

# **Improving Numerical Literacy Skills (INULIS)**



**Project overview**

Cyberce S.A.

# Rationale

- There is a need to enhance the quantitative skills in order to enhance career prospects and to address the deficit in the offer of training on quantitative skills.
- INULIS aims to address those issues and use the project as a showcase for the adoption of quantitative training curriculum in the national vocational training systems. The core principle of INULIS is that effective quantitative skills are of vital importance for European workers and employees, in order to fully exploit their potential and develop their career.
- The central aim of the INULIS project is to develop an on-line assessment instrument to assess a range of quantitative knowledge and skills suitable for workers and small traders.

# Target population

- Workers and employees in need for assessing their abilities and skills, for self-training and for improving their skills.
- Young people seeking employment and cost effective approaches to enhance their vocational skills in the job market.
- Owners of small shops aiming to improve their skills.
- Employers aiming to rationalise recruitment by using a testing tool in order to assess the quantitative skills of job applicants.
- Disabled persons with hearing impairment.

# Consortium

- Freudenthal Institute, the Netherlands
- University of Limerick, Ireland
- Cyberce S.A., Greece
- Consulo Ltd., Cyprus
- Traders Association of Thessaloniki, Greece

# Deliverables

- Database of 2400 tested and rated items.
- Rules and methodology approach report for forming standardised tests using the database of questions.
- Guidelines and manuals for the administration of online tests.
- Interactive web site for the online administration of the tests and for promotion.
- Mobile interface offering access to the testing service.
- Report with recommendations on quantitative literacy.

# Content development

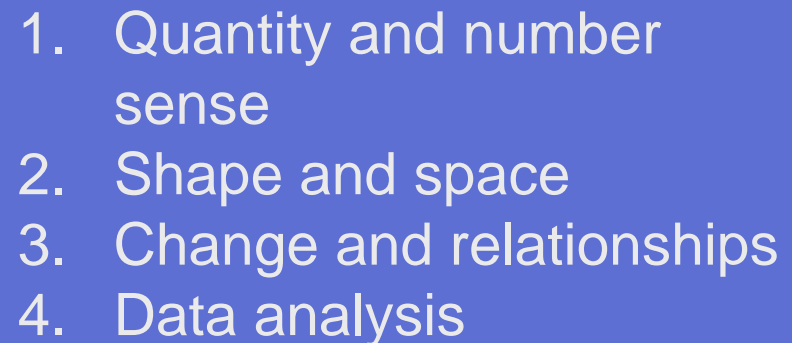
- 2400 items produced by the Freudenthal Institute, University of Limerick and by Konstantinos Tatsis. All items were categorised according to the categories:
  - Theme
  - Class
  - Question type
  - Life context



# Content development

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- 
1. Quantity and number sense
  2. Shape and space
  3. Change and relationships
  4. Data analysis

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- Theme
- **Class**
- Question type
- Life context

## **Class 1 - Reproduction**

Exercise that is totally familiar and well practiced.

## **Class 2 - Connections**

Problem fairly familiar that requires you to identify and apply an algorithm.

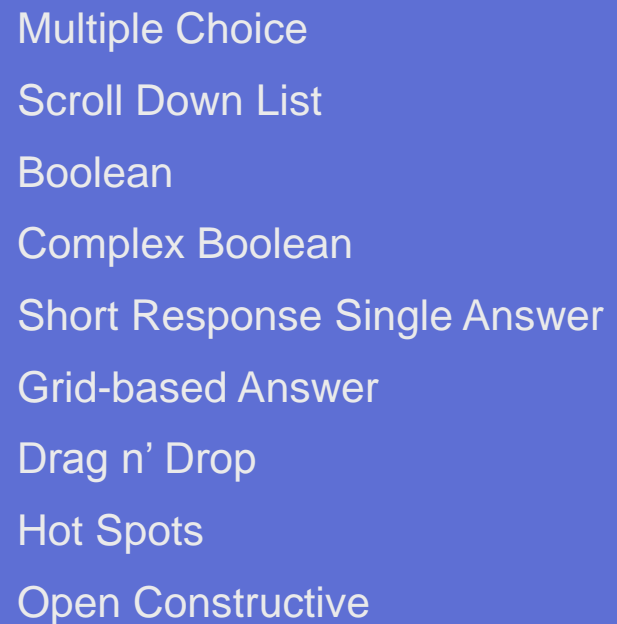
## **Class 3 - Reflection**

An unfamiliar problem that might require generalization or insight.



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  - Life context



- Multiple Choice
- Scroll Down List
- Boolean
- Complex Boolean
- Short Response Single Answer
- Grid-based Answer
- Drag n' Drop
- Hot Spots
- Open Constructive

# Content development

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- Theme
- Class
- Question type
- **Life context**

## **Personal Context**

(Recreation and Entertainment, Citizenship, Personal Finance, Retail)

## **Public Context**

(Policies, Politics, Measurements, Conversions)

## **Occupational Context**

(Business, Engineering, Farming)

## **Scientific Context**

(Mathematics, Physics, Medicine)

# Content development

- All 2400 items were initially written in English and then translated into:
  - Dutch
  - Greek
- Quality check and language check has taken place from the Freudenthal Institute and the University of Limerick.

# Content

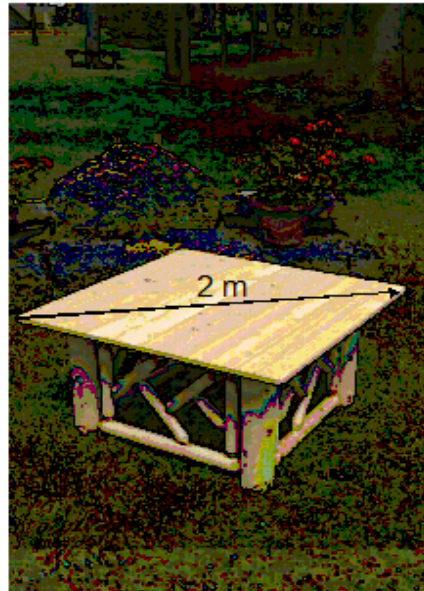
S3:  
Area, volume,  
capacity

SRS:  
short response  
single answer

O:  
Occupational  
context

## Title: Garden Table

Theme	Class	Difficulty Level	Question Type	Life Context	Linking Key
S3	2	L	SRS	O	



The diagonal of the square garden table is 2 m. What is the area of the top of the table?

Answer: 2 m<sup>2</sup>

# Content samples

MC:  
multiple choice

PUB:  
Public context

Q2:  
understanding  
operations

## Title: Roman Empire

Theme	Class	Difficulty Level	Question Type	Life Context	Linking Key
Q2	C1	L	MC	PUB	QG0079

The Roman Empire lasted from 509 B.C. to 476 A.D. How many centuries is that?



- A. About 8
- B. About 9
- C. About 10
- D. About 11

Answer: C



# Content samples

Q5:  
counting and  
measuring

MC:  
multiple choice

P:  
Personal context

## Title: Holiday Pounds

Theme	Class	Difficulty Level	Question Type	Life Context	Linking Key
Q5	2	L	MC	P	

A Dutch tourist weighed 75kg when he went on holiday to the USA. After two weeks in the USA he weighed himself and he found he weighed 185 lb. Which of the following best describes what has happened to his weight? (1kg =2.2 lb)

- A. His weight has not changed
- B. His weight has decreased by 2%
- C. His weight has increased by around 12%
- D. None of the above

Answer: C



# Content

OC:  
open constructive

P:  
Personal context

C2:  
algebraic  
expressions and  
formulas

## Title: Luggage weight

Theme	Class	Difficulty Level	Question Type	Life Context	Linking Key
C2	C1	U	SRS	P	QG0323

When travelling by aircraft, passengers have a maximum allowable weight for their luggage. They are then charged €10 for every kilogram overweight. If a passenger carrying 40 kg of luggage is charged € 50, how much would a passenger carrying 60 kg be charged?



Source: <http://www.siamrivers.com>

Answer: € 250

# Content

SRS:  
short response  
single answer

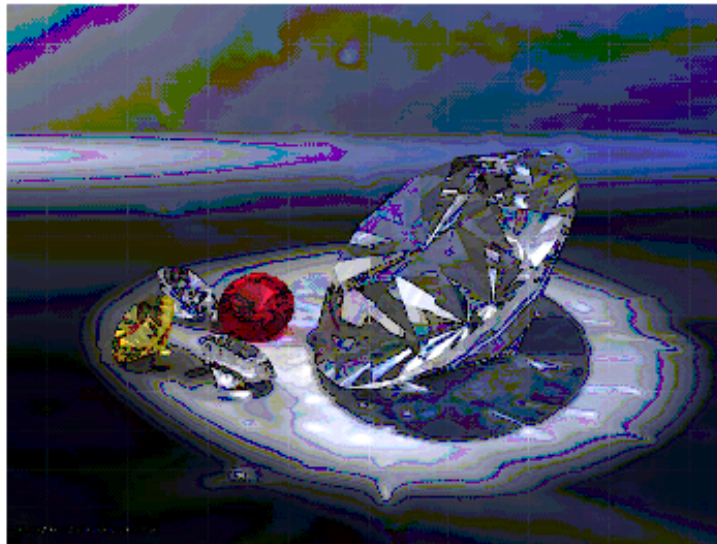
P:  
Personal context

Q4:  
ratio and percent,  
proportional  
reasoning, units

## Title: Diamonds

Theme	Class	Difficulty Level	Question Type	Life Context	Linking Key
Q4	C2	L	SRS	P	QG0242

Carat size describes the weight of a diamond. 1 carat is equivalent to 200 milligrams. A carat is divided into 100 points. How much does a 70-point diamond weight in milligrams?



Source: <http://www.carrara.jp>

Answer: 140

# Content

MC:  
multiple choice

P:  
Personal context

Q4:  
ratio and percent,  
proportional  
reasoning, units

## Title: Diamonds

Theme	Class	Difficulty Level	Question Type	Life Context	Linking Key
Q4	C2	L	MC	P	QG0241

Carat size describes the weight of a diamond. 1 carat is equivalent to 200 milligrams. A red diamond was once sold for almost a million dollars per carat. How much was the price per gram?



Source: <http://www.carrara.jp>

- A. Almost 2 million dollars
- B. Almost 4 million dollars
- C. Almost 5 million dollars
- D. Almost 6 million dollars

Answer: C

# Content

C3:  
representations of  
relationship

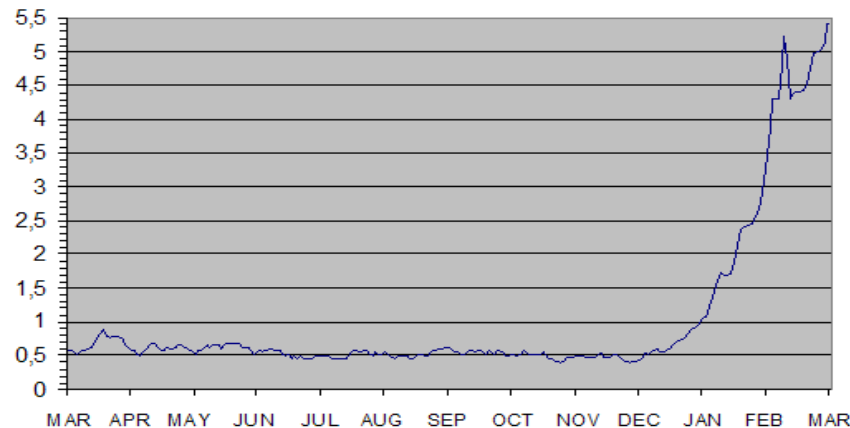
MC:  
multiple choice

P:  
Personal context

**Title: Stock market**

Theme	Class	Difficulty Level	Question Type	Life Context	Linking Key
C3	C2	U	MC	P	QG0259/QG0261/QG0263/QG0264

The diagram below shows the evolution of the value of a stock from March 2005 to March 2006. The values are shown in euros.



On May the 1st, 2005 someone bought an amount of shares equal to € 750. What was the value of his shares at the beginning of February 2006?

- A. € 4800
- B. € 4900
- C. € 5000
- D. € 5100

Answer: D



# Content

D2:  
interpretation of  
graphic  
representations of  
data

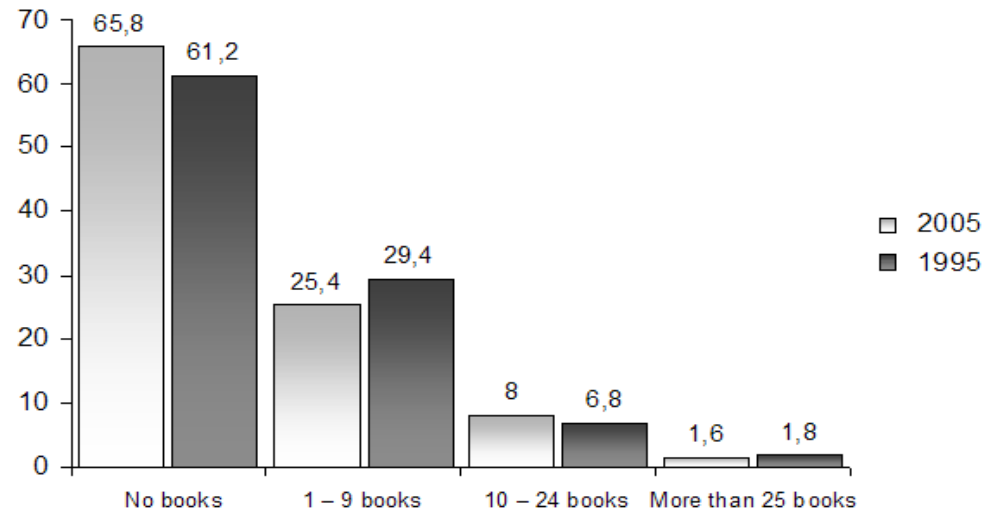
MC:  
multiple choice

P:  
Personal context

Title: Book reading

Theme	Class	Difficulty Level	Question Type	Life Context	Linking Key
D2	C1	U	MC	P	QG0288/QG0290

The diagram below shows the results of a comparative study concerning book reading in the years 1995 and 2005. All figures represent percentages.



The number of participants in the 2005 study was 1500 people. How many people have read less than 10 books in 2005?

- A. 120 people
- B. 381 people
- C. 987 people
- D. 1368 people

Answer: D

# Content samples

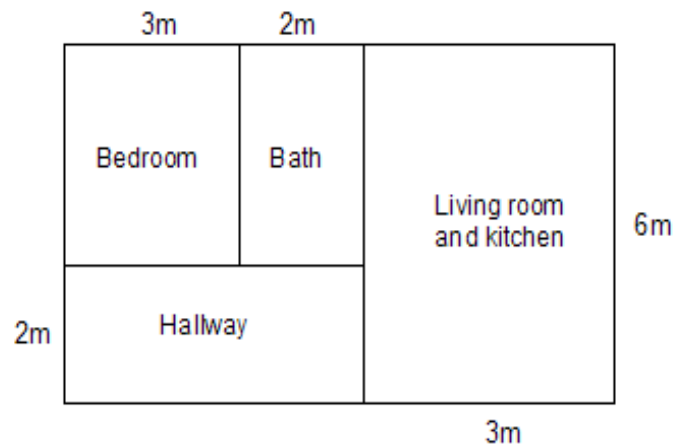
S3:

Area, volume,  
capacity

## Title: House expenses

Theme	Class	Difficulty Level	Question Type	Life Context	Linking Key
S3	C2	L	SRS	P	QG0347

The sketch below shows the top view of a house. The owner has to pay a 3% tax on the value of the house. The value for houses in the particular area is estimated to €850 per m<sup>2</sup>. How much money will the owner pay for the tax?



Answer: €1224



# Content samples

Q2:  
understanding  
operations

Title: Operation signs

DD:  
drag 'n' drop

S:  
scientific context

Theme	Class	Difficulty Level	Question Type	Life Context	Linking Key
Q2	C1	L	DD	S	

Put the operation signs in the right positions so as the shown equation is correct.

$$195 \square 4 \square 1232 \square 6 = 2006$$

+

−

×

÷

Answer:  $195 \times 4 + 1232 - 6 = 2006$

# Development of online tests

- **Test Author**

The Test Author is accessing the system through a predefined account (username and password). Then s/he defines the parameters of a test in order to create an on-line test. Parameters include:

- <Title >
- <Purpose (of the test)>
- <Type (anonymous or not)>
- <Duration>
- <Number of Questions>
- <Class >
- <Theme >
- <Difficulty Level>
- <Context>

# Development of online tests

- **Test Taker (employee)**

The user specifies his/her personal data which include:

- <First Name>
- <Last Name>
- <Gender>
- <Age>
- <Educational Level>
- <Position>

The user starts filling the test and a timer starts to count the time. No information message is presented to the user (in order to avoid causing any pressure to the user). When the time passes, the system submits all provided answers by the user and does not allow the user to fill any more answers. Alternatively, if the user has already filled all answers (and the time has not passed), he/she can submit the test.

At the end of the test the user is able to view the specific answers provided by him/her. The user is also able to see the number and percentage of correct answers. Open Constructive questions are not evaluated by the system.

# Development of online tests


- **HR Manager**

The HR Manager is accessing the system using an automatic generated account and is able to browse the list of employees that have filled the test and view the specific answers provided by each user. The HR Manager is also able to view per employee the number and percentage of correct answers

S/he is also able to view the following report/statistics for a test:

- Number of users that have answered the test
- Percentage of correct answers for the test
- Percentage of correct answers per Gender
- Percentage of correct answers per Age interval
- Percentage of correct answers per Educational Level
- Percentage of correct answers per Position

# Screenshots of online tests



Role: Test Taker (Corporate User) | User: Panos Koutsodimitropoulos


[Home](#) | [Help](#)

Assessing Quantitative Skills

Fill questionnaire

View results

## Login


 **Message:** Please, provide your username and password and then click Login in order to login to INULIS' system.

*Fields with \* are mandatory.*

UserName\*:

Password\*:

Login



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# Screenshots of online tests



Role: Test Taker (Corporate User) | User: Panos Koutsodimitropoulos


[Home](#) | [Help](#) | [Logoff](#)

Assessing Quantitative Skills

## Fill Questionnaire

Fill questionnaire

View results

 **Message:** Please, provide your test related data and then click Next in order to move to the next step.

*Fields with \* are mandatory.*

Test related data

Select language


Questionnaire

Code Identifier: **12345**


First Name\*:

Last Name\*:


Sex\*:

Male 


Country\*:

GREECE 

Education\*:

High school 

Position\*:

Junior 

Prof. experience\*:

1-3 years 

E-mail\*:


Next



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# Screenshots of online tests



Role: Test Taker (Corporate User) | User: Panos Koutsodimitropoulos


[Home](#) | [Help](#) | [Logoff](#)

Assessing Quantitative Skills

Fill questionnaire

View results

Fill Questionnaire


 **Message:** Fill in the following questions. Note that in every page, there are maximum 10 questions. GOOD LUCK!

Test related data

Select language

Questionnaire

Questionnaire title

 **Purpose:** The purpose of this survey is to examine numerical skills in the accounting department of CYBERCE.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ... |

10:00

**Question 1**

**How can someone compute the square root of a positive real number?**


☐ Multiplying the number \* 2

☐ Dividing the number \* 2

☐ Finding a number that multiplied by itself gives the number above.

☐ Multiplying the number \* 4

# Screenshots of online tests

Assessing Quantitative Skills

Role: Test Taker (Corporate User) | User: Panos Koutsodimitropoulos

[Home](#) | [Help](#) | [Logoff](#)

Fill questionnaire


View results

View results

Summary sheet

Results in details

Questionnaire title

 **Info:** Right questions appear with green color, while the wrong ones are highlighted with red color, so you can compare your answers with the right ones.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | ... |

**Question 1**

**How can someone compute the square root of a positive real number?**

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# Screenshots of online tests

inulis

Role: Test Taker (Corporate User) | User: Panos Koutsodimitropoulos

[Home](#) | [Help](#) | [Logoff](#)

Assessing Quantitative Skills

[Fill questionnaire](#)

[View results](#)


## View results

 **Message:** Here, you can see your performance for questionnaire: "Title of questionnaire".

### Summary Sheet

[Results in details](#)

#### Questionnaire Title

 **Info:** Alternatively, you can see in details your answers by clicking "View your answers analytically".

#### General Data

Test Status:	Open
Test Sample:	14 persons
Replied till now:	7 persons

#### Your Score

Success Rate:	150/300 (Total score / max score)
Correct Answers:	15/30
% of Success:	150
Success Level Indications:	60 % have achieved better success than yours 20 % have achieved better success than yours

[View results in details](#)

inulis

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# Current situation

- All 2400 items are to be put in the database.
- 6 tests will be created by the content developers as demos, so that test takers can have the option to test themselves and have a report provided with their results.
- The Traders Association of Thessaloniki will organize two validation seminar sessions in May 2007, so that the duration, result and specifications set for the product can be assessed.
- Mobile interface will be delivered by 31st March 2007. Sample tests will be available in PDA format.

# **Improving Numerical Literacy Skills (INULIS)**

## **Project overview**

Cyberce S.A.