

Twenty-second International Linguistics Olympiad

Taipei (Taiwan), 20–27 July 2025

Individual Contest Problems

Rules for writing out the solutions

Do not copy the problems. Write down your solution to each problem on a separate sheet or sheets. On each sheet indicate the number of the problem, the number of your seat and your surname. If you do not do this, your work may be mislaid or misattributed.

Unless stated differently, you should describe any patterns or rules that you identified in the data. Otherwise your solution will not be awarded full marks.

Problem 1 (20 points). Here are some numbers in Dzongkha and their numerical values:

1 – ci 3 – sum 8 – ge 12 – cupi 17 – cupdyn 19 – cygu

For higher numbers, Dzongkha uses two different systems (referred to here as A and B).

Below are some numbers written in both systems, as well as their numerical values:

System A	System B	Value	System A	System B	Value
ke ci da pi	tsapi	22	ke ko-da sum	ŋaŋa	55
ke ci da ŋa	tsaŋa	25	ke sum da cuɖu	døndu	76
ke pje-da pi	sumcu	30	ke ʒi	gepcu	80
ke ci da cyʒi	soʒi	34	ke ʒi da gu	ʒagu	89
ke pi da dyn	ʒedyn	47	ke ceŋa	sumja	300

Finally, some equalities are given with left-hand side written in system A and right-hand side written in system B. Some numbers are missing.

	System A	System B
(1)	cusum + ke pje-da ʒi	= jasum
(2)	piɕu pi	= piɕu × ʒipcu
(3)	piɕu ci da ke sum da gu	= (ŋapcu × gu) + cygu
(4)	piɕu pje-da pi + ke pje-da ɖu	= ŋapja + pija cutām
(5)	(pi × ko) + pje	= pi
(6)	(piɕu ko-da sum × pje) + ke pje-da sum	= ɖukja
(7)	piɕu ci da ke cuɖu da cuɖu	= (ʒaʒi × ʒi) + ʒipja
(8)	pi × piɕu ci da ke cutām da gu	= (____ _X × piɕu) + copge
(9)	____ _Y + ke ci da ʒi	= jaɖu
(10)	____ _Z + ke ko-da ɖu	= dynja + sumja

(a) Fill in the blanks X–Z with Dzongkha numbers.

(b) Write with digits the equalities (1–10).

(c) Write in Dzongkha in both systems: 75; 570.

△ The Dzongkha language belongs to the Sino-Tibetan family. It is spoken by approx. 171,000 people in Bhutan.

The words are given in a simplified transcription. ɖ, ʒ, p, ŋ, ɕ and ʒ are consonants. ā, ø and y are vowels.

—Vlad A. Neacșu

Problem 2 (20 points). Here are some phrases in Gaahmg and their English translations in arbitrary order:

- | | |
|-------------------|--|
| 1. ā fāndág | A. <i>my aunts</i> |
| 2. á máámààd | B. <i>his horn</i> |
| 3. á tááðà | C. <i>your_{sg} anchor</i> |
| 4. áðág ūyùg | D. <i>my grandmother</i> |
| 5. āg pēbārēēg | E. <i>our ribs</i> |
| 6. āg máàm | F. <i>his hammer</i> |
| 7. dḡōr īnī | G. <i>my grindstones</i> |
| 8. ē īl | H. <i>their grandmothers</i> |
| 9. ē pēbārēēg | I. <i>your_{pl} grandfathers</i> |
| 10. ēg ìlāēg | J. <i>my cheeks</i> |
| 11. ēg tááðàd | K. <i>your_{sg} horns</i> |
| 12. gùùr āyàè | L. <i>their horns</i> |
| 13. gùùrììg ánég | M. <i>your_{sg} uncle</i> |
| 14. ó ābéé | N. <i>our grindstone</i> |
| 15. ǝ bǝōrāà | O. <i>your_{pl} elbows</i> |
| 16. ǝ ìlāèg | P. <i>his ribs</i> |
| 17. ǝg tùndùlīg | Q. <i>your_{sg} shoulder</i> |
| 18. ǝg mǝōðǝōd | R. <i>his anchors</i> |
| 19. tḡél ùùn | S. <i>our aunt</i> |
| 20. tḡélààg ínìgī | T. <i>your_{pl} dogs</i> |

- (a) Determine the correct correspondences.
- (b) Based on the above data, you might think that the phrases ē tááðà and ē mǝōðǝōd would be incorrect, but in fact, they are correct. Translate the phrases and explain why they are unexpected.
- (c) Translate to English:
- (d) Translate to Gaahmg:

- | | |
|-------------------|-------------------------------------|
| 21. āg bǝōrāāg | 26. <i>my grindstone</i> |
| 22. dḡōréēg āyàèg | 27. <i>their cheeks</i> |
| 23. ē bǝōrāàg | 28. <i>your_{pl} anchor</i> |
| 24. ǝ tùndùlìg | 29. <i>our uncle</i> |
| 25. ó máàm | 30. <i>your_{sg} dogs</i> |

△ The Gaahmg language belongs to the Eastern Sudanic family. It is spoken by approx. 100,000 people in the southeastern part of Sudan. **a** ≈ *a* in *father*, **ǝ** = *a* in *about*, **ε** = *e* in *bed*, **ī** = *ee* in *see*, **ǝ** ≈ *o* in *lord*, **u** ≈ *oo* in *pool*. Signs above a vowel indicate tone: ´ = high, ¯ = mid, ` = low, ^ = falling. Double vowels are pronounced long. Other letters denote consonants.

In this problem, *horn* refers to the horn on the heads of some animals.

—David Hultman

Problem 3 (20 points). Here are some sentences in Kuria and their English translations:

1. **aaha** — *He has given (something).*
2. **aaβinǎ** — *He has sung (something).*
3. **asáámba** — *He burns (something).*
4. **nnaasyá** — *Indeed, I have ground (something).*
5. **mbaaβúna** — *Indeed, they have broken (something).*
6. **toraroma** — *We are about to bite (something).*
7. **ndasukurǎ** — *I am about to rub (something).*
8. **toosaambá** — *We have burned (something).*
9. **ndasiitaáka** — *I am about to accuse (someone).*
10. **naaturuújána** — *I have welcomed (someone).*
11. **βahóótóótéra** — *They reassure (someone).*
12. **tookoondókóra** — *We have uncovered (something).*
13. **ndaroma itǵíimbéyo** — *I am about to bite the seeds.*
14. **naarya eyétóóke** — *I have eaten the banana.*
15. **naaryá eyétóóke** — *Indeed, he has eaten the banana.*
16. **toraβiima áβáánto** — *We are about to measure the people.*
17. **ndarya iritáárákímúra** — *I am about to eat the secretary bird.*
18. **torakoondokórá áyátǵúβa** — *We are about to uncover the bottle.*
19. **ntúruújána íritáárákímúra** — *I welcome the secretary bird.*

(a) In (20) is a Kuria sentence with tone marking removed, and with its translation. Mark the correct tones.

20. **aheetoka** — *He remembers (something).*

(b) Translate to English:

(c) Translate to Kuria:

- | | |
|------------------------------|---|
| 21. βaasukurá | 25. <i>We are about to eat the seeds.</i> |
| 22. toosya itǵíimbéyo | 26. <i>I sing (something).</i> |
| 23. ndóma | 27. <i>Indeed, we have measured the secretary bird.</i> |
| 24. naaβína | 28. <i>We are about to burn (something).</i> |
| | 29. <i>He has remembered (something).</i> |

△ The Kuria language belongs to the Eastern Bantu group of the Atlantic-Congo family. It is spoken by approx. 500,000 people in Migori County in southwest Kenya and in the Mara Region in northwest Tanzania.

Signs above a vowel indicate tone: ' = high, ˇ = rising. All other vowels have low tone. Two consecutive vowels are treated as separate, rather than as one long vowel, for the purpose of tone assignment. β is like v in *vine*, but pronounced with the lips held together. ɣ is like ch in *Bach*, but pronounced with vibration of the vocal folds. ŋ = ng in *sing*. ǵ = ch in *church*. y = y in *yacht*. ε and ɔ are vowels.

A secretary bird is a bird found in sub-Saharan Africa.

—Eimear McKnight

Problem 4 (20 points). Here are some phrases in Kewa and their English translations:

- | | | | |
|----------------------------|------------------------|-----------------------|---------------------------------------|
| 1. repena-ini | <i>coals of a fire</i> | 8. ki-komaa | <i>whole arm</i> |
| 2. mena-iri | <i>tough grass</i> | 9. repena-agaa | <i>headlights</i> |
| 3. ora adaa poripu | <i>tempest</i> | 10. orada dia | <i>it is not true</i> |
| 4. mena-irikai | <i>animals</i> | 11. yagaa-iri | <i>beard, whiskers (of an animal)</i> |
| 5. naakina ini-agaa | <i>boy's face</i> | 12. repena ene | <i>swelling on a tree</i> |
| 6. adaa ki | <i>middle finger</i> | 13. adaa-agaa | <i>mother tongue, Kewa language</i> |
| 7. yaa-apaa | <i>bird's egg</i> | 14. balina aga | <i>maize</i> |

(a) Match the Kewa words and phrases below (15–39) with their translations (A–Y).

- | | | | | |
|------------------------|---------------------|-------------------------|------------------------|-----------------------|
| 15. ada-mena | 20. ini apaa | 25. mena-ki | 30. ora-agaa | 35. repena-uni |
| 16. adaa naaki | 21. ki-ene | 26. mena-yagaa | 31. poripu-agaa | 36. suku |
| 17. aga-ini | 22. komaa | 27. nina irikai | 32. poripu | 37. uni nala |
| 18. agaa nala | 23. mena uni | 28. nogona ki | 33. repena suku | 38. yaa-ada |
| 19. balina agaa | 24. mena-ada | 29. ora pamoagae | 34. repena-boke | 39. yaa-agaa |

- | | | | |
|----------------------------|-------------------------|--------------------------|----------------------------|
| A. <i>pig thigh</i> | H. <i>upper arm</i> | O. <i>eyeball</i> | V. <i>girl's hand</i> |
| B. <i>bird's beak</i> | I. <i>pig bone</i> | P. <i>very old woman</i> | W. <i>English language</i> |
| C. <i>my dog</i> | J. <i>sticks</i> | Q. <i>pig's jawbone</i> | X. <i>shiny thing</i> |
| D. <i>domesticated pig</i> | K. <i>truth</i> | R. <i>bird's nest</i> | Y. <i>joint of the arm</i> |
| E. <i>hole in a tree</i> | L. <i>toothache</i> | S. <i>bone ache</i> | |
| F. <i>wind</i> | M. <i>bright flames</i> | T. <i>pandanus nut</i> | |
| G. <i>pig sty</i> | N. <i>big boy</i> | U. <i>gossip</i> | |

(b) Translate to English, giving multiple translations only where necessary:

40. **repena**
41. **agaa**
42. **iri**
43. **yagaa**
44. **nida dia**
45. **yaa-iri**
46. **nogo-naaki**

(c) Translate to Kewa:

47. *white man*
48. *bone*
49. *seed of a tree*
50. *hole*
51. *very big*
52. *pandanus*
53. *old woman's eye*

One has the same form as one of (1–39).

△ No additional explanation besides the answers is required, nor will be marked.

The Kewa language belongs to the Engan branch of the Trans-New Guinea family. It is spoken by approx. 100,000 people in the Southern Highlands province of Papua New Guinea. Kewa has tones, but these are not usually written down. The difference between separating words by a hyphen or a space is not relevant to the solution of the problem.

Pandanus is a genus of trees that includes species whose nuts can be harvested once a year. The pandanus nut and its harvest are very important to Kewa people. Maize is not a native crop of New Guinea.

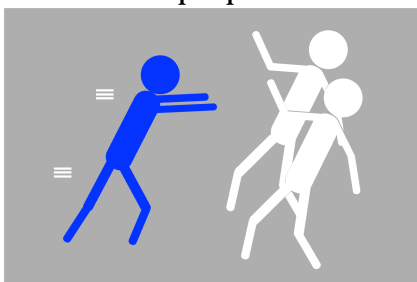
English is an official language of Papua New Guinea, introduced under Australian rule.

—Samuel Ahmed

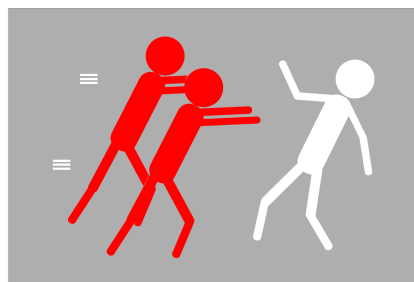
Problem 5 (20 points). In one psycholinguistics study, native speakers of Kaqchikel undertook a task in which they repeatedly had to judge whether a sentence they heard accurately described a picture they saw. While participants were listening to the sentences, their brain activity was recorded using functional Magnetic Resonance Imaging (fMRI). The researchers were interested in measuring activity in two brain regions: the frontal cortex and the auditory cortex. Higher activity in the frontal cortex can signal that the sentence is more difficult to process. Higher activity in the auditory cortex can signal that the sound is surprising or unexpected.

Below are some pictures similar to the ones participants saw paired with Kaqchikel sentences that accurately describe the pictures. Some parts of the sentences have been replaced with gaps.

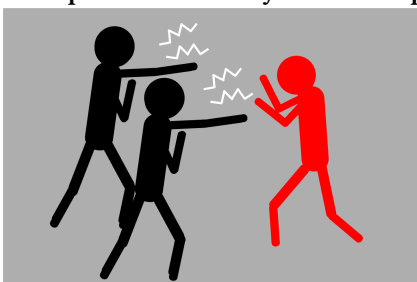
1. Xerunīm ri taq sāq ri xar



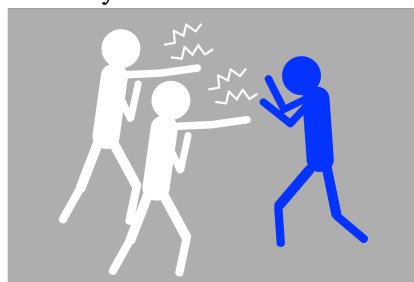
5. _____ [E] _____ ri sāq



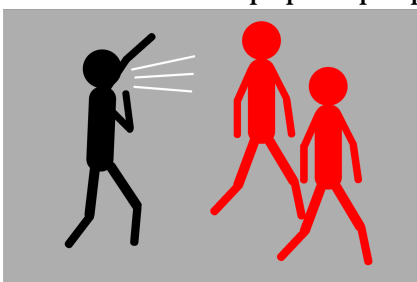
2. Ri taq _____ [A] _____ xkich'äy _____ [B] _____ kāq



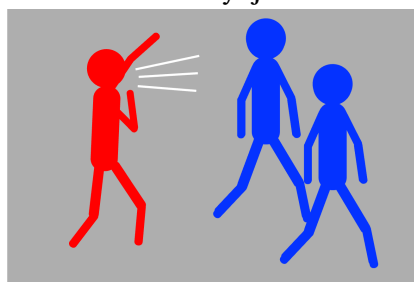
6. Xkich'äy _____ [F] _____



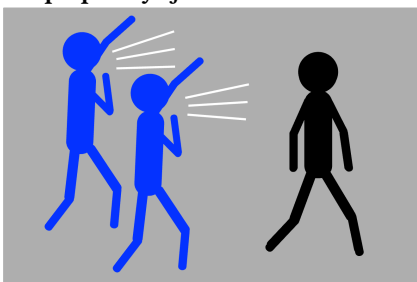
3. _____ [C] _____ ri q'ëq ri taq kāq



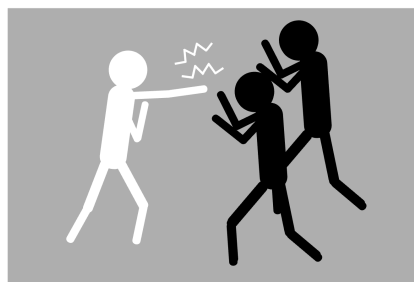
7. _____ [G] _____ xeroyoj _____ [H] _____



4. Ri q'ëq xkoyoj _____ [D] _____



8. _____ [I] _____



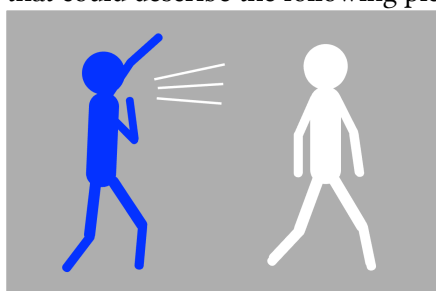
Below is a table containing the brain activity pattern one would expect for the sentence–picture pairs above, based on the results of the original study.

Sentence number	Frontal Cortex (activity)	Auditory Cortex (activity)
1	lower	higher
2	lower	lower
3	higher	higher
4	higher	lower
5	higher	higher
6	lower	higher
7	higher	lower
8	lower	lower

- (a) Fill in the blanks A–I.
- (b) Draw all the possible pictures that the following sentences could describe, or write equivalent verbal descriptions:

9. Ri taq säq xkinīm ri q'ëq
10. Xekich'äy ri taq xar ri taq käq

- (c) Write all the possible Kaqchikel sentences that could describe the following picture:



- (d) What activity levels in the frontal and auditory cortices do you predict for the following sentences? If there is an activity level you cannot predict, explain why not.

11. Xeruq'etey ri käq ri taq q'ëq
12. Xerachik'aj ri taq säq ri xar
13. Ri taq q'ëq xekitz'ët ri taq säq

△ The Kaqchikel language belongs to the Quichean-Mamean branch of the Mayan family. It is spoken by approx. 500,000 people in central Guatemala. **ch'**, **k'**, **q'** and **tz'** are consonants. **ä**, **ë** and **ĩ** are vowels.

—Dan-Mircea Mirea

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Good luck!

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Answer sheet: **Problem 2**

(a)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

(b)

• $\bar{\epsilon}$ tááǎ — _____

• $\bar{\epsilon}$ mǎǎǎ — _____

(c)

21. $\bar{a}g$ bǎǎǎǎ — _____

22. $\bar{d}\bar{o}\bar{r}\bar{\epsilon}\bar{e}g$ ǎyǎg — _____

23. $\bar{\epsilon}$ bǎǎǎǎ — _____

24. $\bar{o}$ túndúlǐg — _____

25. $\acute{o}$ mǎǎm — _____

(d)

26. *my grindstone* — _____

27. *their cheeks* — _____

28. *your_{pl} anchor* — _____

29. *our uncle* — _____

30. *your_{sg} dogs* — _____

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Answer sheet: **Problem 4**

⚠ No additional explanation besides the answers is required, nor will be marked.

(a)

15	16	17	18	19
20	21	22	23	24
25	26	27	28	29
30	31	32	33	34
35	36	37	38	39

(b) 40. *repena* — _____41. *agaa* — _____42. *iri* — _____43. *yagaa* — _____44. *nida dia* — _____45. *yaa-iri* — _____46. *nogo-naaki* — _____(c) 47. *white man* — _____48. *bone* — _____49. *seed of a tree* — _____50. *hole* — _____51. *very big* — _____52. *pandanus* — _____53. *old woman's eye* — _____