



## 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.

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**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?*

**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**.

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:

<b>German (old orthography)</b>	<b>German (new orthography)</b>	<b>English</b>
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.

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

The letter *ß* (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 *ß*, 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 *ß*, 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 *ß* 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.

# 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?

## 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).

## Career Profile

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

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## 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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