APEC-UNESCO (MGIEP)-Tsukuba International Conference XII

On Task Design: International Team Competitions **for Mathematical Literacy**

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International Team Competitions

• Kanazawa University



• Math A-lympiad (1989-)



🔮 Universiteit Utrecht



- Organize Domestic Committee for International Team Competitions for Senior High Schools (2016-)
- KUSH (2016-)

• IM2C: COMAP (2015-)



On Math A-lympiad

- Team: 3 or 4 humanity students of 16-18 years.
- Assignment: open ended problem situation.
- Mathematical problem solving and higher order thinking skills.
- Submit a written report.
- Preliminary and Final rounds.
- Preliminary: November, 9 am 4 pm at their own school
- Final: March, a whole weekend (In the Netherlands)

On IM2C

- Team: Up to 4 students with one teacher/faculty advisor of secondary school.
- Assignment: open ended problem situation.
- Mathematical modelling and applications.
- Mid March early May. Each team chooses 5 consecutive days to work together.
- Submit a written report by Internet.
- Up to 2 teams for participating country.
- Papers are judged by the international expert panel and winners are announced in June.









Assignment: Preliminary Round (2016)

In the sun and the wind in your back

- The realisation of Ambergreen -



Context

- A new residential area is being built in Amberhavn: Ambergreen.
- •175 houses to be built are communally responsible for producing renewable energy: solar and wind energy.
- The costs are divided fairly over the inhabitants.
- Amberhavn city council gives expert advice.

Initial assignment 1: Energy Costs

• Determine, using the data (omitted here), the difference in cost per household between energy use that is completely based on fossil energy and energy use where electricity is drawn from solar panels. Initial assignment 2: Heating with gas or electricity

•Calculate the amount you would spend per year on heating and warm water if you do this in one of the following three ways:

•Gas;

- Electricity from fossil fuel sources;
- Electricity from solar panels.

Initial assignment 3: Solar panels

Opbrengst zonnepanelen juli – totaal 276 kWh – gemiddeld 9 kWh



Dag

Initial assignment 4: Installation of solar panels

• Angle of Placement

• (Wind) Orientation





Data of Solar Panels

- Large set (30m2): € 9000,-
- Small set (20m2): € 6000,-
- 20 year lifespan.
- Installed with a 40° angle.
- The maximum annual yield (in a north-south direction): 330 kWh per year per m2.
- Those 330 kWh are divided over the months.



Initial assignment 4: Installation of solar panels

Determine the maximum yield and the ideal angle of placement of solar panels for the three houses that are oriented as follows:





Initial assignment 5: Wind



Initial assignment 5: Wind





Windsnelheid(km/uur)

Data of Wind Mills

	price	Max energy per year
Matthew	€ 14000	12000 kWh
Kathrina	€ 10000	8000 kWh
Sandy	€ 3500	1100 kWh

- •20 year lifespan.
- The amount of wind is not consistent throughout the year.



Final assignment

•The city council of Ambergreen is giving you the task of designing an A4 flyer, with which every inhabitant of Ambergreen can determine for his own situation what the optimal choice is between solar panels and/or which windmill

Judging

- Legibility and clarity of the final assignment;
- How complete the work is;
- The use of maths;
- The argumentation used and justifying choices that have been made;
- The depth to which the various assignments have been answered;
- Presentation: form, coherence, legibility, illustrations and use of appendices;
- Mathematical creativity in your elaboration of the assignments.





















Thank you for your attention.

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