### 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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