

First name: _____ Last name: _____

Student ID: _____

Patterns Homework

Basic problems:

1. Write the first thirteen triangular numbers.
2. The first square number is 1 squared $= 1^2 = 1 \times 1 = 1$. What is the tenth square number?
3. The first cube number is 1 cubed $= 1^3 = 1 \times 1 \times 1 = 1$. What is the tenth cube number?
4. What is the next number in the sequence: 3, 10, 17, 24, 31, 38, ... ?
5. What is the next number in the sequence: 71, 62, 53, 44, ...
6. What is the next number in the above sequence: 2, 6, 18, 54, ...
7. What is the next number in the above sequence: 2, 3, 5, 8, 12, ...
8. What is the next number in the above sequence: 1, 3, 7, 15, 31, ...

9. What is the next number in the above sequence: 2, 6, 12, 20, ...

10. If the first three Fibonacci numbers are given as 1, 1 and 2, then what is the eleventh number?

Challenge problems

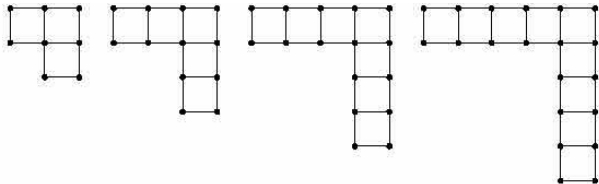
1. How many terms are there in the arithmetic sequence 6, 12, 18, 24, between 33 and 1800?

2. Some marbles are placed in the following pattern: 1 blue, 1 green, 2 blue, 2 green, 3 blue, 3 green, How many blue marbles are there in the first 100 marbles?

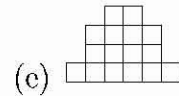
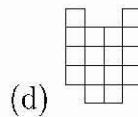
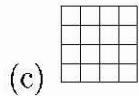
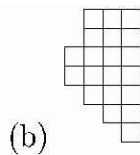
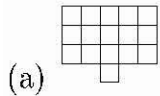
3. Some marbles are placed in the following pattern: 1 blue, 1 green, 3 blue, 3 green, 5 blue, 5 green, How many of the first 100 marbles are blue?

4. Some marbles are placed in the following pattern: 1 blue, 2 greens, 3 reds, 4 yellows, 5 grays, 6 blues, 7 greens, 8 reds, What is the 100th marble in the pattern?

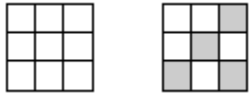
5. The following figures are made from matchsticks. Which figure can be made using 500 matchsticks?



6. Which shape *cannot* be filled, without any overlapping using copies of the tile shown on the right?



7. A three-by-three square grid is shown. Four of the squares in the grid are to be shaded in such a way that no two shaded squares have an edge in common. A possible shading is shown. The number of possible shadings of the grid is:



8. Given the figures below, in which Figure $n + 1$ is obtained from Figure n by adding two squares, one vertically and the other horizontally, the number of squares in the 2003rd figure is:



9. The positive integers are arranged in rows and columns, as shown, and described below.

	A	B	C	D	E	F	G
Row 1		1	2	3	4	5	6
Row 2	12	11	10	9	8	7	
Row 3		13	14	15	16	17	18
Row 4	24	23	22	21	20	19	

:

The odd numbered rows list six positive integers in order from left to right beginning in column B. The even numbered rows list six positive integers in order from right to left beginning in column F.

(a) Determine the largest integer in row 30.

(b) Determine the sum of the six integers in row 2012.

(c) Determine the row and column in which the integer 5000 appears.

(d) For how many rows is the sum of the six integers in the row greater than 10 000 and less than 20 000?