Fifth International Olympiad in Theoretical, Mathematical and Applied Linguistics

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Solutions of the Problems of the Individual Contest

Problem #2

The negative forms are composed of a particle kas followed by a modification of the original form which contains the marker -(k)a'- in one form or another. The rules for insertion of this marker are as follows:

(1) The marker is inserted after the first syllable of the word if this syllable is either closed (i.e., ends in a consonant) or long (i.e., contains a long vowel); otherwise the marker is inserted after the second syllable of the word.

(2) If the marker is inserted after a long vowel, this vowel loses its length.

(3) If the marker is inserted after an open syllable, it retains its original form -ka'-; if it is inserted after a closed syllable (i.e., after a consonant), it loses its initial -k- and assumes the shape -a'-.

(4) If the marker is attached to the end of the word (by Rule (1), only possible in case of mono- and disylabic words), it assumes the shape of -(k)a:®a', where (k) stands or falls as predicted by Rule (3) above and ® is a copy of the preceding consonant. This shape can be regarded as the same -(k)a'- as above, but with -a:®- infixed into it.

§1. The combination in question is kw. We can see this, for example, from the word bakwanyiń 'my wrist' inserting the marker -ka'- after the second syllable, which implies that its first syllable is open.

§2.

base form		**negative form**
as	to sit	kas asa:sa'
enferme:ra	nurse	kas ena'ferme:ra
jiła:pa	to grate manioc	kas jiłaka'pa
de	to lie	kas deka:ka'
rulrul	jaguar	kas rula'rul
tipoysu:da	dressed in *tipoy*	kas tipoya'su:da
wurul	to roar	kas wurula:la'
dewajna	to see	kas dewaja'na
de:wajna	to see traces of somebody	kas deka'wajna

Problem #3

		amb	-ob	
v-	i-	gor	-eb	
		keni		-t
v-		keni		
	i-	nadir	-e	-t
		nadir	-ob	
v-	i-	nadir	-e	
v-		sadil	-ob	-t
v-	i-	sadil	-eb	
v-	i-	tavmGdomarev	-e	
	i-	tavmGdomarev	-e	
v-		tkvi		
		tkvi		
v-	i-	vli		-t
	i-	zam		-t

We break the Georgian words into their components. We derive the suffixes -e and -ob by comparing vinadire and nadirob, and the suffix -eb by contrasting visadileb and vsadilob. We can't tell if -ob is contained in ambob, -eb in vigoreb, or -e in (v)itavmGdomareve, because we have nothing to compare these forms to. Also we don't know if the word izam-t contains a suffix. We shall assume that all initial v- and i- are prefixes.

We analyse the translations as well.

I	←	say
you	←	say
you	◦	say
I	←	do
you *(pl.)*	←	do
you *(pl.)*	→	do
I	→	roll
we	◦	dine
I	→	dine
you *(pl.)*	←	hunt
I	←	hunt
you	◦	hunt
I	←	preside
you	←	preside
we	→	walk

There are 9 Georgian roots but only 7 English ones, meaning that some Georgian verbs have two or even three different roots (cf. *go* and *went* in English).

How are the person/number of the subject expressed? Let us count: 'I' occurs 6 times, 'you' 4 times, 'we' 2 times, 'you *(pl.)*' 3 times. This must correspond to some combination of prefixes and suffixes. It turns out that the combination of the first prefix and the last suffix serves our purpose: v+0, 0+0, v+t, 0+t occur exactly that many times. (From this it follows that in Georgian the subject person/number markers are constructed of markers of 1st/2nd person and singular/plural number.) So the problem is divided into four smaller ones. We can identify two pairs instanty: vigoreb 'I will roll', vivlit 'we will walk'; hence vsadilobt 'we dine' and visadileb 'I will dine' follow also. We are done with 'we'.

We have forms with the root nadir in all three remaining persons/numbers; this must be 'hunt'. The roots keni and zam mean 'do', consequently vkeni is 'I did'. Assuming that tense is marked in the same way in different persons/numbers, we also compute kenit 'you *(pl.)* did' and izamt 'you *(pl.)* will do'.

Most likely the form ambob, which bears the least similarity to the others, means 'you say', since no other present tense forms remain. We are left with (v)-tkvi and (v)-i-tavmGdomarev-e for 'I/you presided' and 'I/you said'. We can't be sure what is what, but common sense suggests that the more common concept should be expressed in a more compact way. The problem has been solved.

vtkvi	'I said'	nadirob	'you hunt'
kenit	'you *(pl.)* did'	visadileb	'I will dine'
inadiret	'you *(pl.)* hunted'	vinadire	'I hunted'
itavmGdomareve	'you chaired'	ambob	'you say'
vsadilobt	'we dine'	vitavmGdomareve	'I chaired'
tkvi	'you said'	izamt	'you *(pl.)* will do'
vigoreb	'I will roll'	vivlit	'we will walk'
vkeni	'I did'		

What did we learn about the tense markers? Let us make another table:

	do	say	walk	roll	dine	hunt	preside
←	keni	tkvi				i-nadir-e	i-tavmGdomarev-e
◦		amb-ob			sadil-ob	nadir-ob	
→	i-zam		i-vli	i-gor-eb	i-sadil-eb		

It turns out that the present tense has the suffix -ob and the future has the prefix i-. We have two groups of verbs: weak verbs with the same prefix i- in the past and the suffixes -e in the past and -eb in the future; strong verbs with no suffixes in these two tenses and with different roots for different tenses.

Problem №4

Precisely half of the names of squares include the word nif. It is reasonable to assume that these are the greater numbers – from 36 to 100, – with nif being the least among them. The frequently occurring word abo probably denotes addition. We notice the pair of squares nif abo tondor abo mer abo thonith and nif thef abo tondor abo mer abo thonith; this supports our guess that 36 is a key notion in the formation of the number names, since in that case we would expect the names of 64=36+28 and 100=64+36=36·2+28 to be very similar.

So the base of the number system is 6. There is one peculiarity: not only 36 but also 18 has a special name; accordingly, instead of multiplying 6 by 4 or 5, one adds 6 or 6 times 2 to 18. The multiplication of 6 by 2 is marked by the function word an; the multiplication of 36 by whatever number is not marked at all.

§1. mer an thef abo thonith = 6·2+4 = 16
nif thef abo mer abo ithin = 6^2 2+6+3 = 81
nif abo mer an thef abo sas = 6^2+6·2+1 = 49
nif abo tondor abo mer abo thonith = 6^2+18+6+4 = 64
nif thef abo tondor abo mer abo thonith = 6^2 2+18+6+4 = 100
tondor abo mer abo sas = 18+6+1 = 25
mer abo ithin = 6+3 = 9
thonith = 4
sas = 1
nif = 6^2 = 36

§2. mer abo sas × meregh = tondor abo mer an thef abo meregh
$7 \times x = (6+1) \times x$ = 18+6·2+x = 30+x

It follows that meregh is 5, and the equality is 7×5 = 35.

§3. nif ithin abo ithin = 6^2 3+3 = 111
mer an thef abo meregh = 6·2+5 = 17

§4. 58 = 6^2+18+4 = nif abo tondor abo thonith
87 = 6^2 2+6·2+3 = nif thef abo mer an thef abo ithin

Problem №5

By examining the data in the table we obtain the following correspondences between the sounds of Turkish and Tatar:

	Turkish		**Tatar**	**note**
1, 4, 11, 14	a	~	a	
2, 6, 12, 15	e	~	i	in the first syllable
7, 8, 13, 15, 18			ä	in a non-first syllable
3, 14, 16	o	~	u	
11, 17	u		o	in the first syllable
3, 16, 17			ı	*following u or o in Turkish*
1, 10, 14	ı			in a non-first syllable
13, 18	ö	~	ü	
7, 9	ü		ö	in the first syllable
9			e	*following ü {or ö} in Turkish*
5, 6, 8, 12, 15, 18	i			in a non-first syllable
5, 8, 10	m	~	m	word-medially
1, 6, 11, 16	b			word-initially if n follows somewhere
4, 9, 14			b	word-initially otherwise
1, 10, 11	d	~	d	
4, 12	t	~	t	
1, 2, 3, 6, 11, 16, 17, 18	n	~	n	
2, 6, 8, 10, 15, 18	l	~	l	
1, 4, 5, 7, 10, 12, 13, 15	r	~	r	
8	s	~	s	
14, 17	z	~	z	
7, 8, 12, 18	ş	~	ş	
3, 6, 14	c	~	ç	
2, 12	y	~	c	before Tatar i
4, 5, 9, 10, 16, 18			y	elsewhere
5, 13	ğ	~	g	
7, 13, 15	g	~	k	word-initially
2, 9, 15	k			elsewhere

Using these observations, we can reconstruct the missing words:

	Turkish	**Tatar**		**Turkish**	**Tatar**
19.	usta	osta	23.	bilezik	beläzek
20.	gözenek	küzänäk	24.	üstünde	östendä
21.	yılan	yılan	25.	bin	men
22.	yedişer	cideşär	26.	yumru	yomrı