



# TECC: Thunderbird Early College Charter School

a 4D Puzzler

## Polyhedral Number Sequences from Python Generators

The triangular and tetrahedral number sequences may be found in successive rows of Pascal's Triangle. The code below uses Python generators to demonstrate this fact. Teachers: be prepared to review generators, list comprehensions, zip function.

```
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def pascal():
    """Generate successive rows of Pascal's Triangle
    http://www.research.att.com/~njas/sequences/A007318
    """
    row = [1]
    while True:
        yield row
        row = [ i + j for i,j in zip([0]+row, row+[0]) ]

def triseq():
    """Read triangular numbers from Pascal's Triangle
    http://www.research.att.com/~njas/sequences/A000217
    """
    pg = pascal()
    next(pg);next(pg) # skip first two rows
    while True:
        yield next(pg) [2]

def tetriseq():
    """Read tetrahedral numbers from Pascals Triangle
    http://www.research.att.com/~njas/sequences/A000292
    """
    pg = pascal()
    next(pg);next(pg);next(pg) # skip first three rows
    while True:
        yield next(pg) [3]
```

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```
>>> tri = triseq(); tet = tetriseq()
>>> [next(tri) for i in range(10)]
[1, 3, 6, 10, 15, 21, 28, 36, 45, 55]
>>> [next(tet) for i in range(10)]
[1, 4, 10, 20, 35, 56, 84, 120, 165, 220]
```