### Numerical patterns

**ALGEBRA**

04

**Odd numbers tower**

The Pascal or Tartaglia triangle is a triangle-shaped arrangement of numbers in which each number in the lower row is the sum of the two contiguous upper numbers.

Some numerical properties of Pascal's triangle are the following:

* The second diagonal is formed by the natural numbers.

 1, 2, 3, 4, 5, …

* The third diagonal is formed by the triangular numbers.

 1, 3, 6, 10, …

* The sum of the rows correspond to the powers of 2:

2, 4, 8, 16, 32, …

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1 | 1 |  |
|  | 1 | 2 | 1 |  |
|  | 1 | 3 | 3 | 1 |  |
|  | 1 | 4 | 6 | 4 | 1 |  |
| 1 | 5 | 10 | 10 | 5 | 1 |

Look at the next pyramid of numbers:

|  |  |  |
| --- | --- | --- |
|  | 1 |  |
|  | 3 | 5 |  |
|  | 7 | 9 | 11 |  |
|  | 13 | 15 | 17 | 19 |  |
|  | 21 | 23 | 25 | 27 | 29 |  |
|  |  |  |  |  |  |

The elements of what row add up 29,791?

**1**

Which number occupies the 6th position on the diagonal (1, 3, 7, 13, 21, ...)? And the 100th position? Generalize the result.

**2**

Which number occupies the 6th position on the diagonal (1, 5, 11, 19, 29,…)? And the 100th position? Generalize the result

**3**

Which number occupies the central position in row 7? Generalize the result.

**4**

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