



# AILO

All Ireland Linguistics Olympiad  
*The Problem Solvers' Challenge*

[www.adaptcentre.ie/ailo](http://www.adaptcentre.ie/ailo)



## Teaching Materials 2019

Improving Second Level Students' Problem-Solving Skills



Run by



Problem-Solving Initiative



An Roinn Cultúir,  
Oidhreachta agus Gaeltachta  
Department of Culture,  
Heritage and the Gaeltacht

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## This pack contains the AILO 2019 Teaching Materials which consist of:

- The 2018/9 AILO Problem-Solving Workshop Pack
- The monthly Sample Puzzle Downloads
- Relevant ADAPT Researcher Career Profiles

The ADAPT AILO Problem-Solving workshop materials were developed and tested in Summer 2018 thanks to funding from Science Foundation Ireland and the Department of Culture, Heritage and the Gaeltacht.

### ABOUT AILO

The All Ireland Linguistics Olympiad (AILO), run by the ADAPT Research Centre, is the problem solvers' challenge. The national contest sees secondary school students develop their own strategies for solving complex problems in unfamiliar languages from around the globe. No prior knowledge of linguistics or foreign languages is required. Even the hardest problems require only logical ability, patient work and a willingness to think around corners.

AILO introduces students to the application of logic and linguistics (i.e. the study of human language) to problems of language understanding and translation. The goal is to develop students' problem-solving skills and to inspire them to consider the fascinating range of careers at the intersection of computing, language and linguistics.

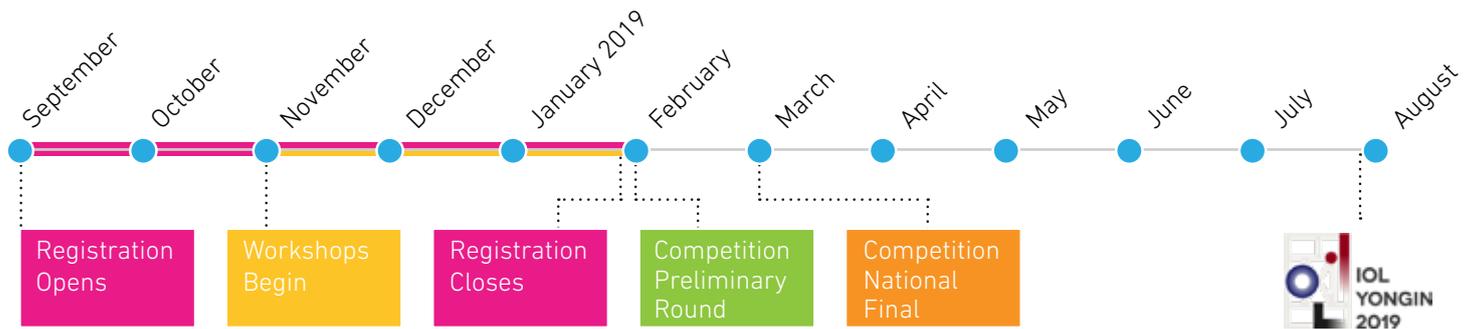
### WHO ARE THESE TEACHING MATERIALS FOR?

These materials were developed and formatively evaluated with secondary school students in June 2018. Following this, our ADAPT tutors received training and ran 31 workshops all over the island. Over 900 students and their teachers from 25 counties have attended and evaluated this workshop (November 2018 – January 2019). Over 1400 teachers and students also downloaded the monthly Sample Puzzle Packs and Career Profiles (September – December 2018).

59% of 2018 AILO National Finalists had attended one of our workshops. Teachers, parents and secondary school students can now use the 2019 Teaching Materials pack in conjunction with our online portal at <https://ailo.adaptcentre.ie/sample-puzzles/> to deliver workshops.



## THE AILO TIMELINE



### ONLINE REGISTRATION

Every September – January  
at  
<https://ailo.adaptcentre.ie/>

### DOWNLOAD

Monthly Sample Puzzles  
and ADAPT Career Profiles  
**September - January**

### WORKSHOPS

Free problem-solving  
workshops  
in your locality  
**November - January**

### PRELIMINARY ROUND FEBRUARY

### NATIONAL FINAL MARCH

**FOUR STUDENTS REPRESENT IRELAND AT THE  
INTERNATIONAL LINGUISTICS OLYMPIAD IN JULY**

Problem-solving is at heart of Science Technology Engineering and Maths (STEM). PISA (2012) defines problem-solving competence as the capacity to engage in cognitive processing to understand and resolve problem situations where a method of solution is not immediately obvious. In the PISA 2012 Creative Problem-Solving Results<sup>1</sup> Irish 15-year-olds ranked 22 out of 44. This is a critical requirement for future leaders in STEM fields where, according to a 2017 Institute for the Future report<sup>2</sup> on the impact of emerging technologies on society and work, an estimated 85 percent of jobs in 2030 haven't been invented yet. The pace of change will be so rapid that people will learn "in-the-moment" using new technologies such as augmented reality and virtual reality. The ability to gain new knowledge will be more valuable than the knowledge itself.

## 2.1 | AILO AND THE CURRICULUM

AILO's learning outcomes are also closely linked with the curriculum and the OECD PISA (2012/5) creative and collaborative problem-solving competencies. The example in Table 1. shows an overview of the links with the Junior Certificate Maths and Coding curricula, key skills and statements of learning. AILO also helps students to open their minds to the languages of the world and gives them the skills to learn a new language in a different way.

| Example of AILO Learning Outcomes linked to Junior Cert (JC) Curricula, JC Key Skills & Statements of Learning (SoL) and the PISA Problem Solving Competencies (2012/5) |               |           |          |               |      |  |
|---|---------------|-----------|----------|---------------|------|--|
| Students learn about  | JC Key Skills | JC Coding | JC Maths | JC SoL        | PISA | Students should be able to:  |
| Developing a positive disposition towards investigating, reasoning and problem-solving  | ✓             | ✓         | ✓        | SoL 15        | ✓    | 1 Discuss the importance of problem-solving skills as a key component in a STEM career.  |
| Seeing patterns and trends in complex logic puzzles in unfamiliar languages   | ✓             |           | ✓        | SoL 2, 15, 16 | ✓    | 2 Complete logic & AILO puzzles  |
| Problem solving strategies for each of the 6 types of AILO puzzle   | ✓             |           | ✓        | SoL 17        | ✓    | 3 Recognise features that will make a language rule.   |
| Gathering, interpreting and representing data   | ✓             | ✓         | ✓        | SoL 17        | ✓    | 4 Understand when and how to use tables and charts to decipher data for each problem type (number systems, semantics, writing systems, phonetics, syntax, morphology.) |
| Expressing ideas clearly and accurately   | ✓             | ✓         | ✓        | SoL 1,18      | ✓    |  |
| Collaborative problem-solving techniques (National Final, IOL)  |               |           | ✓        |               | ✓    | 5 Describe the observations they made about the language with concise and complete rules.  |
|   |               |           |          |               |      | 6 Monitor and reflect on their learning  |
|   |               |           |          |               |      | 7 Work as a team and reflect on their role in the team (National Final, IOL)   |

Table 1

<sup>1</sup>OECD (2014), PISA 2012 Results: Creative Problem Solving: Students' Skills in Tackling Real-Life Problems (Volume V), PISA, OECD Publishing. <http://dx.doi.org/10.1787/9789264208070-en>

<sup>2</sup>ITF (2017), The Next Era of Human Machine Partnerships – Emerging Technologies' Impact on Society and Work in 2030 [https://www.delltechnologies.com/content/dam/delltechnologies/assets/perspectives/2030/pdf/SR1940\\_IJTFforDellTechnologies\\_Human-Machine\\_070517\\_readerhigh-res.pdf](https://www.delltechnologies.com/content/dam/delltechnologies/assets/perspectives/2030/pdf/SR1940_IJTFforDellTechnologies_Human-Machine_070517_readerhigh-res.pdf)

Teachers, parents and secondary school students can use this workshop materials pack in conjunction with our online portal at [www.adaptcentre.ie/ailo/samples-puzzles](http://www.adaptcentre.ie/ailo/samples-puzzles) to deliver workshops.

## WORKSHOP MATERIALS

- Workshop attendance sheet with invite to take part in an AILO longitudinal study
- Welcome survey
- Workshop Slides (AILO\_2019\_Workshop\_Template.ppt)
- Introductory puzzles
- Preliminary Round Level Puzzle - "Japanese Braille"
- National Final Level Puzzle – "Lalana"
- Solutions
- Post-workshop survey

## AT THE WORKSHOP – HOW TO GUIDE

- All students must sign in "Workshop\_attendance.doc". We are beginning a longitudinal study of AILO participants. Students can give their email address for details of the study if they would like to take part.
- Give the students the welcome survey
- Open "AILO\_2019\_Workshop\_Template.ppt", slides 1-6 introduce types of puzzles.
- Hand out "AILO 2019 Exercises".
- Ask them to identify the English word order, the word order of the new language and the rules identified in each one. The aim of the workshop is to help them identify features and rules and describe them in a concise manner.
- Ask students for their ideas, solutions and encourage them to find each feature
- Solutions (rules) can be covered on the screen if you put "AILO 2019 Exercise Solutions" up on screen. The rules and word order are much more important than the answers.
- Give students "Japanese Braille" (Workshop Puzzles) folder and give them 10 minutes with that. Solutions can be covered on screen if you put it up.
- Give the students "Lalana" and cover the solution on screen (in solution doc and it's also in the PowerPoint presentation).
- Give students the post-workshop survey (please leave enough time for this)
- Please return the questionnaires and the sign in sheet to us via post (AILO, ADAPT Centre, Dublin City University, Dublin 9). [ailo@adaptcentre.ie](mailto:ailo@adaptcentre.ie) as this evaluation is very important to improve our programme.



# 3.2

## ADAPT AILO WORKSHOP 2018/9 PRE AILO WORKSHOP QUESTIONNAIRE

**Q1** Is this your first time to participate in an All Ireland Linguistics Olympiad event?  Yes  No

**Q2**  Male  Female  Other

**Q3** How did you hear about the AILO competition?

**Q4a** Did you complete practice puzzles before taking part in this workshop?  Yes  No

**Q4b** If 'Yes', how often did you use these puzzles?  
 Daily  Weekly  
 Monthly  Once-off

**Q5** How much do you agree / disagree with the following statements? (please circle)

I have effective strategies for solving complex problems

Strongly agree  Agree  Neutral  Disagree  Strongly Disagree

I am confident in my current problem-solving skills

Strongly agree  Agree  Neutral  Disagree  Strongly Disagree

**Q6** Had you considered studying computing, languages or linguistics at university prior to this workshop?  Yes  No



Full workshop slides available at [www.adaptcentre.ie/ailo/samples-puzzles](http://www.adaptcentre.ie/ailo/samples-puzzles) which also include all solutions in .ppt format.

### Overview



- Four students qualify for the International Linguistics Olympiad in Yongin, South Korea 29 July – 2nd August 2019
- 4-day team training before IOL 2019

- First Round end Jan 2019 in your own school (5 Qs, 2 hours)
- 100 qualify for the national final in March in Dublin.
- Trophies for Junior (under 16) and Senior (16 and over) categories



### Types of problems in Round One

- 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    ᓄᓇᓂᓪᓕ  
 Iqaluit    ᐃᓃᓂᓪᓕ

Not always left to right or even top to bottom!



www.adaptcentre.ie

Full workshop slides available at [www.adaptcentre.ie/ailo/samples-puzzles](http://www.adaptcentre.ie/ailo/samples-puzzles) which also include all solutions in .ppt format.

## 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)



## Let's try some puzzles

8

- Give students one puzzle to try for 10 minutes
- Solution ideas from students
- Discuss strategies for solving problems and examples of writing down the observations / rules.
- It's not necessary to work out the complete solution once you/they can see HOW to do it.



# 3.4

## INTRODUCTORY PUZZLES

### EXAMPLE 1

Here are few sentences with their english translations. Translate given examples and write the rules that you observed from the given sentences.

- |    |                      |                             |
|----|----------------------|-----------------------------|
| 1. | Makeri kawo yaro.    | The smith brought the boy.  |
| 2. | Yaro kawo makeri.    | The boy brought the smith.  |
| 3. | Mace hura wuta.      | The woman started the fire. |
| 4. | Yarinye dawo.        | The girl returned.          |
| 5. | Makeri kawo yarinye. | The smith brought the girl. |

#### Translate into english:

1. Mace kawo yaro.
2. Makeri dawo wuta.

#### Translate from english:

1. The boy started the fire.
2. The smith returned.

### EXAMPLE 2

Here are few phrases with their english translations. Translate given examples and write the rules that you observed from the given phrases.

- |    |              |                |
|----|--------------|----------------|
| 1. | nimi a gbomu | snake's mouse  |
| 2. | lende a kai  | man's ship     |
| 3. | kafa a kai   | man's shoulder |
| 4. | lende a nimi | mouse's ship   |
| 5. | ja a nimi    | mouse's eye    |
| 6. | keni a gbomu | snake's tongue |

#### Translate into english:

1. ja a kai
2. lende a gbomu

#### Translate from english:

1. man's snake
2. snake's eye

# 3.4

## INTRODUCTORY PUZZLES

### EXAMPLE 3

Here are few phrases with their english translations. Translate given examples and write the rules that you observed from the given phrases.

- |    |              |                |
|----|--------------|----------------|
| 1. | nimi a gbomu | snake's mouse  |
| 2. | lende a kai  | man's ship     |
| 3. | kafa kai     | man's shoulder |
| 4. | lende a nimi | mouse's ship   |
| 5. | ja nimi      | mouse's eye    |
| 6. | keni gbomu   | snake's tongue |

Translate into english:

1. ja kai
2. lende a gbomu

Translate from english:

1. man's snake
2. snake's eye

### EXAMPLE 4

Here are few phrases with their english translations. Translate given examples and write the rules that you observed from the given phrases.

- |     |                   |               |
|-----|-------------------|---------------|
| 1.  | bangul yara       | man           |
| 2.  | bangun yabu       | mother        |
| 3.  | bangun waymin     | mother in law |
| 4.  | bangu yila        | feather       |
| 5.  | bangun malayigara | scorpion      |
| 6.  | bangu gurugu      | drink         |
| 7.  | bangun bima       | snake         |
| 8.  | bangul gubimbulu  | waiter        |
| 9.  | bangu garan       | smoke         |
| 10. | bangun dunan      | poison ivy    |
| 11. | bangu juga        | sugar         |
| 12. | bangu diban       | stone         |
| 13. | bangul binjirin   | chameleon     |
| 14. | bangul gula       | koala         |
| 15. | bangul bargan     | kangaroo      |

Fill in the blanks:

- |                    |           |
|--------------------|-----------|
| 1. _____ mugunanja | aunt      |
| 2. _____ munga     | sound     |
| 3. _____ bayimbam  | butterfly |
| 4. _____ amo       | weapon    |
| 5. _____ nalnga    | boy       |

# 3.4

## INTRODUCTORY PUZZLES

### EXAMPLE 5

Here are few phrases with their english translations. Translate given examples and write the rules that you observed from the given phrases.

- |    |                        |                   |
|----|------------------------|-------------------|
| 1. | ho tu cyriu onos       | owner's donkey    |
| 2. | hoi tu emporu adelphoi | trader's brothers |
| 3. | hoi ton onon emporoi   | donkeys' traders  |
| 4. | hoi ton cyrion hyioi   | owners' sons      |
| 5. | ho ton hyion dulos     | sons' slave       |
| 6. | hoi ton dulon cyrioi   | slaves' owners    |
| 7. | ho ton adelphon oicos  | brothers' house   |
| 8. | ho tu oicu cyrios      | house's owner     |

#### Translate into english:

1. ho tu onu emporos
2. ho ton dulon dulos

#### Translate from english:

1. traders' houses
2. slave's donkeys

### EXAMPLE 6

Below are few sentences with their English translations. Write the rules and the dictionary from these examples and translate few sentences.

- |                          |                          |
|--------------------------|--------------------------|
| Hiiri teatteressa on.    | Cow is in theatre.       |
| Sikri poydalta hyppaa.   | Hen jumps off table.     |
| Hiiri poydalla istuu.    | Bull sits on table.      |
| Sikri liiterissa istuu.  | Hen sits in workshop.    |
| Hiiri liiterilta hyppaa. | Bull jumps off workshop. |

Bull sits on theatre.

\_\_\_\_\_

Rooster jumps off theatre.

\_\_\_\_\_

# 3.4

## INTRODUCTORY PUZZLES

### EXAMPLE 7

Below are few sentences with their english translations. Write the rules and the dictionary from these examples and translate few sentences.

Mi leg kabeag.

Mir Aneešt.

Mi ien šhuahti.

Mi ien kabešt.

Mir kiel phaw.

Mi kel šhuahtiešt.

This was clean dish.

This will be Anna.

This is green table.

This will be clean table.

This is strict boy.

This will be green city.

This is Dima.

---

This was strict Anna.

---

This was city.

---

### EXAMPLE 8

Here you have some sentences written in foreign script and with latin letters. Figure out what each foreign symbol means and write any rules that you observe.

Man is writing a letter.



Woman is writing a letter.



Man wrote a letter.



Man sees a letter.



Write with foreign symbols:

Woman saw a letter.

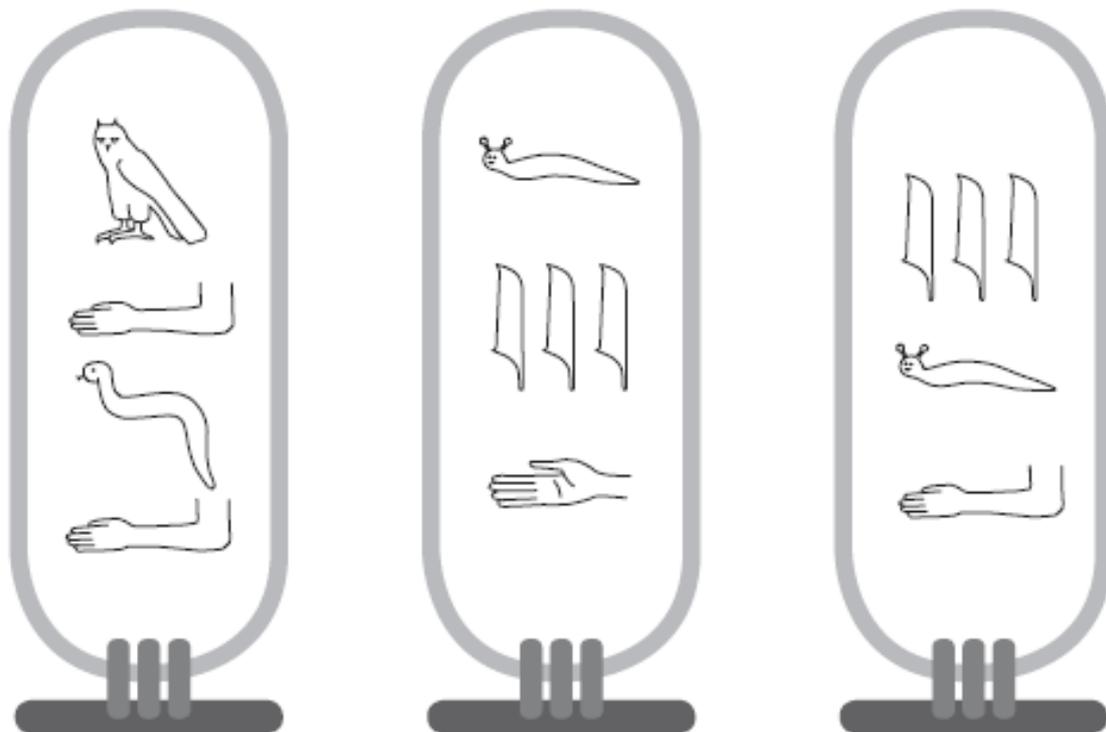
Man saw a woman.

## 3.4

## INTRODUCTORY PUZZLES

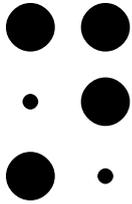
### EXAMPLE 9

Here are written the names Iva, Maja, Vid. Which is which? What kind of writing system is this (what each symbol represents), what is the direction of writing, are there any additional rules for symbols?



# 3.5

## PRELIMINARY ROUND LEVEL PUZZLE - "JAPANESE BRAILLE"



**Braille** is a tactile writing system, based on a series of raised dots, that is widely used by the blind. It was invented in 1821 by Louis Braille to write French, but has since been adapted to many other languages. English, which uses the Roman alphabet just as French does, required very little adaptation, but languages that do not use the Roman alphabet, such as Japanese, Korean, or Chinese, are often organized in a very different manner!

To the right is a Japanese word written in the **tenji** ("dot characters") writing system. The large dots represent the raised bumps; the tiny dots represent empty positions.

karaoke

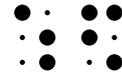


1. The following **tenji** words represent **atari**, **haiku**, **katana**, **kimono**, **koi**, and **sake**. Which is which? You don't need to know either Japanese or Braille to figure it out; you'll find that the system is highly logical.

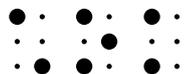
A. \_\_\_\_\_



B. \_\_\_\_\_



C. \_\_\_\_\_



D. \_\_\_\_\_



E. \_\_\_\_\_



F. \_\_\_\_\_



2. What are the following words?

G. \_\_\_\_\_



H. \_\_\_\_\_



3. Write the following words in tenji characters:

I. samurai \_\_\_\_\_

J. miso \_\_\_\_\_

# 3.6

## NATIONAL FINAL LEVEL PUZZLE - "LALANA"

### LALANA CHINANTEC

Lalana Chinantec is a language spoken by approximately 10,000 people who live in the Oaxaca region of Mexico. In the following orthography a colon (:) marks a long vowel, and the :ʔ symbol marks a glottal stop (like the sound in the middle of uh-oh).

|                           |                                     |
|---------------------------|-------------------------------------|
| kalakwa: kwi: li:ʔ        | The beautiful corn grew.            |
| miladʒö mo:h kya          | My pineapples have turned out well. |
| li:ʔ kalane kwi: kwa: kya | My tall corn yellowed beautifully.  |
| ʒö kalaro:h mo:h ne kya   | My yellow pineapples ripened well.  |
| kaladʒö kwi:              | The corn turned out well.           |
| milakwa: kwi:             | The corn has grown.                 |

1. What does the word **li:ʔ** mean? \_\_\_\_\_

2. What does the word **ro:h** mean? \_\_\_\_\_

3. Translate the following sentences into Lalana Chinantec:

a) The good pineapples became beautiful.

\_\_\_\_\_

b) My ripe corn has yellowed well.

\_\_\_\_\_

4. Translate the following sentences into English:

c) *milaro:h kwi: ne* \_\_\_\_\_

d) *li:ʔ kalakwa: kwi:* \_\_\_\_\_

**EXAMPLE 1 - JUST DICTIONARY**

Here are few sentences with their English translations. Translate given examples and write the rules that you observed from the given sentences.

- |                         |                             |
|-------------------------|-----------------------------|
| 1. Makeri kawo yaro.    | The smith brought the boy.  |
| 2. Yaro kawo makeri.    | The boy brought the smith.  |
| 3. Mace hura wuta.      | The woman started the fire. |
| 4. Yarinye dawo.        | The girl returned.          |
| 5. Makeri kawo yarinye. | The smith brought the girl. |

**Translate into English:**

- |                      |                             |
|----------------------|-----------------------------|
| 1. Mace kawo yaro.   | The woman brought the boy   |
| 2. Makeri dawo wuta. | The smith returned the fire |

**Translate from English:**

- |                              |                |
|------------------------------|----------------|
| 1. The boy started the fire. | Yaro hura wuta |
| 2. The smith returned.       | Makeri dawo    |

**Rules observed:**

Word order: SVO

Nouns not affected by position in the sentence, this is just vocabulary/dictionary

Words for boy (Yaro) and girl (Yarinye) may be related, but there's not enough data really to say this

**EXAMPLE 2 - WORD ORDER**

Here are few phrases with their English translations. Translate given examples and write the rules that you observed from the given phrases.

- |                 |                |
|-----------------|----------------|
| 1. nimi a gbomu | snake's mouse  |
| 2. lende a kai  | man's ship     |
| 3. kafa a kai   | man's shoulder |
| 4. lende a nimi | mouse's ship   |
| 5. ja a nimi    | mouse's eye    |
| 6. keni a gbomu | snake's tongue |

**Translate into English:**

- |                  |              |
|------------------|--------------|
| 1. ja kai        | man's eye    |
| 2. lende a gbomu | snake's ship |

**Translate from English:**

- |                |             |
|----------------|-------------|
| 1. man's snake | gbomu a kai |
| 2. snake's eye | ja a gbomu  |

**Rules observed:**

“s” = “a”

Genitive / ownership = “a”

Word order: thing possessed - owner – eg 1: mouse of the snake?

**EXAMPLE 3 - 1 RULE**

Here are few phrases with their English translations. Translate given examples and write the rules that you observed from the given phrases.

- |                 |                |
|-----------------|----------------|
| 1. nimi a gbomu | snake's mouse  |
| 2. lende a kai  | man's ship     |
| 3. kafa kai     | man's shoulder |
| 4. lende a nimi | mouse's ship   |
| 5. ja nimi      | mouse's eye    |
| 6. keni gbomu   | snake's tongue |

Translate into English:

- |                  |              |
|------------------|--------------|
| 3. ja kai        | man's eye    |
| 4. lende a gbomu | snake's ship |

Translate from English:

- |                |                  |
|----------------|------------------|
| 3. man's snake | gbomu a kai      |
| 4. snake's eye | ja gbomu [no'a'] |

**Rules observed:**

“s” = “a” in certain cases

Genitive / ownership = “a” when the noun is a body part, sometimes called inalienable possession

Word order: thing possessed – owner, cf English X of the Y == Y's X

**EXAMPLE 4 - CATEGORIES**

Here are few phrases with their English translations. Translate given examples and write the rules that you observed from the given phrases.

- |                      |               |
|----------------------|---------------|
| 1. bangul yara       | man           |
| 2. bangun yabu       | mother        |
| 3. bangun waymin     | mother in law |
| 4. bangu yila        | feather       |
| 5. bangun malayigara | scorpion      |
| 6. bangu gurugu      | drink         |
| 7. bangun bima       | snake         |
| 8. bangul gubimbulu  | waiter        |
| 9. bangu garan       | smoke         |
| 10. bangun dunan     | poison ivy    |
| 11. bangu juga       | sugar         |
| 12. bangu diban      | stone         |
| 13. bangul binjirin  | chameleon     |
| 14. bangul gula      | koala         |
| 15. bangul bargain   | kangaroo      |

**Rough work table to see things clearly:**

Root: bang

|                    |               |
|--------------------|---------------|
| bang-ul yara       | man           |
| bang-ul gubumbulu  | waiter        |
| bang-ul binjirin   | chameleon     |
| bang-ul gula       | koala         |
| bang-ul bargain    | kangaroo      |
|                    |               |
| bang-un yabu       | mother        |
| bang-un waymin     | mother in law |
| bang-un malayigara | scorpion      |
| bang-un bima       | snake         |
| bang-un dunan      | poison ivy    |
|                    |               |
| bang-u yila        | feather       |
| bang-u gurugu      | drink         |
| bang-u garan       | smoke         |
| bang-u juga        | sugar         |
| bang-u diban       | stone         |

Fill in the blanks:

- |                        |           |
|------------------------|-----------|
| 1. bangun ___mugunanja | aunt      |
| 2. bangu ___munga      | sound     |
| 3. bangul ___bayimbam  | butterfly |
| 4. bangun ___amo       | weapon    |
| 5. bangul ___nalnga    | boy       |

**Rules:**

Root word: bang (indefinite article or "a")

Endings:

ul ending – male, harmless

un - female.dangerous (!)

u – inanimate

### EXAMPLE 5 - ENDINGS FOR SG/PL

Here are few phrases with their English translations. Translate given examples and write the rules that you observed from the given phrases.

- |                           |                   |
|---------------------------|-------------------|
| 1. ho tu cyriu onos       | owner's donkey    |
| 2. hoi tu emporu adelphoi | trader's brothers |
| 3. hoi ton onon emporoi   | donkeys' traders  |
| 4. hoi ton cyrion hyioi   | owners' sons      |
| 5. ho ton hyion dulos     | sons' slave       |
| 6. hoi ton dulon cyrioi   | slaves' owners    |
| 7. ho ton adelphon oicos  | brothers' house   |
| 8. ho tu oicu cyrios      | house's owner     |

#### Translate from English:

- |                    |                       |
|--------------------|-----------------------|
| 1. traders' houses | hoi ton emporon oicoi |
| 2. slave's donkeys | hoi tu dulo onoi      |

#### Translate into English:

- |                       |                 |
|-----------------------|-----------------|
| 1. ho tu onu emporos  | donkey's trader |
| 2. ho ton dulon dulos | slaves' slave   |

#### Rough table to see occurrence:

|         |                   |
|---------|-------------------|
| Hotu    | owner's donkey    |
| Hotu    | house's owner     |
| Ho ton  | sons' slave       |
| Ho ton  | brothers' house   |
| Hoitu   | trader's brothers |
| Hoi ton | donkeys' traders  |
| Hoi ton | owners' sons      |
| Hoi ton | slaves' owners    |

#### Rough work table to see things clearly:

|         |          |           |        |        |        |
|---------|----------|-----------|--------|--------|--------|
| cyri-u  | empor-u  |           | oic-u  |        |        |
| cyri-on |          | adelph-on |        | dul-on | hyi-on |
| cyri-oi | empor-oi | adelph-oi |        |        | hyi-oi |
| cyri-os |          | on-os     | oic-os | dul-os |        |

### SOLUTION:

#### Rules:

- word order:  
Ho / Hoi, tu / ton owner, thing owned
- Ho is in phrases where the 'thing owned' is singular.  
Hoi is in phrases where the 'thing owned' is plural.
- Tu is in phrases where the owner is singular.  
Ton is in phrases where the owner is plural.
- Endings on nouns
 

|     |                           |
|-----|---------------------------|
| -u  | - owner is singular       |
| -on | - owner is plural         |
| -oi | - thing owned is plural   |
| -os | - thing owned is singular |

#### Vocabulary:

|         |         |
|---------|---------|
| donkey  | on-     |
| owner   | cyri-   |
| trader  | empor-  |
| brother | adelph- |
| son     | hyi-    |
| slave   | dul-    |
| house   | oic-    |

**EXAMPLE 6**

Below are few sentences with their English translations. Write the rules and the dictionary from these examples and translate few sentences.

Hiiri teatteressa on.

Sikri poydalta hyppaa.

Hiiri poydalla istuu.

Sikri liiterissa istuu.

Hiiri liiterilta hyppaa.

Cow is in theatre.

Hen jumps off table.

Bull sits on table.

Hen sits in workshop.

Bull jumps off workshop.

**Translate:**

Bull sits on theatre.

Rooster jumps off theatre.

**Solution****Translations:**

Bull sits on theater.

Rooster jumps off theater.

Hiiri teatterella istuu

Sikri teatterelta hyppaa

**Dictionary:**

hiiri = cow, bull

sikri = hen, rooster

teattere = theater

poyda = table

liiteri = workshop

on = is (to be)

hyppaa = jumps (to jump)

istuu = sits (to sit)

**Rules:**

Endings (these can go under dictionary or under rules):

-ssa = in

-lta = off

-lla = on

- Word order: who, where, what is doing  
(Alternative word order description: subject, location or object, verb)
- Word for location gets an ending for proposition (see above the list of endings with their meanings) or alternative phrasing is "how the object is used" (off table, on table)
- They don't distinguish between animal gender.  
(Alternative: They use the same word for male and female.)

**Rough work table to help see things clearly:**

|          |      |              |
|----------|------|--------------|
| liiteri  | -ssa | in workshop  |
| teattere | -ssa | in theatre   |
| liiteri  | -lta | off workshop |
| poyda    | -lta | off table    |
| poyda    | -lla | on table     |

Hen, rooster – Sikri

cow, bull – Hiiri

sits – istuu

jumps – hyppaa

is – on

**EXAMPLE 7**

Below are few sentences with their English translations. Write the rules and the dictionary from these examples and translate few sentences.

|                    |                           |
|--------------------|---------------------------|
| Mi leg kabeag.     | This was clean dish.      |
| Mir Aneešt.        | This will be Anna.        |
| Mi ien šhuahti.    | This is green table.      |
| Mi ien kabešt.     | This will be clean table. |
| Mir kiel phaw.     | This is strict boy.       |
| Mi kel šhuahtiešt. | This will be green city.  |

**Translate:**

This is Dima.  
This was strict Anna.  
This was city.

**SOLUTION****Translations**

|                       |                 |
|-----------------------|-----------------|
| This is Dima.         | Mir Dima.       |
| This was strict Anna. | Mir Ane phaweag |
| This was city.        | Mi keleag       |

**Dictionary**

|                 |               |
|-----------------|---------------|
| Ane = Anna      | leg = dish    |
| ien = table     | kiel = boy    |
| kel = city      | kab = clean   |
| šhuahti = green | phaw = strict |
| mi, mir = this  |               |

**Rules:**

Endings (these can go under dictionary or under rules):

-eag = past tense                      -ešt = future tense

- Word order: mi/mir, noun, adjective  
(alternative descriptions for mi/mir are also correct: this, pronoun)
- mi is used for objects, mir is used for people
- The last word gets ending for tense (see above for the list). Present tense has no ending.  
(alternative description for this rule: adjective gets the tense ending. If there is no adjective then the noun gets the ending. Other alternatives also exist.)

**Rough work table to see things clearly:**

|                   |                          |
|-------------------|--------------------------|
| Mi leg kabeag     | This was clean dish      |
| Mi ien shuahti    | This is green table      |
| Mi kel shuahtiest | This will be green city  |
| Mi ien kabest     | This will be clean table |
| Mir Aneest        | This will be Anna        |
| Mir Kiel phaw     | This is strict boy       |
| Shuahti           | - is green               |
| Shuahti           | - est - will be green    |
| Kab               | - est - will be clean    |
| Ane               | - est - will be Anna     |
| Kab               | - eag - was clean        |
| kel - city        |                          |
| ien - table       |                          |
| leg - dish        |                          |
| kiel - boy        |                          |
| phaw - strict     |                          |
| shuahti - green   |                          |
| clean - kab       |                          |

**EXAMPLE 8 - SYMBOL = WORD**

Here you have some sentences written in foreign script and with Latin letters. Figure out what each foreign symbol means and write any rules that you observe.

Man is writing a letter.



Woman is writing a letter.



Man wrote a letter.



Man sees a letter.

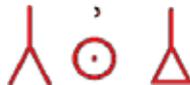


Write with foreign symbols:

Woman saw a letter.



Man saw a woman.



What kind of writing system is this (what each symbol represents), what is the direction of writing, are there any additional rules for symbols?

**Rules:**

Writing system type: Symbol = word

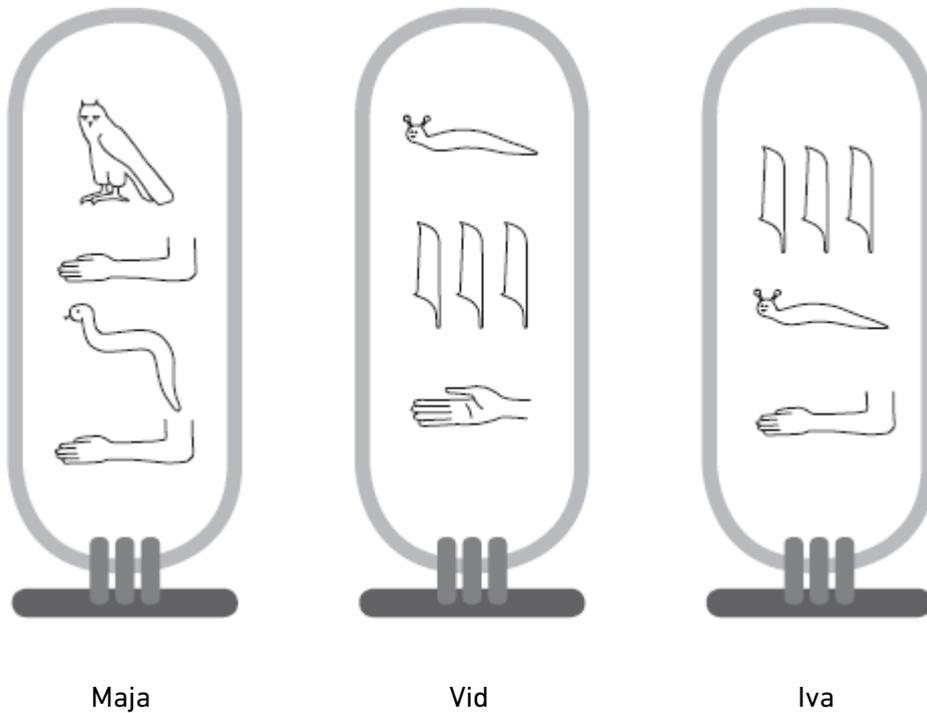
Direction – L-R

Word order: SVO

Present tense - hat ^, past tense ' big apostrophe/comma

**EXAMPLE 9 - SYMBOL = LETTER**

Here are written the names Iva, Maja, Vid. Which is which? What kind of writing system is this (what each symbol represents), what is the direction of writing, are there any additional

**Rules:**

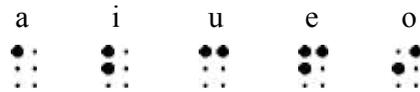
Writing system: top to bottom (i tells you direction) Each symbol reps a letter

No additional rules?

### JAPANESE BRAILLE

This is another writing system problem, but in this case it is not an alphabet. The word *karaoke*, in *tenji*, it has four characters, which may lead us to think that each character represents a syllable (ka-ra-o-ke). Counting syllables of the other words can confirm that *tenji* is a *syllabary*.

Inside the syllable structure, however, we must understand how consonants and vowels are represented. From “karaoke” can see that **ka** and **ra** have the same upper-left dot (⠠), differing only on the second dot position; furthermore, **ka** and **ke** have the same second dot position (down-right – ⠣). This is confirmed for there is a word starting with **a** (*atari*) and word *f* indeed starts with ⠠. So the vowels are represented in the three dots at the upper-left part of the diagram:



The other three dots represents the variety of consonants. So the answers are:

- |           |           |           |          |
|-----------|-----------|-----------|----------|
| 1.        | 2.        |           |          |
| a. haiku  | b. sake   | g. karate | h. anime |
| c. katana | d. kimono |           |          |
| e. koi    | f. atari  | 3.        |          |
|           |           | i. ⠠⠠⠠⠠⠠  | j. ⠠⠠⠠⠠  |

### LALANA CHINANTEC

This is another syntax problem, in a model we call Rosetta Stone: some sentences are presented with translations and, with that, we can understand part of the grammar of the language.

In this case, the word order is not so obvious. We can start by marking the substantives: corn (x4) and pineapples (x2). After this, we can easily identify the pronoun “my” (x3). We can even paint the words, like this:

- |  |   |
|--|---|
| <p><b>kalakwa: kwi: li:ʔ</b></p> <p><b>miladʒö mo:h kya</b></p> <p><b>li:ʔ kalane kwi: kwa: kya</b></p> <p><b>ʒö kalaro:h mo:h ne kya</b></p> <p><b>kaladʒö kwi:</b></p> <p><b>milakwa: kwi:</b></p> | <p>The beautiful <b>corn</b> grew.</p> <p><b>My pineapples</b> have turned out well.</p> <p><b>My tall corn</b> yellowed beautifully.</p> <p><b>My yellow pineapples</b> ripened well.</p> <p>The <b>corn</b> turned out well.</p> <p>The <b>corn</b> has grown</p> |
|--|---|

## 3.7

## SOLUTIONS

Then the verbs. From the last two sentences, it is obvious that they have internal structure: verbs in the past simple receive **kala-**; verbs in the present continuous receive **mila-**.

The adjectives come after the substantives, as in **mo:h ne** / pineapple yellow and **kwi: li:ʔ** / corn beautiful. To use an adjective as a verb, one just have to use a verb prefix, as in **ne – kalane** / yellow – yellowed and **kwa: – kalakwa: – milakwa:** / tall – grew – has grown.

The adverb comes in the beginning of the sentence, as in **li:ʔ** / beautifully and **ɔʒö** / well. (Don't mistake: the "well" in *turned out well* is part of the verb). Adverbs, adjective and verb nucleus have all the same form.

So the general word order is: (Adverb) Verb – Subject (Adjective) (Possessive) And the answers are:

1. **li:ʔ** is beautiful(ly).    2. **ro:h** is ripe.

3.

a) **kalali:ʔ mo:h ɔʒö** PAST-(become beautiful) **pineapples** (good/well)ADJ

b) **ɔʒö mila ne mo:h ro:h kya** (well)ADV [PRES.PERF-(yellow) **corn** (ripe)ADJ (my) ]

4.

c) The yellow corn has ripened.

d) The corn grew beautifully.

## LALANA ROUGH WORK EXAMPLE AND SOLUTION

## Dictionary

kwi: corn  
 mo:h pineapples  
 kya my  
 li:? Beautiful and beautifully  
 dzo well  
 ro:h ripe  
 kwa: tall

## Rules

Verbs:

Past simple receive prefix kala-  
 (kalakwa, kaladzö, kalaro:h)

Present continuous receive miła-  
 (miłakwa, miładzö)

Adjectives:

Adjectives come after the word they describe (kwi: li:? / *corn beautiful*) (mo:h ne / *pineapple yellow*)

Using adjective as a verb – add a verb prefix e.g (ne – kalane / *yellow – yellowed*) and (kwa/kalakwa/miłakwa – tall/grew/has grown)

Adverbs:

Come at the beginning of the sentence (li:? / *beautifully*) Word order:

(Adverb) Verb – Subject (Adjective) (Possessive)

Answers:

1. li:? is beautiful(ly). 2. ro:h is ripe.

3. a) kalali:? mo:h dʒö PAST-(become beautiful) pineapples (good/well)ADJ

b) dʒö miłane mo:h ro:h kya (well)ADV [PRES.PERF-(yellow) corn (ripe)ADJ (my) ]

4. c) The yellow corn has ripened.

d) The corn grew beautifully.

## Rough Work Table:

Prefixes:

Kala-kwa: grew (past simple)

kwa: tall

Miła-kwa: has grown (present continuous) / growing

Kala-dzo turned out well (past simple)

dzo well

Miła-dzo have turned out well (present continuous) / done well

Kalaro:h ripened (past simple)

[ro:h would be “ripe”]

Kala-ne yellowed (past simple)

ne yellow

[Miła-ne would be ‘has yellowed’ (present continuous)]

# 3.8

## ADAPT AILO WORKSHOP 2018/9 POST AILO WORKSHOP QUESTIONNAIRE

**Q1** Would you consider studying computing, languages or linguistics at university?  Yes  No

**Q2** Would you recommend AILO to a friend?  Yes  No

**Q3** Would you like to take Round 1 of AILO in your school at the end of January?  Yes  No

**Q4** What is your overall assessment of the workshop today?  
 Very Satisfied  Satisfied  Neutral  Unsatisfied  Very Unsatisfied

**Q5** What topics or aspects of this workshop did you find most interesting / useful?

**Q6** How much do you agree / disagree with the following statements? (please circle)

I have effective strategies for solving complex problems

Strongly agree  Agree  Neutral  Disagree  Strongly Disagree

I am confident in my current problem-solving skills

Strongly agree  Agree  Neutral  Disagree  Strongly Disagree

I learned strategies for solving puzzles in this workshop

Strongly agree  Agree  Neutral  Disagree  Strongly Disagree

I would recommend this workshop to a friend

Strongly agree  Agree  Neutral  Disagree  Strongly Disagree

Comments / Feedback:

---

---

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Engaging Content  
Engaging People



Problem-Solving Initiative





## Sample Set One - September 2018

### Teacher / Student Guide

This pack includes:

- introductory logic and language puzzles.
- Problem-solving career profile from a Language Technology Scientist
- Last year's samples, workshops and competition papers:

<https://ailo.adaptcentre.ie/sample-puzzles/2018-2/>

### Puzzle Guide

The “weasel” puzzle and solution

- Helps students to recognise features and rules in English.

The “walrus” puzzle and solution

- Uses a perhaps familiar language (German) to introduce how to recognise rules and learn how to begin analysing and describing what they see.
- Ask students to write down any observations / rules they can see in the German language set.

The ‘Georgian Countries’ puzzle and solution

- Introduction to analysing and describing a writing system.

### Career Profile

- Jian Zhang, Language Technology Scientist, Voysis.

Run by:



Part of:



Supported by:





## Sample Set One - September 2018

**Question 1.** *The following sentence, though bizarre and deliberately confusing, is actually grammatically correct:*

*“The weasel that a boy that startles the cat thinks loves smiles eats.”*

*Answer the following questions. In some cases, the answers may be “nobody in this sentence” or “nothing in this sentence”.*

- 1. What is the subject of this sentence? (Give a single-word answer.)*
- 2. How many verbs are in the sentence?*
- 3. Who startles whom or what?*
- 4. Who thinks what?*
- 5. Who loves whom or what?*
- 6. Who smiles?*
- 7. Who eats whom or what?*



## Sample Set One - September 2018

**Answer** A paraphrase of the sentence might be: “The weasel eats. A boy thinks ‘this weasel loves smiles’. That boy startles the cat.”

1. **‘Weasel’** is the subject.
2. **Four:** “startles”, “thinks”, “loves”, and “eats”. “Smiles” is a noun.
3. **A boy** startled **a cat**.
4. **A boy** thought **that a weasel loved smiles**.
5. **A weasel** loves **smiles** (at least in the mind of the boy).
6. **Nobody in this sentence** (explicitly) smiles; “smiles” is used as a noun.
7. **A weasel** eats **something unspecified**.



## Sample Set One - September 2018

Boris Iomdin

In 1996, a joint session of the orthographical committees from Austria, Germany and Switzerland decided to reform German spelling rules for better consistency. In particular, the letter  $\beta$  was in some (not all) cases replaced by the letter combination *ss*. The table below lists some German words in both orthographical variants as well as the corresponding English words:

| German<br>(old orthography) | German<br>(new orthography) | English  |
|-----------------------------|-----------------------------|----------|
| Boß                         | Boss                        | boss     |
| daß                         | dass                        | that     |
| Nuß                         | Nuss                        | nut      |
| küß                         | küss                        | kiss!    |
| mußt                        | musst                       | must     |
| Walroß                      | Walross                     | walrus   |
| barfuß                      | barfuß                      | barefoot |
| groß                        | groß                        | great    |
| Soße                        | Soße                        | sauce    |
| Straße                      | Straße                      | street   |
| süß                         | süß                         | sweet    |
| Auslaß                      |                             | outlet   |
| Baß                         |                             | bass     |
| Biß                         |                             | bit      |
| Floß                        |                             | float    |
| Fußball                     |                             | football |
| Geißhirt                    |                             | goatherd |
| grüß                        |                             | greet    |
| schieß                      |                             | shoot    |
| Schuß                       |                             | shot     |
| Schweiß                     |                             | sweat    |

Assignment 1. Fill in the omissions in the table, providing the new orthographical versions of the German words.

Assignment 2. Do you think it is easier or harder for the foreigners to read German in the new orthography? Explain your solution.

Note. No knowledge of German is required for solving this problem.



## Sample Set One - September 2018

### Boris Iomdin. **Solution to the Walrus problem**

The letter  $\beta$  (pronounced es-tsett) exists only in German language. It is written to render the voiceless sound [s], as well as the letter combination *ss*. Before the reform, the rules for using either variant were rather complex and inconsistent. The reform offers a simpler rule: after a long vowel or diphthong, one writes  $\beta$ , as long as no other consonant follows in the word stem (the latter part is not reflected in the problem).

The problem can be solved without using any knowledge of German, if one compares the German words to their English cognates. We can see that in each syllable which contains the  $\beta$ , English has two vowel letters: *barfuß* – *barefoot*, *groß* – *great*, *Soße* – *sauce*, *Straße* – *street*, *süß* – *sweet*. This may be an indication of the fact that the joint ancestor of German and English had a long vowel in this position. The traditional German orthography does not show the length of the vowel in any way, but we may suppose that the long/short distinction still exists in the language. Then it would be reasonable to assume that according to the new orthography, the length of the vowel in the syllable ending by the [s] sound is reflected by the use of  $\beta$  or *ss*.

#### Assignment 1.

|          |                 |          |
|----------|-----------------|----------|
| Baß      | <b>Bass</b>     | bass     |
| Biß      | <b>Biss</b>     | bit      |
| Floß     | <b>Floß</b>     | float    |
| Fußball  | <b>Fußball</b>  | football |
| Geißhirt | <b>Geißhirt</b> | goatherd |
| grüß     | <b>grüß</b>     | greet    |
| schieß   | <b>schieß</b>   | shoot    |
| Schuß    | <b>Schuss</b>   | shot     |
| Schweiß  | <b>Schweiß</b>  | sweat    |

Assignment 2. The new orthography apparently makes it easier to read some German words for foreigners who otherwise would not know whether to pronounce the vowel in a given word short or long.



## Sample Set One - September 2018

### Georgian Countries

There are names of some countries in South America, written in the Georgian language, together with their translations to English:

|           |         |
|-----------|---------|
| ბრაზილია  | Brazil  |
| პერუ      | Peru    |
| ურუგვაი   | Uruguay |
| არგენტინა |         |
| კოლუმბია  |         |

What are the names, in English, of the two untranslated countries?



## Sample Set One - September 2018

### IOL Sample Solutions

#### Georgian Countries

In this question, one has only to decipher a different alphabet. For that, one can note that “Peru” and “Uruguay”, in Georgian, have the same amount of characters as their translations; furthermore, the repetition of U in Uruguay assures us that Georgian is written left-to-right. So we can do the relation one-to-one. “Brazil”, nevertheless, has more letters than the version in English, but thanks to the two other names, we already know some letters:

\_ R A \_ I \_ I A

This should probably be “Brasilia” or “Brazilia”.

With those letters, we can guess the names of the other two countries:

A R G E \_ \_ I \_ A

\_ \_ L U \_ B I A

which can only be Argentina and Colombia (Columbia).



## Sample Set One - September 2018

### Career Profile

|  |  |   |
|--|--|---|
|  |  | <p><b>Name:</b> Jian Zhang</p> <p><b>Job title:</b> Language Technology Scientist</p> <p><b>Current Company:</b><br/>Voysis - <a href="https://voysis.com/">https://voysis.com/</a></p> <p><b>Industry:</b> Artificial Intelligence (AI), Speech Technology</p> |
|--|--|---|

### Education and Work Experience

#### Undergrad

I studied a B.Sc. in Computer application for software engineering in the School of Computing at Dublin City University (DCU).

#### Internship

I joined CNGL / ADAPT as an undergraduate intern working on a Centre for Talented Youth (CTYI) course on Search Engines.

#### Programmer at CNGL / ADAPT

I was employed by a CNGL research project as a software programmer. My role was to development machine translation engines for several European/Asian languages. Other roles included front/back end server design and implementation.

#### PhD with ADAPT

I then had the opportunity to do a PhD in Neural Machine Translation and Statistical Machine Translation with ADAPT, DCU, graduating in 2017.

### Current Role

#### Main Tasks and Responsibilities

My main task in Voysis involves developing a text-to-speech (TTS) system using a deep learning technique. It requires me to have the ability to understand the state-of-the-art TTS systems and deep learning knowledges.



## Sample Set One - September 2018

### Career Profile

#### Problems I need to solve in my job on a day-to-day basis

The problem usually cannot be solved in a few days or even weeks. I normally break down the large problem into several small problems with a research plan. The plan is dynamic as new experiment results can change the research directions significantly.

#### About me

##### What kind of puzzles/problems do you enjoy?

I like challenges that requires me to think a lot and research a lot.

##### What school subjects influenced your career path?

I think all school subjects contribute a lot in my career path. The school subjects provide me the basic tools and skills that I need for my PhD and current job.

##### Who inspired you?

Dr. Alexandru Ceausu, who was my working colleague in CNGL / ADAPT. I learned so much from him. He shared his knowledge with me and made me ready to be a PhD student.

##### Work/life balance

Yes and No. I always try to have a good balance between work and life. However, it is so hard to have a clear boundary between them if you enjoy what you are doing.

##### Your top tips?

It is important to have a deep understanding of deep learning in different fields, such as in speech, language and image. Programming is also an essential skill.

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## Sample Set Two - October 2018

### Teacher / Student Guide

This pack includes:

- introductory logic and language puzzles.
- Problem-solving career profile from an Irish Language Technology PhD Student
- Last year's samples, workshops and competition papers:  
<https://ailo.adaptcentre.ie/sample-puzzles/2018-2/>
- Free nationwide workshops: <https://ailo.adaptcentre.ie/enter/workshops-20189/>

### Puzzle Guide

The "Curragh of Kildare" puzzle and solution

- Helps students to recognise features based on Irish place names.
- It is useful to look at how rules are written about a language that you may know.

The "Reach for the Top" puzzle and solution (difficult)

- Ilocano was written in the Baybayin script.
- Ask students to write down any observations / rules they see about the writing system.

Students should attempt AILO February 2018 Preliminary / Round One if they have not done it:

- <https://ailo.adaptcentre.ie/sample-puzzles/2018-2/>

### Career Profile

- Abigail Walsh, Irish Language Technology PhD Student, ADAPT Centre, Dublin City University.

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## Sample Set Two - October 2018

YOUR NAME:

REGISTRATION #:

( 20 points )

### (J) The Curragh of Kildare (1/2)

And straight I will repair  
To the Curragh of Kildare  
For it's there I'll find tidings of my dear  
[Irish Folk Song]

In Ireland, each place name has two versions with equal legal status – an English one and an Irish one. Below are some place-names in their two versions and translations of the Irish ones.

|    | English        | Irish                  | Translation of Irish name |
|----|----------------|------------------------|---------------------------|
| 1  | Glenamuckaduff | Gleann na Muice Duibhe | Valley of the Black Pig   |
| 2  | Clonamully     | Cluain an Mhullaigh    | Meadow of the Summit      |
| 3  | Buncurry       | Bun an Churraigh       | Base of the Marsh         |
| 4  | Curraghmore    | An Currach Mór         | The Big Marsh             |
| 5  | Annaghanoon    | Eanach an Uain         | Fen of the Lamb           |
| 6  | Dunard         | An Dún Ard             | The High Fort             |
| 7  | Bunagortbaun   | Bun an Ghoirt Bháin    | Base of the White Field   |
| 8  | Gortnakilly    | Gort na Cille          | Field of the Church       |
| 9  | Binbane        | An Bhinn Bhán          | The White Peak            |
| 10 | Ballyknock     | Baile an Chnoic        | Town of the Hill          |
| 11 | Ballynaparka   | Baile na Páirce        | Town of the Park          |
| 12 | Kilcarn        | Cill an Chairn         | Church of the Mound       |
| 13 | Killeshil      | An Choill Íseal        | The Low Wood              |
| 14 | Clashbane      | An Chlais Bhán         | The White Pit             |
| 15 | Bunbeg         | An Bun Beag            | The Small Base            |

Sometimes the English name is no more than a translation of the Irish one:

|    |            |                     |
|----|------------|---------------------|
| 16 | Blackabbey | An Mhainistir Dhubh |
| 17 | Bigpark    | An Pháirc Mhór      |
| 18 | Castlepark | Páirc an Chaisleáin |
| 19 | Woodland   | Talamh na Coille    |





## Sample Set Two - October 2018

YOUR NAME:

REGISTRATION #:

### (J) The Curragh of Kildare (2/2)

**J1.** What would the Irish names of the following towns and villages be? Provide a translation for each one. If you think more than one Irish name could correspond to a given English name, give all of them:

|    | English         | Irish | Translation of Irish name |
|----|-----------------|-------|---------------------------|
| 20 | Mullaghbane     |       |                           |
| 21 | Killananny      |       |                           |
| 22 | Knocknakillardy |       |                           |
| 23 | Gortnabinna     |       |                           |
| 24 | Clashgortmore   |       |                           |
| 25 | Killbeg         |       |                           |
| 26 | Blackcastle     |       | Black castle              |

**J2.** Explain your reasoning and provide any additional observations about this problem.





## Sample Set Two - October 2018

# (J) The Curragh of Kildare

**J1.** Determine the Irish names of the following villages and translate each name.

|    | English          | Irish  | Translation   |
|----|------------------|--|---|
| 20 | Mullaghbane      | <i>An Mullach Bán</i>                                | <i>The White Summit</i>                                   |
| 21 | Killananny       | <i>Cill an Eanaigh/<br/>Coill an Eanaigh</i>         | <i>Church of the Fen/<br/>Wood of the Fen</i>             |
| 22 | Knocknakillardry | <i>Cnoc na Cille Airde/<br/>Cnoc na Coille Airde</i> | <i>Hill of the High Church/<br/>Hill of the High Wood</i> |
| 23 | Gortnabinna      | <i>Gort na Binne</i>                                 | <i>Field of the Peak</i>                                  |
| 24 | Clashgortmore    | <i>Clais an Ghoirt Mhóir</i>                         | <i>Pit of the Big Field</i>                               |
| 25 | Killbeg          | <i>An Chill Bheag/<br/>An Choill Bheag</i>           | <i>The Small Church/<br/>The Small Wood</i>               |
| 26 | Blackcastle      | <i>An Caisleán Dubh</i>                              | Black castle  |

**J2.** Explain your answers.

**Orthographic correspondences:** The English names are phonetic imitations of the Irish names. The letter correspondences (Irish/English) include *c/k*, *ch/gh*, and *agh/y*, but many Irish letters do not have English equivalents; for example, there is no distinction between *cill* and *coill*.

**Irish place names:** The names fit the following pattern, where brackets represent optional parts; note that adjectives come after the respective nouns:

[An] <noun-1> [<adjective-1>] [an/na <noun-2> [<adjective-2>]]

If a name includes a second noun, it is in the “of” form, which is analogous to the “<noun>’s” form in English, such as “John’s.” If it includes an adjective after the “of” noun, this adjective is also in the “of” form. Furthermore, an article before the “of” noun is sometimes *na* rather than *an*. We can identify the related patterns by comparing the two forms.

### Nouns:

| Base form       | “Of” form    | Translation |
|-----------------|--------------|-------------|
| gort            | an ghoirt    | field       |
| an currach      | an churraigh | marsh       |
| an pháirc/páirc | na páirce    | park        |
| cill            | na cille     | church      |
| an choill       | na coille    | wood        |
| an bun/ bun     | ?            | base        |
| an bhinn        | ?            | peak        |
| baile           | ?            | town        |
| cluain          | ?            | meadow      |
| gleann          | ?            | valley      |
| eanach          | ?            | fen         |

| Base form     | “Of” form     | Translation |
|---------------|---------------|-------------|
| an dún        | ?             | ford        |
| talamh        | ?             | land        |
| an mhainistir | ?             | abbey       |
| an chlais     | ?             | pit         |
| ?             | na muice      | pig         |
| ?             | an mhullaigh  | summit      |
| ?             | an uain       | lamb        |
| ?             | an chairn     | mound       |
| ?             | an chaisleáin | castle      |
| ?             | an chnoic     | hill        |



## Sample Set Two - October 2018

We notice two classes of nouns.

Class A: The nouns whose last vowel is *i*.

- Insert *-h-* in the base form when preceded by the article.
- Add *-e* in the end to construct the “of” form.
- Use the article *na* in the “of” form.

Class B: The nouns whose last vowel is not *i*.

- No changes in the base form.
- Add *-i-* before the last consonant cluster to construct the “of” form.
- Use the article *an* and insert *-h-* after the first consonant in the “of” form.

**Adjectives:** The behavior of an adjective depends on the class of the related noun.

| Base form |         | “Of” form |         | Translation |
|-----------|---------|-----------|---------|-------------|
| Class A   | Class B | Class A   | Class B |             |
|           | dhubh   |           | duibhe  | black       |
|           | bhán    | bháin     |         | white       |
| ard       |         |           |         | high        |
|           | íseal   |           |         | low         |
| mór       | mhór    |           |         | big         |
| beag      |         |           |         | small       |

An adjective after a Class A noun behaves like a Class A noun with an article. Similarly, an adjective after a Class B noun behaves like a Class B noun with an article.

**English place names:** The Irish words always have the same English correspondence, regardless of their grammatical form, with the exception of the *-ach/-aigh* words; for example, *bán*, *bháin*, *bhán*, and *báine* all correspond to *-bane* in an English name.



Sample Set Two - October 2018

YOUR NAME:

REGISTRATION #:

( 20 points )

**(C) Reach for the top (page 1/2)**

The Ilocano language is one of the major languages of the Philippines, spoken by more than 8 million people. Today it is written in the Roman alphabet, which was introduced by the Spanish, but before that Ilocano was written in the *Baybayin* script. *Baybayin* (which literally means “spelling”) was used to write many Philippine languages and was in use from the 14<sup>th</sup> to the 19<sup>th</sup> centuries.

**C1 (practical).** Below are twelve Ilocano words written in Baybayin. Match them to their English translations, listed in scrambled order below.

- ᐃᐃᐃ \_\_\_\_\_
- ᐃᐃᐃᐃᐃ \_\_\_\_\_
- ᐃᐃᐃᐃ \_\_\_\_\_
- ᐃᐃᐃᐃᐃᐃᐃ \_\_\_\_\_
- ᐃᐃᐃᐃᐃ \_\_\_\_\_
- ᐃᐃᐃᐃᐃᐃᐃᐃᐃ \_\_\_\_\_
- ᐃᐃᐃᐃ \_\_\_\_\_
- ᐃᐃᐃᐃᐃᐃᐃ \_\_\_\_\_
- ᐃᐃᐃᐃᐃᐃᐃᐃ \_\_\_\_\_
- ᐃᐃᐃᐃᐃᐃ \_\_\_\_\_
- ᐃᐃᐃᐃᐃ \_\_\_\_\_
- ᐃᐃᐃᐃᐃ \_\_\_\_\_

{ to look, is skipping for joy, is becoming a skeleton, to buy, various skeletons, various appearances, to reach the top, is looking, appearance, summit, happiness, skeleton }

**C2 (practical).** Fill in the missing forms.

- ᐃᐃᐃᐃᐃ \_\_\_\_\_
- ᐃᐃᐃᐃᐃᐃᐃ \_\_\_\_\_
- ᐃᐃᐃᐃᐃᐃᐃᐃ \_\_\_\_\_
- \_\_\_\_\_ (the/a) purchase
- \_\_\_\_\_ is buying





## Sample Set Two - October 2018

YOUR NAME:

REGISTRATION #:

### (C) Reach for the top (page 2/2)

C3 (theoretical). Explain the reasoning behind your solutions to C1 and C2.







## Sample Set Two - October 2018

### Career Profile

|   |  |
|---|--|
|  | <p><b>Name:</b> Abigail Walsh</p> <p><b>Job title:</b> Irish Language Technology PhD Student</p> <p><b>Current Study:</b> ADAPT Research Centre, Dublin City University<br/> <a href="https://www.adaptcentre.ie/">https://www.adaptcentre.ie/</a></p> <p><b>Industry:</b> Natural Language Processing (NLP)</p> |
|---|--|

### Education and Work Experience

#### Undergraduate

I finished my undergraduate degree in Computer Science and Language at Trinity College Dublin in 2016. After graduating, I was employed as a research assistant at the ADAPT Centre, before starting my PhD here. I also did several research internships in the areas of NLP and Machine Learning, one of which was the ADAPT Internship.

#### Internship

My internship title was Semantic Fuzzy Matching for Translation Memory. At the time of my internship at ADAPT, I was questioning my career path and whether I was suited to academic work. I was also experiencing some burnout, after a stressful final year. My internship at ADAPT gave me a positive experience in setting my own goals and deciding which challenges I could tackle, within the framework of an existing research project. I discovered aspects of research I truly enjoyed, and other areas I was struggling in.

### Current Role

#### Main Tasks and Responsibilities

As a PhD Candidate, I research the automatic processing of multiword expressions in Irish - this topic lies at the intersection of linguistics, machine learning, Irish language and technology.

#### What are the main skills you learned during your job at ADAPT?

Aside from learning practical research skills, and honing my knowledge of the topic and related fields; I have learned and am still learning some other very important life skills, such as maintaining a good work/life balance, exploring my passions, building my professional network, managing my time, and, most importantly, understanding my own strengths and



## Sample Set Two - October 2018

### Career Profile

weaknesses and working with those aspects of my personality. I believe this type of personal development comes from working in a positive, supportive and understanding environment.

#### **My Typical Day**

I usually start the day with administrative tasks, such as scheduling meetings or responding to emails; these tasks require excellent organisation skills and attention to detail. My work provides many opportunities for learning and development: the lectures and meetings I attend inform about developments in my field, and I enjoy tutoring other students and sharing my knowledge and experience with them. The bulk of my own PhD work is research and running experiments; only after I sufficiently understand the problem and how others in my field have tackled it, do I begin to plan my own approach. I relish the challenge of establishing a research questions, planning a method, and working towards a solution.

#### **How important is problem solving in your role?**

Many of my tasks I complete throughout the day require some level of problem-solving. Particularly as a computer scientist, much of my work revolves around taking complex and multifaceted problems and distilling them into simpler tasks. This technique is called divide-and-conquer and is particularly helpful when the problem at hand seems too complex to be solved at first glance.

#### **What kinds of problems do you need to solve in your job on a day-to-day basis?**

Some of the problems seem trivial, like how do I install this piece of software, or how do I locate a paper by a certain author. Other problems are more complex; for example, the question of how to automatically process MWEs in Irish. This complex issue actually incorporates several other tasks; such as research, coding, and linguistic analysis. I've found that regardless of whether the problem is simple or complex, the same problem-solving strategies can often be applied.

#### **What is your favourite thing about your work?**

I love the challenges presented by tackling a difficult research question and trying to discover something entirely new and unknown. I love to ask questions, and it's very gratifying to have the opportunity to answer them myself, particularly if nobody else can!

### About me

#### **What kind of puzzles/problems do you enjoy?**

I've always enjoyed logic puzzles, abstract thinking and brain-teasers. For me, a career in computer science seemed a natural choice. I particularly enjoy the types of outside-the-box thinking required for creating a new piece of code, while also trying to work within the limitations of the language. Applying this logical and structured way of thinking to the very messy problems posed by language is fascinating and immensely satisfying to me.

#### **What school subjects influenced your career path?**

Choosing subjects to study at school was difficult, because I was interested in everything! My favourite subjects were maths, physics, technical graphics, music and English. Luckily my



## Sample Set Two - October 2018

### Career Profile

course allowed me to study both science and languages, and I've continued to work in both fields to this day.

#### Who inspired you?

My supervisor, Teresa Lynn, has been a big inspiration to me, particularly when I was deciding what to do next after graduating. I was burned out and felt apprehensive about returning to academic work. She reignited my confidence, my passion for research and my interest in Irish.

#### Work/life balance

As a full-time student, my hours are very flexible. This allows me to dictate my own schedule and work when I am most productive (I prefer to work in the evening time). However, it can be difficult to maintain this balance. Some days I struggle to be productive, while other days I can overwork myself. Overall, I really enjoy the freedom and flexibility.

#### Your top tips?

NLP and other related fields are typically at an intersection of science and humanities. Computer science in particular is a creative subject that allows for some very interesting and diverse applications. It is ideal for people who are logical, inventive and enjoy solving problems. That said, I think the number one quality you can possess as a potential researcher is curiosity. Find an area that fascinates you and start asking questions. If nobody else knows answer, then maybe you should find out what it is.

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## Sample Set Three - November 2018

### Teacher / Student Guide

This pack includes:

- Introductory logic and language puzzles.
- Problem-solving career profile from a Senior Program Manager, Microsoft Ireland.
- Last year's samples, workshops and competition papers: <https://ailo.adaptcentre.ie/sample-puzzles/2018-2/>
- Free nationwide workshops: <https://ailo.adaptcentre.ie/enter/workshops-20189/>
- This year's Nov/Dec 2018 workshop materials are now online: <https://ailo.adaptcentre.ie/sample-puzzles/>

### Puzzle Guide

The Georgian Café

- Thanks to the Babette Newsome and the UKLO.
- Ask students to write down any observations / rules they see about the new language.

Visible Speech

- Thanks to the Daniel Harbour and the UKLO.
- Ask students to write down any observations / rules they see about the new language.

Students should attempt AILO February 2017 Preliminary / Round One if they have not done it:

- <https://ailo.adaptcentre.ie/sample-puzzles/2017-2/>
- **Ask students to write down any observations / rules they see about the new languages in the problems as we are introducing this in the preliminary round.**

### Career Profile

- Dr Declan Groves, Senior Program Manager, Microsoft Ireland.

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## Sample Set Three - November 2018

(Author: Babette Newsome)

### Drinking ყავა in a Georgian Café

Georgian is a language, unrelated to English, spoken by just over 4 million people, mostly in Georgia, but also in Ukraine, Russia, Turkey and Azerbaijan. It is written in the beautiful Mkhedruli alphabet which is recognised in UNESCO's List of the Intangible Cultural Heritage of Humanity.

Can you match the Georgian words and phrases to their English translations and then write **sugar spoon** in Georgian?

|              |               |
|--------------|---------------|
| 1. ჩაი       | a. coffee     |
| 2. შაქარი    | b. sugar      |
| 3. საშაქრე   | c. tea cup    |
| 4. საყავე    | d. spoon      |
| 5. ყავა      | e. coffee-pot |
| 6. კოვზი     | f. tea        |
| 7. ჩაის ჭიქა | g. sugar-pot  |

The British Academy cosponsors the UK Linguistics Olympiad, a competition for schools. Information and the problem solution at: <http://www.uklo.org/problems>



## Sample Set Three - November 2018

### Drinking ყავა in a Georgian Café – Solutions

located at <http://www.uklo.org/problems>.

#### Answers:

|   |   |
|---|---|
| 1 | f |
| 2 | b |
| 3 | e |
| 4 | g |
| 5 | a |
| 6 | d |
| 7 | c |

'tea spoon' = ჩაის კოვზი

#### How to solve it

- #7 is the only Georgian example with two words, and 'tea cup' is the only two-word English form, so they probably match. Notice the careful use of hyphens in 'sugar-pot' and 'coffee-pot'!
- If #7 means 'tea cup', then it must contain the word for 'tea'. That must be #1, in spite of the extra letter in #7.
- #3 contains #2, and #4 contains #5; moreover in both #3 and #4 the extra letters are the same. So we can assume that these pairs are related. In the English we also find two related pairs: 'sugar'~'sugar-pot' and 'coffee'~'coffee-pot', so we can assume that these translate the Georgian pairs, with 'pot' translated by the extra letters. But which pair is which?
- Now look at the title of the problem, containing a Georgian word for something you can drink. This must be 'coffee', not 'sugar'. So #5 must be 'coffee', and the rest follows.
- The remaining word is #6, which must be 'spoon'. This is crucial for solving the bonus question, but you also have to build on the example of 'tea cup', where the word for 'tea' has an extra letter.



## Sample Set Three - November 2018

### Background details

Georgian is not related to the Indo-European group of languages (to which the vast majority of languages in Europe belong thanks to a common ancestor), but belongs to the Kartvelian group of languages. It is part of the South-Caucasian languages sub-group of Georgian-Zan (also Karto-Zan) and is, as far as most linguists are concerned, unrelated to the nearby North-Caucasian languages.

The Georgian alphabet has 33 letters (it used to have 38) because it avoids 'di-graphs' such as the English <sh> combination representing a single sound (represented in the International Phonetic Alphabet as ʃ).

The script may be familiar to science fiction fans, however. Recently, the BBC adapted China Miéville's novel *The City and the City*, and language consultant Alison Long from Keele University gave the characters from the fictional city of Ul Qoma the Georgian script for their language, Illitan. Illitan was invented initially by Miéville as part of the novel, but then developed by Long for the TV series. Long decided to use the Georgian alphabet because it looked so different from English and would convey an alien setting for the story.

You may recognise some of the Georgian words when given in Roman alphabet as they are loanwords (just as English borrowed "tea" and "coffee", so did Georgian).

|   | Georgian   | Transliteration in Roman alphabet   | English Translation |
|---|------------|---|---------------------|
| 1 | ჩაი        | chai  | tea                 |
| 2 | შაქარი     | shakari   | sugar               |
| 3 | საშაქრე    | sashakre ('pot' = sa...e)   | sugar-pot           |
| 4 | საყავე     | saq'ave ('pot' = sa...e)  | coffee-pot          |
| 5 | ყავა       | q'ava [q' is a k-sound produced deep in the throat]   | coffee              |
| 6 | კოვზი      | k'ovzi  | spoon               |
| 7 | ჩაის ჭიკვა | chais ch'ika (notice -s on 'tea' linking it to 'cup'. This is your clue for 'sugar spoon'.) | tea cup             |





## Sample Set Three - November 2018

### Solution

Located at <http://www.uklo.org/problems>.

Alexander Melvil Bell (in the International Phonetic Alphabet: /æləkzandə mɛlvɪl bɛl/).

### How to solve the problem

One challenge in both constructing and solving this problem is that Bell's name has slightly different pronunciations in different English accents – for instance, in some accents the final <ɹ> of <Alexander> is pronounced, while in others it is not. However, these differences are small, so the Received Pronunciation assumed here shouldn't cause many difficulties.

1. To read the name, you need vowels /æ ɛ a ə ɪ/ and consonants /l z n d m v b k/.
2. Of these, /v m d a ə ɪ/ are found directly in the text.
3. In addition, the text includes /ʃ ž i p t ŋ g e/, which are not in the name.
4. Using 2 and 3, the following “deductions” are possible:
  - from nasals /m ŋ/ deduce nasal /n/
  - from labial and alveolar /m n d/ deduce labial /b/
  - from labial, alveolar and velar /p t ŋ g/ deduce velar /k/
  - from sibilant /ʃ ž s/ deduce sibilant /z/
  - from high front vowels /ɪ e/ deduce mid front vowel /ɛ/
  - from high/mid front vowels /i ɪ ɛ/ deduce low front vowel /æ/



## Sample Set Three - November 2018

### Background details

(From Wikipedia: Visible speech)

**Visible Speech** is a system of phonetic symbols developed by [Alexander Melville Bell](#) in 1867 to represent the position of the speech organs in articulating sounds. Bell was known internationally as a teacher of speech and proper [elocution](#) and an author of books on the subject. The system is composed of symbols that show the position and movement of the throat, tongue, and lips as they produce the sounds of language, and it is a type of [phonetic notation](#). The system was used to aid the deaf in learning to speak.

In 1864 Melville promoted his first works on Visible Speech, in order to help the deaf both learn and improve upon their speech (since the profoundly deaf could not hear their own pronunciation).<sup>[1]</sup> To help promote the language, Bell created two written short forms using his system of 29 modifiers and tones, 52 [consonants](#), 36 [vowels](#) and a dozen [diphthongs](#):<sup>[2]</sup> they were named [World English](#), which was similar to the [International Phonetic Alphabet](#), and also Line Writing, used as a shorthand form for [stenographers](#).<sup>[3]</sup>

Melville's works on Visible Speech became highly notable, and were described by [Édouard Séguin](#) as being "...a greater invention than [the telephone](#) by his son, [Alexander Graham Bell](#)".<sup>[3]</sup> Melville saw numerous applications for his invention, including its worldwide use as a [universal language](#). However, although heavily promoted at the [Second International Congress on Education of the Deaf](#) in Milan, Italy in 1880, after a period of a dozen years or so in which it was applied to the education of the deaf, Visible Speech was found to be more cumbersome, and thus a hindrance, to the teaching of speech to the deaf, compared to other methods,<sup>[4]</sup> and eventually faded from use.

Bell's son [Alexander Graham Bell](#) learned the symbols, assisted his father in giving public demonstrations of the system and mastered it to the point that he later improved upon his father's work. Eventually, Alexander Graham Bell became a powerful advocate of visible speech and [oralism](#) in the United States. The money he earned from his patent of the [telephone](#) and the sale of his [Volta Laboratory patents](#) helped him to pursue this mission.



## Sample Set Three - November 2018

### Career Profile

|  |   |
|--|---|
|  | <p><b>Name:</b> Dr Declan Groves</p> <p><b>Job title:</b> Senior Program Manager, Language Technology</p> <p><b>Employer:</b> Microsoft</p> <p><b>Industry:</b> Software Localization / Language Technology</p> |
|--|---|

### Education and Work Experience

#### Undergraduate and Career

BSc. in Applied Computational Linguistics from DCU (2003)

PhD in Machine Translation funded via an Irish Research Council (IRCSET) Postgrad Fellowship Award (2007)

Commercial Development Researcher & Research Integration Officer at CNGL (ADAPT) (2011-2013)

Joined Microsoft as a Linguistic Engineer (2013) in Xbox; joined Office International Engineering in 2016 as a Program Manager.

#### Work at CNGL / ADAPT

In CNGL, and then ADAPT, my primary duties were the management of a number of different EU research projects concerning Machine Translation and Language Technologies and also managing and implementing industrial and commercial projects (including projects jointly-funded by Science Foundation Ireland and Enterprise Ireland). This position focused on all aspects of both research and resource management - managing the local team of researchers, team recruitment & interviewing, budget/financial management, working with commercial and research partners, and leading the composition and submission of funding applications.

### Current Role

#### Main Tasks and Responsibilities

The group I work with are responsibly for localizing all of Office's products and services into over 100 languages around the globe. My work is focused on looking at language technology and how it can help us produce high quality localized products for our international Office customers in a smart and efficient way, which includes the application of artificial intelligence



## Sample Set Three - November 2018

### Career Profile

and machine learning. This means I need good listening and problem-solving skills, as well as engineering skills to work with a larger team of software developers to design and develop solutions and tools that will scale to the large number of languages we work with daily.

#### How important is problem solving in your role?

Problem solving is essential to my role. Every day there are new and interesting problems to solve and challenges to overcome. I need to be able to think about problems broadly and think of smarter ways to solve them.

#### What kinds of problems do you need to solve in your job on a day-to-day basis?

Typical problems I have to solve involve things like how can we make automated translation work better for all languages, how can we take a tool that was written to process and categorize English text work as well for Spanish, Russian or Japanese; or how can we respond better to the feedback our international customers provide us with on the quality of our products and services.

#### What is your favourite thing about your work?

The favourite thing about my work is that I am able to learn from cutting-edge research and apply it to real-world problems. I also love working with a large team of diverse people, from different backgrounds and different experiences. Microsoft has a real commitment to diversity and inclusion and it is something that I am particularly passionate about; it is a company where you really can come as you are and do what you love.

### About me

#### What kind of puzzles/problems do you enjoy?

My favourite puzzles are brain teasers, algebra problems and dingbats. I remember even at primary school my teachers always commented that I seemed to enjoy problem solving, without realising a lot of those basic math problems were rooted in algebra!

#### What school subjects influenced your career path?

As my career lies on the border between computer science and linguistics, both mathematics and languages (I studied French in school) were the biggest influence on my career path. I remember loving both equally in school, in particular the problem-solving aspects of maths and also learning how cultural aspects influence how we communicate, so I was happy to be able to choose a career path that involved combining both language and technology.

#### Who inspired you?

Initially I would have to say my parents – they always put a huge importance on learning and education growing up and were always supportive of anything my siblings or I wanted to do career-wise. Noam Chomsky would be another big inspiration to me – he is a great example of someone with a growth mindset and has contributed so many great ideas to the areas of language, linguistics and cognitive science, amongst many others.



## Sample Set Three - November 2018

### Career Profile

#### Work/life balance

Work/life balance is something I have to make a continual conscious effort to maintain, and it becomes more important and more challenging the further my career has progressed. Luckily, Microsoft has an excellent attitude towards this and provide great flexibility in work. Part of the challenge for me is learning how to manage my time and how to make realistic timelines for delivering completed projects. It's easy to get sucked into an interesting problem and forget that it is important to also make time for the things that really matter, including friends and family.

#### Your top tips?

I think they would need to have excellent problem-solving skills and the ability to approach problems with an objective, scientific and practical point of view. Research and experimental design skills are important for the ability to have a structured and planned approach to your work. The need for good presentation and writing skills should not be neglected as there's no point in doing really interesting work if you can't communicate it effectively to your colleagues. In terms of education, a background in computer science and knowledge of machine learning would be essential, as well as a good understanding of challenges in natural language processing, particularly for languages other than English.

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