第六届国际理论, 数理和应用语言学奥林匹克竞赛

保加利亚, 阳光海滩, 2008年8月4 — 9日

个人赛题目

解答规则

1. 毋需抄题. 将不同问题的解答分述于不同的答题纸上. 每张纸上注明题号、座位号和姓名. 否则答题纸可能被误放或遗失.
2. 解答需详细论证. 无解释之答案, 即便完全正确, 也会被处以低分.

题 #1 (20 分). 下面是以所谓的 Listuguj 拼写法拼写的 Micman 语的单词, 它们的语音转写及汉语翻译:

1	***tmi'gn***	dəmīgən	斧头
2	***an'stawteg***	anəstawtek	不安全
3	***gjiansale'wit***	əkciansalēwit	天使长
4	***mgumie'jo'tlatl***	əmkumiējōdəladəl	钉蹄铁 *(给马)*
5	***amqwanji'j***	amx^{w}ancīc	匙
6	***e'jnt***	ējənt	印第安代理人
7	***tplutaqan***	ətpəludaγan	法律
8	***ge'gwising***	gēg^{w}isink	躺在顶部
9	***lnu'sgw***	lənūsk^{w}	印第安女人
10	***g'p'ta'q***	gəbədāx	上方
11	***epsaqtejg***	epsaxteck	炉

(a) 转写这些词:

12	***gsnqo'qon***	愚蠢 (名词)
13	***tg'poq***	泉水
14	***gmu'jmin***	树莓
15	***emtoqwatg***	崇拜
16	***te'plj***	山羊

(b) 用 Listuguj 拼写法拼写:

17	ətpədēsən	南方
18	əmteskəm	蛇
19	alaptək	环顾四周
20	gəlamen	所以, 因此

NB: Micmac 是一种阿尔冈琴语. 在加拿大, 约有8000人使用该语言.

In the 转写 ə ≈ *o* in *abbot*, [c] = *ch* in *church*, [j] = *j* in *judge*, [x] = *ch* in Scottish *loch*, γ is the same sound but voiced; [^{w}] shows that the preceding consonant is pronounced with rounded lips. The mark ¯ denotes vowel length. —*Bozhidar Bozhanov*

题 #2 (20 分). The following are four excerpts from Old Norse poems composed around 900 C.E. All of them are written using the meter named *dróttkvætt* (lit. 'court meter'):

I

1 **ók at ísarnleiki**
2 **Jarðar sunr, en dunði ⋯**

II

1 **þekkiligr með þegnum**
2 **þrymseilar hval deila.**
3 **en af breiðu bjóði**
4 **bragðvíss at þat lagði**
5 **ósvífrandi ása**
6 **upp þjórhluti fjóra.**

III

1 **áðr gnapsólar Gripnis**
2 **gnýstœrandi fœri**
3 **rausnarsamr til rimmu**
4 **ríðviggs lagar skíðum.**

IV

1 **háði gramr, þars gnúðu,**
2 **geira hregg við seggi,**
3 **(rauð fnýsti ben blóði)**
4 **bryngǫgl í dyn Skǫglar,**
5 **þás á rausn fyr ræsi**
6 **(réð egglituðr) seggir ⋯**

One of the main principles of *dróttkvætt* is alliteration. The first line of each distich (pair of lines) contains two words beginning with the same sound, and the first word of the second line begins with this sound, too: e. g., **rausnarsamr**, **rimmu** and **ríðviggs** (III:3–4). All vowels are considered to alliterate with one another and with **j**: e. g., **ók**, **ísarnleiki** and **Jarðar** (I:1–2). But this is not the only rule.

The texts given above have been handed down in more than one manuscript. Sometimes different words are found in corresponding parts of the text, and the scholars have to decide which of the variants is original. Different considerations may motivate the conclusion. Sometimes the rules of versification help to recognize some of the variants as false. For example, in line I:2 we find not only **dunði**, but also **dulði** and **djarfi**. **dulði** can be rejected because of the structure of the verse, but both **dunði** and **djarfi** fit into the line, and one needs other reasons to choose between these words. In line III:1 **Gripnis** and **Grímnis** occur in the manuscripts, but **Grímnis** doesn't fulfill the requirements of the verse.

(a) Describe the rules which are observed in a distich of *dróttkvætt*.

***

(b) Given is a stanza in which 13 words are omitted:

V

1 [a] **(þreifsk reiddra øxa**
2 [b] **; knǫttu spjǫr** [c] **)**
3 [d] **bitu seggi**
4 [e] **þjóðkonungs ferðar,**
5 **þás (** [f] **hǫlða)**
6 [g] [h] [i]
7 **(hǫr vas** [j] **of** [k] **)**
8 [l] **(flugbeiddra** [m] **).**

The following list contains (in alphabetical order) all 13 omitted words and two words which do not belong in stanza V:

andskoti, Gauta, glymja, hlaut, hugfyldra, hœgra, ríks, rymr, sigr, smíði, svartskyggð, sverð, svírum, sǫngr, vigra

Fill in the gaps in stanza V.

NB: Old Norse is a North Germanic language which was in use approximately between 700 and 1100 C.E.

æ ≈ English *a* in *cat*, **œ** = French *eu* or German *ö* (these letters stand for long vowels). **ø** is read as a short **œ**; **y** = French *u* or German *ü*, **ǫ** is an open *o*. **au** and **ei** are pronounced as a single syllable. **ð** and **þ** = English *th* in *this* and *thin* respectively. **x** = **k**+**s**. The mark ´ denotes vowel length. All samples of poetry in the problem are given in a normalized orthography and conform to the rules of the genre. —*Alexander Piperski*

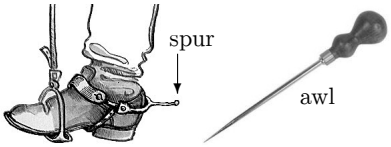
题 #3 (20 分). The following are words and compounds in two languages of New Caledonia -- Drehu 语 andCemuhî -- andtheir English translationsgiven out of order:

Drehu 语	中文
drai-hmitrötr, gaa-hmitrötr, i-drai, i-jun, i-wahnawa, jun, ngöne-gejë, ngöne-uma, nyine-thin, uma-hmitrötr	sanctuary, bunch of bananas, calendar, bone, church, coast, awl, Sunday, skeleton, wall

Cemuhî	中文
a-pulut, ba-bwén, ba-jié, bé-ôdu, bé-tii, bé-wöli, bé-wöli-wöta, tii, wöta	bed, animal, fork, cup, pencil, coast, to write, twilight, spur

And here are several words translated from Drehu 语 into Cemuhî:

Drehu 语	***gaa***	***ngöne-gejë***	***nyine***	***thin***
Cemuhî	***a***	***ba-jié***	***bé***	***wöli***



(a) 找出正确的对应关系.

(b) What do you think the words ***wahnawa*** and ***drai*** mean in Drehu 语, and ***wöli*** and ***pulut*** in Cemuhî?

(c) In Drehu 语 ***tusi*** is `book' and ***bii*** is `bee'. 翻译 Drehu 语: ***i-bii***, ***tusi-hmitrötr***.

NB: Drehu is spoken by over 10 000 people on Lifu Island to the east of New Caledonia. Cemuhî is spoken by approx. 2000 people on the east coast of New Caledonia. Both languages belong to the Austronesian family.

In Drehu ***ë*** ≈ *a* in *aspen*, ***ö*** = French *eu* or German *ö*, ***hm*** and ***hn*** are specific unvoiced consonants; ***dr*** and ***tr*** ≈ *d* and *t* in *word* and *art*, uttered with the tip of the tongue turned back; ***j*** and ***th*** = English *th* in *this* and *thin* respectively; ***ng*** = *ng* in *hang*; ***ny*** ≈ *ni* in *onion*.

A sanctuary is the principal, most sacred part of a church. —*Ksenia Gilyarova*

题 #4 (20 分). The following are words in Copainalá Zoqueandtheir English translations:

mis nakpatpit	with your cactus	**k2m2ŋdaPm**	shadows
nakpat	a cactus	**P2s ncapk2sm2šeh**	as ifabove my sky
mokpittih	onlywith the corn	**capšeh**	likea sky
pokskuky2sm2taPm	above the chairs	**pahsungotoya**	for the squash
pokskuy	a chair	**pahsunšehtaPmdih**	justlikesquashes
peroltih	onlya kettle	**t2ckotoyatih**	onlyfor the tooth
koc2ktaPm	mountains	**kumguky2sm2**	above the town
komg2sm2tih	rightabove the post	**kumgukyotoyataPm**	for the towns
P2s ŋgom	my post	**cakyotoya**	for the vine
k2m2ŋbitšeh	as ifwith the shadow	**mis ncay**	your vine

(a) 翻译成中文:

caky2sm2tih
k2m2ŋšeh
P2s mok
mis nd2ctaPm
pahsunbit
perolkotoyašehtaPm

(b) 翻译成 Copainalá Zoque:

for the chair
with my kettle
justlikea mountain
posts
above the shadows
your town

NB: The Copainalá Zoque language is of the Mixe-Zoque linguistic family. 在墨西哥南部的 Chiapas 省, 约有10 000人使用该语言.

2 ≈ *u* in *but*; **c** ≈ *ts* in *hats* (pronounced as a single consonant), **nc** ≈ *nds* in *hands*, **š** = *sh*, **ŋ** = *ng* in *hang*, **y** = *y* in *yay!*; **P** is a specific consonant (the so-called glottal stop).

—*Ivan Derzhanski*

题 #5 (20 分). The following are sentences in Inuktitutandtheir English translations:

1.	***Qingmivit takujaatit.***	Your dogsaw you.
2.	***Inuuhuktuup iluaqhaiji qukiqtanga.***	The boy shot the doctor.
3.	***Aanniqtutit.***	You hurt yourself.
4.	***Iluaqhaijiup aarqijaatit.***	The doctor cured you.
5.	***Qingmiq iputujait.***	You speared the dog.
6.	***Angatkuq iluaqhaijimik aarqisijuq.***	The shamancured a doctor.
7.	***Nanuq qaijuq.***	The polar bear came.
8.	***Iluaqhaijivit inuuhuktuit aarqijanga.***	Your doctor cured your boy.
9.	***Angunahuktiup amaruq iputujanga.***	The hunterspeared the wolf.
10.	***Qingmiup ilinniaqtitsijiit aanniqtanga.***	The dog hurt your teacher.
11.	***Ukiakhaqtutit.***	You fell.
12.	***Angunahukti nanurmik qukiqsijuq.***	The huntershot a polar bear.

(a) 翻译成中文:

13. ***Amaruup angatkuit takujanga.***
14. ***Nanuit inuuhukturmik aanniqsijuq.***
15. ***Angunahuktiit aarqijuq.***
16. ***Ilinniaqtitsiji qukiqtait.***
17. ***Qaijutit.***
18. ***Angunahuktimik aarqisijutit.***

(b) 翻译成 Inuktitut:

19. The shamanhurt you.
20. The teacher saw the boy.
21. Your wolf fell.
22. You shot a dog.
23. Your doghurt a teacher.

NB: Inuktitut (Canadian Inuit) belongs to the Eskimo-Aleut family of languages. 在加拿大北部, 约有35 000人使用该语言.

The letter ***r*** denotes a `Parisian' *r* (pronounced far back in the mouth), and ***q*** stands for a *k*-like sound made in the same place.

A shaman is a priest, sorcerer and healer in some cultures. —*Bozhidar Bozhanov*

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祝你好运!

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个人赛解答

题 #1. 规则:

1. The apostrophe indicates length if it follows a vowel, and is read as ə if it follows a consonant.
2. The letter ***w*** stands for a rounding of the lips after a consonant and for the sound [w] otherwise.
3. ə is pronounced, though not written, between any consonant and a following sonorant consonant ([l m n]).
4. ə is also pronounced before a consonant cluster at the beginning of a word.
5. ***p t j g gw q qw*** are pronounced as voiced consonants (b d j g g^w γ $γ^w$) at the beginning of a word or between vowels and as voiceless consonants (p t c k k^w x x^w) at the end of a word or next to another consonant.

答案:

(a) 12 əksənxōγon, 13 ətkəbox, 14 gəmūjəmin, 15 emtoγ^{w}atk, 16 dēbəlc;

(b) 17 ***tp'te'sn***, 18 ***mtesgm***, 19 ***alapt'g***, 20 ***glamen***.

题 #2. **(a)** 规则:

1. Number of syllables. Each line contains 6 syllables.
2. Alliteration. See the statement of the problem.
3. Internal rhyme. Let us denote the vowels (and diphthongs) in each line by V_1, V_2, ⋯, V_6. At least one consonant immediately following V_5 must immediately follow V_n (n = 1, 2 or 3). Also, in even lines $V_n = V_5$.

For instance, cf. lines IV, 1–6 (alliteration is marked in boldface, internal rhyme by underlining):

IV

1 háði **g**ramr, þars **g**núðu,
2 **g**eira hregg við seggi,
3 (rauð fnýsti **b**en **b**lóði)
4 **b**ryngǫgl í dyn Skǫglar,
5 þás á **r**ausn fyr **r**æsi
6 (**r**éð egglituðr) seggir ⋯

(b) Leftover words: **hœgra**, **smíði**.

V

1 $_a$ **r**íks (þreifsk **r**eiddra øxa
2 $_b$ **r**ymr ; knǫ́ttu spjǫr $_c$ glymja)
3 $_d$ **s**vartskyggð bitu **s**eggi
4 $_e$ **s**verð þjóðkonungs ferðar,
5 þás ($_f$ **h**ugfyldra **h**ǫlða)
6 $_g$ **h**laut $_h$ andskoti $_i$ Gauta
7 (hǫr vas $_j$ **s**ǫngr of $_k$ **s**vírum)
8 $_l$ **s**igr (flugbeiddra $_m$ vigra).

题 #3. The modifier follows its head in both languages.

(a)	***jun***	bone	
	i-jun	skeleton	(multitude of bones)
	i-wahnawa	bunch of bananas	(multitude of bananas)
	i-drai	calendar	(multitude of days)
	drai-hmitrötr	Sunday	(holyday)
	gaa-hmitrötr	sanctuary	(holyplace)
	uma-hmitrötr	church	(holyhouse)
	ngöne-uma	wall	(house border)
	ngöne-gejë	coast	(water border)
	nyine-thin	awl	(tool to poke)
	tii	to write	
	bé-tii	pencil	(tool to write)
	bé-wöli	fork	(tool to poke)
	wöta	animal	
	bé-wöli-wöta	spur	(tool to poke animal)
	bé-ôdu	cup	(tool to drink)
	ba-jié	coast	(water border)
	ba-bwén	twilight	(night border)
	a-pulut	bed	(place to sleep)

(b) ***wahnawa*** 'banana', ***drai*** 'day'; ***wöli*** 'to poke', ***pulut*** 'to sleep'.

(c) ***i-bii*** 'swarm of bees (multitude of bees)', ***tusi-hmitrötr*** 'Bible (holybook)'.

题 #4. The noun suffixes seen in this problem are:

1. **-k2sm2** '上方', **-kotoya** 'for', **-pit** `with';
2. **-šeh** 'like, as if';
3. **-taPm** plural;
4. **-tih** 'only (just, right)'.

After a nasal consonant (**m**, **n**, **ŋ**) the stops **p**, **t**, **k** become voiced (**b**, **d**, **g** respectively). If **k** comes after **y**, the two sounds exchange places.

The possessive pronouns are **P2s** `my' and **mis** `your'; if the noun begins with a stop, this consonant becomes voiced and the corresponding nasal appears before it.

(a)	**caky2sm2tih**	rightabove the vine
	k2m2ŋšeh	likea shadow
	P2s mok	my corn
	mis nd2ctaPm	your teeth
	pahsunbit	with the squash
	perolkotoyašehtaPm	as iffor the kettles

(b)	for the chair	**pokskukyotoya**
	with my kettle	**P2s mberolpit**
	justlikea mountain	**koc2kšehtih**
	posts	**komdaPm**
	above the shadows	**k2m2ŋg2sm2taPm**
	your town	**mis ŋgumguy**

题 #5. The Inuktitut sentences have the following general structure:

	X-***(q)***		V--	'X V (himself).'
	X-***(q)***	Y-***(r)mik***	V-***si***--	'X V a Y.'
X-***up***	Y-***(q)***		V--	'X V the Y.'

where X and Y are nouns and V is the verb. If a noun gets the ending ***-q*** when it is either a definite object or a subject of a sentence that doesn't have a definite object, it also gets ***-r*** before the ending ***-mik*** when it is an indefinite object (***nanu-q*** — ***nanu-r-mik***; ***iluaqhaiji*** — ***iluaqhaiji-mik***). To say `your', ***-(q)*** is replaced by ***-it***, ***-up*** by ***-vit***.

The verb receives the following suffixes:

- ***-j*** following a vowel or ***-t*** following a consonant;
- an ending for the persons of the subject and the definite object, if there is one:
  - in the first two schemata: ***-u-tit*** '2', ***-u-q*** '3';
  - in the third schema: ***-a-it*** '2/3', ***-a-nga*** '3/3', ***-a-atit*** '3/2'.

A transitive verb without an object is interpreted as reflexive.

(a)
13. The wolf saw your shaman.
14. Your polar bear hurt a boy.
15. Your hunter cured himself.
16. You shot the teacher.
17. You came.
18. You cured a hunter.

(b)
19. ***Angatkuup aanniqtaatit.***
20. ***Ilinniaqtitsijiup inuuhuktuq takujanga.***
21. ***Amaruit ukiakhaqtuq.***
22. ***Qingmirmik qukiqsijutit.***
23. ***Qingmiit ilinniaqtitsijimik aanniqsijuq.***

第六届国际理论, 数理和应用语言学奥林匹克竞赛

保加利亚, 阳光海滩, 2008年8月4 — 9日

团体赛题目

At the time when the dictionary *Guangyun* was compiled (1007--1011), the Chinese language was comparatively homogeneous. Since the Chinese script is not phonetic, the dictionary employed a simple system for giving the pronunciation of each character using two other characters, the pronunciation of which the reader was supposed to know (they were in common use). This system is known as *fanqie*.

Later, when Chinese dialects split apart, it was still possible to use many of the ancient fanqie 转写 s, but in different (and more complex) ways in different dialects.

Here are some such 转写 s. For each character its reading in Cantonese is given.

	character	=	转写	
1.	倦 **kyn**^{2}	= 渠 **k^{h}œy**^{21}	⋆ 卷 **kyn**^{3}
2.	求 **k^{h}au**^{21}	= 巨 **kœy**^{2}	⋆ 鳩 **kau**^{53}
3.	住 **cy**^{2}	= 持 **c^{h}i**^{21}	⋆ 遇 **y**^{2}
4.	病 **piŋ**^{2}	= 皮 **p^{h}ei**^{21}	⋆ 命 **miŋ**^{2}
5.	掉 **tiu**^{2}	= 徒 **t^{h}ou**^{21}	⋆ 弔 **tiu**^{3}
6.	鳩 **kau**^{53}	= 居 **kœy**^{53}	⋆ 求 **k^{h}au**^{21}
7.	僖 **hei**^{53}	= 許 **hœy**^{35}	⋆ 其 **k^{h}ei**^{21}
8.	朗 **loŋ**^{13}	= 盧 **lou**^{21}	⋆ 黨 **toŋ**^{35}
9.	韶 **siu**^{21}	= 市 **si**^{13}	⋆ 昭 **ciu**^{53}
10.	帳 **cœŋ**^{3}	= 知 **ci**^{3}	⋆ 亮 **lœŋ**^{2}
11.	愀 **c^{h}iu**^{35}	= 親 **c^{h}an**^{3}	⋆ 小 **siu**^{35}
12.	舞 **mou**^{13}	= 文 **man**^{2}	⋆ 甫 **p^{h}ou**^{35}
13.	謏 **siu**^{35}	= 先 **sin**^{53}	⋆ 鳥 **niu**^{13}
14.	臼 **k^{h}au**^{13}	= 其 **k^{h}ei**^{21}	⋆ 九 **kau**^{35}
15.	斜 **c^{h}e**^{21}	= 似 **c^{h}i**^{13}	⋆ 嗟 **ce**^{53}
16.	薨 **kau**^{3}	= 古 **ku**^{35}	⋆ 候 **hau**^{2}

(a) Explain how ancient fanqie 转写 s could be used in modern Cantonese.

(b) How were the fanqie 转写 s designed to work at the time of the compilation of *Guangyun*? The old simple rule can be applied with correct results in Cantonese to only one of the 转写 s above. Which one?

In most Chinese dialects today (including Cantonese and Mandarin) there are no voiced consonants other than sonorants (**l**, **m**, **n**, **ŋ**). At the time when *Guangyun* was compiled the language had other voiced consonants, which later merged with the voiceless ones: voiced fricatives became voiceless fricatives (e. g., **z** > **s**), voiced stops became aspirated or unaspirated voiceless stops (e. g., **d** > **t** or **t^{h}**). The voiced sounds have been retained in the Wu dialect of Chinese. For example, the character 徒 is pronounced [**du**^{21}] in Wu, [**t^{h}ou**^{21}] in Cantonese and [**t^{h}u**^{35}] in Mandarin.

(c) Which of the characters in the section above were pronounced with voiced initial consonants at the time of the compilation of *Guangyun*? Under what conditions did the voiced consonants become aspirated or unaspirated in Cantonese?

(d) In Classical Chinese there were four tones, but only three of them are present in this problem. Explain how these three tones have evolved to yield the six tones of Cantonese.

Here are some more 转写 s, but with Mandarin readings only:

17. 遭 **ʂan**^{5} = 張 **ʂaŋ**^{5} ⋆ 連 **lian**^{35}
18. 良 **liaŋ**^{35} = 呂 **ly**^{214} ⋆ 章 **ʂaŋ**^{5}
19. 遵 **cun**^{5} = 將 **ʧiaŋ**^{51} ⋆ 倫 **lun**^{35}
20. 蕭 **ɕiao**^{5} = 蘇 **su**^{5} ⋆ 彫 **tiao**^{5}
21. 嵌 **ʧ^{h}ian**^{5} = 口 **k^{h}ou**^{214} ⋆ 銜 **ɕian**^{35}
22. 先 **ɕian**^{5} = 蘇 **su**^{5} ⋆ 前 **ʧ^{h}ian**^{35}
23. 巉 **ʂ^{h}an**^{35} = 鋤 **ʂ^{h}u**^{35} ⋆ 銜 **ʧ^{h}ian**^{35}
24. 婻 **ɕiŋ**^{51} = 胡 **xu**^{35} ⋆ 頂 **tiŋ**^{214}
25. 弗 **ʂ^{h}an**^{214} = 初 **ʂ^{h}u**^{5} ⋆ 限 **ɕian**^{51}
26. 趡 **ʂ^{h}uei**^{214} = 千 **ʧ^{h}ian**^{5} ⋆ 水 **ʂuei**^{214}
27. 初 **ʂ^{h}u**^{5} = 楚 **ʂ^{h}u**^{214} ⋆ 居 **ʧy**^{5}
28. 釧 **ʂ^{h}uan**^{51} = 尺 **ʂ^{h}**^{214} ⋆ 絹 **ʧyan**^{51}
29. 卷 **ʧyan**^{214} = 居 **ʧy**^{5} ⋆ 轉 **ʂuan**^{214}
30. 處 **ʂ^{h}u**^{51} = 昌 **ʂ^{h}aŋ**^{5} ⋆ 據 **ʧy**^{51}
31. 俜 **p^{h}iŋ**^{5} = 普 **p^{h}u**^{214} ⋆ 丁 **tiŋ**^{5}
32. 蚪 **tou**^{214} = 當 **taŋ**^{5} ⋆ 口 **k^{h}ou**^{214}

(e) Ignoring the tones for the moment, formulate rules for using the ancient fanqie 转写 s in Mandarin.

Given are Chinese characters with both Cantonese and Mandarin readings:

		Cantonese	Mandarin
33.	唐	**t^{h}oŋ**^{21}	**t^{h}aŋ**^{35}
34.	謨	**mou**^{21}	**mo**^{35}
35.	踐	**c^{h}in**^{13}	**ʧian**^{51}
36.	少	**siu**^{35}	**ʂao**^{214}
37.	夔	**k^{h}wai**^{21}	**k^{h}uei**^{35}
38.	你	**nei**^{13}	**ni**^{214}
39.	暫	**caam**^{2}	**can**^{51}

		Cantonese	Mandarin
40.	采	**pin**^{2}	**pian**^{51}
41.	帝	**tai**^{3}	**ti**^{51}
42.	透	**t^{h}au**^{3}	**t^{h}ou**^{51}
43.	被	**p^{h}ei**^{13}	**pei**^{51}
44.	囂	**hiu**^{53}	**ɕiao**^{5}
45.	枌	**fan**^{21}	**fen**^{35}

(f) Describe how the tones and initial voiced consonants have evolved in Mandarin. What rules for reading tones in fanqie 转写 s for Mandarin can be formulated?

(g) Some combinations of initial consonant and tone are extremely rare in modern Mandarin. Which ones?

More characters, with their readings in both Cantonese and Mandarin, are given below. Some tones have been left out:

		Cantonese	Mandarin
46.	罿	**t^{h}uŋ**……	**t^{h}uŋ**^{35}
47.	載	**coi**^{3}	**cai**……
48.	米	**mai**……	**mi**^{214}

		Cantonese	Mandarin
49.	眠	**min**^{21}	**mian**……
50.	蛸	**siu**……	**ɕiao**^{5}
51.	亂	**lyn**……	**luan**^{51}

(h) Determine what the missing tones are.

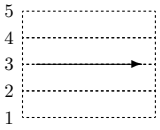
(i) Read the following 转写 sin Cantonese:

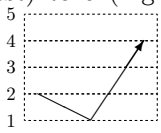
52. 梯 ? = 土 **t^{h}ou**^{35} ⋆ 雞 **kai**^{53}
53. 嘯 ? = 蘇 **sou**^{53} ⋆ 弔 **tiu**^{3}
54. 浪 ? = 魯 **lou**^{13} ⋆ 當 **toŋ**^{53}
55. 憊 ? = 蒲 **p^{h}ou**^{21} ⋆ 拜 **paai**^{3}

(j) Read the following 转写 sin Mandarin. Some 转写 s cannot be read by themselves, but this problem contains enough information to read all of them:

56. 賽 ? = 先 **x́ian**^{5}=13A=22X ⋆ 代 **tai**^{51}
57. 簡 ? = 古 **ku**^{214}=16A ⋆ 限 **x́ian**^{51}=25B
58. 賞 ? = 書 **s̩u**^{5} ⋆ 兩 **liaŋ**^{214}
59. 倍 ? = 普 **p^{h}u**^{214}=31A ⋆ 乃 **nai**^{214}
60. 泫 ? = 胡 **xu**^{35}=24A ⋆ 畎 **k̀^{h}yan**^{214}
61. 犬 ? = 苦 **k^{h}u**^{214} ⋆ 泫 =60X
62. 下 ? = 胡 **xu**^{35}=24A ⋆ 駕 **k̀ia**^{51}
63. 捍 ? = 下 =62X ⋆ 赧 **nan**^{214}
64. 紂 ? = 除 **ç^{h}u**^{35} ⋆ 柳 **liou**^{214}
65. 囊 ? = 奴 **nu**^{35} ⋆ 當 **taŋ**^{5}=32A=54B
66. 鰓 ? = 蘇 **su**^{5}=20A=22A=53A ⋆ 來 **lai**^{35}

NB: Mandarin is China's official language, based on the dialect of Beijing. It is spoken by approx. 850 mln people. Wu (Shanghainese) is spoken by 90 mln people, Cantonese (Yue) by 70 mln.

Each Chinese dialect has a fixed number of tones (melodies in one of which every syllable is pronounced). The system proposed by the linguist Yuen Ren Chao, which is used in this problem, denotes five levels of the voice by numbers from 1 (lowest) to 5 (highest) and transcribes the melody as a succession of levels: **a**^{3} 

, **a**^{214} 

. All the tones you need are present in this problem.

The mark ^{h} indicates that the preceding stop consonant is aspirated (pronounced with a puff of air). **x** = *ch* in Scottish *loch*, **ŋ** = *ng* in *hang*. **c** ≈ *ts* in *hats* (pronounced as a single consonant), **s̩** and **ç** are hard consonants similar to English *sh* in *shut* and *ch* in *chuck*, **x́** and **k̀** are soft consonants similar to *sh* in *sheet* and *ch* in *cheat*. **œ** and **y** = French *eu* and *u* (German *ö* and *ü*).

If you do not want to write Chinese characters, you can refer to them using the number of the 转写 where they occur and specifying which character you mean: X (transcribed), A (first in the 转写) or B (second in the 转写).

Note that in the Mandarin reading of character 28A there is no vowel.

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祝你好运!

第六届国际理论, 数理和应用语言学奥林匹克竞赛

保加利亚, 阳光海滩, 2008年8月4 — 9日

团体赛解答

The syllables of Chinese consist of three parts: onset (initial consonant, which may be missing as in 3B), rhyme (all following sounds) and tone. Cantonese tones can be thought of as having two distinct qualities: height (highorlow) and contour (rising, levelorfalling).

	rising	level	falling
high	35	3	53
low	13	2	21

(a) To use a fanqie 转写 in Cantonese, A's onset and tone height are combined with B's rhyme and tone contour. But if A's (and X's) tone is low, X's onset, if a stop, must always be aspirated if B's (and X's) tone is rising (13) orfalling (21), and unaspirated if it is level (2).

(b) Certainly the onset was from the A character, and the rhyme from B. But the aspiration rule is strange. Probably it was not part of the original fanqie system. Maybe the tone came from only one of the two characters? That has to be B, because the old rule should give correct results in only one 转写.

Thus the original simple rule for fanqie was: A's onset is combined with B's rhyme and tone. Only 转写 11 can be read now using this rule.

(c) Looking at the syllables with a sonorant onset, we see that they are always in a low tone (13, 2 or 21). Assuming that all voiced consonants evolved alike in Cantonese, we may conclude that what is in a low tone now, had a voiced onset earlier. This is also true of the character of the example from Wu. What is said in **(d)** supports this idea.

Thus the characters whose onsets were voiced are: 1X and 1A, 2X (=6B) and 2A, 3X and 3A, 3B (if it had an onset at all), 4X and 4A, 5X and 5A, 7B (=14A), 9X and 9A, 14X, 15X and 15A, 16B.

Voiced stops became aspirated if the tone was risingorfalling, and unaspirated if it was level.

(d) The contours of the Cantonese tones correspond to the three tones of Classical Chinese; tone height is an innovation brought about by the evolution of the voiced consonants.

Now we can explain why fanqie 转写 s should be read in Cantonese the way they are. The X character has the same tone height as A because it got its onset from A, and height in Cantonese is determined by the voicing of the onset in Classical Chinese. But if the onset was a voiced stop, it could evolve in different ways in X and A, because its aspiration was determined by the tone contour, which X got from B, and it could differ from A's contour.

(e) In Mandarin onsets and rhymes are not combined in such a straightforward way as in Cantonese. It can be noted that after **x́** (**ḱ**, **ḱʰ**) we always find **i** or **y**, whereas **x** (**k**, **kʰ**), **s** (**c**, **cʰ**) and **ṣ** (**ç**, **çʰ**) are never followed by these vowels.

We already know that the onset came from A and the rhyme from B. When the constraint above came into being,

- **i** was lost and **y** became **u** after **ṣ** (**ç**, **çʰ**);
- **x** (**k**, **kʰ**) and **s** (**c**, **cʰ**) became **x́** (**ḱ**, **ḱʰ**) before **i** or **y**.

These are also the rules that we must apply when using a fanqie 转写 in Mandarin. However,

- if A's onset is **x́** (**ǩ**, **ǩ^{h}**) and B's rhyme starts with neither **i** nor **y**, we can't determine what X's onset is;
- if B's onset is **ʂ** (**ɕ**, **ɕ^{h}**) and A's onset is none of these, we can't determine what X's rhyme is.

(f) On the basis of the tone of the Cantonese syllable we can determine whether the onset was voiced or not in Classical Chinese. In Mandarin the tones developed as follows:

- rising: 51 if the onset was voiced but not a sonorant, 214 otherwise;
- level: 51 (always);
- falling: 5 if the onset was voiceless, 35 otherwise.

We see that the contour is not preserved here. Voiced stops became aspirated if the tone was falling, and unaspirated if it was levelorrising.

In fanqie 转写 s read in Mandarin the tones work as follows:

	5, 35	214	(F, H−)^{51}	(H+, L)^{51}
5	5	214	214, 51	51
L^{35}	35	214	214, 51	51
(F, H+)^{35}	35	51	51	51
L^{214}	35	214	214, 51	51
(F, H±)^{214}	5	214	214, 51	51
L^{51}	35	214	214, 51	51
H+^{51}	5	214	214, 51	51
(F, H−)^{51}	5, 35	214, 51	214, 51	51

Here L stands for a sonorant, F for a fricative, H− for an unaspirated and H+ for an aspirated stop. Thus most of the time X's tone in Mandarin can't be derived unambiguously from A's and B's tones, though in some cases it can.

(g) Syllables with a sonorant onset and tone 5 or with an unaspirated onset and tone 35 should not exist in Mandarin (if they do, then the rules must have had exceptions).

(h) 46: **21**, 47: **51**, 48: **13**, 49: **35**, 50: **53**, 51: **2**.

(i) 52 **t^{h}ai**^{53}, 53 **siu**^{3}, 54 **loŋ**^{2}, 55 **paai**^{2}.

(j) 56 **sai**^{51}, 57 **ǩian**^{214}, 58 **ʂaŋ**^{214}, 59 **p^{h}ai**^{214}, 60 **x́yan**^{51}, 61 **ǩ^{h}yan**^{214}, 62 **x́ia**^{51}, 63 **xan**^{51}, 64 **ɕou**^{51}, 65 **naŋ**^{35}, 66 **sai**^{5}.