ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΙΓΑΙΟΥ

English I

Course Unit 1: Reading and Grammar 1

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Με τη συγχρηματοδότηση της Ελλάδας και της Ευρωπαϊκής Ένωσης

Reading 1: The How, When And Why Of Mathematics

Pre-questions

***Scan* the text below to find the answers to the following questions:**

- **What is mathematics?**
- **What are the steps in solving a mathematical problem?**

1. What is mathematics? Many people think of mathematics (incorrectly) as addition, subtraction, multiplication, and division of numbers. Those with more mathematical training may think of it as dealing with algorithms. But most professional mathematicians think of it as much more than that. What mathematicians really want is for their students to understand three things: how you do something, why it works, and when it works.
2. There are some general rules that can assist students in doing higher mathematics. Many people have written about this subject before, but the classic text on how to approach a problem is a book called *How to Solve It* by George Pólya. In his text, Pólya gives a list of guidelines for solving mathematical problems. Here's what this list looks like.
3. *First. "Understanding the problem."* What should you do? Make sure you know what all the words of the problem mean. Look at the statement carefully to figure out what you are given and what you have to find. If a picture helps, draw it. What do you need to prove? Do you have to give an example? Do you have to show that something is false?
4. *Second. "Making a plan."* How do you attack the problem? Have you seen anything like it before? Look over the text with the problem in mind, read over your notes with the problem in your head, look at previous exercises and theorems that sound similar.
5. *Third. "Carrying out your plan."* Solve the problem. Look at your solution. Is each sentence true? Put the problem down and come back to it a few hours later. Is each sentence still true?
6. *Fourth. "Looking back."* It's a good idea to check the result and the argument, or even to look for a different proof. One really good way to check a proof is to give it

to someone else. If you can work together with someone else, switch proofs and ask your partner for criticism of your proof.

7. When you are convinced that your argument is correct, it is time to write up a correct and neat solution to the problem.

Adapted from: Ulrich Daepp, Pamela Gorkin, *Reading, Writing and Proving. A Closer Look at Mathematics,* Springer: 2003.

Context clues

1. Try to guess the meaning of the following words from the sentences and words around them.

1. assist (par. 2)

   .....

2. approach (a problem) (par. 2)

   .....

3. guidelines (par. 2)

   .....

4. false (par. 3)

   .....

5. over (look over, read over, etc) (par. 4)

   .....

6. switch (par. 6)

   .....

Vocabulary

2. Try to understand the meaning of the following words (use a dictionary, if necessary) and use them in the sentences below. Some words can be used more than once.

algorithm, proof, solution, solves, statement, subtraction, theorem

1. The test involves simple calculations, such as addition and ..... .
2. A(n) ..... is a set of mathematical instructions that must be followed in a fixed order.
3. This strategy creates more problems than it ..... .
4. There is no easy ..... to this problem.
5. In mathematics, a(n) ..... is a presentation that shows that a mathematical ..... is correct.
6. A(n) ..... is a statement which we have shown that it is true.

Comprehension

3. Match the statements with the paragraphs of the text (write a paragraph number in the space).

In which paragraph is it stated that...

1. you may need to look for another way to prove the solution of a problem? .....
2. you have to revise older exercises? .....
3. there is a text with advice on mathematical problems? .....
4. you may ask someone else's opinion? .....
5. many people have a wrong idea about mathematics? .....
6. you may have to prove that something is wrong? .....
7. you may have to look at the problem again, some time later? .....

Answers to the exercises

Pre-questions

These are open questions. You can discuss them in the class forum.

Exercise 1

1. to help
2. to solve, to find a solution
3. advice for doing something
4. wrong
5. again
6. exchange, give something and take something else

Exercise 2

1. The test involves simple calculations, such as addition and **subtraction**.
2. A(n) **algorithm** is a set of mathematical instructions that must be followed in a fixed order.
3. This strategy creates more problems than it **solves**.
4. There is no easy **solution** to this problem.
5. In mathematics, a(n) **proof** is a presentation that shows that a mathematical **statement** is correct.
6. A(n) **theorem** is a statement which we have shown that it is true.

Exercise 3

In which paragraph is it stated that...

1. you may need to look for another way to prove the solution of a problem? **par. 6** ("It's a good idea to check the result and the argument, or even to look for a different proof.")
2. you have to revise older exercises? **par. 4** ("...read over your notes with the problem in your head, look at previous exercises and theorems that sound similar.")
3. there is a text with advice on mathematical problems? **par. 2** ("In his text, Pólya gives a list of guidelines for solving mathematical problems.")
4. you may ask someone else's opinion? **par. 6** ("One really good way to check a proof is to give it to someone else.")
5. many people have a wrong idea about mathematics? **par. 1** ("Many people think of mathematics (incorrectly) as addition, subtraction, multiplication, and division of numbers.")
6. you may have to prove that something is wrong? **par. 3** ("Do you have to show that something is false?")
7. you may have to look at the problem again, some time later? **par. 5** ("Put the problem down and come back to it a few hours later.")