



Problems – 09/08/2025  
The solutions to the problems below  
will be published on Thursday 09/11/2025

 **Problem 1.** Determine all positive integers  $n$  such that the number

$$\frac{2^n}{n+1}$$

is a square of an integer.



**Bonus:** Let  $A$  be the set of all positive integers  $n > 2025$  such that the number

$$\frac{2^n}{n+1}$$

is a square of an integer, and let  $B$  be the set of all positive integers  $n > 2025$  such that the number

$$\frac{2^{2^n}}{n+1}$$

is a square of an integer. Prove that the sets  $A$  and  $B$  are disjoint.



**Problem 2.** Given an acute triangle  $ABC$ . Let  $D, E, F$  be the feet of the altitudes from vertices  $A, B, C$  respectively. On side  $BC$  lies a point  $K$ . Let  $L$  be the intersection of  $EF$  and  $AK$ . Prove that the circumcenter of triangle  $ABC$  lies on segment  $AK$  if and only if  $\angle ELA$  is a right angle.

*Good Luck!*

We encourage you to submit your solutions via the website:

<https://mathlovers.eu/submit-solution/>!