Олимпиада студентов и выпускников «Высшая лига» – 2021 г.
Критерии оценивания олимпиадных заданий заключительного этапа
по направлению «360. Фундаментальная и прикладная лингвистика»

Task 1. Hayfoot, strawfoot!

Preliminaries:

Let us term any two soldiers looking at each other a *conflict*.

Let us term any configuration of the row in which there are no conflicts a *final configuration*. In a final configuration, there are no turns, so that it does not change anymore.

- Instead of saying that the soldiers turn, we can consider them as changing places, so that in a pair of conflicting soldiers, instead of turning, the right soldier, the one looking left, moves left, and the left soldier, the one looking right, moves right. In each turn, all conflicting soldiers swap places, with the conflicting soldiers looking to the left moving to the left, and all conflicting soldiers looking to the right moving to the right. As one simple consequence, the total number of soldiers looking left and right cannot change.

Q1: The answer is: No, the soldiers cannot keep turning around infinitely. There were several different solutions.

Solution 1. Let us replace all soldiers looking to the right with a 1, all soldiers looking to the left with a 0. Each conflict is then a sequence 10 which changes to 01. Now consider the row as a binary number. With each turn, the binary number decreases. A natural number cannot decrease infinitely. Q.E.D.

Solution 2. Proof by induction: n soldiers will arrive at a final configuration after a finite number of turns. Indeed:

The basis (one soldier) is trivial.
Let us assume the statement has been proven for n soldiers. Now let us prove it for n + 1. Consider the rightmost soldier (RMS).

1. If RMS is looking to the right, he does not conflict with any other soldier, so we can consider the other n soldiers separately. On the assumption of the induction, for n, the statement has been proven.

2a. Else, if RMS is looking to the left:

a. If the whole row is also looking to the left, there are no conflicts, so this is the final configuration.

b. If it is *not true* that the whole row is looking to the left (i.e. some of the soldiers are looking to the right), take the rightmost soldier looking to the right.
   i. If this soldier is immediately facing RMS, then the RMS will turn to the right and we arrive at a situation of (1) above.
   ii. If this soldier is not immediately facing RMS, then there is a number of soldiers between this soldier and RMS, all facing left. The soldier will

then be “moving” rightwards until (s)he reaches the RMS. After this, RMS will turn to the right, and we arrive at a situation of (1) above

Q.E.D.

2b. Else, if RMS is looking to the left:

Either (s)he will at some point turn to the right and stop facing any other soldiers, or (s)he will never turn, which means he will never face another soldier (meaning looking into his face), so he will not conflict with other soldiers and we can again exclude him and consider the row of n soldiers. We arrive at a situation of (1)

Q.E.D.

Solution 3. Let us note that the leftmost left-looking soldier is moving to the left (supposed he is not the leftmost soldier) since at his left can only be right-looking soldiers, so he will at some point reach the left end of the row. Then we can consider the row without him. Applying the same logic to every leftmost left-looking soldier (not in the leftmost line of left-looking soldiers) we will at some point reach the situation where the row looks like LL...LLRR...RR (the number of L’s or R’s can be 0). This is a final configuration.

Q2:
As we have seen, the number of soldiers looking to the left does not change. So if at the final configuration it equals 0 or n (where n is the total number of the soldiers), it was also equal 0 or n at the beginning. In both situations not one of the soldiers turns around even once, because the row consists only of soldiers looking to the left or only of soldiers looking to the right (LL...LL or RR...RR).

Q3: (a note: we discovered there were two alternative ways to interpret Q3. Under one interpretation, the soldiers make only the first, random turn, and then do not turn anymore; this was supposed to be the actual Q3. Under another interpretation, the soldiers make only one turn *after the first, random turn* (so, the total of two turns). We decided to step down and consider both options.)

Solutions under Interpretation 1:

Solution 1. As has been shown in 1.3, the final configuration must be LL...LLRR...RR, so if the starting configuration is the final configuration, it has to be LL...LLRR...RR.

Solution 2. If there is a soldier looking to the right, on his right there can only be a soldier looking to the right, and so on rightwards to the end of the row. In other words, if there is a soldier looking to the right, to the right of him there is a continuous line of soldiers looking to the right to the right end of the row. The same is true about the soldiers looking to the left (mutatis mutandis). Then, the row looks like LL...LLRR...RR.

Solution for Interpretation 2. If there are no conflicts, the starting configuration is also the final configuration, which does not correspond to Interpretation 2 of the task. If there is a conflict, the soldier to the right from the conflict cannot be looking to his left (otherwise we will have a conflict after the turn, and there will be more turns), so (s)he is looking to the right. Again to the right, the soldier also has to be looking to the right (otherwise (s)he will be moving to the left until (s)he reaches the soldier who is moving to the right and was in the original

conflict). So to the right of the conflict the soldiers can only be looking to the right. Similarly, on the left side of the conflict the soldiers can only be looking to the left. Then, the row must look like this: LL..LLRLRR...RR.

Grading: (shown below out of 10; as the weight of the task was 35, the actual score can be calculated by multiplying this score by 35/10 = 3.5):

In Q1, we awarded 5 points for a correct proof, 0 points for a correct answer with no proof or with a proof which was largely problematic. One example of a common mistake was claiming without proof that the rightmost soldier will at some point turn right (this is not true; if it were true the whole row would always turn to the right at some point). If the proof was by and large correct, but had small issues, several points were taken away (the score would be 5 - x points, where x is an estimate of actually how big the small issues are).

In Q2, we awarded 0.5 points for the correct answer and 1 point for a correct proof (it should have been proven that the answer you provided is the only possibility).

In Q3, we awarded 1 point for the correct answer and 2.5 points for a proof. One common mistake here was suggesting that "the row has to have no conflicts" (as defined above) which is not a valid answer because it does not describe the configuration.

Task 2. Jealousy, speak!

In a nutshell: we are dealing here with the so-called *inverse number* marking system on nouns, whereby the presence of marking indicates a marked (unusual) quantification, whether singular or plural. On the verbs, we observe two interacting but distinct systems: *verbal number* (rather than agreement in number) comprising the values of singular, dual and plural; and the system of *agreement in inverse number*. While the two systems are better viewed as separate, the presence of inverse agreement marker ousts verbal number marking.

Detailed analysis.

Note: below, we attempt to formulate the solution in as rigorous terms as possible; many unwarranted assumptions that led to other terminological choices in the solutions of the participants were not considered mistakes (though some were - see below in the Common Mistakes section).

Trivially, the first wordform in each sentence is a noun, and the second is a verb (more specifically, a form of the verb 'give'). For the sake of simplicity, let us call the noun the object (which is not entirely warranted, but was implicitly assumed by most of the participants, so this will be easier to follow). The patterns of nominal morphology trivially suggest that we observe one nominal suffix, *-gɔ* and the rest is the stem. Because the only variable grammatical information on the noun is the number, we somehow have to relate the nominal suffix to quantification. Similarly, provided that *-ɔ́* is the root, all verbal prefixes must be somehow related to the categories of the object, and the data suggests that the only variable grammatical information on the verb is also related to the quantification of the object. <u>All these steps were considered trivial and were not graded</u>.

As the verb shows, the quantities of objects that are differentiated morphologically are one , two and three or more. We see that, all information taken into account together, there are three groups of nouns, two nouns in each group, which behave similarly: <u>Animals</u> 'cow' and 'horse'; <u>Plants</u> 'leaf' and 'potato'; and <u>Inanimates</u> 'stone' and 'rope'. A rigorous formal account of the morphosyntactic patterns for each of the group, without any attempt of further analysis - and, above all, without an attempt to interpret the use of the same markers, *-gɔ* and *dé-*, for the expression of the opposite meanings of the singularity and plurality - was graded 10, with a possibility of some bonuses or fines for further clever remarks or blunders, respectively.

Let us first consider <u>nominal morphology</u>.

Inverse number. We only observe the suffix *-gɔ* which expresses plurality with nouns for animals, singularity with nouns for plants, and is not used with nouns for inanimate objects. Let us first consider the nouns with which it is used, in apparently opposite functions. We can explain this pattern of use by stipulating that the marker is not a plural marker but a number marker which expresses the quantificational value which is <u>marked</u> (alias unexpected, salient, uncommon etc, in many other formulations from various participants) than the other. Horse and cows are more individuated, and leaves and potatoes are more like mass nouns (some participants provided parallel evidence on the noun for 'potato' from Russian). Is is quite common, if not more common, to talk about one horse or cow, so *-gɔ* is used for plural reference. On the other hand, it is more common to talk about foliage and piles of potatoes, so the singular reference is less common / more marked for these concepts and is thus expressed by *-gɔ*, in which case it is used as singulative marker. Let us label this category *inverse* number, as it is sometimes called in typological literature.

Importantly, no other category is expressed in the noun. There is no singular, dual or plural nominal number, and solutions that treated nominal forms as containing zero suffixes for singular, dual and plural, in parallel with verbal prefixation, were fined (but not if the were only graded with the base of ten). Indeed, if we consider *-gɔ* an inverse number marking separate from the conventional categories of the singular, dual and the plural, then all number categories are expressed by a zero, and this is not a valid analysis. And in case if we try to interpret *-gɔ* as an element of the conventional Sg ~ Du ~ Pl opposition, apart from making the inverse number analysis impossible, this would yield a system where a singular or a plural could be marked (depending on the noun), but the dual is always zero marked, a configuration highly unlikely on typological grounds.

The status of the nominal forms with dual reference is not absolutely clear. One could probably assume, together with some participants, that *-gɔ* with animates is more precisely a collective marker, as if referring to a herd / flock etc., and this is the reason why it is not used on nouns referring to a set of two elements.

As for the fact that the quantity of inanimate objects is not expressed morphologically, this can be accounted in terms of animacy hierarchy. Alternatively, one could suggest that the distinctions discussed for animates and plants are irrelevant for this group of nouns - rope and stone may be perceived either as individuated objects (and thus group with animates) or as mass nouns (and thus group with plants). Both suggestions seem to be equally plausible for the data presented.

Let us now proceed to the marking on the verb.

Verbal number. Let us first not consider the marker *dé-* which is transparently connected to the only nominal marker, the inverse number suffix (see below on inverse agreement). The use of the three markers *gya-* / *nẽn-* / *gyat-* is clearly the usual opposition between Singular, Dual and Plural. (Some participants also suggested to further segment *gyat-* into *gya-t-*, a plausible analysis that was not fully warranted by the data, so we did not score it, either negatively or positively). It is important to notice that these are *not* agreement markers. As we argued above, the noun itself does not express these oppositions (it only expresses the opposition of the inverse number). In other words, we deal with the quantification expressed on the verb alone, the so-called verbal number (more specifically its participant number variety - see e.g. Corbett 2000).

Inverse agreement. Let us now consider the use of *dé-*. In our data, this marker is used if and only if the noun carries the inverse number suffix *-gɔ*. Unlike verbal number prefixes, *dé-* may thus be interpreted as agreement (agreement in the category of inverse). (One of the participants did use the term inverse for this marking; unfortunately, (s)he meant inverse in the sense of hierarchical systems, and the solution obviously did not work).

Note that the two systems are better analysed as separate but interacting mechanisms. Considering them as one single system integrating *gya-* / *nẽn-* / *gyat-* / *dé-* leads to unexpected and unexplained syncretisms and ultimately undermines the inverse number analsysis and any attempt to explain the different functions of *dé-* and *-gɔ*

Interaction of verbal number and inverse agreement. What is important is that the inverse agreement marker <u>ousts</u> the relevant verbal number prefix from the verbal template; once the verb takes a non-zero marker of inversivity agreement, it cannot express participant number anymore. Trying to consider the prefix *dé-* as an element of the system constituted by the other verbal prefixes (as opposed to consider them as two separate systems, (a) agreement in inversivity and (b) participant number, as suggested above) leads to all kinds of problems, including being forced to posit the many zeroes for the singular, dual and plural on the noun.

Note: One analytical problem here is as follows. If we describe the use of *dé-* as agreement, then a noun with non-inverse number value noun supposedly controls a zero prefix and should oust verbal number prefixes just as *dé-* does. There are different ways to circumvent this, all

based on some type of hierarchy in which inverse agreement is higher than verbal number. Thus, one could say that the category of verbal number gets access to the prefix slot only if it is not taken by any material coming from inverse agreement.

General remarks and common mistakes.

Animacy hierarchy - multiple participants attempted to explain the number marking on the noun by the animacy hierarchy, known to be highly relevant for number marking cross-linguistically. While this step was possible (but not necessary) to explain absence of the marking on inanimate nouns, it could not explain the patterns of marking for animates and plants. As a result, participants who relied on animacy hierarchy alone would come to different version of the hierarchy (animates > plants > inanimate or animates > inanimates > plants) and could not explain the use of *-gɔ* in an adequate way (or at least I am unaware of any).

Countability - one or two participant suggested that the use of *-gɔ* is connected to countability. The intuition behind this explanation is partly true, but there are two issues with this solution. It either explains the use of the marker with plants (derivation of countables from uncountables) or the use of the marker with animates (derivation of uncountables from countables) but as such, this does not explain its use in both directions. So that, in any case, on top of collecting this to countability, you also had to posit it as a 'mirror' marker. Second, (un)countability is a semantically oriented notion, Saying that a noun is uncountable amounts to saying it is considered as a single entity, not a multiplicity. Then, a collective noun cannot be used with a verb prefixed with the plural *gyat-*. However, we see that 'leaves' and 'potatoes' do combine with the verbal plural marker.

Agreement class analysis - quite a few participants have called the classes as animates, plants and inanimates agreement classes (or genders). This is totally unwarranted and indicates a misunderstanding of the notion of agreement class, or else a wrong analysis of the data in the task. Indeed, by definition, agreement classes are a system of nominal categorization where the agreement with nouns as controllers formally depends on their affiliation with one of these classes. This is not the case in our data. As the solution above shows, the affiliation of a noun with a class of animates, plants or inanimates only determines the expression of (inverse) number, and the agreement on the verb is determined by this category, not by the affiliation of the noun itself. Of course, one would have to posit agreement class in case the different functions of *-gɔ* and *dé-* were not analysed in a unified way. But if the participant would suggest an explanation related to the use of *-gɔ* as based on markedness and *then* would call the nominal classification agreement classes, some score was subtracted (from the 35-40 base).

Agreement analysis - as I argued above in the solution, there are not enough grounds to posit inflection for the singular, dual and plural number on nouns (which also leads to multiple zeroes). Therefore, there is no number category on nouns (other than inverse number), and the verb cannot agree with the noun in this category; what we deal here with is verbal number.

Multiple zeroes - one of the consequences of either not providing a proper analysis of the multiple uses of *-gɔ* or of the number prefixes on the verb as agreement was positing multiple zeroes in nominal inflection. Please remember: positing zero is not a default analytical tool but only a necessary evil, and should be avoided whenever possible. Occam's Razor!

Differential object marking - several participants suggested that we deal here with differential object marking. By definition DOM is using different morphosyntactic strategies to mark the direct object depending on the properties of this object, such as animacy or definiteness. We have no evidence that *-gɔ* is in anyway related to the direct object relation, because all we have are "objects", the variation (having or not having *-gɔ*) may be explained as related to the expression of number, and (c) positing DOM does not explain any additional facts. Occam's Razor, please!

Simplex -gɔ dé- analysis - quite a few participants suggested that *-gɔ dé-* consituted on single marker divided by a wide space. This approach was not in any way warranted by the data in the task and is not well interpretable.
Object, patient or theme - most people would assume that the noun was the object of 'give'; this is not necessarily true (we do not have exact information on ditransitive alignment), but was not counted as a mistake. In fact, for the sake of terminological simplicity I have adopted the same simplification above.
Isolating class prefixes - several participants noticed common initial segments on the nouns belonging to the class of animals and especially to the class of plants. This is a plausible analysis, but did not - and could not - play any role in the further argument, and was not graded.
Redundant glosses - some people would include additional glosses such as Pst, 1Sg for the person of the Agent, Acc, etc. There is absolutely no evidence for these categories to be expressed in the language. OR.

Grading.
Below I only describe base grading. Additional problematic or illustrious statements could have led to adding a bonus or subtracting a fine.

A rigorous but formal description of patterns without any further analysis, including absence of any interpretation of why the same markers *-gɔ* and *dé-* seem to express plurality with one nouns and singularity with the others, was only scored as 10 as a base score.

Any feasible description of the use of *-gɔ* and *dé-* was graded as 35 to 40, depending on the transparency of the explanation.

The full score would be achieved if, in addition, the participant would explain that (a) noun did not distinguish number values of Sg, Du and Pl (b) inverse agreement and verbal number were two separate systems and (c) inverse agreement had a morphological priority over verbal number. Unfortunately, there were not any participant to whom the full score could be awarded.