Report on the presentation of Ingrid Schirmer-Saneff and Angelika Thal at the ACDCA Conference in Portoroz, July 2000.

We told the audience about a project currently in use in its trial phase at our high school in Berndorf, Austria. The project is geared towards 9th graders who are using the TI92 for the first time. We are convinced that the teaching with the support of a computer algebra system as used by the TI92 has to lead to new methods of assessment as well.

The presentation focused on the way traditional exams were enriched or replaced by different, new exam formats. During the project, the 6 usual tests of 50 minutes each were replaced by 3 written tests per semester that varied in both allotted time and aims of assessment. At the onset of each semester students took a 30-minute exam geared towards testing their ability to perform calculations by hand and handling the TI92, respectively. The second, 100-minute exam was open-book and aimed at assessing students' problem solving skills. It was followed by a 20-minute quiz that covered the material presented in students' oral talks or in "focus papers" throughout the semester. In addition to these written forms of assessment Ingrid introduced the idea of these yearly "focus papers" and oral presentations thereof done by each student each year. The independent research, experiments and reading for the focus papers help students integrate math skills and the use of English across the curriculum as they rely on material from the areas of physics, finance and economics written in English.

In short, the assessment has been remodeled to fit the new teaching situation and we hope for positive backwash to the learning with the TI92 in class. It seems logical to look for test formats that would further motivate the kind of teaching done in the project, and the ones used at our school seem to have worked for both teachers and students over the course of the past semesters.
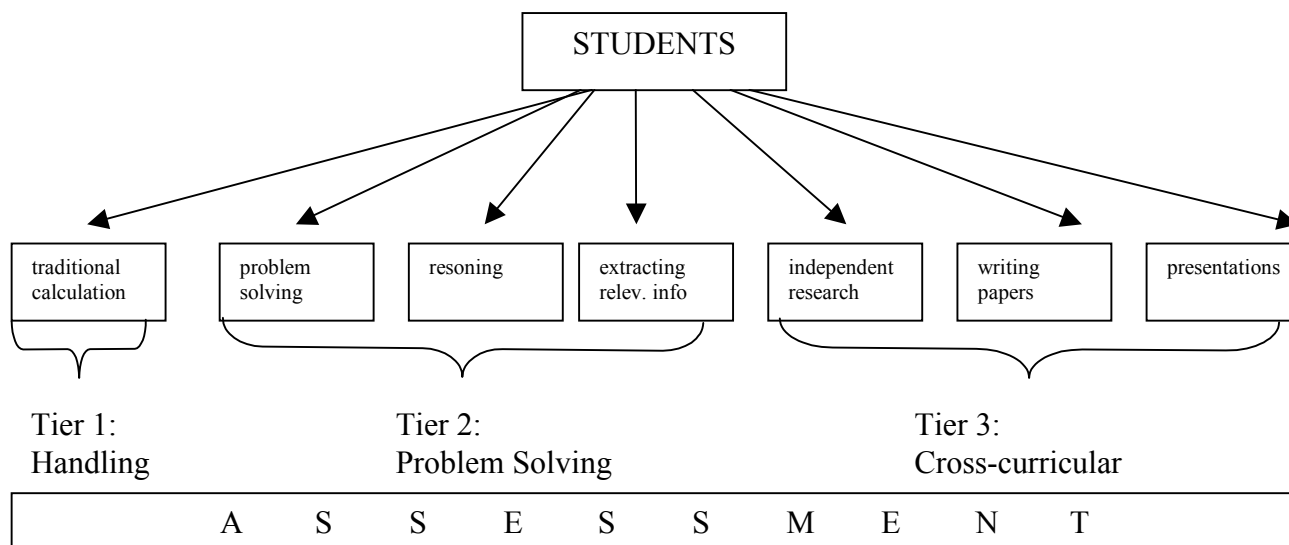
Dr. Heugl introduced the short handling tests in his presentation (you can probably find one of those tests in his report) and we did therefore not touch upon them in our talk. You are, however, welcome, of course, to discuss them with us via email. We'd be glad to share our thoughts and experiences.

We presented the problem solving tests in some greater detail by showing the text and solution to some of the problems. In doing so we wanted to exemplify the kinds of skills needed on the part of the students, especially those skills that go beyond the scope of traditional testing.

Last but not least, we talked about the focus papers and the organizational details for handling the work connected with them. There was a list of focus topics as given to the classes, and we showed some examples of handouts and additional material provided by the students for their colleagues when they presented their focus papers. At the end of our presentation we showed the audience a short video extract so that they could get an idea of the student presentations.

Before opening the floor for discussion and questions or the sharing of experience with new assessment models, we commented briefly on parents', students' and teachers' reactions to the project as run at Berndorf right now.

In essence, we propose a <u>three-tier model of assessment</u>: The 6 usual tests of 50 minutes each are replaced by 3 written tests per semester that vary in both allotted time and aims of assessment.

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                          │  STUDENTS   │
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| traditional calculation | problem solving | resoning | extracting relev. info | independent research | writing papers | presentations |

Tier 1:   Tier 2:   Tier 3:
Handling   Problem Solving   Cross-curricular

| A | S | S | E | S | S | M | E | N | T |

TIER 1: HANDLING EXAMS

As mentioned above, please consult Dr. Heugl's report for a copy of handling exams as they were used in our project.

TIER 2: PROBLEM-SOLVING EXAMS

Let us now turn directly to the problem solving exams: As you have read in the introduction, the second tests of each semester are 100 minutes long and geared towards assessing students' problem-solving skills. They are open-book exams, which means that students are not only allowed but encouraged to use all resources available to them as individuals in order to solve the given problems. They can bring any books, their class notes and, of course, their TI92 with whatever programs they have written and saved in it.

We have to say in advance that students still found this kind of test to be the most difficult of all the test formats used in the project. This was also reflected in the resulting grades, which were even worse in the second semester.

On the whole we noticed that students' motivation decreased drastically towards the end of the school year, but that seems to be a common problem without special connection to the kind of teaching and testing done in our project.

As far as the handling of the TI92 is concerned, we found students to be surprisingly comfortable with the computer. In the preparation phase of the project we worried about those students less used to working with computers, especially since there are no, or virtually no, tutors who are competent in that area. It didn't turn out to be a great problem, 'though. It seems that the current generation of teenagers is generally more used to handling computers.

When you think about what we call the "scissors effect", that is, good students becoming better and weak students becoming even weaker, it does appear through this new kind of exam. But one has to mention that there are also a few students who didn't perform well at the handling tests and could show their skills much better when it came to the applied-math problems that called for creative solutions. With the low number of students who partook in our project, namely 35, it is hard to actually detect a trend, so all we can do is make suggestions as to the effects these new methods would have on the whole.

When you now look at a few of the problems presented to the students in the new exams, please keep in mind that they represent a considerable difficulty in so far as the students need to adapt to the kinds of studying that have to precede the different kinds of learning that is assessed here.

2nd TEST

Type: Open-book exam with TI92
Time: 100 minutes

1.) max.mobil (see adjunct 1)
   When you compare the monthly basic rate of the various tariff models to the price of 1-minute units for calls to the Austrian phone net in the time of MO – FR; 7am – 8pm you will see that the unit price for calls is reduced as the basic rate increases.
   a) Produce a table and introduce / describe a linear function that approximates this relationship. Mention explicitly all parameters used on the TI 92 leading to the window in which you graph the regression and the 3 ordered pairs. Draw the graphics window into your exercise book.
   b) If this function represented a meaningful business-like relationship, what amount per minute would max.mobil have to charge its clients in case there were a tariff model without a basic rate?
   c) Interpret a) and b) !

Extra credit:
a) Read through the mobilkom tariffs of A1 and attribute them to the various respective tariff models of max.mobil. Which strategy do the managers of the mobile nets have? Discuss your findings!
b) Formulate and answer questions to go with problem 4.)!
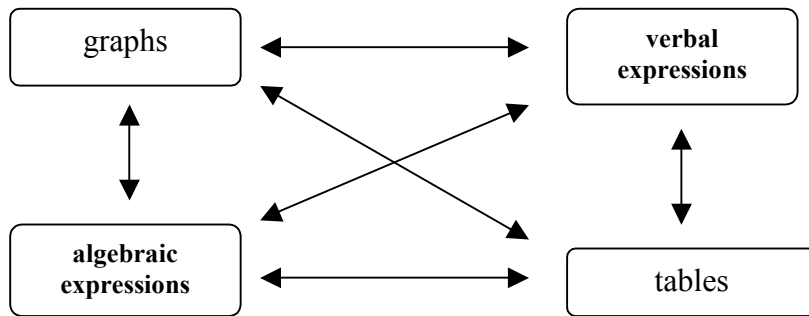
MAX.MOBIL SOLUTION GRAPH
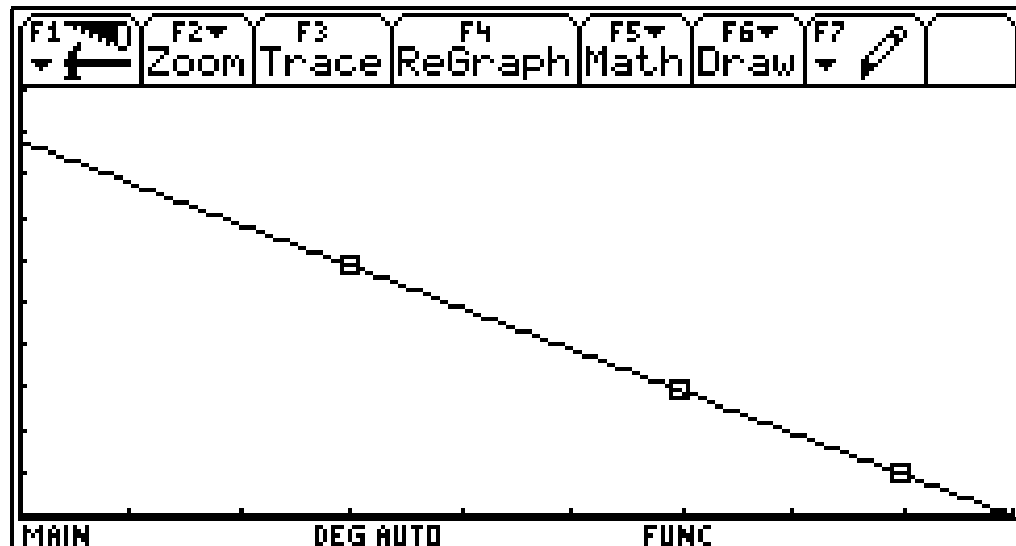
MAX.MOBIL ADJUNCTS !!!   **(Appendix A)**

As you can see from the problem given and the adjuncts provided to the students, there are quite a number of skills that need to be performed in order to answer the questions; skills that are not necessarily part of traditional exams, at least not in this number.

Clearly, students need to be able to extract data from tables. But not only that, they also have to decide which of the data presented to them did in fact apply to their problem. The table was taken out of the company's internet site and left exactly the way one would find it there. In reality, students would have to look for the relevant data themselves, and we expect them to do the same during the exam.

You will notice throughout the problem solving tasks how students need to exhibit "translation" skills: They frequently have to translate back and forth between verbal expressions, graphs, algebraic expressions, and tables.

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  ┌──────────┐                    ┌──────────────┐
  │  graphs  │ <────────────────> │    verbal    │
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Students have to express relationships graphically and, in order to do that on the TI-92, they have to find feasible window parameters. This is really a skill that cannot be overemphasized, we feel. It ties in closely with the ability to calculate rough estimates and make "intelligent guesses" about the outcome of a problem.

In question 3, students needed to understand the concepts and the significance of slope and y-intercept in order to interpret the graphic solution attained before.

By answering the extra credit question, finally, students had to think about the general ideas of advertisement and had to discover the strategy behind the offers of that particular company. Again, this constitutes an important real-life skill that would benefit a great many people had they mastered it in school.

## 2nd TEST

Type: Open-book exam with TI92
Time: 100 minutes

1.) max. mobil is currently offering various tariffs for cell phones (see adjunct1). A businesswoman calculating her phone costs is looking for the cheapest variant. She knows that she places calls to the Austrian phone net about 60% of the time and calls the mobile net about 40% of the time, half of which A1 is called, the other half of the calls going to max.mobil.
   a) State a general formula for the calculation of the monthly cell-phone costs, using a mean time of x minutes a day MO – FR; 7am – 8pm for calls. Choose your own variables for the different rates.
   b) Following that, apply the formula to the various rates.
   c) Then calculate the monthly costs for x = 10 minutes at the given tariff rates. Which of the tariffs would you choose?
   d) Find an upper and a lower limit for the probable costs if the monthly total length of calls varies ± 20% of the time given above.
   e) For which lengths of calls would the costs of 2 tariffs, respectively, be equal? Use the facts given earlier. Which tariff would be preferable under which circumstances? Discuss your result!

2.) In the adjunct (2) you will find real estate offers from the advertisement section of a magazine. Choose at least 8 offers (with a rather small area) and put the data (flat size in m² and price of flat) into your data-matrix editor.
   a) Sort the table according to increasing size. Which linear function approximates this relationship? Also describe how you represent ordered pairs and functions in the graphics window! (Don't forget to mention the window parameters you used.)
   b) What is the mean price per m² when you buy a house? Which offer do you find appealing? Why? In how far does the regression line fall short of representing the true relationship or price and size? What would a more realistic function look like?
   c) Predict what size of flat (from – to) you would be able to get at the real estate market if you had about 2 million Austrian shillings at your disposal (capital and loans)? At least how much money do you need if you want to buy a house with 180m²? Explain your answer!

ADJUNCT OF REAL-ESTATE OFFERS !!!   **(Appendix B)**

SOLUTION GRAPH OF REAL-ESTATE PROBLEM
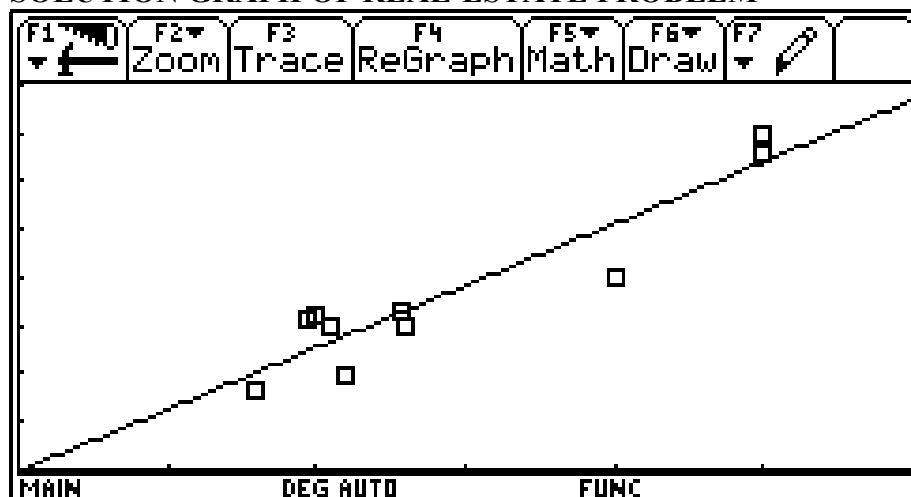
As mentioned above, the finding of feasible window parameters constitutes an important prerequisite to the solution of the problem. The ability to predict approximate results was crucial in our problem-solving exams time and again.

Here, the slope of the regression line had to be interpreted as the mean price per square meter. Please note that students had to think about the range of prices in more than one sense. Firstly, they had to interpret the location of the individual offers in relationship to the regression line as decision factor whether a place was cheap or expensive in comparison. Moreover, secondly, the regression line had to be discussed in terms of its being true to reality. Students needed to realize that the closer the line moved to zero, the more impossible it was for it to represent actual flat size, and the farther it moved on, the more likely it was for the function to level out instead of continuing linearly.

In order to answer the last part of question 3, price and size of the apartments had to be attributed to the two axes not only for the graph but for the interpretation of it. The minimum of m² and the maximum of price had to be represented by vertical / horizontal lines within the graph. Again, you can easily see the applicability to a realistic situation in the future of our students.

Let us reiterate that there a quite number of additional pieces of paper that need to handed out along with the exams, as the list of advertisements in a real estate magazine above. It is on purpose that we didn't extract the relevant information in advance, but that we expect students to strengthen and use their competence in that specific area. In the beginning our students were taken aback by the unusual amount of information made available to them during the exam; after some time, however, they began to get used to the adjuncts. When it came to furnishing the school's yard with various ramps for inline skating, they specifically mentioned having fun looking through the variety of offers.

5th TEST

Type: Open-book exam with TI 92
Time:100 minutes

1.) Roller-skate court in Berndorf:
The outdoor sports grounds of our school are shaped roughly like a right triangle (see adjunct 1). Many students want a school facility for skaters. The expenses could be met through fund-raising at the school party at the end of the year.
a) First, calculate the maximum-sized rectangular area in the sports grounds if the soccer field remains there, its width being 20m. Document what you put into the TI92 and, in addition, explain in your own words how you arrived at the solution.
b) Use the adjunct (2) advertisement material of skater ramps to propose your design of the new skater court. Be aware of the maximum area available to you and keep in mind that there has to be enough room for walkways or stands for visitors. Explain both, your design and your decisions leading up to it!
c) Give a rough estimate of what the court will cost all in all, using the adjunct (3) price list. Can our school afford your design? (At the last school party we were able to raise about ATS 100,000.)
d) When you take a closer look at the elements "inner corner" and "ramp", the radius of the curvature seems rather large in comparison to the heights of the elements. Use the formula $v = r \cdot \omega$, where ω equals the angular velocity. (Angular velocity = Change in angle of rotation / time used) What kind of graph do you get for the angular velocity as dependent on radius if you can assume a constant speed of the skaters? What does that mean?
e) Describe the possible movement of a skater in the halfpipe with at least 4 vectors, if the skater goes from one end to the other, does a one-eighty, and comes back. Number the vectors and label them in their respective positions in a rough sketch. Also: explain in your own words!

MAP OF BERNDORF !!!	**Appendix C**
DESCRIPTION OF RAMPS !!!	**Appendix D**
POSSIBLE COMBINATIONS OF RAMPS !!!	**Appendix E**
PRICELIST OF RAMPS !!!	**Appendix F**

Our students enjoyed this problem especially because they knew that there was, in fact, a discussion going on at our school at the time about such an inline-skate ground. The problem of finding the optimal size and prize as related to the appeal of the various ramps therefore was a realistic one which they liked to tackle.

What was particularly interesting here was the fact that the TI92 made it possible for the students to tackle problems concerned with maximum and minimum without the help of derivation, which is introduced much later in the course of their studies at high school. In their answers we found different approaches to the problem: Some used the table to determin the maximum size possible, others looked at the graph. A few students used the maximum function of the TI92 and looked directly at the functional term given.

One problem I would like to mention here was time: Probably because it was interesting to them, students forgot to think about the time they had allotted to that particular problem and instead just got into it so deeply that the relation to the rest of the exam was lost for some of them.

Similarly, it seemed a difficulty, overall, to decide the right level of "intimacy", so to speak, with each problem in these new questions. Students will definitely need more time to get used to answering the interpretation questions at the right level of accuracy.

While we were dealing with problem-solving tasks, their solutions and the interpretations thereof, we wanted to show a couple of questions as posed in our Matura this past year. It could well give some sort of flavour of the kinds of problems that students can tackle at the end of our project.

1999/2000 Matura written exam: Mathematics   8B

1.) According to the experience of the Institute for Road Safety, about 22% of the drivers in Lower Austria in the evening have a blood alcohol concentration above .8 ppt (parts per thousand). Of about 23% of the drivers one can expect a blood alcohol concentration between .5 ppt and .8 ppt. We can safely assume that the drivers drank independently from each other.
   a) What is the probability of finding 1.) exactly four 2.) at least three in ten tested drivers who have a blood alcohol concentration above .8 ppt?
   b) How many drivers do you have to test under the above circumstances to find at least one driver whose blood alcohol concentration is above .8 ppt with a probability of no less than 95%?
   c) In table 1 (adjunct 1) you can find the results of a large routine alcohol testing of drivers done in the city of Graz in 1996. Estimate the relative frequency of those drivers with a blood alcohol concentration above .5ppt with a confidence of 95% (confidence interval!). Check in how far the above-mentioned results from Lower Austria match those of Graz and discuss your findings!
   d) We assume further that the drinking habits of Berndorf's drivers are essentially the same as those of other drivers across Lower Austria. After the legal limit of blood alcohol concentration had been lowered to .5 ppt, the city police of Berndorf carried out alcohol tests one evening. A pessimistic policeman commented that he thought the drinking habits of drivers had not changed for the better. In fact, the police found a blood alcohol concentration below the legal limit of .5 ppt in 15 out of 20 tested drivers. Can you, therefore, discard the pessimist's opinion with an error probability of 5% or not? What significance does the alcohol testing have, and how would you regard the policeman's opinion?
   Document what you calculate with your TI 92 and explain the formulas used in your own words. Also discuss the underlying problems of accepting or discarding hypotheses after the taking of samples.

STATISTICS !!!   **Appendix G**

One can easily imagine that the students need to be able to read the given text very carefully in order to extract the relevant information and translate it into algebraic expressions. Once the translation has been done, the calculation is worked out easily and fast by the TI92. So, again, the main importance is in understanding and translating into various mathematical forms of expression rather than in calculatory skills.

When you consider the kinds of statistics done here, you realize at once that problems like this one could never be solved within the allotted time without the help of a computer algebra system. But in this case there is the additional difficulty of reading the histogram in such a way that they can find out the probability which they need to woek out the confidence interval. We considered this question to be important in so far as students have to make a connection between the two statistical renditions and to discuss whether and why or why not the are, in fact, comparable at all. In this case, for example, you can see that the probability of

finding drunk drivers in Lower Austria with a blood alcohol level above .05 percent doesn't fit into the respective confidence interval for Graz (the probability of Graz lies under the lower limit of the interval).

1999/2000 Matura written exam: Mathematics   8B

2.) The oldest building in Pottenstein is an ossary, which is a house for the storage of skeletal remains of old. It was built at the end of the 12th century AD and consists of a circular chapel room and a semicircular apse, both of which have almost exactly cone-shaped roofs (see adjunct 2).

  a) For last year's renovations the restaurateurs had to calculate the floor area of the upper prayer room. Extract the measurements from the drawing, choose a useful coordinate system, find the circular equations and calculate their intersections. Also find the central angles α and β. Consequently calculate the entire floor area of the upper prayer room.

  b) Prove the following outstanding geometrical feature of the building: If you lay common tangents to the two outer circles (outside walls), then the two diameters drawn through the touching points of the smaller outer circle roughly run through the respective intersection of each of the two outer circles.

  Document sufficiently and explain the relevant steps in your proceeding!

3.) The integral as limit of upper and lower sums: Prove it for the shaded area of a quarter of the circle in the upper story of the ossary!

  - To approximate the area, first build upper and lower sums by dividing the interval into 5 parts. Explain the formula you use!
  - Choose a finer partition. Which value do upper and lower sums approach and why? Find the actual limit and check your work by calculating it in two other, different ways.
  - How does the difference between upper and lower sums behave with increasingly finer partition? Can you give a reason for your answer? How can you show graphically on the TI92 how the upper and lower sums approach their common limit?
  - Use the ossary to exemplify the fact that formulas for the volumes of cone and cylinder can be arrived at by integration. Show it generally first, then take the measurements of the drawing and apply your findings to the larger cone and the larger cylinder (assume idealized shapes). Choose good functions for your exemplification and also reason verbally!

MAPS OF OSSARY !!!   **Appendix H**

The main difficulty here was for students to place the rectangular coordinate system in such a way that would allow them to calculate the intercepts of the circles, in contrast to the usual kind of geometrical problem where such basic problems are already solved through the given coordinates etc.

In 3b) the students have to combine visual competence (in reading the given map) with handling skills of the TI92 in order to perform an analytical proof.

There is a clear advantage in using the TI92 when trying to show how the limits of upper and lower sums converge into the definite integral.

Notice that, once more, the students had to come up with the functions' equations as well as the limits for the integration before starting to calculate their results. In reading the maps, they also have to deal with the handling of a scale and translate the depicted dimensions into real ones.

Concerning the question of documentation at the end of the problem, I must say that students documented their work on the TI92 intuitively to such an extent as was necessary and at the same time sufficient for me to understand the steps they were taking to arrive at a solution to the respective problem. Of course, the correction of a test like this takes a lot more time than the correction of a traditional exam, because you have to take into account the many different possible approaches that students may take.

Time, of course, is a key problem in general when it comes to introducing new methods of teaching and / or assessment. Not only does it take longer for you as a teacher to prepare the teaching and the assessment materials but it also takes longer for the students to work out their homework, to study for their exams and to solve the problems that they are presented with during exams. Consequently, it also takes longer to correct the homework, their study results (think of the focus papers!) and their exams. Still, the positive backwash is well worth the additional energy you have to put into these alternative methods.

TIER 3: FOCUS PAPERS and TESTS OF PRESENTATIONS

During the first part of the year, students were given list of topics from which they could choose their focus paper topic. There were two main areas of work: crosscurricular work with physics and applied math. Students were expected to
1) choose a topic
2) research their topic individually
3) work out a focus paper (handed in and checked before the presentations)
4) give a presentation including short summary handouts for colleagues, and
5) pass a test containing one short question from each focus paper presented

Both presentation and handout were graded as in-class participation, and the students knew in advance that they should also provide example problems for school- and home-exercises. Here, then, is a list of topics as received by the students (it was handed out at our presentation in Portoroz along with all the examples presented so far):

LIST OF TOPICS
A) **Mathematics and physics** (mainly with the CBR):
1. *There is expansion...* (1): expansion as a function of a number of coins etc. spring constant, error calculation, mean, deviation
2. *Tracing a graph...* (3): time – distance – velocity, diagrams, enacting diagrams, calculate constant velocity – distance, "where do we meet", calculation of intersections, problems concerning movement
3. *A ball keeps rolling...* (2): function of height, slanted plane, gravitation, kinetic and potential energy
4. *A ball bounces...* (2): slope of a graph, height, velocity, find a maximum, adjusting functions
5. *A ball is falling...* (1): experiments involving interconnected functions, quadratic functions, parabola, hole in a tin can
6. *Fender benders...* (1): elastic / nonelastic impulse, laws of reflection, friction (different surfaces)
7. *There's ups and downs* (1): duration of oscillation, function

B) **Mathematics and economics** (mainly with the help of our partners at the local bank)
1. *The value of a car decreases...* (1): model for tax deductions, calculation of remaining value, taxes, concurrence with the actual loss in value
2. *Financing a car...* (1): models for leasing, calculation supported by tables
3. *What to do with an old flat* (1): selling or renting, the real estate market, state- and other funds
4. *What can I afford?* (1): banks' checking finances, planning expenses, calculation supported by tables
5. *Growing up* (1): models of retirement funds, ways of saving money
6. *We need more money than we have* (1): loans, additional expenses, balancing your account
7. *We have more money than we need* (1): ways of saving
8. *Stock "exchangers", gamblers and gifted mathematicians* (1): the stock exchange, ways of planning ahead, charts, adjusting and analyzing of functions
9. *Currencies...* (1): foreign currencies, -loans, the Euro

To a large extent students worked alone (some in pairs) and were very successful in their individual research efforts (+ integration of parents: brochures, advertisements, help in construction of material for groupwork / open learning) There was an extensive amount of cross-curricular activities, especially as our students had to read up on issues in physics and mathematics with their resources largely being literature in English.

Many students conducted their own experiments with the CBR extension of the TI92. They did, of course, receive some help from our side but the main bulk of preparation and execution was done by them. We believe that not many adolescents have worked with practical experiments in as much detail as our students have during their work on the focus papers.

In addition to this unusual practical emphasis, extensive work with theory (physics and economics) had to be done by the participants of the project. In this area it was, once more, important to be able to extract relevant information, although we did try to help students narrow down their search by pointing them in the right direction as often as possible. We felt that they not only mastered the problem of gathering material from a wide range of sources but that they were proud of their achievement as well. Some students actually constructed material for open learning including the TI92.

Generally speaking, the focus papers went well beyond our expectations in both scope and accuracy (only 2-3 did not).

Similarly, the presentations were better than we had anticipated: Students talked for 2-3 hours (we had told them we expected 20-30 minutes), and although many were nervous in the beginning (esp. with the video camera in the back of the classroom) they grew with the responsibility of having to explain subject matter to their peers. A surprisingly extensive use of different media (OHP, projector, slides) turned out to make the presentations both lively and interesting to the rest of the class. The presenters sometimes even organized groupwork to be done by their colleagues. These additional attempts were, of course, fully supported and helped by the teachers.

The handouts, another requirement for the presenters, were overall of high quality and good structure, which constituted a clear basis for studying for the tests. The tests were rather short compared to the problem solving exams, and the questions pertained to material presented by the students to each other (see example below).

6th TEST

Mathematics and Economics

1.) Investing money

The income of a small family (3 people) amounts to 35,000 ATS. Approximately 5,000 ATS can be set aside for the education and future living expenses of the 10-year-old son. How would you invest? According to which rule, and why?

....

....

....

2.) The stock market

- Graph the way of a company towards being officially listed at the stock exchange in a flowchart!

- You want to invest 20,000 ATS in shares of Coca-Cola (or Austria Tabak). How do you proceed?
  - O   20,000 ATS are invested all at once
  - O   2,000 ATS (or a similar amount) are invested each month
  - O   you observe the value of the shares over a period of time and whenever it is low you invest a few thousand
  - O   you observe the value of the shares over a period of time and invest all money at the first low.

  - What is a cost-average-effect?

  ....

3.) Loans

You take out a loan of 1.5 million ATS to buy a flat, and you want to pay it off within the next 20 years. Draw a possible graph of the amount of money you owe depending on time if you keep paying constant rates.

The effective interest rate is .... than the interest rate of the loan and includes ....

For a hypothecate loan a .... is used as security for ....

The most expensive loan is ....

The differences between a foreign currency loan and one in ATS are

....

....
....

The differences between leasing and loan are ....

4.) Financial retirement plans

The problem of pensions being paid by the state has been connected closely to the development of the population pyramid over the last century. The significant points are: ....

....
....

The advantage of an insurance (of life or death) as retirement plan is

...., the disadvantage being ....

.... will guarantee a high level of security and immediate access.

Using an investment fund grants additional security through

....;

but the interest rate is .... because ....

5.) Living quarters

Estimate the amounts of family's (parents 40-45 years old, 2 kids 10-16 years old) income and cost of living (incl. furnishing, paying back loans, etc).

The costs for a house (or a flat) depend on

....

....

....

6.) Some vocabulary and abbreviations: Explain these words!

- building loan
- giro account
- solvency
- dividend

Mathematics and Physics

7.) A rolling ball

If you use the CBR to record a rolling ball on a slanted board, the form of the curve is .... because ....

With increasing slope of the board, the absolute value of acceleration affecting the rolling Ball .... and is .... at 90°.

8.) Inclined throw

Tennisballs that are thrown with the same force but at different angles can reach more or less far. Briefly explain the diagram and attribute an angle that makes sense to you to each of the parabolas.

PICTURE OF INCLINED THROW GRAPHS !!!
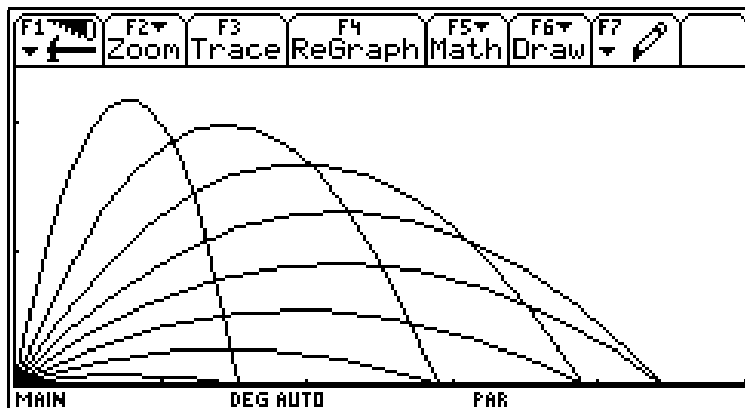
Sketch a possible graph of the function representing throw distance as dependent on throw angle!

The tests all yielded positive results (no Ds or Fs), but there were also only few As. We therefore assumed that the tests had not been too difficult or too easy.

In conlusion, we would like to point out that our three-tier model of assessment not only yielded satisfactory results in the subject area of mathematics, but that there were in fact many other positive results to be observed. Again referring to Dr. Heugl's talk, we believe that the kind of teaching and examining as proposed in our project fostered all four areas of competence that should ideally be attained in school: **Subject competence**, it could be argued, was even greater because students were more intimately involved in the process of presentation thereof. They proved a respectable level of understanding throughout the different kinds of exam. But whereas this subject-centered competence is also learned in the traditional teaching and assessment, our students also exhibited a growing **methodological competence** through independent accumulation of information, productive usage of information, skilled usage of heuristic strategies, choice of appropriate media, adequate presentation techniques and systematic practice and repetition (comp. Heugl). In addition to that, students' **social competence** was definitely added to by the need for communication and cooperation skills which pervaded the project but were especially called for during the presentation and test-preparation phase of the focus papers. Last but not lease, we believe that a three-tier model of assessment like ours will also foster students' **personal competence** in that they have to display independence, self confidence, self evaluation, motivation, willingness to perform, language competence, and logical thought processes (comp. Heugl).

All in all, students perceived this kind of math class as very different to traditional teaching; to them, the focus papers constituted the main difference, and their reactions to the whole project were largely positive despite the additional workload in comparison to the regular classes.

On a final note, we would like to foresee another main advantage in the future of the students in the poject classes: They should be well prepared to tackle the great Matura examinations at the end of their school career. The project is a preparation for Matura in so far as the focus papers approximate the so-called "Fachbereichsarbeiten", the given topics prepare the way for meaningful crosscurricular oral exams, and the competence in speaking in front of other people as well as the presentation skills gathered during the project will be readily accessible during the oral exams.

At the end of our talk in Portoroz we showed the audience a short video film put together by the students during and after the focus paper presentations. We will try to make it possible for you to download the video clip onto your computer. It should be largely self-explanatory and give you an impression of students' work.

Should you have any further questions or comments or if you are planning (or finishing) a project similar to ours, please don't hesitate to contact either of us via email. We would very much like to hear from you!

Der supergünstige Draht
von Herz zu Herzlein

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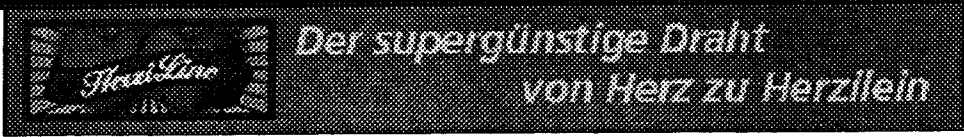
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Beilage 2

WOHNUNGSMARKT · IMMOBILIEN

Objekt-Nr.: 577
GEFFA Immobilien
Tel.: 01/804 67 44

**EINFAMILIENHAUS/VILLA
GUTENSTEIN/
NIEDERÖSTERREICH**
Zustand: sehr gut
Grundfläche: 863 m²
Wohnfläche: 500 m²
1Stockwerk, 6 Zimmer
Kaufpreis: S 4.200.000
Objekt-Nr.: 607
GEFFA Immobilien
Tel.: 01/804 67 44

**HÄUSER/MIETE
HINTERBRÜHL**
Zustand: sehr gut
Wohnfläche: 170 m²
Anz. Zimmer: 4
Miete/Pacht: S 35.000
Kaution: S 100.000
Objekt-Nr.: 2355
IMMOBILIENRING
Tel.: 022 36/267 41

**EINFAMILIENHAUS/VILLA
HINTERBRÜHL**
Zustand: sehr gut
Grundfläche: 780 m²
Wohnfläche: 171 m²
Anz. Zimmer: 4
Kaufpreis: S 6.900.000
Objekt-Nr.: 2608
IMMOINVEST
Tel.: 01/878 15

**EINFAMILIENHAUS/VILLA
HOLLABRUNN-RASCHALA**
Zustand: gut
Grundfläche: 200 m²
Wohnfläche: 60 m²
Anz. Zimmer: 2
Kaufpreis: S 1.400.000
Objekt-Nr.: 614
B.A.F.
Tel.: 01/711 91/518 62

**EINFAMILIENHAUS/VILLA
KALTENLEUTGEBEN**
Zustand: gut
Grundfläche: 1280 m²
Wohnfläche: 280 m²
Stockwerk: 2
Anz. Zimmer: 9
Kaufpreis: S 4.900.000
BK: S 2.000
Objekt-Nr.: 2575
IMMOBILIENRING
Tel.: 022 36/267 41

**HÄUSER/MIETE
KIERLING - GUGGING**
Zustand: sehr gut
Grundfläche: 778 m²
Wohnfläche: 150 m²
Anz. Zimmer: 5
Miete/Pacht: S 20.000
Kaution: S 66.000
Objekt-Nr.: 2009

DUSCHEK Immobilien
Tel.: 01/328 40 30

**HÄUSER/MIETE
KLAUSEN-LEOPOLDSDORF**
Zustand: gut
Grundfläche: 825 m²
Wohnfläche: 102 m²
1 Stockwerk, 4 Zimmer
Miete/Pacht: S 8.500
BK: S 1.000
Kaution: S 30.000
Objekt-Nr.: 2622
IMMOBILIENRING
Tel.: 022 36/267 41

**EINFAMILIENHAUS/VILLA
KLOSTERNEUBURG**
Zustand: gut
Grundfläche: 1443 m²
Wohnfläche: 126 m²
Anz. Zimmer: 5
Kaufpreis: S 3.700.000
Objekt-Nr.: 965
DIE ERSTE REAL
Tel.: 01/545 16 30

**EINFAMILIENHAUS/VILLA
KLOSTERNEUBURG**
Zustand: gut
Grundfläche: 590 m²
Wohnfläche: 200 m²
2 Stockwerke, 7 Zimmer
Kaufpreis: S 5.500.000
Objekt-Nr.: 3458
R. OESER Immobilien
Tel.: 01/470 68 78

**REIHENHAUS/
DOPPELHAUSHÄLFTE
KLOSTERNEUBURG**
Zustand: sehr gut
Grundfläche: 200 m²
Wohnfläche: 150 m²
Anz. Zimmer: 4
Kaufpreis: S 4.950.000
Objekt-Nr.: 827
DIE ERSTE REAL
Tel.: 01/545 16 30

**EINFAMILIENHAUS/VILLA
KLOSTERNEUBURG**
Zustand: gut
Grundfläche: 561 m²
Wohnfläche: 100 m²
1 Stockwerk, 4 Zimmer
Kaufpreis: S 3.600.000
Objekt-Nr.: 3302
R. OESER Immobilien
Tel.: 01/470 68 78

**EINFAMILIENHAUS/VILLA
KLOSTERNEUBURG**
Zustand: sehr gut
Grundfläche: 400 m²
Wohnfläche: 140 m²
1 Stockwerk, 4 Zimmer
Kaufpreis: S 3.600.000
Objekt-Nr.: 2034
IMMOINVEST
Tel.: 01/878 15

**EINFAMILIENHAUS/VILLA
LAABEN
BEI NEULENGBACH**
Zustand: sehr gut
Grundfläche: 3000 m²
Wohnfläche: 150 m²
Anz. Zimmer: 6
Kaufpreis: S 5.500.000
Objekt-Nr.: 1514
DUSCHEK Immobilien
Tel.: 01/328 40 30

**HÄUSER/MIETE
LANGENZERSDORF**
Zustand: sehr gut
Grundfläche: 400 m²
Wohnfläche: 200 m²
Miete/Pacht: S 22.800
BK: S 2.500, 6 Zimmer
Kaution: 3 MM
Objekt-Nr.: 2510
SPIEGELFELD Immob.
Tel.: 01/699 123 40

**REIHENHAUS/
DOPPELHAUSHÄLFTE
LEOBERSDORF**
Zustand: sehr gut
Grundfläche: 365 m²
Wohnfläche: 128 m²
1 Stockwerk, 4 Zimmer
Kaufpreis: S 3.290.000
Objekt-Nr.: 452
B.A.F.
Tel.: 01/711 91/518 62

**EINFAMILIENHAUS/VILLA
LEOBERSDORF**
Zustand: gut
Grundfläche: 788 m²
Wohnfläche: 140 m²
Anz. Zimmer: 8
Kaufpreis: S 2.800.000
BK: S 1.000
Objekt-Nr.: 2761
IMMOBILIENRING
Tel.: 022 36/267 41

**EINFAMILIENHAUS/VILLA
LEOPOLDSDORF
IM MARCHFELDE**
Zustand: sehr gut
Grundfläche: 900 m²
Wohnfläche: 160 m²
1 Stockwerk, 5 Zimmer
Kaufpreis: S 3.700.000
Objekt-Nr.: 2510
KUBICEK Immobilien
Tel.: 01/285 77 22

**EINFAMILIENHAUS/VILLA
LEOPOLDSDORF
IM MARCHFELD**
Zustand: sehr gut
Grundfläche: 250 m²
Wohnfläche: 125 m²
1 Stockwerk, 4 Zimmer
Kaufpreis: S 2.790.000
Objekt-Nr.: 2602
KUBICEK Immobilien
Tel.: 01/285 77 22

**EINFAMILIENHAUS/VILLA
LEOPOLDSDORF
IM MARCHFELD**
Zustand: sehr gut
Grundfläche: 270 m²
Wohnfläche: 140 m²
1 Stockwerk, 4 Zimmer
Kaufpreis: S 3.400.000
Objekt-Nr.: 2519
KUBICEK Immobilien
Tel.: 01/285 77 22

**HÄUSER/MIETE
MARIA ENZERSDORF
AM GEBIRGE**
Zustand: sehr gut
Grundfläche: 500 m²
Wohnfläche: 200 m²
Miete/Pacht: S 24.000
Kaution: 3 MM, 8 Zimmer
Objekt-Nr.: 684
DR.ALEXANDRA
GABRIEL
Tel.: 01/533 10 96

**REIHENHAUS/
DOPPELHAUSHÄLFTE
MARIA ENZERSDORF
AM GEBIRGE**
Zustand: gut, 5 Zimmer
Grundfläche: 250 m²
Wohnfläche: 120 m²
Kaufpreis: S 4.950.000
Objekt-Nr.: 1177
BÖCK Immobilien
Tel.: 022 52/871 36

**EINFAMILIENHAUS/VILLA
MATZEN**
Zustand: sehr gut
Grundfläche: 421 m²
Wohnfläche: 95 m²
Anz. Zimmer: 2
Kaufpreis: S 1.650.000
Objekt-Nr.: 2611
KUBICEK Immobilien
Tel.: 01/285 77 22

**HÄUSER/MIETE
MAUERBACH**
Zustand: sehr gut
Grundfläche: 800 m²

Wohnfläche: 250 m²
Anz. Zimmer: 5
Miete/Pacht: S 25.000
BK: S 1.000
Kaution: 3 BMM
Objekt-Nr.: 8663
DR.ALEXANDRA
GABRIEL
Tel.: 01/533 10 96

EINFAMILIENHAUS/VILLA
Zustand: gut
Grundfläche: 400 m²
Wohnfläche: 300 m²
2 Stockwerke, 10 Zimmer
Kaufpreis: S 5.300.000
Objekt-Nr.: 2598
RUCKENDORFER
Immobilien
Tel.: 01/587 72 23

DOPPELHAUSHÄLFTE
Zustand: sehr gut
Wohnfläche: 130 m²
Anz. Zimmer: 5
Kaufpreis: S 5.490.000
Objekt-Nr.: 2751
IMMOBILIENRING
Tel.: 022 36/267 41

HÄUSER/MIETE
Zustand: sehr gut
Grundfläche: 430 m²
Wohnfläche: 138 m²
Anz. Zimmer: 4
Miete/Pacht: S 18.182
Kaution: S 70.000
Objekt-Nr.: 1494
MAGNUM Immobilien
Tel.: 01/402 67 52

Zustand: sehr gut
Grundfläche: 300 m²
Wohnfläche: 130 m²
Anz. Zimmer: 4

Kaufpreis: S 3.990.000
BK: S 2.300
Objekt-Nr.: 4253
ÖRAG Immobilien
Tel.: 01/534 73

EINFAMILIENHAUS/VILLA
Zustand: gut
Grundfläche: 2973 m²
Wohnfläche: 124 m²
Anz. Zimmer: 5
Kaufpreis: S 4.500.000
Objekt-Nr.: 4310
KREFINA Immobilien
Tel.: 01/587 87 37

**EINFAMILIENHAUS/VILLA
ORTH AN DER DONAU**
Zustand: sehr gut
Grundfläche: 2500 m²
Wohnfläche: 80 m²
Anz. Zimmer: 4
Kaufpreis: S 2.950.000
Objekt-Nr.: 2035
KUBICEK Immobilien
Tel.: 01/285 77 22

**EINFAMILIENHAUS/VILLA
ORTH AN DER DONAU**
Zustand: sehr gut
Grundfläche: 732 m²
Wohnfläche: 160 m²
1 Stockwerk, 4 Zimmer
Kaufpreis: S 3.780.000
Objekt-Nr.: 2391
KUBICEK Immobilien
Tel.: 01/285 77 22

**EINFAMILIENHAUS/VILLA
PERCHTOLDSDORF**
Zustand: sehr gut
Grundfläche: 1000 m²
Wohnfläche: 250 m²
Anz. Zimmer: 5
Miete/Pacht: S 40.000
Kaution: 3 BMM
Objekt-Nr.: 5354
DR.ALEXANDRA
GABRIEL
Tel.: 01/533 10 96

In Zusammenarbeit mit der CA, der Bank zum Erfolg

WOHNUNGSMARKT · IMMOBILIEN

Column 1

Kaufpreis: S 5.500.000
Objekt-Nr.: 2599
RUCKENDORFER
Immobilien
Tel.: 01/587 72 23

**HÄUSER/MIETE
GAADEN BEI MÖDLING**
Zustand: gut
Grundfläche: 1025 m²
Wohnfläche: 65 m²
Miete/Pacht: S 7.000
BK: S 1.000, 2 Zimmer
Kaution: S 35.000
Objekt-Nr.: 2746
IMMOBILIENRING
Tel.: 022 36/267 41

**EINFAMILIENHAUS/VILLA
GAADEN BEI MÖDLING**
Zustand: gut
Grundfläche: 730 m²
Wohnfläche: 150 m²
Anz. Zimmer: 3
Kaufpreis: S 5.300.000
Objekt-Nr.: 1538
Dr. E. OTTO Immobilien
Tel.: 01/512 77 77

**HÄUSER/MIETE
GABLITZ**
Zustand: sehr gut
Grundfläche: 182 m²
Wohnfläche: 135 m²
1 Stockwerk, 4 Zimmer
Miete/Pacht: S 18.000
Kaution: S 50.000
Objekt-Nr.: 2659
IMMOBILIENRING
Tel.: 022 36/267 41

**MEHRFAMILIENHAUS/
VILLA
GABLITZ**
Zustand: gut
Grundfläche: 899 m²
Wohnfläche: 255 m²
2 Stockwerke, 9 Zimmer
Kaufpreis: S 4.900.000
Objekt-Nr.: 4359
KREFINA Immobilien
Tel.: 01/587 87 37

Column 2

**EINFAMILIENHAUS/VILLA
GABLITZ**
Zustand: gut
Grundfläche: 1063 m²
Wohnfläche: 147 m²
Stockwerk: 1
Anz. Zimmer: 6
Kaufpreis: S 4.950.000
Objekt-Nr.: 4053
ÖRAG Immobilien
Tel.: 01/534 73

**HÄUSER/MIETE
GABLITZ**
Zustand: sehr gut
Grundfläche: 83 m²
Wohnfläche: 109 m²
1 Stockwerk, 4 Zimmer
Miete/Pacht: S 16.000
Kaution: S 50.000
Objekt-Nr.: 2658
IMMOBILIENRING
Tel.: 022 36/267 41

**MEHRFAMILIENHAUS/
VILLA
GABLITZ**
Zustand: gut
Grundfläche: 489 m²
Wohnfläche: 200 m²
2 Stockwerke, 6 Zimmer
Kaufpreis: S 4.000.000
Objekt-Nr.: 4360
KREFINA Immobilien
Tel.: 01/587 87 37

**EINFAMILIENHAUS/VILLA
GÄNSERNDORF SÜD**
Zustand: sehr gut
Grundfläche: 1004 m²
Wohnfläche: 250 m²
1 Stockwerk, 6 Zimmer
Kaufpreis: S 6.600.000
Objekt-Nr.: 3658
ÖRAG Immobilien
Tel.: 01/534 73

**HÄUSER/MIETE
GERASDORF BEI WIEN**
Zustand: gut
Grundfläche: 592 m²
Wohnfläche: 110 m²
Anz. Zimmer: 3

Column 3

Miete/Pacht: S 10.000
Kaution: 3 BMM
Objekt-Nr.: 8234
DR. ALEXANDRA
GABRIEL
Tel.: 01/533 10 96

**HÄUSER/MIETE
GERASDORF BEI WIEN**
Zustand: sehr gut
Grundfläche: 563 m²
Wohnfläche: 130 m²
Anz. Zimmer: 4
Miete/Pacht: S 18.000
Kaution: 6 BMM
Objekt-Nr.: 2558
IMMOINVEST
Tel.: 01/878 15

**EINFAMILIENHAUS/VILLA
GERASDORF BEI WIEN**
Zustand: sehr gut
Grundfläche: 501 m²
Wohnfläche: 160 m²
Stockwerk: 1
Anz. Zimmer: 4
Kaufpreis: S 3.290.000
Objekt-Nr.: 2562
KUBICEK Immobilien
Tel.: 01/285 77 22

**HÄUSER/MIETE
GERASDORF BEI WIEN**
Zustand: sehr gut
Grundfläche: 300 m²
Wohnfläche: 140 m²
Anz. Zimmer: 4
Miete/Pacht: S 18.000
BK: S 2.000
Kaution: 3 BMM
Objekt-Nr.: 1485
DR. ALEXANDRA
GABRIEL
Tel.: 01/533 10 96

**EINFAMILIENHAUS/VILLA
GERASDORF BEI WIEN**
Zustand: gut
Grundfläche: 592 m²
Wohnfläche: 90 m²
Anz. Zimmer: 5
Kaufpreis: S 2.850.000

Column 4

Objekt-Nr.: 222
KUBICEK Immobilien
Tel.: 01/285 77 22

**HÄUSER/MIETE
GERASDORF BEI WIEN**
Zustand: sehr gut
Wohnfläche: 150 m²
Anz. Zimmer: 4
Miete/Pacht: S 25.000
Kaution: 6 BMM
Objekt-Nr.: 8449
DR. ALEXANDRA
GABRIEL
Tel.: 01/533 10 96

**EINFAMILIENHAUS/VILLA
GERASDORF BEI WIEN**
Zustand: sehr gut
Grundfläche: 572 m²
Wohnfläche: 190 m²
1 Stockwerk, 5 Zimmer
Kaufpreis: S 4.800.000
Objekt-Nr.: 2464
KUBICEK Immobilien
Tel.: 01/285 77 22

**EINFAMILIENHAUS/VILLA
GIESSHÜBL BEI WIEN**
Zustand: sehr gut
Grundfläche: 352 m²
Wohnfläche: 132 m²
1 Stockwerk, 6 Zimmer
Kaufpreis: S 5.485.000
Objekt-Nr.: 2653
IMMOBILIENRING
Tel.: 022 36/267 41

**EINFAMILIENHAUS/VILLA
GROSS-ENZERSDORF**
Zustand: sehr gut
Grundfläche: 300 m²
Wohnfläche: 80 m²
Anz. Zimmer: 4
Kaufpreis: S 1.680.000
Objekt-Nr.: 2339
KUBICEK Immobilien
Tel.: 01/285 77 22

**EINFAMILIENHAUS/VILLA
GROSS-ENZERSDORF**
Zustand: sehr gut
Grundfläche: 450 m²
Wohnfläche: 150 m²
1 Stockwerk, 5 Zimmer
Kaufpreis: S 2.800.000
Objekt-Nr.: 2526
KUBICEK Immobilien
Tel.: 01/285 77 22

**EINFAMILIENHAUS/VILLA
GROSS-ENZERSDORF**
Zustand: sehr gut
Grundfläche: 300 m²
Wohnfläche: 130 m²
Stockwerk: 1
Anz. Zimmer: 4
Kaufpreis: S 2.990.000
Objekt-Nr.: 2558
KUBICEK Immobilien
Tel.: 01/285 77 22

Column 5

**EINFAMILIENHAUS/VILLA
GROSS-ENZERSDORF**
Zustand: gut
Grundfläche: 650 m²
Wohnfläche: 110 m²
Anz. Zimmer: 2
Kaufpreis: S 1.990.000
Objekt-Nr.: 2075
KUBICEK Immobilien
Tel.: 01/285 77 22

**EINFAMILIENHAUS/VILLA
GROSS-ENZERSDORF**
Zustand: sehr gut
Grundfläche: 826 m²
Wohnfläche: 178 m²
Anz. Zimmer: 5
Kaufpreis:
S 4.990.000
Objekt-Nr.: 2393
KUBICEK Immobilien
Tel.: 01/285 77 22

**REIHENHAUS/
DOPPELHAUSHÄLFTE
GROSS-ENZERSDORF**
Zustand: sehr gut
Grundfläche: 300 m²
Wohnfläche: 105 m²
Stockwerk: 2
Anz. Zimmer: 4
Kaufpreis: S 2.950.000
Objekt-Nr.: 1076
BAF MARIAHILF
Tel.: 01/711 91/579 79

**EINFAMILIENHAUS/VILLA
GROSSEBERSDORF**
Zustand: sehr gut
Grundfläche: 3242 m²
Wohnfläche: 130 m²
Stockwerk: 1
Anz. Zimmer: 4
Kaufpreis: S 3.950.000
Objekt-Nr.: 2690
KLUGER Immobilien
Tel.: 01/505 96 97

**EINFAMILIENHAUS/VILLA
GROSSRUSSBACH**
Zustand: gut
Grundfläche: 608 m²
Wohnfläche: 100 m²
Stockwerk: 1
Anz. Zimmer: 4
Kaufpreis: S 2.300.000
Objekt-Nr.: 3960
ÖRAG Immobilien
Tel.: 01/534 73

**EINFAMILIENHAUS/VILLA
GUGGING**
Zustand: gut
Grundfläche: 700 m²
Wohnfläche: 90 m²
Anz. Zimmer: 4
Kaufpreis: S 2.700.000
Objekt-Nr.: 1009
ADVANTA Immobilien
Tel.: 01/409 84 00

Column 6

**EINFAMILIENHAUS/VILLA
GUNTRAMSDORF**
Zustand: gut
Grundfläche: 1300 m²
Wohnfläche: 250 m²
2 Stockwerke, 8 Zimmer
Kaufpreis: S 7.000.000
Objekt-Nr.: 2722
RUCKENDORFER
Immobilien
Tel.: 01/587 72 23

**REIHENHAUS/
DOPPELHAUSHÄLFTE
GUNTRAMSDORF**
Zustand: sehr gut
Grundfläche: 136 m²
Wohnfläche: 97 m²
Stockwerk: 1
Anz. Zimmer: 4
Kaufpreis: S 3.120.000
Objekt-Nr.: 594
GEFFA Immobilien
Tel.: 01/804 67 44

**REIHENHAUS/
DOPPELHAUSHÄLFTE
GUNTRAMSDORF**
Zustand: sehr gut
Grundfläche: 136 m²
Wohnfläche: 97 m²
1 Stockwerk, 4 Zimmer
Kaufpreis: S 3.155.333
Objekt-Nr.: 575
GEFFA Immobilien
Tel.: 01/804 67 44

**REIHENHAUS/
DOPPELHAUSHÄLFTE
GUNTRAMSDORF**
Zustand: sehr gut
Grundfläche: 142 m²
Wohnfläche: 99 m²
1 Stockwerk, 4 Zimmer
Kaufpreis: S 3.203.000
Objekt-Nr.: 578
GEFFA Immobilien
Tel.: 01/804 67 44

**REIHENHAUS/
DOPPELHAUSHÄLFTE
GUNTRAMSDORF**
Zustand: sehr gut
Grundfläche: 136 m²
Wohnfläche: 97 m²
Stockwerk: 1
Anz. Zimmer: 4
Kaufpreis: S 3.155.333
Objekt-Nr.: 576
GEFFA Immobilien
Tel.: 01/804 67 44

**REIHENHAUS/
DOPPELHAUSHÄLFTE
GUNTRAMSDORF**
Zustand: sehr gut
Grundfläche: 143 m²
Wohnfläche: 99 m²
Stockwerk: 1
Anz. Zimmer: 4
Kaufpreis: S 3.203.000

- Sportpromenade
- SCHULE
- SPORTPLATZ
- Sportplatz
- Triesting
- 6774
- Leobersdorf – St. Pölten
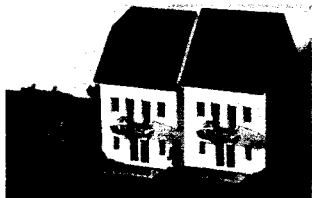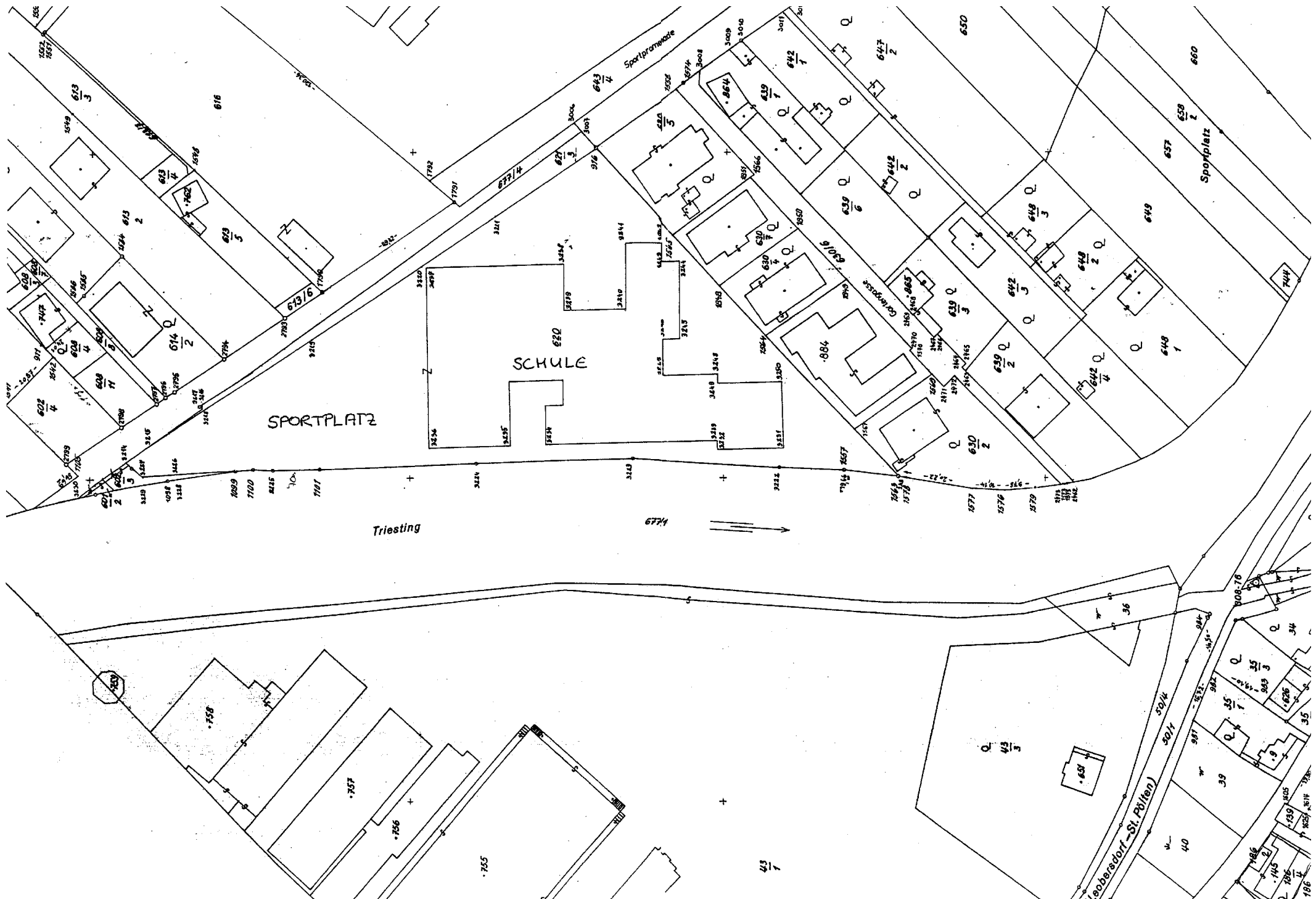
# Half-Pipe

Bestell-Nr.:	78 496
Maße:	Länge: 10,60 m
	Breite: 2 x 2,50m = 5,00 m
	Höhe: 3,30 m
	Radius: 2,85 m
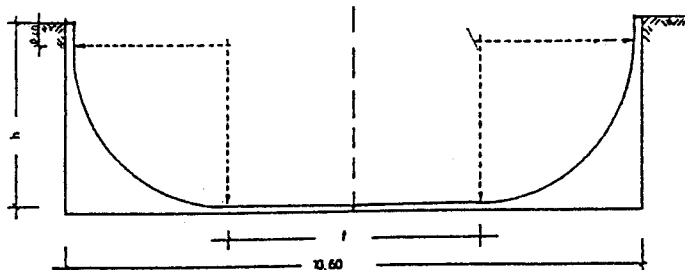
Beschreibung: Die Elementbreite beträgt 2,50 m. Normale Anlagenbreite: 2 x 2,50 m = 5.00 m. Diese Anlage besteht aus 4 Kurven-
elementen. Es empfiehlt sich, die Anlage etwa 1,00 m tief in das Gelände einzubauen. An die Rückseite der Ele-
mente wird der ausgehobene Boden angeschüttet. Die offenen Seiten können mit einer Stufenanlage abgetreppt
werden. Hierfür eignen sich ausgezeichnet unsere Steh- und Sitzstufen. Sollte die Anlage keine Erdanböschung
erhalten, sind an jeder oberen Kante Podest mit Geländer anzuschrauben – siehe Zubehörliste
Lieferung einer „Halfpipe Soft" oder „Funpipe" auch möglich: siehe beiligende Querschnitte!
Alle Betonelemente der Skateboardanlagen bestehen aus hochwertigem Stahlbeton B 45, kreuzweise 2-lagig
bewehrt, wasserundurchlässig. Die Laufseiten sind in glattem Sichtbeton geschalt (= gute Rolleigenschaften). Die
Rückseiten sind abgerieben. Die Fahrgeräusche sind bei Betonelementen geringer als z.B. bei Holz-, Kunststoff-
und Stahlblechbeläge . Die obere, innere Elementkante erhält ein einbetoniertes feuerverzinktes Copingrohr als
Stoß-, Gleit- und Haltekante. Die Fugen zwischen den Fertigteilen werden mit Gummiprofilen geschlossen.
Sie wissen ja, Beton ist haltbar und lebt lang!

Half-Pipe Soft

Bestell-Nr.:	78 497
Maße:	Länge: 10,60 m
	Breite: 2 x 2,50m = 5,00 m
	Höhe: 2,00 m - 2,90 m
	Radius: 2,85 m
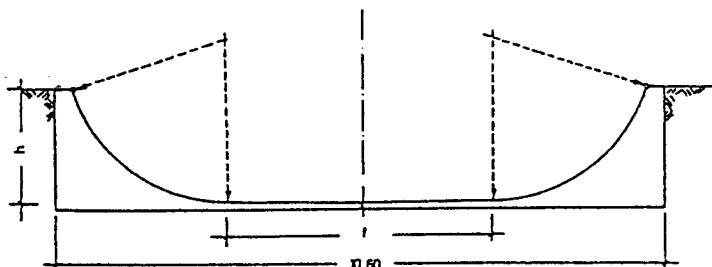
Besonderes für Anlieferung und Aufstellung mittels Tieflader und Montagekrans. Durch das hohe Gewicht und Größe ist es nötig
einen befestigten Zufahrtsweg bis zur Baustelle (Fundament) zu gewährleisten. Die Erdarbeiten und Ortbetonarbeiten sind laut Län-
gen- und Breitenmaß vor Ort zu erstellen.

Fun-Pipe
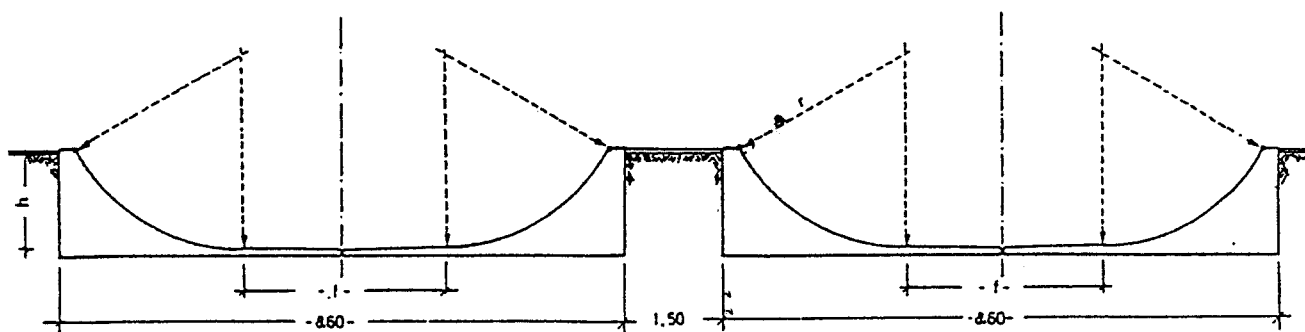
Bestell-Nr.:	78 498
Maße:	Länge: 2 x 8,60 m + 1,50 m
	Breite: 2 x 2,50m = 5,00 m
	Höhe: 1,50 m
	Radius: 2,85 m

Seite 15

Coping-Ramp 98

Bestell-Nr.:	78 030
Maße:	Länge: 1,90 m
	Breite: 1,25 m
	Höhe: 0,98 m
	Radius: 1,80 m
Gewicht:	ca. 2000 kg
Material:	Beton B45 armiert
Qualität:	Glatt geschalt, Schraubhöhenverstellung, Edelstahl, Anlaufkeil aus Edelstahl Coping-Rohr feuerverzinkt hohe Gleitfähigkeit
Aufstellung:	Direktaufstellung mittels Hub-Roll-Geräten, mindestens 2 St. nebeneinander auf ebenen tragfähigen Belägen. Bei Rampen-Kombinationen Anpassung (Ausgleich durch Schraubhöhenverstellung). Leise, wartungsarm, witterungsfest. Keine Verankerung durch hohes Eigengewicht.
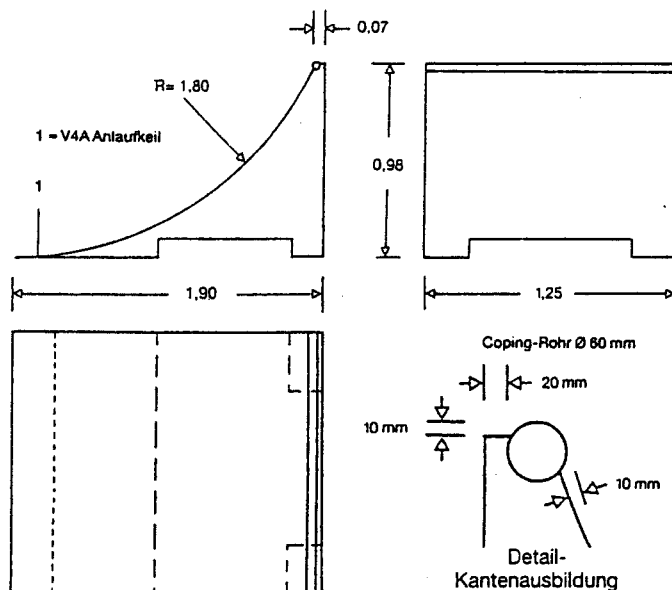
Beschreibung: Coping-Rampe mit Abschlußrohr zum Abheben, Drehungen und seitlichen Rutschen, Kantentricks; steilere, konkav geschwungene Rampe, nicht ohne Podest frei aufstellbar; nur mit Podest. Teil einer Funbox, Quarter Ramp: mindestens 2 Teile nebeneinander Spine-Ramp: 2 Teile Rücken an Rücken oder in einer Funpipe siehe Kombinationsvorschläge
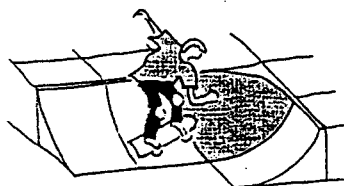
Innen-Corner

Bestell-Nr.:	78 040
Maße:	Länge: 1,90 m
	Breite: 1,90 m
	Höhe: 0,98 m
	Radius: 1,80 m
Gewicht:	ca. 3500 kg
Material:	Beton B45 armiert
Qualität:	Glatt geschalt, Schraubhöhenverstellung, Edelstahl, Anlaufkeil aus Edelstahl Coping-Rohr feuerverzinkt hohe Gleitfähigkeit
Aufstellung:	Direktaufstellung mittels schwerer Hub-Roll-Geräten, mindestens 1 St. auf ebenen tragfähigen Belägen. Bei Rampen-Kombinationen Anpassung (Ausgleich durch Schraubhöhenverstellung). Leise, wartungsarm, witterungsfest. Keine Verankerung durch hohes Eigengewicht.
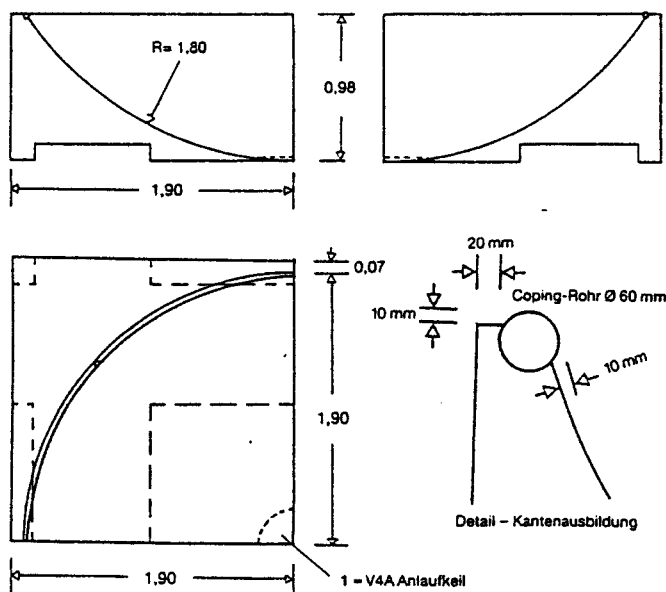
Beschreibung: Einzelne Elemente der Coping-Ramp können über eine Kurve verbunden werden – längere Übungen werden möglich.

Skizzen-Vorschläge von Kombinationen der einzelnen Elemente
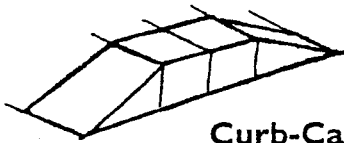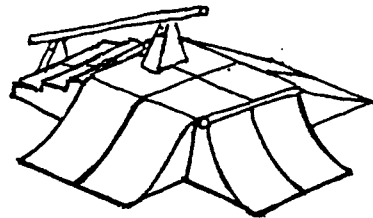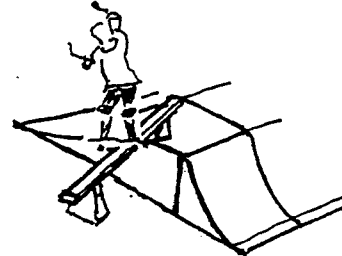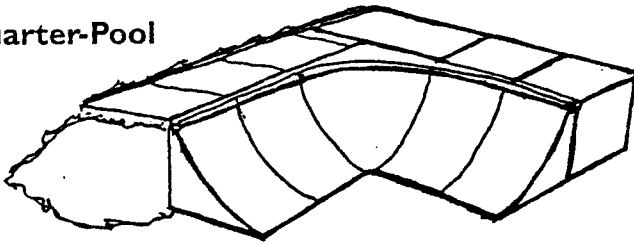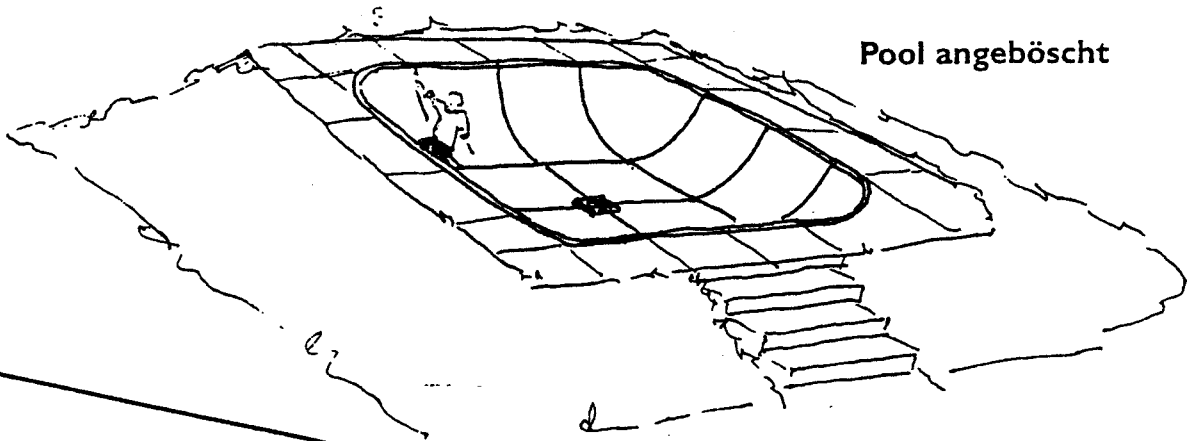
Bank
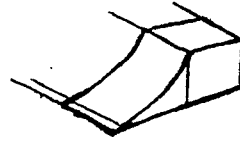
Jump-Ramp
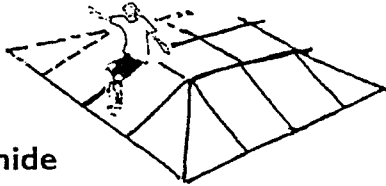
Pyramide

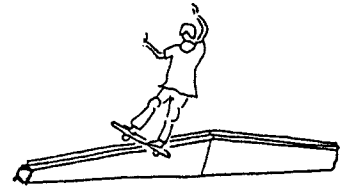Spine-Ramp

Fun-Box

Curb-Cat

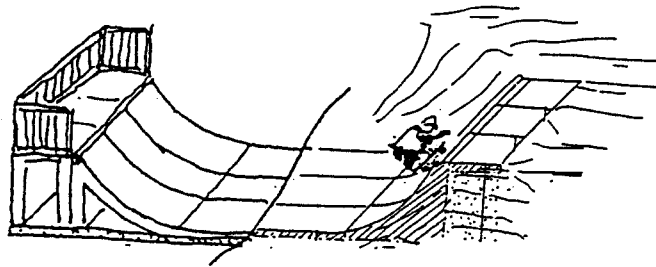Quarter-Pool

Combi-Hand-Rail
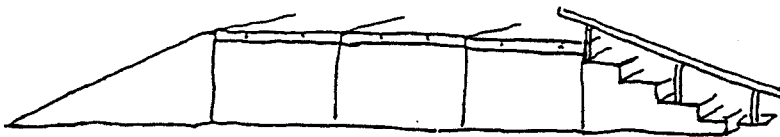
Pool angeböscht

Fun-Pipe 98

Curb schräg

**Mini-Pipe
Freistehend**

**Mini-Pipe
Erdeinbau**

**Curb-Cat
erweitert**

Speed-Ramp 125

27.04.00

| Best.Nr.	TRENDSPORT KATALOG 2000 Bezeichnung	BAUKASTEN excl. Mwst.	inkl. Mwst.	LEISTUNG excl. Mwst.	inkl. Mwst.
	Aktivzone				
68570	Spielfeld TZU104, Größe 18 x 15,6 m	663.270,–	795.924,–	98.000,–	117.600,–
68571	Spielfeld TZU114, Größe 24 x 15,6 m	728.995,–	874.794,–	116.600,–	139.920,–
68572	Zuschauerturm TZU115	76.830,–	92.196,–	6.800,–	8.160,–
68573	Bank TZA095, mit je 5 Sattelsitzen	19.105,–	22.926,–	2.400,–	2.880,–
68574	Tor TZU105, mit Flügelwänden und Basketballkorb	143.425,–	172.110,–	33.300,–	39.960,–
68575	Tor TZU106, ohne Flügelwände, mit Basketballkorb	68.495,–	82.194,–	9.960,–	11.952,–
	Rollskateanlagen				
	Stangl Beton-Rollskateanlagen				
68594	Table 45	7.065,–	8.478,–	Preis auf Anfrage	
68595	Bank 45	12.240,–	14.688,–		
68596	Half-Wave 45	6.595,–	7.914,–		
68597	End-Wave 45	7.535,–	9.042,–		
68598	Stairs 45	6.120,–	7.344,–		
68599	Comer- Wave 45	8.475,–	10.170,–		
68600	Bank 60	13.185,–	15.822,–		
68601	Table 60	8.005,–	9.606,–		
68602	Comer 60	21.185,–	25.422,–		
68603	Jump- Ramp 60	15.065,–	18.078,–		
68604	Stairs 60	6.595,–	7.914,–		
68605	Pyramiden- Comer 60	21.185,–	25.422,–		
68610	Bank 75	14.125,–	16.950,–		
68611	Jump- Ramp 75	16.480,–	19.776,–		
68612	Coping- Ramp 75	18.360,–	22.032,–		
68613	Stairs 75	7.535,–	9.042,–		
68614	Table 75	8.945,–	10.734,–		
68615	Curb- Rail	13.655,–	16.386,–		
68616	Comer 75	22.600,–	27.120,–		

| Best.Nr.	TRENDSPORT KATALOG 2000 Bezeichnung	BAUKASTEN excl. Mwst.	inkl. Mwst.	LEISTUNG excl. Mwst.	inkl. Mwst.
68617	Corner- Ramp 75	27.305,–	32.766,–		
68619	Quarter- Ramp 98	25.420,–	30.504,–		
68620	Coping- Ramp 98	19.775,–	23.730,–		
68621	Innen-Corner 98	46.605,–	55.926,–		
68622	Table 98	9.890,–	11.868,–		
68623	Table für Corner 98	13.655,–	16.386,–		
68624	Stairs 98	8.945,–	10.734,–		
68626	Bank 98	16.480,–	19.776,–		
68627	Bank 98 flach	16.480,–	19.776,–		
68628	Jump- Ramp 98	17.420,–	20.904,–	Preis auf Anfrage	
68630	Speed Ramp 125	18.360,–	22.032,–		
68631	Table 125	10.830,–	12.996,–		
68632	Stairs 125	10.830,–	12.996,–		
68633	Bank 125	18.360,–	22.032,–		
68634	Coping- Ramp 125	20.715,–	24.858,–		
68635	Quarter- Ramp 125	27.305,–	32.766,–		
68639	Olly-Box mit Curb	25.420,–	30.504,–		
68640	Olly-Box	15.065,–	18.078,–		
68641	Wall-Ramp 150	19.775,–	23.730,–		
68642	Combi-Hand-Rail	13.655,–	16.386,–		
68643	Pömpel	2.355,–	2.826,–		
68679	Rollsportplatten	1.180,–	1.416,–		
68680	Rollsportplatten für Corner 98	1.840,–	2.208,–		
68646	Tabel 150	13.185,–	15.822,–		
68647	Bank 150	19.775,–	23.730,–		
68648	Coping- Ramp 150	21.655,–	25.986,–		
68649	Speed-Ramp 150	20.715,–	24.858,–		
68650	Mini-Pipe 150 Freistehend	235.365,–	282.438,–		
68652	Mini-Pipe 150 Erdeinbau	169.465,–	203.358,–		
68654	Mini-Pipe 185 Erdeinbau	263.610,–	316.332,–		

	TRENDSPORT KATALOG 2000	BAUKASTEN		LEISTUNG	
Best.Nr.	Bezeichnung	excl. Mwst.	inkl. Mwst.	excl. Mwst.	inkl. Mwst.
68655	Mini-Pipe 250 Freistehend	357.755,–	429.306,–		
68656	Quarter- Ramp 150	29.190,–	35.028,–		
68659	Rail 300	6.120,–	7.344,–		
68673	Geländer beidseitig 125x375x125x100	67.790,–	81.348,–		
68677	Geländer beidseitig 125x500x125x100	79.085,–	94.902,–		
68672	Geländer Segment Mitteil	6.595,–	7.914,–		
68658	Geländer Segment Seitenteil	7.065,–	8.478,–		
68678	Curb 300 R	13.655,–	16.386,–		
68681	Curb 300 C	13.655,–	16.386,–		
68683	Back- Rail 625	32.010,–	38.412,–	Preis auf Anfrage	
68684	Back- Rail 750	36.720,–	44.064,–		
68674	Mauerscheibe 305 für Wall- Ramp	7.345,–	8.814,–		
68670	Hinweisschild mit Pfosten	4.190,–	5.028,–		
68671	Hinweisschild "Scaty"	7.065,–	8.478,–		
	Schützenberger-Skateanlagen in Holzkonstruktion				
68685	Miniramp	87.400,–	104.880,–	38.850,–	46.620,–
68686	Curb-Cut/Ledge, Wheelie-Table combo	85.390,–	102.468,–	30.955,–	37.146,–
68687	Pyramide	98.350,–	118.020,–	25.620,–	30.744,–
68688	¾ Fun-Box mit Rail	68.600,–	82.320,–	25.725,–	30.870,–
68689	¾ Pyramide mit Curb	85.430,–	102.516,–	19.845,–	23.814,–
68690	Quarterpipe	42.450,–	50.940,–	17.220,–	20.664,–
68691	Bank	49.620,–	59.544,–	17.220,–	20.664,–
68692	Coping Ramp	18.855,–	22.626,–	3.800,–	4.560,–
68693	Spine Ramp	25.340,–	30.408,–	3.800,–	4.560,–
68694	Mini Bank	16.445,–	19.734,–	3.800,–	4.560,–
68695	Jump Ramp	11.145,–	13.374,–	3.800,–	4.560,–
68696	Slide Curb	9.150,–	10.980,–	3.800,–	4.560,–
68697	Wheelie Table	13.180,–	15.816,–	3.800,–	4.560,–

Alkoholüberwachung in der Stadt Graz 1996

Übersicht über sämtliche Alkoholproben (N=1170)

Quelle: Bundespolizei Graz   Kuratorium für Verkehrssicherheit
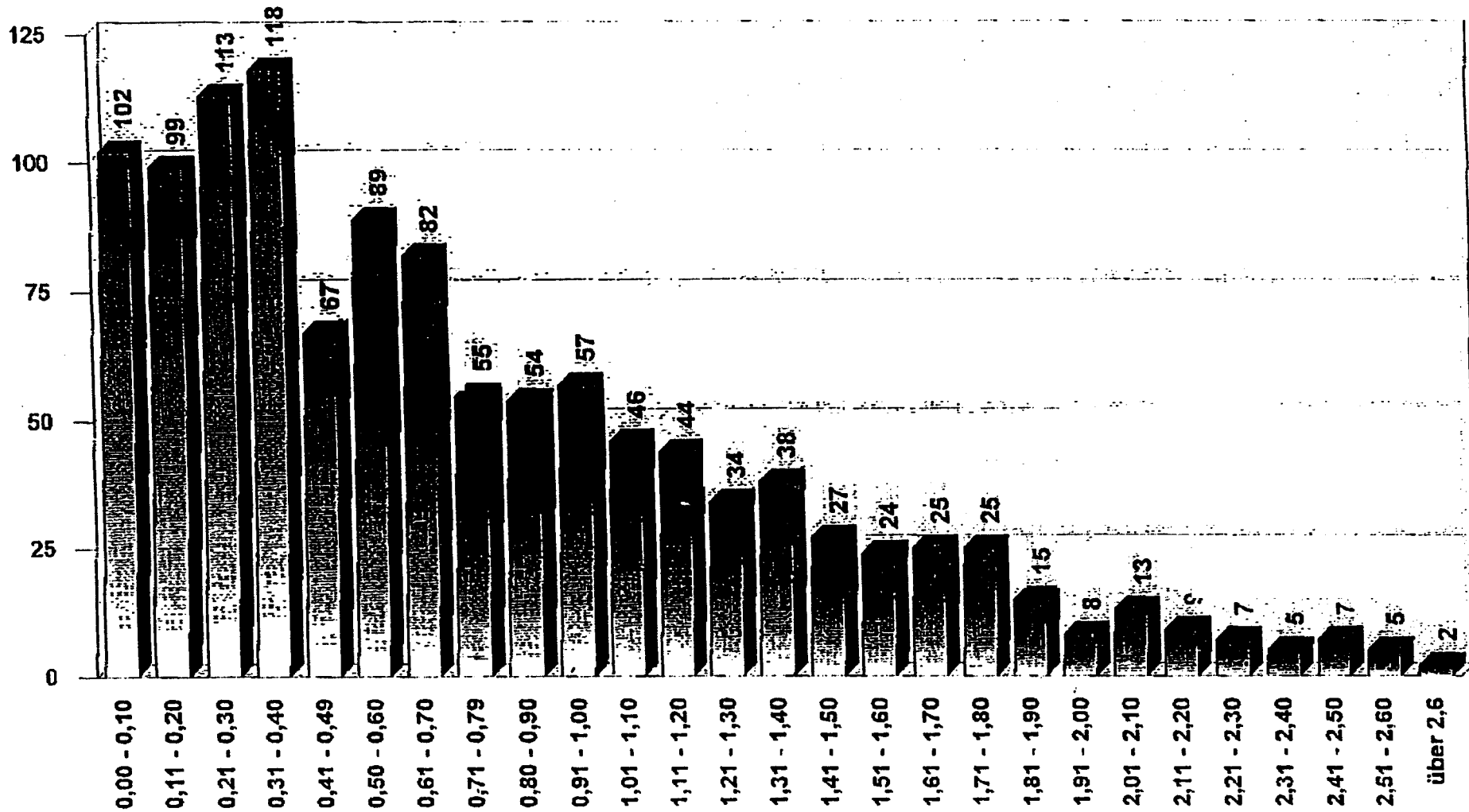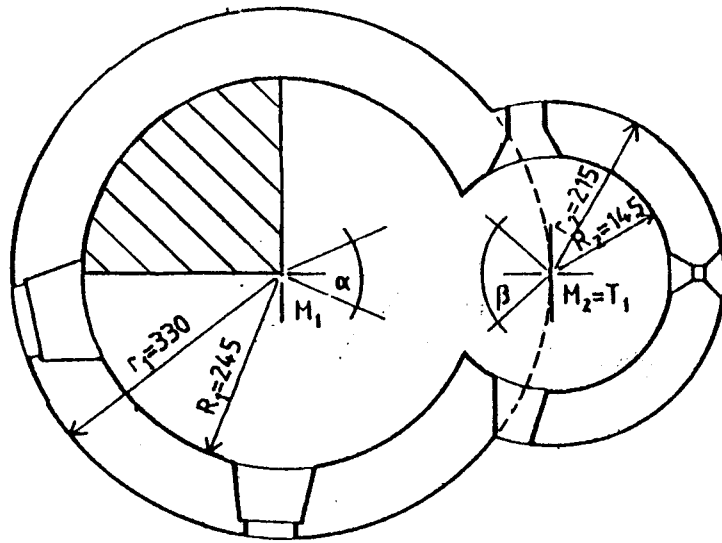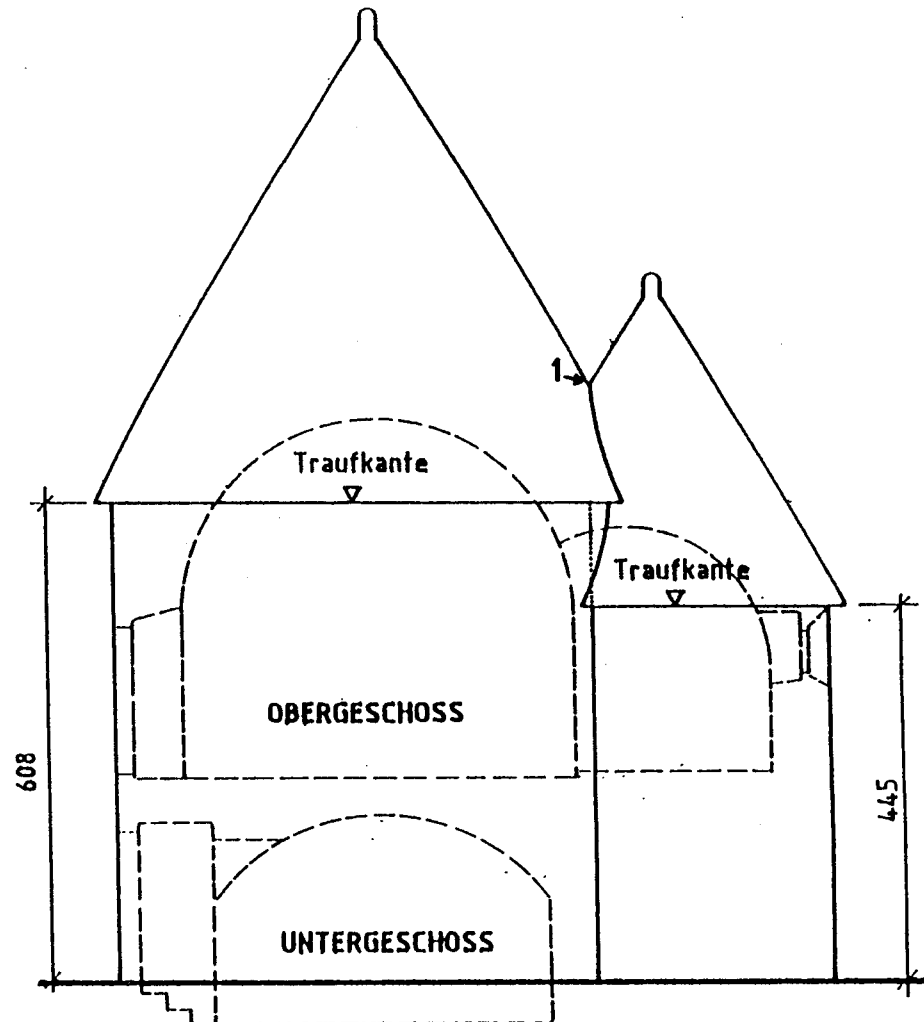
GRUNDRISS OBERGESCHOSS
(ANDACHTSRAUM)

DOPPELKARNER
IN 2563 POTTENSTEIN

Maße in cm   Maßstab 1:100

ANSICHT / SCHNITT