Engelhaupt remarked that in general, if $n = 2^{a_1} + 2^{a_2} + \cdots + 2^{a_r}$*, where* $0 \leq a_1 < a_2 < \cdots < a_r$*, then* $n!$ *finishes in* $n - r$ *zeros since*

$$\begin{aligned} E_2(n!) &= \sum_{t=1}^{\infty} \left\lfloor \frac{n}{2^t} \right\rfloor = \sum_{i=1}^{r} \sum_{t=1}^{\infty} \left\lfloor \frac{2^{a_i}}{2^t} \right\rfloor = \sum_{i=1}^{r} (2^{a_i - 1} + 2^{a_i - 2} + \cdots + 1) \\ &= \sum_{i=1}^{r} (2^{a_i} - 1) = \left(\sum_{i=1}^{r} 2^{a_i} \right) - r = n - r\,. \end{aligned}$$

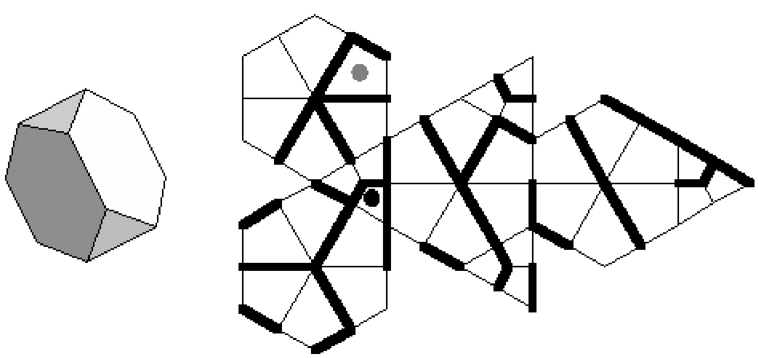
He gave the following example: Since $n = 216 = 2^3 + 2^4 + 2^6 + 2^7$ *has four summands,* $216!$ *finishes in* $216 - 4 = 212$ *zeros.*

Reference:

[1.] J.Robert, Elementary Number Theory — A Problem Oriented Approach, M.I.T. Press. Chapter X. Ex. 5, p. 76 and pp. 96–97.

Another maze from Isador Hafner

How can you move from the dark spot to the light spot?



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