an e-mail shortly after the competition is finished with instructions on how to fill it out.
12. **DO NOT DISCUSS THE PROBLEMS UNTIL THEY HAVE BEEN POSTED ONLINE! THIS MAY BE SEVERAL WEEKS AFTER THE END OF THE CONTEST.**

Oh, and have fun!

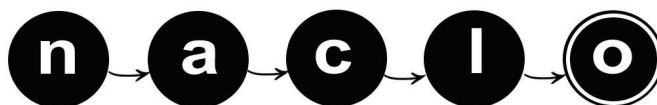
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Problem A: Patrick Littell
Problem B: Lauren Gawne
Problem C: Simon Zwartz, based on work by Kevin Knight
Problem D: Dragomir Radev
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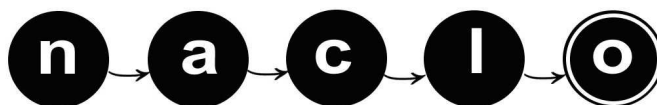
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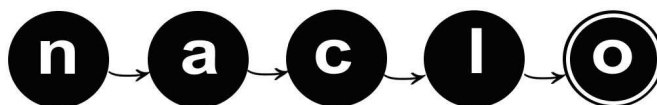
National Science Foundation
The North American Chapter of the Association for Computational Linguistics (NAACL)
Carnegie Mellon University
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Special thanks to:

Tanya Korelsky, Joan Maling, Terry Langendoen, NSF
More than 100 high school teachers from at least 34 states and provinces

And many other individuals and organizations

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A. Cat and Mouse Story (I/I)

[10 points]

“Okay, so my cat *pombed gwee* the *trowby*, and she *pombed gwee* the *foba*. She *pombed ippip* the *foba* and *pombed gorch* the *foba*, and eventually she *pombed ippip* the *trowby*.”

Your friend has apparently joined some strange new subculture and is trying out the slang. Either that or he hit his head. Whatever the cause, it looks like your friend has replaced the words *down*, *into*, *up*, *run*, *mouse*, and *street* with the words *gwee*, *ippip*, *trowby*, *foba*, *pomble*, and *gorch*. You can't yet tell which is which, so you have this conversation:

You: So, it started off with the cat *pombling* the *trowby gwee*.

Him: That's nonsense; that's not even a good sentence.

You: Could I say “The cat *pombed* the *foba gwee*?”

Him: That's just as bad.

You: It *was* *gwee* the *foba* that the cat *pombed*, right?

Him: Correct.

You: Then the cat *pombed gorch* the *foba* and *ippip* the *foba*.

Him: Yes.

You: And the cat *pombed gorch* the *foba* and *ippip* the *trowby*?

Him: You're talking nonsense again.

You: But it *was* *ippip* the *trowby* that the cat *pombed*?

Him: You don't know how to use words, do you?

You: The cat *pombed* the *trowby ippip*.

Him: That sounds a lot better.

A-I What do the following words mean? Context clues are useful to give you hints, but to *prove* which words mean which, you should also use your friend's judgments about your attempted sentences.

foba

ippip

gwee

pomble

gorch

trowby



YOUR NAME:

REGISTRATION #

B. Learn Yolmo with pleasure (1/1)

[5 points]

Yolmo is a Tibeto-Burman language spoken in Nepal by around 10,000 people. The sentences below come from a small dialect spoken by around 500 people in the district of Lamjung. Below is a list of sentences in Lamjung Yolmo with their English translations. The ɬ and ɖ symbols represent retroflex consonants, pronounced (roughly) as “tr” and “dr”, respectively, by curling the tip of the tongue backwards in the mouth.

ngà ngàki làkpaki tó sàke	I eat rice with my hand
ngà ɬ ángaki kwèla nyòke	I buy clothes with money
ngà ngàki khí nyímu ɖ òke	I walk with my dog
ngà ngàki kéeki lú lènke	I sing a song with my voice
ngà ngàki áma nyímu kwèla nyòke	I buy clothes with my mother
ngà ngàki ádzi nyímu lú lènke	I sing a song with my sister
ngà ngàki kángbaki ɖ òke	I walk with my legs

B-1 Two of the English sentences below would be translated into Yolmo by a sentence using the word *nyímu*. Mark these two sentences with X.

- A. I eat rice with my spoon.
- B. I talk with my mouth.
- C. I walk with my bag.
- D. I never travel with money (on me).
- E. Since my accident I have to walk with my stick.

B-2 How would you translate the phrase “with money” in sentence D above?

B-3 How would you translate the sentence, “I eat rice with my sister”?



C. Interstellar First Contact (1/2)

[10 points]

It's hard enough to translate between languages when you understand both languages. It's harder still when you only understand one. But what do computers do? They don't truly understand either language. To illustrate the challenge that computers face, Kevin Knight posed this classic puzzle (Knight 1997): given two equivalent texts in two unknown alien languages, how would you go about translating one to another?

It is the year 2354 AD. Our scientists have been eavesdropping on messages between two alien civilizations for a very long time, but we have never met either. The closest aliens, the Centauri, have finally begun to communicate with us. Their first message was a message of peace, "Farok crrok hihok yorok klok kantok ok -yurp."

Now, we know that the Centauri have been in contact for some time with the Arcturan race, who live in another solar system. We have never had contact with the Arcturans, but newly developed technology makes it possible for us to send them a message. We would like to send them, first, a message of peace, but because we do not understand their language, this is not an easy task.

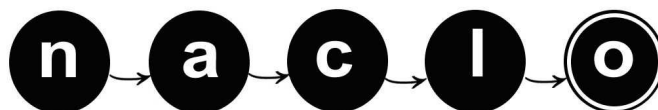
Luckily, we have intercepted communications from the Centauri that include both languages. Here are 12 sentences in Centauri and their 12 translations in Arcturan. Unfortunately, because we have only been eavesdropping, their meaning is unknown. However, we do know that the sentence pairs on each line are translations of each other. We want to use this information to translate the original peace message from the Centauri and then send this to the Arcturans. Your assignment will be to do this translation.

CENTAURI

ok-voon ororok sprok.
 ok-drubel ok-voon anak plok sprok.
 erok sprok izok hihok ghirok.
 ok-voon anak drok brok jok.
 wiwok farok izok stok.
 lalok sprok izok jok stok.
 lalok farok ororok lalok sprok izok enemok.
 lalok brok anak plok nok.
 wiwok nok izok kantok ok-yurp.
 lalok mok nok yorok ghirok klok.
 lalok nok crrok hihok yorok zanzanak.
 lalok rarok nok izok hihok mok.

ARCTURAN

at-voon bichat dat.
 at-drubel at-voon pippat rrat dat.
 totat dat arrat vat hilat.
 at-voon krat pippat sat lat.
 totat jjat quat cat.
 wat dat krat quat cat.
 wat jjat bichat wat dat vat eneat.
 iat lat pippat rrat nnat.
 totat nnat quat oloat at-yurp.
 wat nnat gat mat bat hilat.
 wat nnat arrat mat zanzanat.
 wat nnat forat arrat vat gat.



YOUR NAME:

REGISTRATION #

C. Interstellar First Contact (2/2)

C-1 Let's start with the first Centauri word: "farok". This word occurs in two of our Centauri sentences. Given that these sentences' Arcturan translations only have one word in common with each other, we can assume that this word is the translation for "farok". Which word it is?

farok

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

C-2 Do the same thing for "hihok" and "yorok". For "yorok" you will need to make some assumptions about word ordering.

hihok

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

yorok

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

C-3 The Centauri word "clok" only occurs once. However, you can figure out its Arcturan translation in another way.

clok

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

C-4 Try to use the processes from the previous assignments to complete as much as possible of the following table.

crrok

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kantok

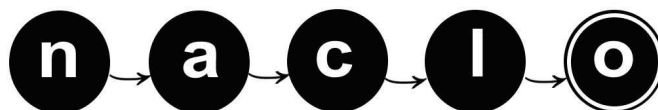
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ok-yurp

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

C-5 Complete the translation of "farok crrok hihok yorok clok kantok ok-yurp." Keep in mind that Centauri and Arcturan sentences can have a different word order. There may be more than one correct reply.

C-6 After some years a reply message is received in Arcturan. It reads, "Totat nnat forat arrat mat bat." Translate this message into Centauri. There may be more than one correct reply.



D. All in the Family (1/3)

[10 points]

Many languages are related to each other for historical reasons. They may have a common ancestor or they may have borrowed words from each other. Linguists group languages into families and branches, based on their common ancestry.

Here is a list of translations of the first article of the Universal Declaration of Human Rights in 17 languages:

- A. (English) All human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood.
- B. (Latin) Omnes homines dignitate et iure liberi et pares nascuntur, rationis et conscientiae participes sunt, quibus inter se concordiae studio est agendum.
- C. Vsi ljudje se rodijo svobodni in imajo enako dostojanstvo in enake pravice. Obdarjeni so z razumom in vestjo in bi morali ravnati drug z drugim kakor bratje.
- D. Dieub ha par en o dellezegez h ag o gwirioù eo ganet an holl dud. Poell ha skiant zo dezho ha dleout a reont bevañ an eil gant egile en ur spered a genvreudeuriez.
- E. Tuots umans naschan libers ed equals in dignità e drets. Els sun dotats cun intellet e conscienza e des-san agir tanter per in uin spiert da fraternità.
- F. Toate ființele umane se nasc libere și egale în demnitate și în drepturi. Ele sunt înzestrațe cu rațiune și conștiință și trebuie să se comporte unii față de altele în spiritul fraternității.
- G. Genir pawb yn rhydd ac yn gydradd â'i gilydd mewn urddas a hawliau. Fe'u cynysgaeddir â rheswm a chydwybod, a dylai pawb ymddwyn y naill at y llall mewn ysbryd cymodlon.
- H. Visi žmonės gimsta laisvi ir lygūs savo orumu ir teisėmis. Jiems suteiktas protas ir sąžinė ir jie turi elgtis vienas kito atžvilgiu kaip broliai.
- I. Totu sos èsseres umanos naschint liberos e eguales in dinnidade e in deretos. Issos tenent sa resone e sa cussèntzia e depent operare s'unu cun s'àteru cun ispiritu de fraternidade.
- J. Gizon-emakume guztiak aske jaiotzen dira, duintasun eta eskubide berberak dituztela; eta ezaguera eta kontzientzia dutenez gero, elkarren artean senide legez jokatu beharra dute.
- K. Kai rahvas roittahes vällinny da taza-arvozinnu omas arvos da oigevuksis. Jogahizele heis on annettu mieli da omatundo da heil vältämättäh pidäy olla keskenäh, kui vellil.

(Continued on Next Page)



D. All in the Family (2/3)

L. Všetci ľudia sa rodia slobodní a sebe rovní, čo sa týka ich dôstojnosti a práv. Sú obdarení rozumom a majú navzájom jednať v bratskom duchu.

M. Nascinu tutti l'omi libari è pari di dignità è di diritti. Pussedinu a raghjoni è a cuscenza è li tocca ad agiscia trà elli di modu fraternu.

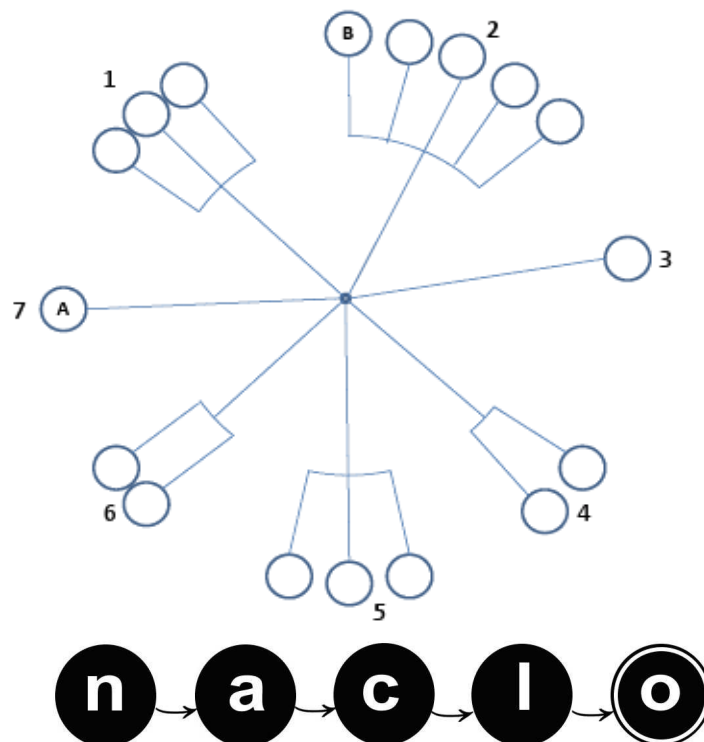
N. Saoláitear na daoine uile saor agus comhionann ina ndínit agus ina gcearta. Tá bauidh an réasúin agus an choinsiasa acu agus dlíd iad féin d'iompar de mheon bhrthreachais i leith a chéile.

O. Visi cilvēki piedzimst brīvi un vienlīdzīgi savā pašcienā un tiesībās. Viņi ir apveltīti ar saprātu un sirdsapziņu, un viņiem jāizturas citam pret citu brālības garā.

P. Kaikki ihmiset syntyvät vapaina ja tasavertaisina arvoltaan ja oikeuksiltaan. Heille on annettu järki ja omatunto, ja heidän on toimittava toisiaan kohtaan veljeyden hengessä.

Q. Wszyscy ludzie rodzą się wolni i równi pod względem swej godności i swych praw. Są oni obdarzeni rozumem i sumieniem i powinni postępować wobec innych w duchu braterstwa.

Your task is to identify similarities among these languages and group them into seven clusters (groups) of related languages as sketched in the diagram below:



YOUR NAME:

REGISTRATION #

D. All in the Family (3/3)

It is clear that the languages can be grouped together based on their similarities. We have already added English and Latin to the boxes below.

D-1 Fill the letters C-Q in the table below. Within each group (e.g., 1, 2, 4, 5...), the internal order of languages doesn't matter. E.g., you can enter either Y, X, Z or X, Z, Y in the entry for group 5.

1						
2	B					
3						
4						
5						
6						
7	A					

D-2 Which two groups (not languages) are farthest away from the rest and may not be related to the others at all? Place their *numbers* (in either order) in the boxes below.

YOUR NAME:

REGISTRATION #

E.Traevölörs Freisbuk (I/I)

[15 points]

The language below looks like some strange relative of Dutch or Swedish... and it is!

- | | | | | | |
|-------------|------------|---------------|----------------|------------|--------------|
| 1. töörkois | 2. bönaenö | 3. zöörti | 4. puul | 5. kueil | 6. braun |
| 7. keik | 8. uön | 9. pôökör | 10. uatörmêlön | 11. ghuuss | 12. pöörpöl |
| 13. ssikss | 14. dzêlôô | 15. ghrei | 16. aisskriim | 17. fighs | 18. chikön |
| 19. yêlôô | 20. dök | 21. chêkörs | 22. kukis | 23. tênöss | 24. födʒ |
| 25. höndröd | 26. töörki | 27. painaepöl | 28. ghalf | 29. zrii | 30. ghreipss |

It's American English, as written in a phrasebook for foreign tourists. Why? Well, it's difficult to know how an English word is pronounced from how it is written, and it's doubly hard if you're completely unfamiliar with the language. The relationship between how English words are pronounced and how they're spelled can be pretty arbitrary!

So to help readers with the unfamiliar language, this book used pronunciation guides that represent the actual sounds of English words more systematically, and made use of spelling conventions from their own language.

The thirty words above are taken from various word-lists in the phrasebook, and can be sorted into six categories of five words each. Your task is to sort them into six categories and then name the categories – using the same writing system! We've started you off with one of the category names; can you figure out the rest? Please remember to write your answers in "Freisbuk language" (e.g, "nömbörs") and not in real English.

Category names (one letter per box)

Words from list (one number per box)

n	ö	m	b	ö	r	s			

7				
15				



YOUR NAME:

REGISTRATION #

F. Crocodile Bardi (1/4)

[15 points]

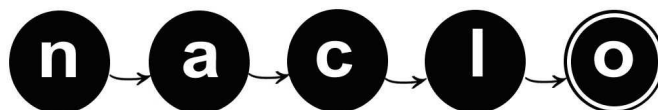
F-I Bardi is part of the Nyulnyulan language family and is the traditional language of the Bardi people, who live in and around One Arm Point and the Lombadina/Djarrindjin Aboriginal Communities, along the coast of Australia's Kimberley Region. Although about a thousand people identify as Bardi, only a handful of people can be considered fluent speakers of the Bardi language.

In the diagram of the scene (below), note that both you and the speaker are facing the paper. The bird is to the left of everything else and the kangaroo is to the right of everything else. The cat is behind everything else and the kangaroo is in front of everything else.



Here are some Bardi sentences describing the diagram:

Aamba bornkony yaawardon.
Baawa joorroonggony garrabagoon.
Boorroo alaboor yaawardon.
lila alaboor ooranygoon.
lila baybirrony aambon.
Minyaw baybirrony baawon.
Oorany joorroonggony baawon.
Yaawarda bornkony aambon.



YOUR NAME:

REGISTRATION #

F. Crocodile Bardi (2/4)

Using the sentences on the previous page, fill in the chart below with words from the “Bardi Word Bank.” Each Bardi word should be used exactly once.

Bardi Word Bank

1. Aarlgoodony
2. Aamba
3. Alaboor
4. Baybirrony
5. Boorroo
6. Bornkony
7. Lila
8. Joorroongony
9. Minyaw
10. Oorany
11. Yaawarda

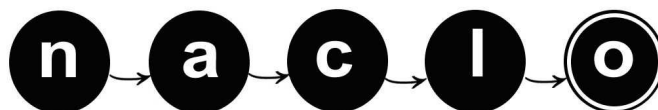
Garrabal = “bird”

Baawa = “child”

English Word

Bardi Word (number)

Cat	
Dog	
Horse	
Kangaroo	
Man	
Woman	
Next to	
Behind	
In front of	
To the right of	
To the left of	

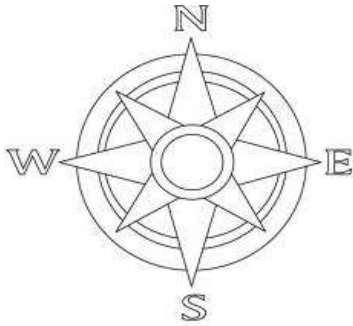


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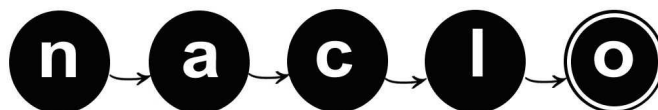
F. Crocodile Bardi (3/4)

F-2 Here is a diagram of a different scene, with a compass rose added:



Here are some about this scene:

Aamba ardi inin boorroogo.
Aamba baana inin oorany.
Baawa aalgamadan inin yaawardago.
Baawa alang inin aambago.
Garrabal goolarr inin aambago.
Garrabal goolarr inin baawago.
lila ardi inin yaawarda.
lila ardingarr.
Minyaw baana inin ooranygo.



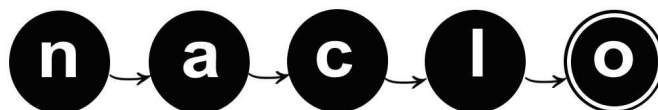
YOUR NAME:

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F. Crocodile Bardi (4/4)

Using these sentences and what you learned from F-I, fill in the boxes below with the English symbols E, N, NE, NW, S, SE, SW, and W (the eight main cardinal directions). This time, each symbol may be used more than once, exactly once, or not at all. For example, in the first blank box, you could enter “E or S” or just “N”. Make sure to use the word “or” if there is more than one direction per box.

Bardi Word	English Direction(s)
Aalgamadan	
Alang	
Ardi	
Baana	
Goolarr	



YOUR NAME:

REGISTRATION #

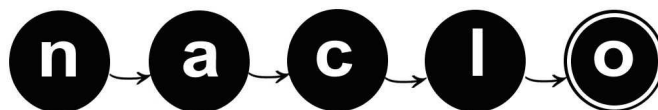
G. Haitian Creole (1/2)

[25 points]

Haitian Creole is a language spoken by 10 million people in Haiti. It is based on French and some African languages. The combinations **an**, **en**, and **on** denote nasal vowels (partially produced through the nose). The table below gives you nouns in Haitian Creole with definite articles and the corresponding English translations:

1	kòl la	the necktie
2	jaden an	the garden
3	lanp lan	the lamp
4	kouto yo	the knives
5	mayi a	the maize
6	lanmou an	the love
7	ri a	the street
8	pant lan	the slope
9	manman an	the mother
10	kabann nan	the bed
11	sant yo	the odours
12	lèt la	the letter
13	sans lan	the sense
14	telefòn nan	the telephone
15	kò a	the body
16	mi an	the wall
17	fanm nan	the woman
18	joumou an	the pumpkin
19	ban an	the bench, the ban
20	kay la	the house
21	fanmi an	the family
22	pon an	the bridge
23	liv yo	the books
24	dam nan	the lady

(Continued on Next Page)



YOUR NAME:

REGISTRATION #

G. Haitian Creole (2/2)

Complete the tables below. If more than one answer is possible, pick the singular one. Note that the two columns are aligned (“lalin” means “moon”). To get credit, please use the same formatting as in the previous table, that is the Creole column should contain a noun followed by an article whereas the English column should contain an article followed by a noun.

You need to add the missing four Creole nouns, twelve Creole articles, and two English nouns.

l	a	l	i	n															
p	i	t	i	m	i														
m	u	z	i	k															
m	a	l	d	a	m	o	u												
k	a	p																	
r	a	d	y	o															
v	a	n	t																
t	a	n																	

t	h	e		m	o	o	n												
t	h	e		m	i	l	l	e	t										
t	h	e																	
t	h	e		l	o	v	e	-	s	i	c	k	n	e	s	s			
t	h	e		k	i	t	e												
t	h	e																	
t	h	e		b	e	l	l	y											
t	h	e		t	i	m	e												
t	h	e		k	n	i	f	e											
t	h	e		b	o	d	i	e	s										
t	h	e		o	d	o	r												
t	h	e		b	o	o	k												

Note: “millet” is a type of cereal grain.



YOUR NAME:

REGISTRATION #

H. Waorani Numbers (I/I)

[10 points]

Waorani is an indigenous language from Ecuador. The following arithmetic expressions involve the numbers from 1 to 10 in Waorani. The \times symbol is used to denote multiplication. The square of a number n is marked as n^2 . Each underlined sequence represents one number from 1 to 10.

- (a) měña měña měña měña + měña go měña = ãëmãëmpoke go aroke \times 2
- (b) aroke² + měña² = ãëmãëmpoke
- (c) ãëmãëmpoke go aroke² = měña go měña \times ãëmãëmpoke měña go měña
- (d) měña \times ãëmãëmpoke = tipãëmpoke

H-I Can you write these numbers in Waorani?

3 =

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

5 =

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

7 =

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

10 =

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



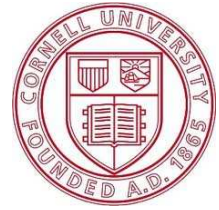


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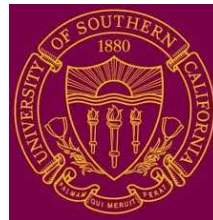
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