



## Remember:

- Include team name.
  - For math tasks, solve each one separately, the process of reasoning must be clear.
  - Send your solutions to [geomatical@gynome.cz](mailto:geomatical@gynome.cz) before the end of November.
  - The next set of tasks is headed your way in January.
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# Round 1

## Geography

### Deserts & desertification

#### 1. Oleshky sands

Desertification is a threat for vast areas across the globe, especially in Africa. However, even in temperate regions we can see landscapes slowly turning into deserts. An example of such region is Oleshky Sands in Ukraine.

Study the text (<https://earthobservatory.nasa.gov/images/145801/oleshky-sands>) and decide if the following sentences are **true** or **false**. **Correct** the false sentences.

- a) We can find Oleshky Sands in the southern part of Ukraine, north of the Black Sea.
- b) The dunes in the area are up to fifteen meters high.
- c) According to one of the theories, the process of desertification in the area started as early as the 18<sup>th</sup> century, when huge herds of cattle were pastured there.
- d) People could see the smoke from the big fire in May 2018 on pictures from space.

#### 2. Megadunes and Desert Lakes in China

One of the little-known facts about the Sahara – the largest hot desert in the world – is that the majority of its area is not sand but rock. One of the largest sand dunes are in China in the Badain Jaran Desert.

Study the text (<https://earthobservatory.nasa.gov/images/84773/megadunes-and-desert-lakes-in-china>) and answer the following questions:

- a) How high is the highest dune in the area?
- b) What are the three main factors influencing the height of dunes?
- c) Why do the lakes in the area dry out?
- d) (Not in the text) What is the name for an area with rich geological, national and cultural heritage, something the Badain Jaran Desert is recognised as?

### 3. Catching Rays in the Desert

Many desert areas have significant economic importance. The most sought-after resource has traditionally been oil and natural gas. In the recent years, however, we have witnessed a rising number of solar farms appearing in the deserts. One of the largest ones in the world is being built in Egypt at the moment.

Study the text (<https://earthobservatory.nasa.gov/images/145738/catching-rays-in-the-desert>) and answer the following questions:

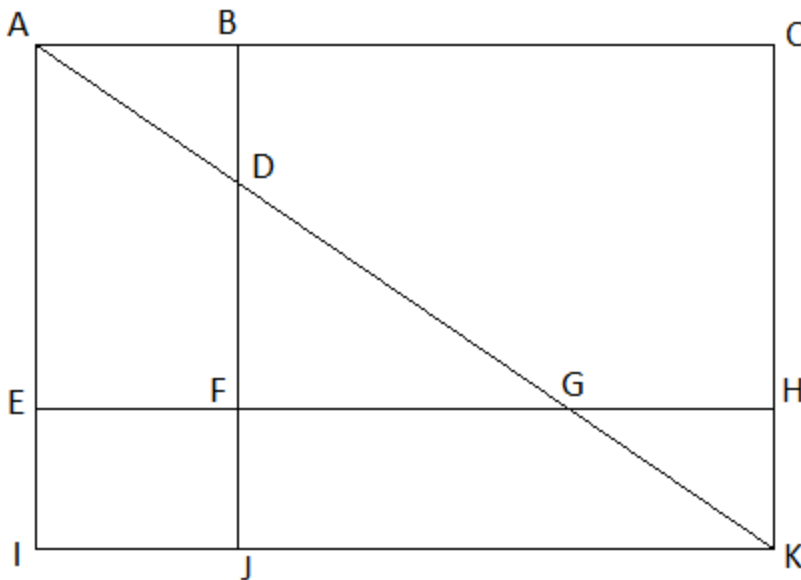
- a) What is the approximate average cost (in US dollars) of one photovoltaic solar panel of this power plant?
- b) What is the approximate average area (in square meters) needed for one photovoltaic solar panel in this power plant?
- c) Suggest another area in Egypt, which would be suitable for building a similar large-scale solar installation. Justify your choice. Focus on both natural and socio-economic factors.

## Maths

1. Mark had been playing with his new calculator. First, he wrote a number on a piece of paper. Then he used that number as the initial input for the calculator and continued by pressing  $+$ ,  $4$ ,  $\div$ ,  $4$ ,  $-$ ,  $4$ ,  $\times$ ,  $4$ . He took the resulting number and did the same thing he did with the original number. That means he wrote it on the piece of paper, used it as input and pressed the same buttons again:  $+$ ,  $4$ ,  $\div$ ,  $4$ ,  $-$ ,  $4$ ,  $\times$ ,  $4$ . He copied the result on the same piece of paper and after that he repeated the process one more time to finally record the last result. To his astonishment, Mark realized that the sum of the four numbers he had recorded was 80.

What **numbers** in what **order** did Mark record on the piece of paper?

2. In a rectangle  $ACKI$  there are lines  $BJ$  and  $EH$  parallel to sides  $AI$  and  $IK$  respectively, point  $D$  is the intersection of  $AK$  and  $BJ$ .  $EH$  and  $AK$  intersect in point  $G$ . Triangles  $ABD$  and  $GHK$  are congruent.



Inspect rectangles  $ABFE$  and  $FHKJ$ . Determine the **ratio** of their **areas**.

3.  $\alpha$  and  $\beta$  are roots of the following equation:  $ax^2 + bx + c = 0$ .

Express  $\left(\frac{\alpha}{\beta} - \frac{\beta}{\alpha}\right)^2$  using variables  $a, b, c$ .