



Engaging Content
Engaging People



All Ireland Linguistics Olympiad
The Problem Solvers' Challenge

AILO Workshop – Oct 2019

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- Enhance problem-solving skills
- Introduce you to logic, linguistics and language technology
- Encourage you to take Science, Technology, Engineering (STEM) courses in University



- Languages, maths, computing
- Computational Linguistics
 - Rule-based modelling of natural language
- Neural Machine Translation
 - artificial neural network to predict the likelihood of a sequence of words



Overview



- First Round end Jan 2020 in your own school (5 Qs, 2 hours)
- Online for the first time
- 100 qualify for the national final in March in Dublin.

- Trophies for Junior (under 16) and Senior (16 and over) categories
- Four students qualify for the International Linguistics Olympiad in Ventspils, Latvia 20-24 July 2020.
- 3-day team training before IOL 2020



Types of problems in Round One

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- Writing systems e.g. Inuit
 - A writing system is any conventional method of visually representing verbal communication
- Morphology
 - The study of the structure of words
- Morphonemics
 - the interaction between morphological and phonological or phonetic processes
- Syntax
 - The set of rules that govern the structure of sentences in a given language

Nunavut

ᓄᓇᓂᓄᓄᓄ

Iqaluit

ᓄᓄᓄᓄᓄᓄᓄᓄ

Not
always
left to
right or
even top
to
bottom!



Tips for Round One / Observations

6

- Observations / Explanations in the Participation Round
 - The new “explanation / observation ” part asks you to summarise WHAT you have discovered, not HOW you discovered it.
 - Write down everything you notice about the language structure in a systematic way
 - We do not want you to recap the steps you took in finding the answer
- Look carefully
 - The fine detail matters, look for patterns
 - Look for clues in the title and the description
 - Build on what you already know
 - (but beware of the assumptions you make)



Pali

- Structure of problem:
 - 6 sentences in Pali with their translations
 - Notice that some repeated words have different endings
- Challenge:
 - Work out which words correspond
 - and why the endings differ



Pali: What do you see?

- mahāmatto nisīdati The minister sits down.
- mahāmattam upasamkamanti They visit the minister.
- samano tathāgato hoti The philosopher is enlightened.
- samane attham pucchanti They ask the philosophers the meaning.
upāsako pucchati The disciple asks.
- loko mahāmattassa the minister's world



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Pali: What do you see?

- mahāmatto nisīdati The minister sits down.
- mahāmattam upasamkamanti They visit the minister.
- samanō tathāgato hoti The philosopher is enlightened.
- samane attham pucchanti
upāsako pucchati They ask the philosophers the meaning.
The disciple asks.
- loko mahāmattassa the minister's world



Pali: What do you see?

- mahāmatto nisīdati The minister sits down.
- mahāmatto am upasamkamanti They visit the minister.
- samano tathāgato hoti The philosopher is enlightened.
- samane attham pucchanti They ask the philosophers the meaning.
upāsako pucchati The disciple asks.
- loko mahāmatto assa the minister's world



Pali: What do you see?

- Look for patterns in the data
 - sets of similar words
 - e.g. *mahāmatto*, *mahāmattam*, *mahāmattassa* all mean ‘minister’ but in different roles
 - other words with similar endings
- try to account for everything
- also notice the word order!



Pali

- This question is about case endings, typical of Indo-European languages.
- **Rules / Observations**
 - The nominative or subject case marker is -o
 - The accusative or object marker is -am
 - The dative or indirect object plural –e (who or what is receiving the action of a verb)
 - The genitive or possessive -assa
- In addition, the verb agrees in number with the subject:
 - -ti for singular
 - -nti for plural
- Note also the word order:
 - the verb comes at the end of the sentence
 - the genitive follows the noun it applies to. So rājo gāmassa is ‘king of the village’, not ‘village of the king’.



As Easy as 2-3-5

- The η symbol represents a velar nasal, like the ‘ng’ in ‘sing’.

ashi gohon	five legs
banana sambon	three bananas
bōru niko	two balls
empitsu nihon	two pencils
kami nimai	two sheets of paper
ishi sanjō	three stones
neko gohiki	five cats
risu nihiki	two squirrels
sara gomai	five plates
uma nitō	two horses
ushi santō	three cows



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As Easy as 2-3-5

- The η symbol represents a velar nasal, like the ‘ng’ in ‘sing’.

ashi gohon	five legs
banana sambon	three bananas
bōru n iko	two balls
empitsu n ihon	two pencils
kami n imai	two sheets of paper
ishi san̄ko	three stones
neko gohiki	five cats
risu n ihiki	two squirrels
sara gomai	five plates
uma n itō	two horses
ushi santō	three cows



- You can see the counting word comes after rather than before the noun, and that it consists of the words ni (2), sam/san/saṅ (3) and go (5).



What of the other part of the word? If you rearrange the list so words with the same second part are together, a pattern should emerge:

- hon/bon: legs, bananas, pencils
- ko: balls, stones
- mai: sheets of paper, plates
- hiki: cats, squirrels
- tō: horses, cows
- **Rules:**
- The second part of the counter word depends on the type of object being counted: long thin things, round things, flat things, small animals, big animals



Rules

- There are two other little tricky things going on: the variation in the word for 3 is because the 'n' of san matches ('is assimilated') to the following consonant:
- n+m/b becomes 'm', n+k/g becomes 'ŋ'.
- And with the word for 'long thin things' hon, 'h' becomes 'b' with san (sam), so that explains why san+hiki becomes sambiki.



Fill in the blanks

- (a) disuku three disks
- (b) endomame five peas
- (c) han̄kachi two handkerchiefs
- (d) kaba five rhinos
- (e) kyūri three cucumbers
- (f) morumotto two guinea pigs
- (g) nezumi three mice
- (h) ringo five apples
- (i) tsuna two ropes
- (j) zō three elephants



- (a) disuku sammai three disks
- (b) endomame goko five peas
- (c) han̄kachi nimai two handkerchiefs
- (d) kaba gotō five rhinos
- (e) kyūri sambon three cucumbers
- (f) morumotto nihiki two guinea pigs
- (g) nezumi sambiki three mice
- (h) ringo goko five apples
- (i) tsuna nihon two ropes
- (j) zō santō three elephants



Explanations

- Round 2 will ask you to explain your answer
- We do not want you to recap the steps you took in finding the answer
- The “explanation” part asks you to summarise **WHAT** you have discovered, not **HOW** you discovered it.
- For example, Slide 10 summarises what you discovered about Pali, but says nothing about how you went about solving the problem.



The following expressions show how to tell the time in Estonian:



Kell on üks



Kell on kaks



Veerand kaks



Pool neli



Kolmveerand üksteist



Viis minutit üks läbi





Kell on üks



Kell on kaks



Veerand kaks



Pool neli



Kolmveerand üksteist



Viis minutit üks läbi

- Here are some more numbers in English and Estonian:

- 6 *kuus* 7 *seitse* 8 *kaheksa* 10 *kümme*

- A1. Translate the following into English words

- *Kakskümmend viis minutit üheksa läbi*

- *Veerand neli*

- *Pool kolm*

- *Kolmveerand kaksteist*

- *Kolmkümmend viis minutit kuus läbi*

-

- A2. Translate the following times into Estonian:

- Quarter to nine

- Quarter past four

- Half past eleven

- Five past seven

- Half past twelve



Rules

- “Quarter past” and “half past” are translated as “Quarter of” and “Half of”, pointing to the next hour.
- So *neli* in the fourth example is 4, not 3, which could also be guessed by the fact that *kolmveerand* is “three quarters”.



- 9 in 2a is not given, though *üheksa* appears in 1a, and can be guessed by analogy with *kaheksa* (8) (note the pattern $\ddot{u}=1$, $ka=2$, if *-heksa* means “from 10”).
- Similarly, for 2c you need to figure out that 12 is *kaksteist*, which is given in 1d, on the basis that *üksteist* in the fifth example is 11.
- The word for 5, needed for 2b, is shown in the sixth example.
- *Kakskümmend* (20) and *kolmkümmend* (30) must be guessed based on the fact that $kaks=2$, $kolm=3$ and $kümme=10$.



Solution

A1. Translate the following into English words

Kakskümmend viis minutit üheksa läbi

Veerand neli

Pool kolm

Kolmveerand kaksteist

Kolmkümmend viis minutit kuus läbi

Twenty-five past nine

Quarter past three

Half (past) two

Quarter to twelve

Twenty-five to seven

A2. Translate the following times into Estonian:

Quarter to nine

Quarter past four

Half past eleven

Five past seven

Half past twelve

Kolmveerand üheksa

Veerand viis

Pool kaksteist

Viis minutit seitse läbi

Pool üks



Any questions?

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Thank you!

