SOLUTIONS

The Twelfth Annual
North American Computational Linguistics Olympiad
2018
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Invitational Round
March 8, 2018

Serious language puzzles that are surprisingly fun!

-Will Shortz, Crossword editor of The New York Times and Puzzlemaster for NPR
(I) A Menya Puzzle (1/1)

I1. Match up the Menya words and phrases to their well-formed English translations.

<table>
<thead>
<tr>
<th>Menya</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ai</td>
<td>G. done</td>
</tr>
<tr>
<td>2. tānɡa</td>
<td>M. now (this + TIME)</td>
</tr>
<tr>
<td>3. yā naqānāŋa</td>
<td>A. a very large tree (tree big + very)</td>
</tr>
<tr>
<td>4. ymeqā wāŋqā</td>
<td>N. a small child</td>
</tr>
<tr>
<td>5. moni naqāŋganji</td>
<td>Q. Fines are big these days.</td>
</tr>
<tr>
<td>6. ōmaqā naqā</td>
<td>B. an important person (person big)</td>
</tr>
<tr>
<td>7. yāmbuayā</td>
<td>E. a Cassava plant</td>
</tr>
<tr>
<td>8. ymeqā qokā</td>
<td>P. a son (child + male)</td>
</tr>
<tr>
<td>9. ōkewi yŋŋa naqā hmanji</td>
<td>D. The ōkew is not a large bird.</td>
</tr>
<tr>
<td>10. aiŋgā</td>
<td>F. long ago (done + TIME)</td>
</tr>
<tr>
<td>11. yā aŋa</td>
<td>O. a wooden house</td>
</tr>
<tr>
<td>12. buayā</td>
<td>K. a sweet potato</td>
</tr>
<tr>
<td>13. ōmaqā qokā</td>
<td>H. a man (person male)</td>
</tr>
<tr>
<td>14. tā</td>
<td>L. this</td>
</tr>
<tr>
<td>15. i</td>
<td>J. that</td>
</tr>
<tr>
<td>16. tā sipqāti botqā ɑ̈witɑ̈ti</td>
<td>I. I wonder if this is a ship or a boat.</td>
</tr>
<tr>
<td>17. i tāqueqā ōŋi?</td>
<td>C. That is whose house?</td>
</tr>
</tbody>
</table>

I2.

Translate into Menya.

a. ‘large’ naqā
b. ‘a small piece of wood’ or ‘a small stick’ yā wāŋqā (tree/wood small)
c. ‘the house’ aŋi (aŋā+i)
d. ‘a very small bird’ yŋŋa wāŋqānāŋa

Translate into English.

e. aŋa naqānāŋa a very large house
f. iŋgā then (that + TIME)
g. hikŋāŋga (note: hikŋā means ‘lad’ or ‘young man’) as a youth (while a young man)

I3. Within one of the multiword Menya phrases in the data is a single word typically used by Menya speakers to mean ‘husband.’ Which word is it?

Answer: qokā
(J) It’s True: The truth about Chalcatongo Mixtec (1/2)

J1. Answers:

<table>
<thead>
<tr>
<th>Chalcatongo Sentences</th>
<th>English Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ndučá kaa ñíɁní.</td>
<td>a. The water is hot.</td>
</tr>
<tr>
<td>2. Maria kúu iì xasúčí.</td>
<td>e. Maria is a young person.</td>
</tr>
<tr>
<td>3. ÑíɁní ndučá.</td>
<td>f. The water is hot.</td>
</tr>
<tr>
<td>4. Juan kaa lúlí.</td>
<td>i. Juan is small / short.</td>
</tr>
<tr>
<td>5. Ndežu kaa żaʔu.</td>
<td>h. The food is expensive.</td>
</tr>
<tr>
<td>6. Súčí Maria.</td>
<td>g. Maria is young.</td>
</tr>
<tr>
<td>7. Juan kúu xažiirí.</td>
<td>c. Juan is my husband.</td>
</tr>
<tr>
<td>8. Pedro kúu xalúlírí.</td>
<td>b. Pedro is my child.</td>
</tr>
</tbody>
</table>

J2. Translate the following into Chalcatongo Mixtec:
   a. depth = xakûnú
   b. heat = xañíʔnì
   c. Maria is brave = Ndeʔé Maria.
   d. Pedro is tall. = Pedro kaa súkú.
   e. Pedro is a tall person. = Pedro kúu iì xasúkú.
   f. The fruit is red. = Kwaʔá xabiší.
   g. My fruit is the green one. = Xabiširí kúu xakwií.
   h.* It is true. = Kaa ndáa.
   i.* It is true. = Ndáa.
   j.* It is the truth. = Kúu xandáa.

*There is no equivalent in Chalcatongo Mixtec of the English “it” in these sentences.

Notes:
This problem is based on several features of Chalcatong Mixtec – however, for the purposes of the problem, some of the tasks & the discussion below have been simplified.

1. Two copulas:
Chalcatongo Mixtec has two verbs that can be used as copulas: kúu and kaa.
Kúu is used when the predicate is a noun phrase, as in example sentence 2: Maria kúu iì xasíʔi. = Maria is a woman.
However, when the predicate consists of an adjective, the copula is kaa. This can be be seen in example sentence 4: Juan kaa lúlí. = Juan is short / small.
2. The copula “kaa” as optional & its role in adding emphasis to the subject as sentence topic:
The copula kaa is also optional – as example sentences 1 and 3 demonstrate. Sentence 1 features the copula kaa. Nduča kaa ŋîʔnî. – this means that the subject of the sentence, nduča, is stressed or emphasised. The speaker is referring to a particular volume of water, whereas in sentence 3, the copula kaa can be omitted: Ŋîʔnî nduča. In this case, the speaker is not emphasising a particular volume of water, they are not putting any emphasis on the water as topic & subject of this sentence. Interestingly, the word order (which is mostly VSO in Chalcatongo Mixtec, but not consistently) changes when the copula kaa is omitted, the predicate (adjective) precedes the subject.

3. Nominalization: making nouns out of adjectives
By adding the prefix xa- to an existing adjective, you can create a noun with a similar meaning as the original adjective. In example sentence 6: the adjective súčí translates as “young”, while in example sentence 2: Maria kúu iî xasúčí, a new noun has been formed by adding xa to súčí, creating the noun “young one (young person)”.

4. Possessive marker –rí:
The suffix –rí can be added to the end of a noun to express first person singular possessive (e.g. “my” or “mine”). Example sentence 8 demonstrates this: Pedro kúu xalúlírí. Here the original adjective lúlí (small, short) has become a noun through having the nominalizer xa- prefixed (making it mean “child”) and the adding of the suffix -rí can be translated as the possessive determiner “my”.

References:
• https://www.ethnologue.com/language/mig
(K) Sri Lankan Names (1/1)

<table>
<thead>
<tr>
<th>Start</th>
<th>End</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>4</td>
<td>Place</td>
</tr>
<tr>
<td>9</td>
<td>11</td>
<td>Person</td>
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<tr>
<td>14</td>
<td>16</td>
<td>Person</td>
</tr>
<tr>
<td>23</td>
<td>24</td>
<td>Place</td>
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<tr>
<td>26</td>
<td>28</td>
<td>Person</td>
</tr>
<tr>
<td>36</td>
<td>39</td>
<td>Place</td>
</tr>
<tr>
<td>41</td>
<td>43</td>
<td>Person</td>
</tr>
</tbody>
</table>

This corresponds to:

<table>
<thead>
<tr>
<th>English</th>
<th>Sinhalese</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>He lives in the Colombo District.</td>
<td>ඉහු සිල්වියට්කේ දිස්ත්රික් කේ ජීවත්වේ.</td>
<td>Place</td>
</tr>
<tr>
<td>Sometimes, Mrs. Sirisena meets him for meals.</td>
<td>ඉහු කොලොම් පුළුලෙන් පිළිබඳ උත්සාහකයා අගන් මෙය.</td>
<td>Person</td>
</tr>
<tr>
<td>Mr. Gunaratne eats with them.</td>
<td>ඉහු සමග ඉදිකරක් ආහාර කරය.</td>
<td>Person</td>
</tr>
<tr>
<td>Last week, he flew to Dehiwala.</td>
<td>ඉහු දිස්ත්රික් කේ වියට බිම් කරය.</td>
<td>Place</td>
</tr>
<tr>
<td>Mr. Weeraratne always meets him there.</td>
<td>ඉහු සමග ඉදිකරක් ආහාර කරය.</td>
<td>Person</td>
</tr>
<tr>
<td>But, he still lives in Sri Jayawardenepura Kotte.</td>
<td>ඉහු සමග ඉදිකරක් ආහාර කරය.</td>
<td>Place</td>
</tr>
<tr>
<td>Mrs. Weeraratne eats with her cousin when he is away.</td>
<td>ඉහු සමග ඉදිකරක් ආහාර කරය.</td>
<td>Person</td>
</tr>
</tbody>
</table>

Translation credit: S. Suthakaran

For places

1. Start with the (ශ්‍රී) ඉහු and identify Sri Jayawardenepura Kotte (ශ්‍රී වර්ධනපුර ෝට්කට්) in sentence 6. You know this is a place.

2. Using the context of this sentence, find that sentence 1 also has ඉහු and so this sentence likely has a place. The only place name that could match the place names is that for Colombo District: (ක ොළඹ දිස්ත්රික් කේ).

3. After finding all other solutions (for places and people), you are left with sentence 4. There is only one word that starts with a "d" (කොපියෝ) in this sentence. This is dehivalata (Dehiwala).

For people

- 2 and 5 share the words ඉහු සමග ආහාර කරය; while 3 and 7 share the words ඉහු සමග ආහාර කරය. Since the language is SOV, you can assume that the words at the end of the sentence are not the names.
- These sentences all each have either උන්දිකාර්කි or උන්දිකාර්කි which are close in form and there are two w/ one version (husband) and two w/ the other (wife). This the most probable choice for the “married” indicator.
- 5 and 7 both have ඉහු සමග ආහාර කරය and ඉහු සමග ආහාර කරය in them, but since උන්දිකාර්කි / උන්දිකාර්කි is next to the name and ඉහු සමග ආහාර කරය shows up in the verb phrase in 7, ඉහු සමග ආහාර කරය is the probable name in 7, making ඉහු සමග ආහාර කරය the name in 5, and the other two names following the same pattern (last name + married marker), since it is a rule that the names are one word long last names and no first names.
### L1.

<table>
<thead>
<tr>
<th>Instance</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct Label</td>
<td>V</td>
<td>N</td>
<td>V</td>
<td>N</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>V</td>
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<td>N</td>
<td>V</td>
<td>N</td>
<td>N</td>
<td>V</td>
<td>N</td>
</tr>
</tbody>
</table>

### L2.

<table>
<thead>
<tr>
<th>Instance</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learned Label</td>
<td>V</td>
<td>N</td>
<td>N</td>
<td>V</td>
<td>V</td>
<td>N</td>
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<td>V</td>
<td>N</td>
<td>N</td>
<td>V</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### L3. Label all instances V.

This can be used as a baseline, because it requires no linguistic rules of the sentence to assign and is the default *majority* correct V/N option from the correct labels (the “gold standard”).

### L4. 1. B; 2. C; 3. A

<table>
<thead>
<tr>
<th>Prep</th>
<th>Verb</th>
<th>Noun1</th>
<th>Noun2</th>
<th>Correct</th>
<th>Rule A</th>
<th>Rule B</th>
<th>Rule C</th>
</tr>
</thead>
<tbody>
<tr>
<td>[1]</td>
<td>as</td>
<td>joined</td>
<td>circus</td>
<td>walker</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[2]</td>
<td>of</td>
<td>is</td>
<td>head</td>
<td>acrobats</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[3]</td>
<td>in</td>
<td>performs</td>
<td>act</td>
<td>leotard</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[4]</td>
<td>with</td>
<td>likes</td>
<td>routine</td>
<td>trapeze</td>
<td>N</td>
<td>N</td>
<td>V</td>
</tr>
<tr>
<td>[5]</td>
<td>as</td>
<td>liked</td>
<td>act</td>
<td>child</td>
<td>V</td>
<td>N</td>
<td>V</td>
</tr>
<tr>
<td>[6]</td>
<td>with</td>
<td>performs</td>
<td>act</td>
<td>gusto</td>
<td>V</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>[7]</td>
<td>with</td>
<td>perform</td>
<td>act</td>
<td>sadness</td>
<td>V</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>[8]</td>
<td>in</td>
<td>lost</td>
<td>penny</td>
<td>street</td>
<td>V</td>
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<td></td>
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<tr>
<td>[9]</td>
<td>with</td>
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<td>charm</td>
<td>inscription</td>
<td>N</td>
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</tr>
<tr>
<td>[10]</td>
<td>with</td>
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<td>routine</td>
<td>Charley</td>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[12]</td>
<td>with</td>
<td>likes</td>
<td>act</td>
<td>bananas</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>[13]</td>
<td>with</td>
<td>likes</td>
<td>one</td>
<td>pie</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>[14]</td>
<td>with</td>
<td>perform</td>
<td>act</td>
<td>Annie</td>
<td>V</td>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>
(M) Quests and Requests in Nivkh (1/2)

M1.

<table>
<thead>
<tr>
<th>1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
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<th>18</th>
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<th>22</th>
<th>23</th>
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<tbody>
<tr>
<td>G</td>
<td>Q</td>
<td>T</td>
<td>K</td>
<td>B</td>
<td>M</td>
<td>P</td>
<td>A</td>
<td>R</td>
<td>N</td>
<td>I</td>
<td>W</td>
<td>D</td>
<td>F</td>
<td>V</td>
<td>S</td>
<td>E</td>
<td>U</td>
<td>H</td>
<td>O</td>
<td>L</td>
<td>C</td>
<td>J</td>
</tr>
</tbody>
</table>

M2.

| ņi  tįpikamuxelix lithium | I need your big boat |
| ņi  hazyafk’elix | I need that bear |
| ņi  taflangxelix | I need this big ash |
| ņi  p’ețusk’elix | I need my own meat |
| ņi  ahaqxelix | I need that cap over there |

M3.

| I need your big track. | ņi tįpilatįfk’ekid / xekid |
| I need my knife. | ņi Ňzaqoxekid |
| I need that cap over there. | ņi ahaqxekid |
| I need your hare. | ņi Ňajkxekid |
| I need my nail. | ņi Ňzrovsk’ekid / xekid |

**How to solve:**

**Easy step 1**
See that ņi = I
See that xekid = need (x → k’ after f and s)
alternate analysis zyafk’ and liysk’ end in k’ (x → ervative/after k’)
These analyses might not pop out at first, but they are seeable.

**Easy step 2**
Count the nouns in the English translations.
See that fish shows up 3 times.
See that cap shows up 5 times.
See that hut shows up 1 time.
See that all other nouns show up twice.

**Step 3a**
Look for correspondences in the Nivkh data (looking for fish, cap, and hut)

**Step 3b**
Notice ‘pila’ (could initially mean ‘big’ or ‘over there’ by factoring out all of the nouns – cap is tricky, but the others are easy)
Notice ťo 3 times (after segmentation of pila), ţo = fish
Notice Ňivra = my hut, so ivra = hut, Ňi means my, which is nice because it goes with Ňi=I
Notice (h)aq = hut (5 times) – the h will be tricky
Step 4
figure out if pila is ‘big’ or ‘over there’
compare ţpilazyafk’ and tapilaŋo = ??(that or this)- pila –fish
Notice that the two words containing pila have different prefixes (t vs. ţ)
Look at the other sentences that contain ‘big’ or ‘over there’ in their translations.
zyafk’ = either boat or bear
Compare I need that boat over there vs I need that fish over there
Notice that the prefixes don’t match
Compare I need this big fish with I need your big bear
Notice they have different prefixes, so ta = this, ţ=your
Now you can match up 13 with D, 19 with H, 7 with P and 8 with A, ...

Step 5
You still have ţo and a-ţo – one means a fish and the other means that fish over there
Notice a-mu and ţ-mu. ţmu is my ___. Of the nouns that appear twice, boat, branch, and picture have ‘my’ in their translation.
Only ‘boat’ also goes with ‘that over there’, none have ‘a’ translations. So mu = boat, ţ = my, and a=that over there.
So 1=G, 16=S, 14=F and 20=O

Step 6 : Cap
aq shows up 5 times (it is haq, and x→∅/after a prefix)
2: ţi ha-haq-xekið
5: ţi ţ-qa-xekið
12: ţi ţ-aq-xekið
17: ţi ţ-it’ulv-haq-xekið
21 : ţi haq-xekið

Meanings :
B : ‘I need my cap’
E: ‘I need my winter cap’
L: ‘I need a cap’
Q: ‘I need that cap’
W: ‘I need your cap’

evident that 12=W, 5=B, 17=E (so it’ulv(h) = winter, but the ‘h’ shows up in 21 too, so it’ulv)
a cap vs that cap, we know ‘a’ = no prefix on fish, and haqxekið is obviously less prefixed than hahahaqekið , so haq = cap (h deletes after a C, or after ‘my’ and ‘your’) ha = that
21=L, 2=Q

Step 7
ha-zaqo and ţ-zaqo = that X and your X , so zaqo = knife and 9=R and 18=U
lišk’ and ţ-lišk’ = a X and your X, so lišk’ = wolf and 10=N and 23=J
ţ-eľaŋk and ţ-eľaŋk = your X and my X, so 22=C and 4=K
p’-eznaj and ţ-eznaj = my own X (we haven’t seen p’ before, but we know ţ is ‘your’) and your X, so 6=M and 15=V
i-tafk’ and tafk’ = his/her X (by elimination) and a X, so 3=T and 11=I

The only thing left was the vowels of the prefixes of a few forms. I took the offenders out. I modified the answers so that there are 2 right answers for 2 of the Eng à Nivkh translations.
(N) You’ve Got This: Fijian Ownership (1/1)

N1. | Fijian | English | English phrase | Fijian translation |
---|---|---|---|
| a. uto | heart | my heart | na utoqu |
| b. yaqona | kava | her kava (she’s drinking) | na mena yaqona |
| c. draunikau | witchcraft | my witchcraft (used on / against me) | na kequ draunikau |
| d. dali | rope | your (sing.) rope (you own) | na nomu dali |
| e. ika | fish | your (dual) fish (for dinner) | na kemudrau ika |
| f. wai | water | your (pl.) water | na memuni wai |
| g. luve | child | her child | na luvena |
| h. yaqona | kava | his kava (drunk in his honor) | na kena yaqona |
| i. waqa | canoe | our (incl.) canoe | na noda waqa |
| j. yapolo | apple | their apple (they’re selling) | na nodra yapolo |
| k. draunikau | witchcraft | your (dual) witchcraft (you’re making) | na nomudrau draunikau |
| l. dali | rope | your (pl.) rope (restraining you two) | na kemuni dali |
| m. maqo | mango | their mango (for drinking) | na medra maqo |

N2.

b. ‘My coconut’: *na mequ niu* means my coconut for drinking (coconut water from), *na kequ niu* means my coconut for eating (the inside of), and *na noqu niu* means my coconut for selling, picking, etc. There may be up to five meanings available in the data: my inalienable coconut (in a strange fantasy universe), my alienable coconut, my edible coconut, my drinkable coconut (assuming you are referring to the liquid), a coconut that will fall on me or be used against me out of my control.

Notes:

| Table of pronouns used in the data set: |
|---|---|---|
| | singular | dual | plural |
| 1 | -qu | -da (incl) |
| 2 | -mu | -mudrau | -muni |
| 3 | -na | -dra |

(Simplified) System of possessives in Fijian:

- **inalienable / direct possessions**: (most) body parts & relatives (possessor directly marked on the noun, no classifier)
- **indirect possessions**: possessor suffixed on the relational classifier
  - classifier *me*:- drinkables / liquids and mushy-soft edibles intended for sucking, slurping or drinking
  - classifier *ke*:-
    * solid edibles intended to eat;
    * possessor is the subject matter or semantic patient
- classifier *no*:-
  * general possessions that don’t belong in the other three categories;
  * edibles and drinkables used for other purposes (i.e. selling, growing, etc.)
**Grammar chart:**

<table>
<thead>
<tr>
<th>Person:</th>
<th>Past tense:</th>
<th>Future tense:</th>
<th>Negative*</th>
</tr>
</thead>
<tbody>
<tr>
<td>first sing</td>
<td>stem + tt + ēn</td>
<td>stem + pp + ēn</td>
<td>stem + ēn</td>
</tr>
<tr>
<td>second sing</td>
<td>stem + tt + āy</td>
<td>stem + pp + āy</td>
<td>stem + āy</td>
</tr>
<tr>
<td>third person sing masculine</td>
<td>stem + tt + ān</td>
<td>stem + pp + ān</td>
<td>stem + ān</td>
</tr>
<tr>
<td>third person sing feminine</td>
<td>stem + tt + āl</td>
<td>stem + pp + āl</td>
<td>stem + āl</td>
</tr>
<tr>
<td>first plural</td>
<td>stem + tt + ēm</td>
<td>stem + pp + ēm</td>
<td>stem + ēm</td>
</tr>
<tr>
<td>second plural</td>
<td>stem + tt + ār</td>
<td>stem + pp + ār</td>
<td>stem + ār</td>
</tr>
<tr>
<td>third plural</td>
<td>stem + tt + ār</td>
<td>stem + pp + ār</td>
<td>stem + ār</td>
</tr>
</tbody>
</table>

*when stem ends in -i as in “pati”, the -y- is added e.g. “patiēn” – a glide after a front vowel.
### EXPLANATION
The verb (which includes the subject pronoun) occurs at the end of the sentence, after the direct object. The indefinite article (‘a’) is not translated.

Where nouns are modified, there is a choice of word order: the modifier (an adjective or relative clause) can precede or follow the noun. If it follows, then the final vowel is doubled and a –b added (indicating object case). Compare akra tak ‘strong man’ and tak akraab, translated here as ‘a man that is strong’ (actually ‘strong man’ would also be a reasonable translation, but we have presented the data as if the word-order change mirrored a change in translation, just to make things more straightforward when it comes to possible translations in the exercise). If it is a relative clause, an –e is added to the verb, but again the two word-orders are possible, with the same vowel-doubling +b rule: from Tak rihan ‘I saw a man’ we get Rihane tak or tak rihaneeb, both translated as ‘a man that I saw’ (because in English we can’t say something like ‘a seen by me man’ with the relative clause preceding the noun).

Data from *Invitation to Linguistics* (Richard Hudson, Blackwell, 1984).
Here is a summary of all the answers--more detailed descriptions follow these answers:

(a) membuat
(b) memilih
(c) mattimbe
(d) mappande
(e) hatumba
(f) hatumbi
(g) flawta
(h) ndisko
(i) ŋgopak
(j) esosi
(k) embafu
(l) epagi
(m) etambi
(n) nasal
(o) voiceless consonant
(p) sentence

Part 1:
Every verb has a root. To form the passive of the verb, simply add the prefix di-. To form the active, add the prefix meN-, where N is the nasal at the same place of articulation as the following consonant (or is n if the root is vowel-initial). If this prefixing results in a nasal being directly followed by a voiceless stop, delete the voiceless stop; e.g., underlying /mentulis/ becomes /ditulis/.

From dibuat and dipilih, we can see that the roots for “make” and “choose” are buat and pilih, respectively. In both cases, the active prefix would then be mem- since the start of the root is bilabial; but for pilih the p must then be deleted because mempilih has a nasal followed by a voiceless stop. Thus, the answers are:
(a) membuat
(b) memilih

Part 2:
Mandar is very similar to Indonesian but with a couple of differences: First, the default nasal (ie the one before vowels) is ŋ rather than n as in Indonesian. Secondly, when a configuration of a nasal followed by a voiceless consonant occurs, it is not repaired by deleting the voiceless consonant but rather by turning the nasal into the voiceless consonant; e.g., underlying /mantunu/ becomes /mattunu/. Finally, the active prefix is maN- rather than meN-.

From ditimbe and dipande, we can see that the roots for “throw” and “feed” are timbe and pande. Both of these start with voiceless sounds, so in both cases the nasal turns into a copy of the voiceless sound. Thus, the answers are: 
(Q) Better Left Unsaid (2/3)

(c) mattimbe
(d) mappande

Part 3:
From the examples, you can see that -pa is a possessive prefix while -pi means “in”. However, the p in these suffixes becomes b if the preceding sound is a nasal. Using this info, we get the following answers:
(e) hatumba
(f) hatumbi

Part 4:
From the examples, you can see that the prefix N- means “my” (where N is a nasal at the same place of articulation as the following sound). If the word begins with a voiceless stop, then the m- prefixation also results in voicing of the voiceless stop. If it begins with a voiceless fricative, then the N- is not realized at all. Using these rules, we get:
(g) flawta
(h) ndisko
(i) ngopak

Part 5:
Each noun has a stem. To make the singular, you give the stem the prefix olu-, while to make it plural you add the prefix eN- (where N is a nasal at the same place of articulation as the following sound). However, the nasal is deleted from the eN- prefix if the following sound is voiceless. Thus, we get the following answers:
(j) esosi
(k) embafu
(l) epagi
(m) etambi

Part 6:
In all 5 previous parts, the relevant phonological process(es) all worked to avoid having a configuration of a nasal followed by a voiceless stop. Indonesian did this by deleting the stop (which might in fact be better viewed as the nasal and stop coalescing); Mandar did this by turning the nasal consonant pair into a geminated version of the consonant; Quechua did this by voicing the consonant; Zoque did this by deleting the nasal (if before a voiceless fricative) or by voicing the stop if before a voiceless stop; and Lunyole did this by deleting the nasal. Thus we can sum it up by answering:
(n) nasal
(o) voiceless consonant

The word in the bolded sentence that violates the rule is sentence, which contains nt (as well as [ns] if you think phonetically!):
(p) sentence
Sources:

- **General inspiration and source for some language data:**

- **Puyo Pungo Quechua:**

- **Indonesian:**
  ◦ The following dictionary: [http://www.lexilogos.com/english/indonesian_dictionary.htm](http://www.lexilogos.com/english/indonesian_dictionary.htm)

- **Mandar:**

- **Lunyole:**
  ◦ The following dictionary: [http://lunyole.webonary.org/](http://lunyole.webonary.org/)

- **Zoque:**
R1.a. UFO
R1.b. USA
Explanation: This sentence has two possible parses--either SSSSSRRRSSRRRRR (UFO) or SSSSSRRSSSSRRRRR (USA)--due to prepositional phrase attachment ambiguity.

R2.a. Egypt
R2.b. China
Explanation: This sentence has two possible parses--either SSRSSSSRSSRRSSRSSRRRRR (CHINA) or SSSRRSSSSRSSRRSSRSSRRRRR (EGYPT)--due to ambiguity in the parts of speech of individual words. The two possible parse could be paraphrased as “The saw (cutting tool) that was made out of glass and that was felt by the really soft orange (fruit) really heard the giraffe” and “The (drinking) glass saw (observed) that the really soft, orange-colored felt (fabric) really heard the giraffe.”

R3.a. Quito
R3.b. There are multiple possible reasons why the cities other than Quito wouldn't work; providing any of the answers is fine. Here are the specific problems with the other cities:
- All five of them would require an R before there have been two S's, which is impossible (Fez and Perth start with R, but you cannot reduce without anything on the stack; and Ottawa, Oslo, and Irkutsk start with SR, but you cannot reduce with only one thing on the stack).
- For the sequence of S's and R's to work, the number of S's must be exactly one more than the number of R's. This is not true for any of the five cities.
- Ottawa and Oslo have an even number of letters, which is impossible in this code.
- Fez, Irkutsk, and Perth end with a S, which is impossible.

R3.c. Some possible sentences:
- the giraffe here heard the really really really soft orange glass saw extraordinaire
- the giraffe here heard the really really really glass soft orange spots extraordinaire