Problem of the Week

Problem E

The Area of the Year

In the diagram, $\triangle AB_1C_1$ is right-angled with $AB_1 = 2$ and $AC_1 = 5$. Lines AB_1 and AC_1 are extended and many more points are labelled at intervals of 1 unit, so that

$$B_1B_2 = B_2B_3 = B_3B_4 = B_4B_5 = \cdots = 1, \text{ and}$$

$$C_1C_2 = C_2C_3 = C_3C_4 = C_4C_5 = \cdots = 1.$$

In fact, $B_1B_j = j - 1$ and $C_1C_k = k - 1$ for any positive integers j and k.

For example, $B_1B_5 = 5 - 1 = 4$ and $C_1C_4 = 4 - 1 = 3$.

Determine the value of n so that the area of quadrilateral $B_nB_{n+1}C_{n+1}C_n$ is 2020. That is, determine the value of n so that the area of the quadrilateral with vertices B_n, B_{n+1}, C_{n+1}, and C_n is 2020.