

# Ninth International Olympiad in Linguistics

## Pittsburgh (United States of America), July 24–31, 2011

### Team Contest Problem

The following ten lines are incorrect examples of Sanskrit poetry. They were originally written correctly, but there have been five deleted macra, four added macra, three changed letters and two deleted words, so that only one line remained unchanged. No syllables have been added or lost (except in the deleted words).

For instance, sentence 9 was originally *syād indravajrā yadi tau jagau gah*. We can restore the deleted macron over the *a* in *syād* for metrical reasons, but to purge the added macron over the second *a* in *indravajrā* requires knowing the word (or comparison with line 10). Fortunately, the poets wrote in such a way that it's possible to correct all the changes except that one without any prior knowledge of Sanskrit.

The mark “ $\bar{}$ ”, called a macron (pl. macra), denotes vowel length; *b<sup>h</sup>*, *d<sup>h</sup>*, *g<sup>h</sup>*, *h*, *j*, *ñ*, *n̄*, *s̄*, *t<sup>h</sup>* and *y* are consonants. There is one more rule of transliteration relevant to the meter that you will have to discover.

The translations correspond to the lines after the two words were deleted and the three letters changed, but before any macra were added or deleted.

1. <i>b<sup>h</sup>ujanga-prayātam</i>	“The movement of the snake” consists of four <i>gas</i> .
2. <i>caturb<sup>h</sup>ir gakaraiḥ</i>	
3. <i>gurunid<sup>h</sup>anamānulag<sup>h</sup>ur iha śāśikalā</i>	In the case where a <i>guru</i> is at the end of 14 <i>lag<sup>h</sup>us</i> , it is said to be “the ascending period of the moon”.
4. <i>jarau jarau tato jagau ca pañcacamarām vadet</i>	A <i>ja-and-ra</i> , a <i>ja-and-ra</i> and then a <i>ja-and-ga</i> is called “the fan made of five yak tails”.
5. <i>mab<sup>h</sup>alagā gajagatih</i>	“The gait of an elephant” is <i>ma b<sup>h</sup>a la ga</i> .
6. <i>mo go go go vidyunmālā</i>	A <i>ma</i> and a <i>ga</i> and a <i>ga</i> and a <i>ga</i> is “the garland of lightning”.
7. <i>nanagi mad<sup>h</sup>umati</i>	Where there is <i>na na ga</i> , there is “(that which is) full of honey”.
8. <i>pramanikā _____</i>	“The little measure” is _____.
9. <i>syād indravajrā yadi tau jagau gah</i>	Two lines of “the little measure” they call “the fan made of five yak tails”.
10. <i>upendravajrā prat<sup>h</sup>ame lag<sup>h</sup>au sā</i>	If perchance there are a pair of <i>tas</i> , a <i>ja-and-ga</i> , and a <i>ga</i> , then it is “Indra’s thunderbolt”. “Upendra’s thunderbolt” is that (Indra’s thunderbolt) in which the first is <i>lag<sup>h</sup>u</i> .

- (a) What is the additional rule of transliteration?
- (b) Restore the two deleted words, revert the three changed letters, remove the four added macra, and restore the five deleted macra.
- (c) The macra have been removed from the Sanskrit mnemonic *yamatarajab<sup>h</sup>anasalagam*. Which syllables were *guru*?

⚠ A mnemonic is a word or sentence that helps remembering something (*How I wish I could recollect ... → 3.14159 ≈ π*). Indra and his younger brother Upendra are Hindu gods. —Adam Hesterberg

## Distribute at 0 minutes

The following insights will at some point be given as hints: the meaning of *guru*, the constraints of the poetry, and (in 3 hints) the use of *yamatarajab<sup>h</sup>anasalagam*.

## Answers as of 30 minutes

Team: \_\_\_\_\_

(a) What is the additional rule of transliteration?

\_\_\_\_\_.

(b) • Deleted words: \_\_\_\_\_, \_\_\_\_\_.

• Changed letters:

- 1.
- 2.
- 3.

• Words with added macra:

1. The second *a* in the word *indravājrā* in line 9.
- 2.
- 3.
- 4.

• Words with deleted macra:

1. The *a* in the word *syad* in line 9.
- 2.
- 3.
- 4.
- 5.

(c) Which syllables in *yamatarajab<sup>h</sup>anasalagam* were *guru*?

(+) Insights into the problem matter (use the back of the paper if necessary):

## Distribute at 30 minutes

We suggest that you compare lines 3 and 8, and lines 9 and 10. (This is just a hint, not the sort of insight you'd get points for.)

A syllable is *guru* if and only if it has a long vowel or a diphthong or ends in a consonant. Division into syllables ignores word divisions. A sequence of type VCV is divided as V-CV; of type VCCV, as VC-CV.

The **a** in syllable 12 in line 2 had a macron added.

## Answers as of 60 minutes

Team: \_\_\_\_\_

(a) What is the additional rule of transliteration?

\_\_\_\_\_.

- (b)
- Deleted words: \_\_\_\_\_, \_\_\_\_\_.
  - Changed letters:
    - 1.
    - 2.
    - 3.
  - Words with added macra:
    1. The second **a** in the word *indravājrā* in line 9.
    2. The **a** in syllable 12 in line 2.
    - 3.
    - 4.
  - Words with deleted macra:
    1. The **a** in the word *syad* in line 9.
    - 2.
    - 3.
    - 4.
    - 5.

(c) Which syllables in *yamatarajab<sup>h</sup>anasalagam* were *guru*?

(+) Insights into the problem matter (use the back of the paper if necessary):

A syllable is *guru* if and only if it has a long vowel or a diphthong or ends in a consonant. Division into syllables ignores word divisions. A sequence of type VCV is divided as V-CV; of type VCCV, as VC-CV.

## Distribute at 60 minutes

We suggest that everyone on the team read every part of the problem and all the hints, since some of them may be relevant in unexpected places. (This is just a hint, not the sort of insight you'd get points for.)

Each line describes the meter in which it's written.

The last *g* in line 1 is incorrect.

## Answers as of 90 minutes

Team: \_\_\_\_\_

(a) What is the additional rule of transliteration?

\_\_\_\_\_.

- (b)
- Deleted words: \_\_\_\_\_, \_\_\_\_\_.
  - Changed letters:
    1. The last *g* in line 1 was originally \_\_\_\_\_.  
2.  
3.
  - Words with added macra:
    1. The second *a* in the word *indravājrā* in line 9.
    2. The *a* in syllable 12 in line 2.  
3.  
4.
  - Words with deleted macra:
    1. The *a* in the word *syad* in line 9.  
2.  
3.  
4.  
5.

(c) Which syllables in *yamatarajab<sup>h</sup>anasalagam* were *guru*?

(+) Insights into the problem matter (use the back of the paper if necessary):

A syllable is *guru* if and only if it has a long vowel or a diphthong or ends in a consonant. Division into syllables ignores word divisions. A sequence of type VCV is divided as V-CV; of type VCCV, as VC-CV.

Each line describes the meter in which it's written.

## Distribute at 90 minutes

If a scribe knew Sanskrit but not the mnemonic system, they're more likely to have changed, say, a *ta* to a *ra* than a basic Sanskrit word. (This is just a hint, not the sort of insight you'd get points for.)

Each meter can be described by a *unique* sequence of the consonants of *yamatarajab<sup>h</sup>anasala-ga(m)*.

The *a* in syllable 2 in line 7 had its macron deleted.

## Answers as of 120 minutes

Team: \_\_\_\_\_

(a) What is the additional rule of transliteration?

\_\_\_\_\_.

(b) • Deleted words: \_\_\_\_\_, \_\_\_\_\_.

• Changed letters:

1. The last *g* in line 1 was originally \_\_\_\_\_.  
2.  
3.

• Words with added macra:

1. The second *a* in the word *indravājrā* in line 9.  
2. The *a* in syllable 12 in line 2.  
3.  
4.

• Words with deleted macra:

1. The *a* in the word *syad* in line 9.  
2. The *a* in syllable 2 in line 7.  
3.  
4.  
5.

(c) Which syllables in *yamatarajab<sup>h</sup>anasalagam* were *guru*?

(+) Insights into the problem matter (use the back of the paper if necessary):

A syllable is *guru* if and only if it has a long vowel or a diphthong or ends in a consonant. Division into syllables ignores word divisions. A sequence of type VCV is divided as V-CV; of type VCCV, as VC-CV.

Each line describes the meter in which it's written.

Each meter can be described by a *unique* sequence of the consonants of *yamatarajab<sup>h</sup>anasala-ga(m)*.

## Distribute at 120 minutes

That line 1 is four of something is useful information even if you don't know what it's four of. (This is just a hint, not the sort of insight you'd get points for.)

The syllables *la* and *ga* stand for *lag<sup>h</sup>u* and *guru*. Each other syllable of *yamatarajab<sup>h</sup>anasa-laga(m)* represents a *unique* sequence of three *lag<sup>h</sup>u* or *guru* syllables.

The additional rule of transliteration is that *e* and *o* are long vowels, although they are written without macra. (In fact, they were once diphthongs *ai* and *au*, and the current diphthongs were once *āi* and *āu*.)

## Answers as of 150 minutes

Team: \_\_\_\_\_

(a) What is the additional rule of transliteration?

— The vowels *e* and *o* are long, although they are written without macra.

(b) • Deleted words: \_\_\_\_\_, \_\_\_\_\_.

• Changed letters:

1. The last *g* in line 1 was originally \_\_\_\_\_.  
2.  
3.

• Words with added macra:

1. The second *a* in the word *indravajra* in line 9.  
2. The *a* in syllable 12 in line 2.  
3.  
4.

• Words with deleted macra:

1. The *a* in the word *syad* in line 9.  
2. The *a* in syllable 2 in line 7.  
3.  
4.  
5.

(c) Which syllables in *yamatarajab<sup>h</sup>anasa-lagam* were *guru*?

(+) Insights into the problem matter (use the back of the paper if necessary):

A syllable is *guru* if and only if it has a long vowel or a diphthong or ends in a consonant. Division into syllables ignores word divisions. A sequence of type VCV is divided as V-CV; of type VCCV, as VC-CV.

Each line describes the meter in which it's written.

Each meter can be described by a *unique* sequence of the consonants of *yamatarajab<sup>h</sup>anasa-laga(m)*.

The syllables *la* and *ga* stand for *lag<sup>h</sup>u* and *guru*. Each other syllable of *yamatarajab<sup>h</sup>anasa-lagam* represents a *unique* sequence of three *lag<sup>h</sup>u* or *guru* syllables.

## Distribute at 150 minutes

The names of some of the meters correspond to the meters in poetically interesting ways. For instance, there are 14 days in the lunar cycle, starting with the new moon, when the moon waxes, followed by the full moon itself. (This is just a hint, not the sort of insight you'd get points for, unless you manage to guess a meter from its name alone.)

Each of the first 8 syllables of *yamatarajab<sup>h</sup>anasalagam* stands for the pattern of *lag<sup>h</sup>u* and *guru* syllables in that and the next two syllables, after restoring its macra.

One of the deleted words is *jaraū*.

## Answers as of 180 minutes

Team: \_\_\_\_\_

(a) What is the additional rule of transliteration?

— The vowels *e* and *o* are long, although they are written without macra.

(b) • Deleted words: *jaraū*, \_\_\_\_\_.

• Changed letters:

1. The last *g* in line 1 was originally \_\_\_\_\_.  
2.  
3.

• Words with added macra:

1. The second *a* in the word *indravājrā* in line 9.  
2. The *a* in syllable 12 in line 2.  
3.  
4.

• Words with deleted macra:

1. The *a* in the word *syad* in line 9.  
2. The *a* in syllable 2 in line 7.  
3.  
4.  
5.

(c) Which syllables in *yamatarajab<sup>h</sup>anasalagam* were *guru*?

(+) Insights into the problem matter (use the back of the paper if necessary):

A syllable is *guru* if and only if it has a long vowel or a diphthong or ends in a consonant. Division into syllables ignores word divisions. A sequence of type VCV is divided as V-CV; of type VCCV, as VC-CV.

Each line describes the meter in which it's written.

Each meter can be described by a *unique* sequence of the consonants of *yamatarajab<sup>h</sup>anasala-ga(m)*.

The syllables *la* and *ga* stand for *lag<sup>h</sup>u* and *guru*. Each other syllable of *yamatarajab<sup>h</sup>anasala-ga(m)* represents a *unique* sequence of three *lag<sup>h</sup>u* or *guru* syllables.

Each of the first 8 syllables of *yamatarajab<sup>h</sup>anasalagam* stands for the pattern of *lag<sup>h</sup>u* and *guru* syllables in that and the next two syllables (after restoring its macra).