

## Queen's College 155 Anniversary Quiz

1. Consider the number **39**.

The smallest prime and the biggest prime factor of 39 are 3 and 13.

The prime numbers between 3 and 13 are 3, 5, 7, 11, 13.

Also, **39** = 3 + 5 + 7 + 11 + 13.

Find the next number that has each property.

(Hint: the number is bigger than 100 and it must not be a prime number.)

2. The number of vertices of a right prism is greater than the number of vertices of a right pyramid by 1. If the pyramid has **155** faces, find the sum of the number of edges of the two solids.

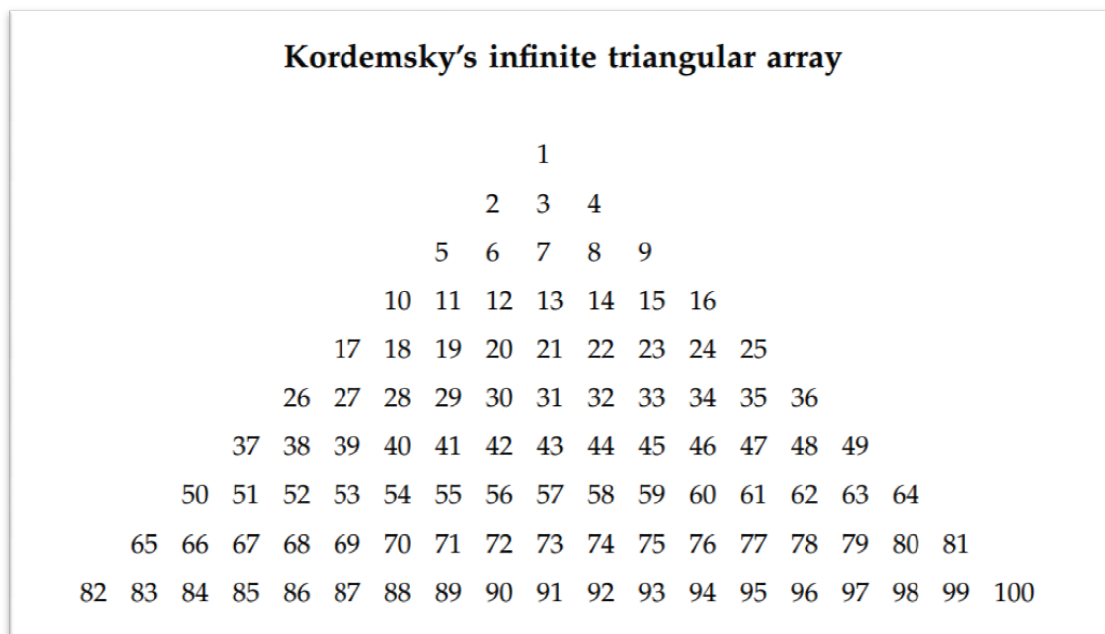
- 3.**  $15! = 15 \times 14 \times 13 \times \dots \times 1 = 1307674368000$

There are 3 trailing zeros. (Continuous number of zeros in the right side of the number.)

How many trailing zeros are there in  $155!$

4. Simplify  $1(1!) + 2(2!) + 3(3!) + \cdots + 155(155!)$

5. Find the **centre number** of the 155<sup>th</sup> row the Kordemsky's triangular array. Find also the sum of all numbers in this row.



6. If  $f(x^2 - 313x) = (x - 155)(x - 156)(x - 157)(x - 158)$ , find  $f(x - 155^2)$ .

- 7.** The sequence  $x_1, x_2, x_3, \dots, x_{155}, x_{156}, \dots$  satisfies :

$$x_1 = \frac{1}{2}, \quad x_{k+1} = x_k^2 + x_k \quad \text{where } k = 1, 2, \dots, 155, \dots$$

Find the integral part (that is, excluding the decimal part) of the sum

$$\frac{1}{x_1+1} + \frac{1}{x_2+1} + \cdots + \frac{1}{x_{155}+1}. \quad (\text{Hint: } \frac{1}{x_1} - \frac{1}{x_1+1}.)$$