



**OzCLO**

**Australian Computational and Linguistics Olympiad  
National Round 2011**

OzCLO website: [www.ozclo.org.au](http://www.ozclo.org.au)

**Proudly supported by these organisations**

Australian Linguistic Society (ALS)

Australian Commonwealth Scientific and Research Organization (CSIRO)

Defence Science & Technology Organisation (DSTO)

Macquarie Dictionary

National ICT Australia (NICTA)

**and these universities**

Flinders University

Griffith University

Macquarie University

The Australian National University

The University of Adelaide

The University of Melbourne

The University of New England

The University of Queensland

The University of South Australia

The University of Sydney

The University of Western Australia



## OzCLO

Welcome to the Australian Computational and Linguistics Olympiad!

To be completely fair to all participants across Australia, we need you to read, understand and follow these rules.

### RULES

1. Write your registration number on each page of the Answer Booklet.
2. The contest is two hours long.
3. Follow the facilitators' instructions carefully.
4. If you want clarification on any of the problems, talk to a facilitator.
5. You may not discuss the problems with anyone except your team members and the facilitator.
6. It's up to each team to decide how you want to solve the problems. You may decide to divide up the problems among your team members, or work on each problem together.
7. There are six problems. Each problem is worth a specified number of points, with a total of 100 points in the contest.
8. Only work in the **Answer Booklet** will be graded. All your answers should be in the spaces provided in the coloured paper Answer Booklet, not in the individual Contest Booklet. (Make sure you allow enough time to transfer your answers to the Answer Booklet.)
9. At the end of the Session, leave all booklets on your table to be collected by the facilitator.

The National Round is held under the same conditions as Round One.

Each problem has been thoroughly checked for clarity, accuracy and solvability. Some are more difficult than others, but all can be solved using ordinary reasoning and analytic skills. You don't need to know anything about linguistics or about these languages in order to solve the problems. If we have done our job well, almost no one will solve all these problems completely in the time allotted. So don't be discouraged if you don't finish everything.

**Oh, and have fun!**

**<A> Eat your Words! (1/2)**

(15 points)

Arabic is spoken by more than 200 million people as a first language or as a foreign language used in religious practices associated with Islam. There are over 20 main regional spoken varieties, and within these regions, there are further local and social varieties. A more formal variety known as Modern Standard Arabic is spoken by educated people in the Arabic speaking countries.

These words belong to one variety of fast casual everyday spoken Arabic.

1	laHm	<i>meat</i>	21	mishmish	<i>apricot</i>
2	fijli	<i>a radish</i>	22	laymūni	<i>a lemon</i>
3	qāqūni	<i>a rockmelon</i>	23	xyār	<i>cucumber</i>
4	xārūf	<i>sheep</i>	24	baqara	<i>a cow</i>
5	kbīr	<i>big</i>	25	baSli	<i>an onion</i>
6	fraiz	<i>strawberry</i>	26	ka <sup>°</sup> ki	<i>a biscuity cake</i>
7	wazz	<i>goose</i>	27	lawz	<i>almond</i>
8	sukkar	<i>sugar</i>	28	laHəm ghazāl	<i>venison (deer meat)</i>
9	ktīr	<i>much/very</i>	29	baqar	<i>cattle</i>
10	mawz	<i>banana</i>	30	filfil	<i>pepper</i>
11	sukkara	<i>a sugar lump</i>	31	laHmi mafrūmi	<i>ground meat</i>
12	qāqūn	<i>rockmelon</i>	32	mishmishi	<i>an apricot</i>
13	zghīr	<i>little/small</i>	33	laymūn	<i>lemon</i>
14	laHmi	<i>a bit of meat</i>	34	shwayyit əxyār	<i>some cucumber</i>
15	xyāra	<i>a cucumber</i>	35	qāqūn əktīr əktīr	<i>a lot of rockmelon</i>
16	wazzi	<i>a goose</i>	36	finjān əzghīr	<i>a little cup</i>
17	fijil	<i>radish</i>	37	lawzi zghīri	<i>a small almond</i>
18	mawzi	<i>a banana</i>	38	al-baSli l-əkbīri	<i>the big onion</i>
19	baSil	<i>onion</i>	39	l-əxyār əl-bārīda	<i>the cold cucumber</i>
20	fraizāya	<i>a strawberry</i>	40	Halīb əl-baqara	<i>milk of the cow</i>

**Pronunciation of unfamiliar letters** (not essential knowledge for solving the problem):

j = sound of 'z' in 'azure'; i = vowel sound in 'sit'; ī = vowel sound in 'seed'; u = vowel sound as in 'full'; ū = vowel sound in 'fool'; a = vowel in 'cat'; ā = vowel sound in 'pear'; ə = unstressed vowel as the last vowel in 'horses'; ai = as in 'lie'; D = deeper 'd'; S = a deeper 's'; H: breathy 'h'; x = ch in Scottish 'loch'; ° = like a growl in the throat; digraph sh = beginning sound of 'she'; digraph gh = the 'r' sound in French 'rouge'. The other letters are like their English equivalents.

**<A> Eat your Words! (2/2)**

A1. Write the Arabic equivalent of these English phrases:

English	Arabic Equivalent
a big strawberry	
the big apricot	
some biscuity cake	
a lot of sugar	
a pepper	
beef	

A2. When does the sound written 'ə' appear in words?

---



---

A3. Why is 'meat' pronounced as *laHəm* in 28 rather than as *laHm* in 1, while in 34-36 'ə' is the first sound of the second word in the phrase?

---



---

A4. Why is the word for 'the big (one)' in 38 pronounced as *l-ək̄b̄iri*, not as *al-k̄b̄iri* following the pattern of *al-baSli* 'the onion' or as *əl-k̄b̄iri* like *əl-bārīda* in 39?

---



---

A5. Explain the variant forms of 'cucumber' listed below.

'cucumber'	Example No.	Explanation
xyār	23	
xyāra	15	
əxyār	34	
l-əxyār	39	

<B> A Large Spoon is Enough (1/2)

(15 points)

Swahili is a Bantu language spoken by various peoples in an extensive area of eastern Africa. While only 5-10 million people speak it as their native language, it is a *lingua franca* for much of the region.<sup>1</sup> It is a national language of Tanzania, Kenya and the Democratic Republic of the Congo, and is the only language of African origin among the official working languages of the African Union.

Study these sentences with their English translations, given in order, and then translate the sentences on the next page. Swahili has no words for 'the' or 'a'.

Swahili	English
1 <i>Mtu ana watoto wazuri.</i>	The man has good children.
2 <i>Mto mrefu una visiwa vikubwa.</i>	The long river has large islands.
3 <i>Wafalme wana vijiko vidogo.</i>	The kings have small spoons.
4 <i>Watoto wabaya wana miwavuli midogo.</i>	The bad children have small umbrellas.
5 <i>Kijiko kikubwa kinatosha.</i>	A large spoon is enough.
6 <i>Mwavuli una mfuko mdogo.</i>	The umbrella has a small bag.
7 <i>Kisiwa kikubwa kina mfalme mbaya.</i>	The large island has a bad king.
8 <i>Watu wana mifuko mikubwa.</i>	The men have large bags.
9 <i>Viazi vibaya vinatosha.</i>	The bad potatoes are enough.
10 <i>Mtoto ana mwavuli mkubwa.</i>	The child has a large umbrella.
11 <i>Mito mizuri mirefu inatosha.</i>	Good long rivers are enough.
12 <i>Mtoto mdogo ana kiasi kizuri.</i>	A small child has a good potato.

<sup>1</sup> A *lingua franca* is sometimes called a vehicular language as it goes beyond the boundaries of its original community, and is used as a second language for communication between communities.



<B> A Large Spoon is Enough (2/2)

B1. Translate the following phrases into Swahili writing one letter in each cell:

a. *The small children have good spoons.*


b. *A long umbrella is enough.*


c. *A bad potato has a good bag.*


d. *Good kings are enough.*


e. *The long island has bad rivers.*


f. *The spoons have long bags.*


B2. If the Swahili word for 'the prince' is *mkuu*, what do you think the word for 'the princes' is, and why?

a. Write the Swahili word for 'the princes'. \_\_\_\_\_

b. Explain your answer to (a).

---



---

<C> Swallow the Salt (1/3)

(20 points)

Here are some sentences in another rather different type of African language. Tadaksahak is a Songhay language spoken primarily along the Niger River in the north of the Republic of Mali, a landlocked country in Western Africa. Tadaksahak has borrowed many words from the Tamashek language spoken by the neighbouring Tuareg. Approximately 32,000 people speak Tadaksahak.

Below are several Tadaksahak phrases and their English translations, given in order:

- |    |                               |  |
|----|-------------------------------|--|
| 1  | <i>ayagon cidi</i>            | I swallowed the salt.                          |
| 2  | <i>atezelmez hamu</i>         | He will have the meat swallowed (by somebody). |
| 3  | <i>atedini a</i>              | He will take it.                               |
| 4  | <i>hamu anetubuz</i>          | The meat was not taken.                        |
| 5  | <i>jifa atetukuš</i>          | The corpse will be taken out.                  |
| 6  | <i>amanokal anešukuš cidi</i> | The chief didn't have the salt taken out.      |
| 7  | <i>ayakaw hamu</i>            | I took out the meat.                           |
| 8  | <i>itegzem</i>                | They were slaughtered.                         |
| 9  | <i>ayasezegzem a</i>          | I'm not having him slaughtered.                |
| 10 | <i>anešišu aryen</i>          | He didn't have the water drunk (by anybody).   |
| 11 | <i>feji abnin aryen</i>       | The sheep is drinking the water.               |
| 12 | <i>idumbu feji</i>            | They slaughtered the sheep.                    |
| 13 | <i>cidi atetegmi</i>          | The salt will be looked for.                   |
| 14 | <i>amanokal abtuswud</i>      | The chief is being watched.                    |
| 15 | <i>cidi asetefred</i>         | The salt is not being gathered.                |
| 16 | <i>amanokal asegni i</i>      | The chief had them looked for.                 |

**Note:** š is pronounced like sh in shoe; ɣ is like a voiced h.



**<C> Swallow the Salt (3/3)**

C3. Indicate which part of the various forms of verbs meaning 'swallow' and 'take out' in the sentences below express the elements of meaning listed in the following Table.

<i>ayagon cidi</i>	I swallowed the salt.
<i>atezelmez hamu</i>	He will have the meat swallowed (by somebody).
<i>cidi abtelmez</i>	The salt is being swallowed.
<i>jifa atetukuš</i>	The corpse will be taken out.
<i>amanokal anešukuš cidi</i>	The chief didn't have the salt taken out.
<i>ayakaw hamu</i>	I took out the meat.
<i>abkaw cidi</i>	He takes out the salt.

Write your answers in the Tadaksahak column:

Meaning in English	Tadaksahak
I	
He	
future	
present	
not (negative)	
make/have (something happen)	
take out	
be taken out	
swallow	
be swallowed	

**<D> Counting in Irish (1/2)**

(15 points)

Irish, also known as Erse, Gaeilge, or Irish Gaelic, is spoken by approximately 260,000 people in Ireland. There are about 25,870 speakers in the USA, or about one in every 10,000 Americans. It is a Celtic language, distantly related to English.

Below are some number phrases in Irish and their English equivalents, given in order:<sup>2</sup>

<b>Irish</b>	<b>English translation</b>
<i>garra amháin</i>	1 garden
<i>gasúr déag</i>	11 boys
<i>ocht mballa is dhá fichid</i>	48 walls
<i>dhá gharra déag is ceithre fichid</i>	92 gardens
<i>trí bhád</i>	3 boats
<i>seacht ndoras déag</i>	17 doors
<i>seacht mbád déag is dhá fichid</i>	57 boats
<i>naoi nduine déag is fiche</i>	39 people
<i>ceithre fichid doras</i>	80 doors
<i>cúig bhalla</i>	5 walls
<i>sé ghasúr is trí fichid</i>	66 boys
<i>deich mbád</i>	10 boats
<i>sé dhuine</i>	6 people
<i>trí dhoras is dhá fichid</i>	43 doors
<i>garra is ceithre fichid</i>	81 gardens

<sup>2</sup> Original problem by M. O. Revinskij. Translation and adaptation by Tom Payne. English version Copyright © 2007, University of Oregon Department of Linguistics.

**<D> Counting in Irish (2/2)**

D1. Translate into English:

Irish	English Translation
a. naoi mbád déag is ceithre fichid	
b. sé dhuine déag	
c. naoi nduine	
d. fiche gasúr	
e. garra déag is fiche	

D2. Translate the following phrases into Irish:

English	Irish Translation
a. 38 walls	
b. 14 walls	
c. 71 doors	
d. 21 boats	
e. 90 people	

**<E> Flapping around in Warlpiri (1/3)**

(15 points)

Warlpiri is an Australian language spoken in the Tanami Desert area of the Northern Territory. Over 2,000 people speak Warlpiri as their first language, and at least another 1,000 speak it as their second or third language. The traditional Warlpiri country is as big as many European countries or American states, so it is not surprising to find that Warlpiri spoken in one part of Warlpiri country differs in various ways from the language spoken in another part.

One of the ways in which Warlpiri dialects differ is in the relationship between a 't'-like sound written using the digraph *rt* and a different 'r'-like sound written as *rd*.

The table below shows how the 'same' words are pronounced in each of three distinct dialects of Warlpiri, which are simply labeled A, B and C. Study the data in the table and then answer the questions which follow.

	A	B	C
1 <i>father</i>	kirda	kirda	kirda
2 <i>for father</i>	kirdaku	kirdaku	kirdaku
3 <i>father &amp; child</i>	kirtarlangu	kirtarlangu	kirdarlangu
4 <i>aunt</i>	pimirdi	pimirdi	pimirdi
5 <i>for aunt</i>	pimirdiki	pimirdiki	pimirdiki
6 <i>by aunt</i>	pimirtirli	pimirtirli	pimirdirli
7 <i>flame</i>	rtili	rdili	rdili
8 <i>hand</i>	rtaka	rdaka	rdaka
9 <i>raw</i>	rtarri	rdarri	rdarri
10 <i>heel</i>	rtari	rtari	rtari
11 <i>walk placing feet on tufts of grass</i>	marnangkartari	marnangkartari	marnangkartari
12 <i>heart</i>	kurturdurru	kurturdurru	kurturdurru
13 <i>tooth</i>	kartirdi	kartirdi	kartirdi
14 <i>with/by teeth</i>	kartirtirli	kartirtirli	kartirdirli
15 <i>on teeth</i>	kartirtirla	kartirtirla	kartirdirla
16 <i>hold it!</i>	mardaka	mardaka	mardaka
17 <i>holding</i>	martarni	martarni	mardarni
18 <i>held</i>	martarnu	martarnu	mardarnu
19 <i>summit</i>	rtaarnpa	rtaarnpa	rtaarnpa
20 <i>accompany</i>	rtanparni	rdanparni	rdanparni
21 <i>smoke</i>	yulyurdu	yulyurdu	yulyurdu
22 <i>by smoke</i>	yulyurturlu	yulyurturlu	yulyurdurlu

**<E> Flapping around in Warlpiri (2/3)**

The sounds written using the digraphs *rt*, *rd*, *rl*, and *rn*, as well as the monograph *r*, all belong to a class of sounds called 'retroflex', made by curling back the tongue tip so that the underside of the tongue tip touches the hard palate.

E1. In all three dialects the word for 'again' or 'more' is *yarda*. If we add the suffix *-rni* meaning 'this way' to this word, how would this complex word be pronounced in each of the three dialects?

Dialect A														
-----------	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Dialect B														
-----------	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Dialect C														
-----------	--	--	--	--	--	--	--	--	--	--	--	--	--	--

E2. The word for 'red' in dialect A is *rtiri*. How is it pronounced in the other dialects?

Dialect B						
-----------	--	--	--	--	--	--

Dialect C						
-----------	--	--	--	--	--	--

E3. The word for 'shelter' in dialect C is *rdupa*. How is it pronounced in the other dialects?

Dialect A						
-----------	--	--	--	--	--	--

Dialect B						
-----------	--	--	--	--	--	--

E4. The word for 'big sister' in all three dialects is pronounced *kapirdi*. To say 'big sister and little sister/brother' you add the suffix *-rlangu* to the word for 'big sister'. How is this complex word pronounced in each dialect?

Dialect A															
-----------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Dialect B															
-----------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Dialect C															
-----------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

### <E> Flapping around in Warlpiri (3/3)

E5. Explain how dialect A differs from dialect B in the distribution of the *rt* and *rd* sounds by completing the following sentence. (No slot may contain more than one word.)

The sound \_\_\_\_ never occurs in Dialect \_\_\_\_ at the \_\_\_\_\_ of a word.

E6. If you were a Warlpiri speaker and heard someone you didn't know speaking Warlpiri, you could conclude that person was a dialect A speaker if they said certain words from the list given. List all relevant words:

---

---

E7. You could detect Warlpiri Dialect C speakers if you heard them do which of the following? (Tick the appropriate box or boxes.)

- They never pronounce the *rd* sound if the following consonant is a retroflex sound.
- They never pronounce the last consonant of a word as *rt*.
- They never pronounce the sound *rd* at the beginning of a word.
- They never vary the pronunciation of a word (or part of word) between *rd* and *rt*.

<F> Axolotl in the Water (1/2)

(20 points)

Nahuatl was the language of the Aztec empire, which dominated central Mexico in the fifteenth century. Nahuatl has over a million and a half speakers, more than any other family of indigenous languages spoken in Mexico today.

Some Nahuatl sentences have been translated into English below (translations are given in order):

Nahuatl	English Translation
1. Nacatl itlacual in itzcuintli.	<i>The dog eats the meat.</i>
2. Xocolatl notlacual.	<i>I eat the chocolate.</i>
3. Niquitta in itzcuintli.	<i>I see the dog.</i>
4. Quitta in itzcuintli in calli.	<i>The dog sees the house.</i>
5. Nechixcuepa in axolotl ipan in atl.	<i>The axolotl in the water confuses me.<sup>3</sup></i>
6. Ical in oquichtli ipan in tepetl.	<i>The man's house is on top of the hill.</i>
7. Quixcuepa in itzcuintli in cihuatl.	<i>The dog confuses the woman.</i>
8. Nipantlalia ipan in milli.	<i>I ride (horseback) on the field.</i>
9. Nechitta notah.	<i>My father sees me.</i>

<sup>3</sup> The axolotl is a freshwater salamander native to Lakes Xochimilco and Chalco near Mexico City.





## Problem Credits

These problems were created by the following people:

### Problem A

Verna Rieschild, Macquarie University

### Problem B

Harold Somers, Dublin City University

### Problem C

Bozhidar Bozhanov, Computational Linguist

### Problem D

Tom Payne, University of Oregon

### Problem E

Mary Laughren, The University of Queensland

### Problem F

John Berman, NACLO

OzCLO problem sets are created in cooperation with:

NACLO (North American Computational Linguistics Olympiad)

AILO (All Ireland Linguistics Olympiad)

UKLO (UK Linguistics Olympiad)