

## Experience with solving real-life math problems in DQME II project

Koreňová L., Dillingerová M., Vankúš P., Židová D

The network "Developing Quality in Mathematics Education II" is a continuation of the associated project "Developing Quality in Mathematics Education" (<http://www.dqime.uni-dortmund.de/>). In this project participate universities, teacher education institutions and schools from 11 European countries. Cross-cultural cooperation and exchange of ideas, materials, teachers and pupils support developing quality in mathematics education, especially in the area of mathematical modelling.

The quality and application of the developed learning materials is also guaranteed by using, comparing and modifying them in eleven different countries. This comparison leads to an agreement about contents of mathematical learning and teaching in eleven European countries. Thus we want to establish a "European Curriculum for the teaching and learning of mathematics" in the 21st century.

A special feature of this project is the strong connection between theory and practice and between the research and development of mathematics education.

In this project our Faculty of Mathematics, Physics and Informatics of Comenius University Bratislava manage testing of translated teaching materials at the high school „Gymnázium Sturovo“.

We know that using ICT and didactical software in schools is almost present and wide spread. So we try to focus on several possibilities in solving real-life tasks using this technologies, regard to the fact technologies are hard upon the young generation of students.

**Tasks** ( [http://www.dqime.uni-dortmund.de/index-entry.php?language\\_chosen=0](http://www.dqime.uni-dortmund.de/index-entry.php?language_chosen=0) )

The price for tobacco and demand. Author: Heinz Böer

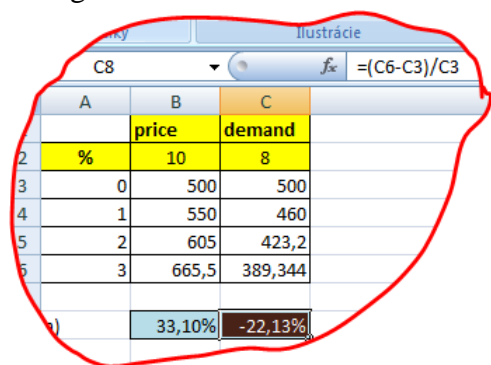
### Medics want expensive cigarettes

The British journal for medicine "The Lancet" warns about a worldwide lung cancer epidemic and pleads for a drastic increase of cigarette prices. Lung cancer had become the most common kind of cancer, the oldest journal for medicine emphasizes. According to calculations of the world bank a price increase of 10 percent could decrease the demand for tobacco by 8 percent. Westfälische Nachrichten, 14.05.2005

Assume that the relation price/demand is true for a wide range of areas. At which increase/decrease will the parameters be after 3 changes? "12 times decreasing by 8 %, the remaining demand is 4% and nearly gone"- Is that true? Write down a term of a function for the price development and one for the development of the demand for tobacco. Also write down what x stands for. How many steps does one need to double the price ( $\approx$ ). What is the demand then? After how many steps has the demand decreased by 50%? What is the price then? "The demand has to be lower than 1% to make the risk of smoking negligible for the population's health" the opponents of smoking say. – The price? Think of other scenarios for prices and demands.

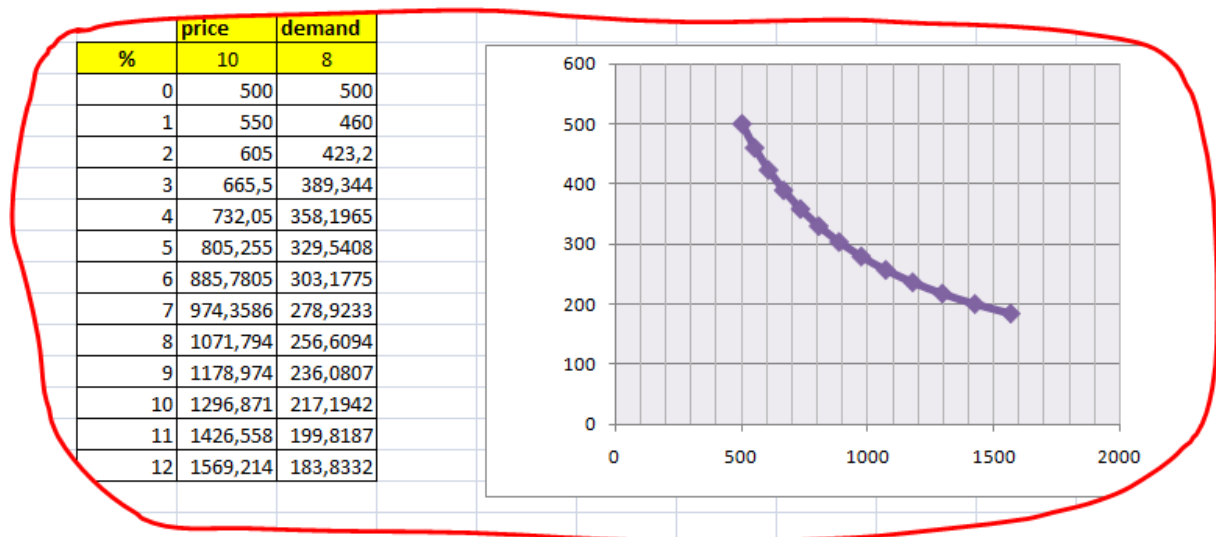
**Solution:** The author's solution in a classic way is on the website shown above.

Using MS EXCEL – students can make their own experiments.



	A	B	C
		price	demand
2	%	10	8
3	0	500	500
4	1	550	460
5	2	605	423,2
6	3	665,5	389,344
7		33,10%	-22,13%

Students have a possibility to make experiments, design a sheet computing the demand and offer in each year. Their mathematical thinking can so be enlarged and this is important in solving problems in every day's life. Here mathematical models of thinking and presenting are requested.



**Tasks** ([http://www.dqime.uni-dortmund.de/material/Sledging\\_in\\_every\\_weather-10-sintan.doc](http://www.dqime.uni-dortmund.de/material/Sledging_in_every_weather-10-sintan.doc) )

Sledging in every weather

Author: Heinz Böer

After about five months of test phase the longest all weather sledging course was officially opened in Todtnau in the Black Forrest. The 2900 metres long course overcomes a height difference of 390 metres and will be opened all year long said owner Adolf Braun. 100 bobsleighs are at disposal. Every hour they can carry up to 350 passengers - children and adults.

Westfälische Nachrichten, 13.06.2005

1. What is the course's average gradient angle?
2. With which percentage can the slope be described (as it is the custom with streets)?

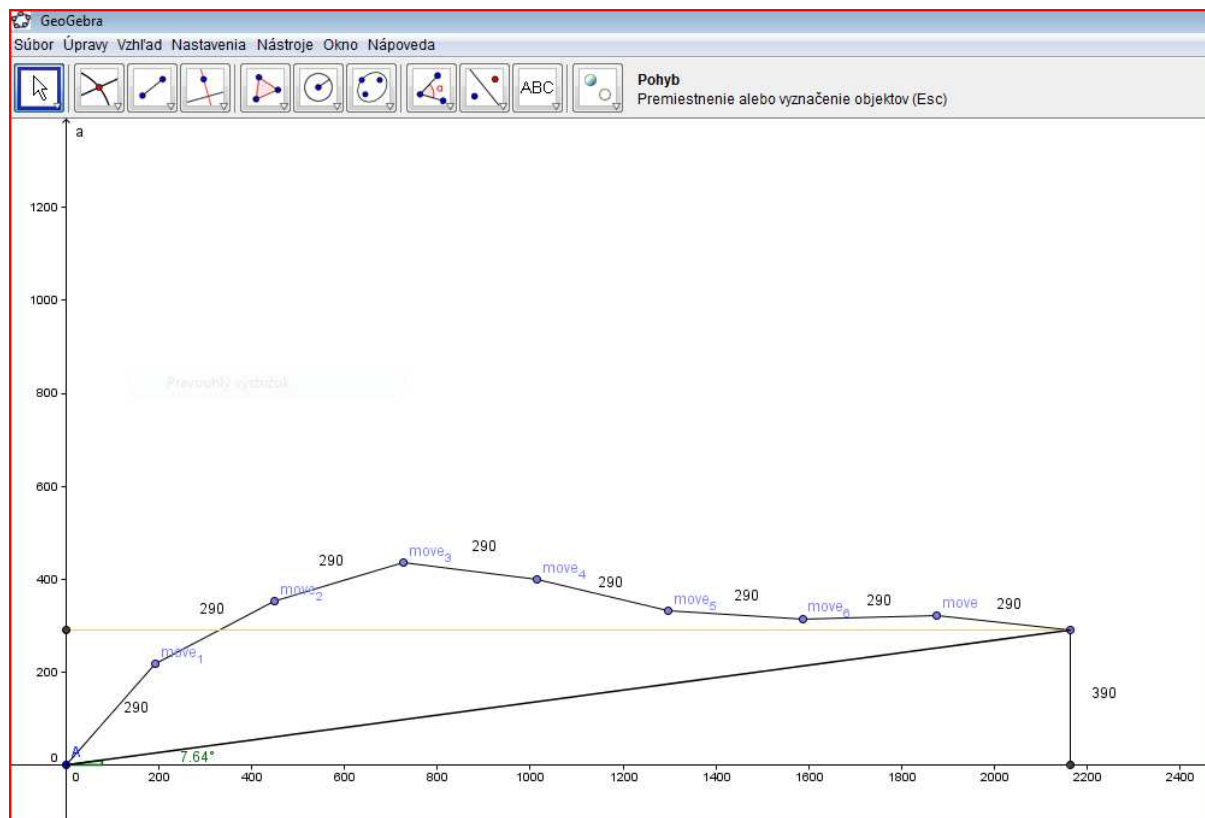
**Solution:**

The author's solution in a classic way is on the website shown above.

Teaching maths has to be done with an effort of gaining new knowledge by solving problems with various contexts. They should create hypotheses, check their verity. Another goal is to be able to use several methods of representation of an mathematical content. The students should enlarge their abilities to orient themselves in plane and space. Maths has to develop algorithmical thinking, working with guidelines and create them

In this task we will use GeoGebra (<http://www.geogebra.org/cms/>) – students can make their own experiments again. They create with some help of their teacher the trajectory built-up of some segments of different length (in the picture are 10 segments each with 290 m length shown), so they can change the sledge course, but the full length will stay 2900 m and the height difference always remains 390 m. They investigate the average slope. In such a process of investigations the students pose a lot of questions and they gain not only some social and informatics competencies, but also knowledge about statistics and trigonometry.

In the DQME II project, there is a huge amount of tasks related to real life experiences. We could show many more, each solved by another type of ICT or software. But the aim of our paper was rather to present few of this tasks but let you much more see the complexity of such tasks and to let you know, ICT and maths software are useful helpers in obtaining experiences and develop competencies.



## Workshop: Some interesting math problems for high school students solved by graphic calculators CASIO

Korenova L., Zidova D.

### Abstract

The complete solution of real-life problems starts with the specification of the problem, its expression using mathematical concepts, solving it using a mathematical apparatus and interpreting its results using the terminology of the original problem area. In this four-stage process, graphic calculators can be efficiently used for speeding up its third (“purely mathematical”) stage. The application of ICT will free the teachers’ hands and allow them to concentrate on the pre-solution and post-solution relationships between the problem and its mathematical classification, representation, and meaning. During our 60-minute hands-on workshop, this principle will be demonstrated on examples from financial mathematics and other real-life problems using CASIO ClassPad. The workshop participants can play the role of learners. They are also invited to discuss and express their opinions on even more effective exploitation of this flexible tool. No previous experience with CASIO ClassPad is needed.

### Good classroom practice – how a new journal supports this

Rüdiger Vernay

Teacher in Bremen, Germany and editor of the journal “Mathematik 5-10”  
 (“Maths year 5 –10”)

In December 2007 a new maths journal in Germany started with a really innovative concept: The journal articles are written by expert teachers with ample classroom experience. All articles show good classroom practice with innovative ideas and teaching methods. Teaching suggestions can be put into practice immediately. Materials needed are provided in a materials pack that comes along with the journal. Schools can order a teacher training service held by members of the “Mathematik 5-10” editorial board and based on particular issues of the journal. This concept will be presented and explained in detail supported by examples taken from the journal.