PROBLEM CORNER
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Problem 1: Consider a parallelogram ABCD. Construct squares on all four sides and mark their centres. Join these centers to form a quadrilateral. What conjectures can you make regarding this quadrilateral? Can you prove your conjecture?

Problem 2: We are all aware of the polygonal number series. Among them, the triangular, square, and pentagonal number series are as follows:

1, 3, 6, 10, 15, 21, 28, 36, 45, 55,…

1, 4, 9, 16, 25, 36, 49, 64, 81, 100,…

1, 5, 12, 22, 35, 51, 70, 92, 107, 135,…

There are numbers that belong to two of the above series. For example, 36 is both a triangular number as well as a square number. Such numbers are called *triangular square numbers*. Similarly, there are numbers that are *pentagonal square numbers*.

(i)   Generate the series of the first 1000 triangular, square, and pentagonal numbers. (You may use a spreadsheet such as MS Excel.)
(ii)   Identify the triangular square numbers and the pentagonal square numbers from the data generated in (i).
(iii)   Is it possible to find a rule for generating both types of numbers without using a spreadsheet?