## Matematicko-logická soutěž

Řešení:

## Úloha č.1: Velmi velké číslo

 $\check{C}$ íslo  $(10^{2025} + 2025)^2$  má 4051 cifer.

Jaký je součet všech těchto cifer?

 $(10^{2025} + 2025)^2 = (100000 \dots 00002025)^2 = 100000 \dots 00002025 \cdot 100000 \dots 00002025$ 

1 0000 ... 00000045000 ... ... ... ... ... 000410625

Ciferný součet je 1+4+5+4+1+6+2+5=28

Úloha č. 2: Záhadný šestiúhelník



$$x = \frac{5}{\cos 30^{\circ}} = \frac{10\sqrt{3}}{3} cm$$
$$v = \sqrt{\left(\frac{10\sqrt{3}}{3}\right)^{2} - \left(\frac{10\sqrt{3}}{6}\right)^{2}} = 5 cm$$
$$10\sqrt{3} - c$$

$$S = 6 \cdot \frac{\frac{1000}{3} \cdot 5}{2} = 50\sqrt{3} \approx 86,6 \ cm^2$$

## Problem no. 3: Not back, but to the future!

A year has 365 days, and since  $365 = 7 \cdot 52 + 1$  every non-leap year shifts a fixed calendar date forward by 1 day of the week. In a leap year, it shifts by 2 days instead.

To find the weekday of May 1st in the year 20025, we only need to calculate how many leap years occur between 2025 and 20025.

How leap years work:

A year is a leap year if it is divisible by 4, unless it is also divisible by 100, except if it is divisible by 400 — in which case it is a leap year.

Year Div. by 100 Div. by 400 Div. by 4 Leap year? 2020 YES 5 × × NO 1900  $\checkmark$  $\checkmark$ × 2000 YES  $\checkmark$  $\checkmark$  $\checkmark$ 2025 NO X X X 2400  $\checkmark$ YES  $\checkmark$  $\checkmark$ 

Here's a summary table:

From the year 2025 to 20025, 18 000 years will pass. Among them, the number of years divisible by 4 is: (20024 - 2028): 4 + 1 = 4500

There will also be several years divisible by 100 - in total: (20000 - 2100): 100 + 1 = 180

And the number of years divisible by 400 is:  $(20\ 000 - 2400): 400 + 1 = 45$ 

So, the total weekday shift is: 18000 + 4500 - 180 + 45 = 22365

This number is divisible by 7, so May 1st, 20025 will also fall on a Thursday, just like in 2025.