Problem A: Horse race

The solution is to compute the time (in seconds) used by the horse to finish the race and to convert this time in the $HH : MM : SS$ format. In the following formulae, $\div$ stands for integer division.

$$\begin{aligned} time &= length\ of\ the\ circuit \ \div\ average\ speed \\ hours &= time \ \div\ 3600\ (there\ are\ 3600\ seconds\ in\ one\ hour) \\ minutes &= remaining\ time\ (from\ above)\ \div\ 60\ (there\ are\ 60\ seconds\ in\ one\ minute) \\ seconds &= remaining\ time \end{aligned}$$

Problem B: Seconds

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Problem C: Sub Triangles

The number of triangles of length 1 that can be seen is just the square of the length of the triangle side.

Demonstration
Let l be the length of a side of an equilateral triangle.

$$\begin{aligned} Area\ of\ triangle &= base\ \times\ height\ \div\ 2 = l\ \times height \div\ 2 \\ Height\ of\ triangle &= l\ \times\ \sqrt{3}\ \div\ 2\ (from\ Pythagore\ theorem) \end{aligned}$$

Thus the area of an equilateral triangle is

$$Area\ =\ l^2 \times \sqrt{3}\ \div\ 4$$

We can deduce that the height of an equilateral triangle with side $l\ =\ 1$ is

$$H(1)\ =\ \sqrt{3} \div 4$$

Thus the area of an equilateral triangle with side $l\ =\ 1$ is

$$A(1) = \sqrt{3}\ \div\ 4$$

So the number of triangles of side $l\ =\ 1$ within another triangle of side $l\ =\ n$ is:

$$\begin{aligned} N &= A(n)\ \div\ A(1) \\ N &= (n^2\ \times\ \sqrt{3}\ \div\ 4)\ \div\ (\sqrt{3}\ \div\ 4) \\ N &= (n^2\ \times\ (\sqrt{3}\ \div\ 4))\ \div\ (\sqrt{3}\ \div\ 4) \\ N &= n^2 \end{aligned}$$

Problem D: Sums

Remember these formulae?

$$\sum_{i=1}^{n} i = \frac{n \times (n+1)}{2}$$

$$\sum_{i=1}^{n} i^2 = \frac{n \times (n+1) \times (2 \times n + 1)}{6}$$

$$\sum_{i=1}^{n} i^3 = \left(\frac{n \times (n+1)}{2}\right)^2$$

Use them to simplify and compute $W(n)$. The official solution says that:

$$W(n) = \frac{n \times (n+1) \times (n+2) \times (n+3)}{8}$$

Problem E: Cylinders

Sorry, no solution for this at the moment.

Problem F: Base Conversion

Classic problem about converting a number from a base A to another base B. First convert the number from base A to base 10, then the number from base 10 to base B.