Panini Linguistics Olympiad 2018 (SENIORS)
Solutions

Problem #1: Sixteen Japanese Phrases

Assignment 1: Match the translations			
Japanese phrase	*English translation*	*Japanese phrase*	*English translation*
niko tamago	two eggs	*gohiki neko*	five wildcats
gohon kawa	five rivers	*rokumai pureto*	six plates
hachihon gen	eight strings	*nihon hashi*	two chopsticks
goko ringo	five apples	*kyuhon kawa*	nine rivers
kyuhiki inu	nine dogs	*kyumai kitte*	nine postage stamps
gomai pureto	five plates	*hachihiki ari*	eight ants
nihiki neko	two wildcats	*kyuko tama*	nine balls
rokumai enberopu	six envelopes	*rokuko tama*	six balls

Assignment 2: Given your current knowledge and that *tiger* translates to *tora* in Japanese, which of the following would be valid and why?
nihiki tora

Assignment 3: Which of the following are correct/valid Japanese phrases? Provide the English translations for the correct ones. If invalid, write INVALID.			
Japanese Phrase	English translation	Japanese Phrase	English translation
hachimai hashi	INVALID	*niko ringo*	two apples
rokuhon yajirushi	six arrows	*hachiko hashi*	INVALID
gohiki zo	INVALID	*goto neko*	INVALID

- The order of the words is *<Number word> <Noun>*
- The number word is a compound which breaks up into *<Number>* + *<Counter>* where the counter marks agreement with the class of the noun
- There are 5 counter words:
    - *ko* for small and/or round things

    - *mai* for flat things
    - *hon* for long and/or thin things

- ○ *hiki* for animals (based on Assignment 1)
- ○ Refined knowledge : (based on following Assignments)
  - ■ *hiki* for small animals
  - ■ *to* for large animals

Problem #2: Word Embeddings

Assignment 1: Match the English words to their Santali translations. (Write down the English words next to the Santali word letters)

Santali word	English word	Santali word	English word	Santali word	English word
A	Mathematics	G	Second	M	Literature
B	Mathematician	H	Position	N	woman
C	Number	I	Time	O	man
D	One	J	Queen	P	girl
E	Two	K	Language	Q	boy
F	First	L	Grammar		

Assignment 2: Guess the embedding of the words

king	<10,14>	linguist	<4,6>	princess	<7, 15>

Assignment 3: Give English translations of the Santali word. (Anything that means one who studies grammar should be fine).

Grammarian (one who studies grammar)

On a graph, the coordinates appear as follows:
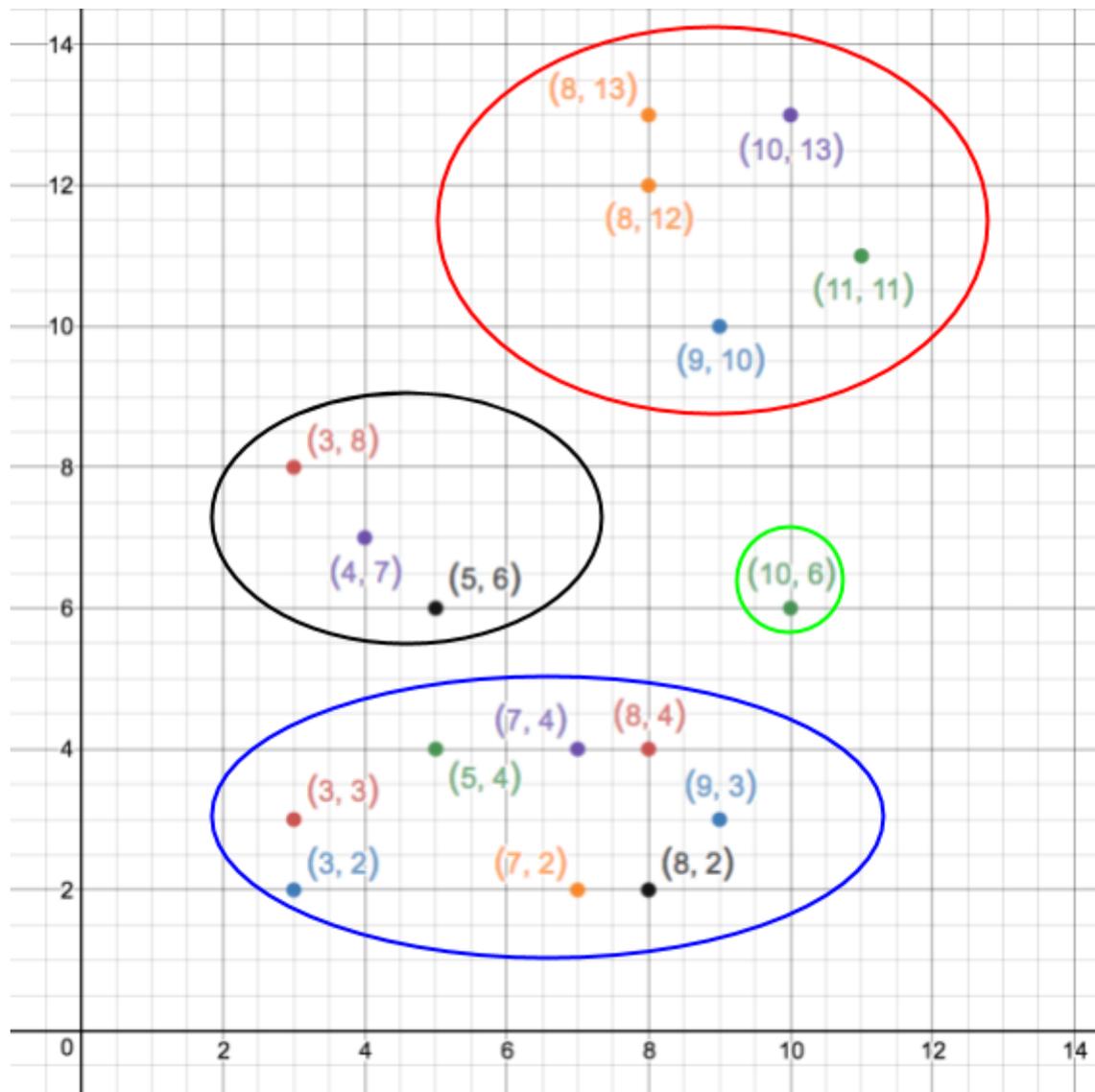
On the graph, we can see that there are clusters of points, and by observing these points we can guess that the cluster circled in blue contains {mathematics, mathematician, number, first, second, one, two, position}, the cluster in red contains {man, woman, boy, girl, queen}, the cluster in black contains {language, literature, grammar} and the cluster in green contains {time}.

We can then use the relations between the English meanings of words, such as:

- *position* has a meaning that is close to *first* and *second*,
- *number* is a feature of the *grammar* of a language
- *second* has a meaning that is close to *time*.

and the similarities between the words in the Santali script (between N and O, P and Q, A and B, etc.) to arrive at the meanings of the words.

For Assignment 2, we can observe the relationships between the points on the graph and see that if we consider each word to be represented by the vectors, then:

- *man - boy = woman - girl ⇒ man = boy + woman - girl*

- *two - second = one - first ⇒ two = second + one - first*

These vector equations of the form A = B - C + D capture the relation 'A is to B what D is to C.' Similar linear relation can be formulated for the three new words in assignment 2, using which their coordinates can be computed.
- *king = queen +man - woman*
- *linguist = language + mathematician - mathematics*
- *princess = girl + queen - woman*

In Assignment 3, we see that the word is formed from the word for *grammar*, with a suffix that indicates occupation, so we conclude that the embedding for this word should be related to the embedding for *grammar* the same way the embedding for *mathematician* is related to the embedding for *mathematics*.

Problem #3: Kurmali

Assignment 1: Translate the following sentences into Kurmali.
1. I saw Radha. *Moi Radha ke dekhe*
2. I gave Salman rice. *Moi Salman ke bat dei*
3. Girls ate the rice *Choanira bat khaenu*
4. A girl gave Radha dolls. *Choani Radha ke putulira deuoe*
5. Radha saw the boys. *Radha choara ke dekhuoi*
6. We saw a dog. *Moira kokur dekhyonu*

Assignment 2:
The word order in Kurmali is <Subject> (<Indirect object>) (<Accusative case>) <Direct object> (<Accusative case>) <Verb>, where elements within parentheses may or may not occur, and the accusative case /ke/ occurs only with animate objects.

The verb is the form <Verb root><Subject marking><Object marking>.

Subject Marking:

Gender	Number	Person		
		1	2	3

Masculine	Singular			lia	ao
	Plural	yon	lin		aon
Feminine	Singular			leo	uo
	Plural	yon (*)	lin (*)		en
Neuter	Singular				
	Plural				yon

Object Marking:

- Object marking is marked for the direct object in the transitive verb and for the indirect object in the ditransitive verb.
- Masculine: i
- Feminine: e
- Neuter (animal & inanimate objects): u

List of Nouns

choa/choani	boy/girl
ghar	house
moi	I
toi	you (singular)
kokur	dog
bat	rice
putuli	doll

List of Verbs

kha	To eat
de	To give
dekh	To see
kin	To buy

Problem #4: Imya Imyevna Rossiyov

Assignment 1: Fill in the full, three-part names of the family members in the family tree. If there are multiple possible solutions, write only one.	
Family Member	*Full Name*
A	Vladimir Vladmirovich Ivanov
B	Ivan Vladimirovich Ivanov
C	Yelena Vladimirovna Ivanova
D	Olga Vladimirovna Ivanova
E	Viktor Aleksandrovich Smirnov

F	Nataliya Alexandrovna Smirnova
G	Andriy Vladimirovich Ivanov
H	Boris Andriyevich Ivanov
I	Olga Andriyevna Ivanova
J	Anna Vladimirovna Ivanova
K	Leonid Sergeyevich Popov
L	Valeriya Sergeyevna Popova

These names can also appear in the order <A, B, C, J, K, L, G, H, I, D, E, F>, <G, H, I, D, E, F, A, B, C, J, K, L>, or <G, H, I, J, K, L, A, B, C, D, E, F>.

Assignment 2:
- Each full name is of the form <First name> <Patronymic> <Last name>.
- The patronymic is formed by taking the father's name, and adding a suffix:
    - -ovich for males
    - -ovna for females
    - -evich/-evna for males and females respectively if the father's name ends in a 'y'
- The last name has a root form, which appears as it is in a male member's name. The last name of a female member is formed by taking her father's last name and appending 'a'.
- Parents may call their children with a diminutive name, which is formed by replacing the final -a with -ochka (or -echka if a 'y' occurs before the -a) in the short name.

Assignment 3: What is the grammatical error in the title of the problem?

The title of the problem has the middle name Imyevna, indicating that the the name is of a woman, but if that is the case the last name would have to have the -a suffix, which is not the case.
If the name is of a man, then the middle name would have to be Imyevich.

Problem #5: Washo

Assignment 1: Translate the following sentences into English. If there are multiple translations possible, give all of them.

a. *da'mo'mo' basa' umsilige basa'i*
The woman wrote the book that she gave to you.

b. *teliwhu basa' disilisge digyi*
I saw the book that the man gave to me.

c. *da'mo'mo' basa' disilisge dipigelyayi*
I returned to the woman the book she gave to me.

AND The woman returned to me the book that I gave to her.
Assignment 2: Translate the following sentences into Washo.
a. The man gave to me the book that I returned to him. *teliwhu basa' dipigelyayisge disili*
b. You saw the book that you gave the woman. *da'mo'mo' basa' umsilige umgyi*

Assignment 3:

1. Verb roots: *basa'* (write), *sil* (give), *gy* (see), *pigelyay* (return)
   Note: *basa'i, sili, gyi, pigelyayi* are also valid answers.
   Nouns: *teliwhu* (man), *da'mo'mo'* (woman), *basa'* (book)

2. Suffixes:
   -i : past tense
   -ge : found on verbs of relative (or any other name for it) clauses
   -s- : found on verbs of relative clauses before *–ge*, if the subject of the relative clause is different from the subject of the matrix/main clause
   Prefixes:
   di- : first person argument (subject and indirect object)
   um-: second person argument (subject and indirect object)

3. **Note**: We will be using the following terminology: S for subjects, O for objects and R for recepients, rel for relative clauses and mat for matrix clauses. Since the object of matrix and relative clauses is same in all the sentences ("book), I will simply refer to it as O. Thus, we have 5 arguments, S-rel, S-mat, O, R-rel and R-mat, and 2 verbs, V-rel and V-mat, in each sentence.

   The underlying order is: S-rel R-rel O V-rel S/R-mat* V-mat
   ****Note**: Any relative ordering between S-mat and R-mat is acceptable.

   If R-mat or S-mat is an argument in the relative clause (either R-rel or S-rel), then it is omitted i.e. the same argument is not repeated twice.

   Moreover, if any of these arguments are 1st person or 2nd person, then that argument is omitted, and it is only marked as a prefix on the respective verb.

   Of course, if the verb has no recipient (write/see), then the recipient argument is omitted.