Teaching –learning module compiled by the PARSEL consortium
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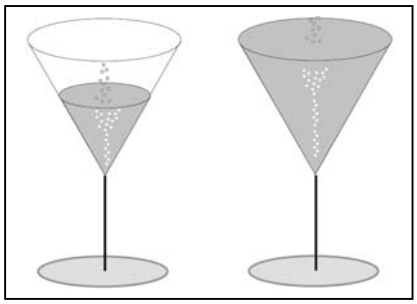
Popularity and Relevance of Science Education for scientific Literacy

How much Champagne could you afford?

Teacher materials

A grade 8-9 mathmatics module on
getting scientific information



Abstract:

This task needs calculation on the capacity of a champagne-glass to calculate the price and on the risk to go over the limit of the alcohol-content in the blood.
On first sight a glass which is half full should cost only the half of a full one. But if you calculate the capacity of a cone, the complete filled glass containes 8 times more.

It is possible to addto the task is a calculation, how much half full champagne glases you can drink before you overgo the alcohol-limit of traffic drivers.

Advice: if you want to calculate while you are drinking, you should prefer cylindrical glasses.

Developer: **Martin Lindner (adapted fromSinus)**
Institution: IPN - Leibniz-Institute of Science Education
Country: Gemany

Goals

- Volume of a cone
- Knowledge on calcualtion of volume

Task

A bottle of champagne is sufficient to fill seven glasses. How many glasses can you fill, if you pour only up to half of the hight of the glass?
Before starting to calculate: share your ideas and try to find a nice reason for your ideas.

Variations

You should try a hands-on activity in the classroom
How many half-full glasses are necessary to fill one glas completely?
How high rises the level in a glass when you add one half full glas to another?
Try to use other forms of drinking glasses

Method

After the task or any variation is given, the studends try to find an own way to calculate and/or measure the difference. If they don´t find any way, the teacher gives two support-envelopes, each contains one of the following help-cards:

Help 1 | Voume of a cone $V = 1/3\ \pi * h * r^2$ |

Help 2: Do you find any other ways to calculate the difference?

Calculation

If a champaing-glass has the form of a cone, the double hight means the eigth of the Volume. So, if you fill the glasses only half, you can fill 56 glasses.

Voume of a cone $V = 1/3\ \pi * h * r^2$

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If you want to compare different levels in the glass, the constants 1/3 and π are not necessary for the calculation. So you have to draw these consequences:

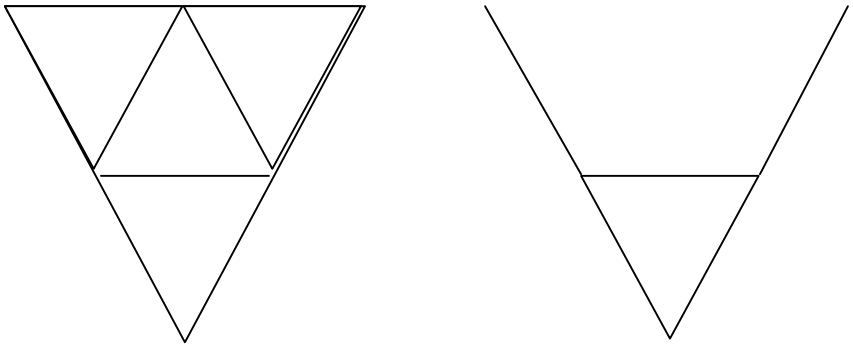
- if the glass is half full: h'= ½ h ⇒ r'= ½ r ⇒ V'= ½ * (½)² = 1/8
- if the level is double the hight: h" = 2 h ⇒ r" = 2 r ⇒ V" = 2*(2)^2 = 8

Measuring methods

Some students might want to test their results by measuring the content with a graduated cylinder. Why not?

Graphical solution

A simple graphical solution will not lead to acorrect result. If you draw a cylinder, it looks like a triangel. A simple construction suggests a difference in the two contents of abaut 3 times more or less filling.



Additional task:

How many glasses of champagne can you drink before driving?

Formular for alchohl-content in blood (Widmark) c (in parts per thousand) = A / (r*G)

c: Blood alcohol level in ppt
A: amount of drunken alcohol in g
r: body distribution factor (0,7 for men / 0,6 for women)
G: weight in kg

Results:

This means that estimately 100 g Alcohol drunken by a 70 kg man leads to 1 ppt of Alkohol.

As champaigne contains about 10 % of alcohol you could drink 200 - 500 ml of champaigne before you reach the limit. But it depends on the country where you drive. So the best advice is: **don´t drink and dirve!**

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