First name: _____ Last name: _____ Student ID: _____

Counting and Patterns 2 Homework

Basic problems

1. **Find the missing term in each pattern.**

1. 27281, 27272, 3409, 3400, ☐, 416, 52, 43	2. 49, ☐, 441, 1323, 3969, 11907, 35721
3. ☐, 65, 59, 53, 47, 41	4. 19, 95, 475, 2375, 11875, 59375, 296875, ☐, 7421875
5. 117, 98, 79, ☐, 41, 22, 3	6. 291, 286, ☐, 138, 69, 64, 32, 27
7. 21, 63, 189, 567, 1701, 5103, 15309, 45927, ☐	8. 18, 30, 42, ☐, 66, 78
9. 1, 8, 4, 11, 7, 14, 10, ☐	10. 35, 48, 61, 74, 87, ☐

2. a) How many permutations of the word “square” are there?

b) In how many of them is r the second letter?

3. a) How many different car number plates are possible with 2 letters followed by 3 digits?

b) How many of these number plates begin with A and end with 0?

4. How many arrangements of the letters of the word REMAND are possible if:
   a) there are no restrictions?

b) they begin with RE?

c) they do not begin with RE?

d) they have RE together?

5. From the digits 2, 3, 4, 5
   a) how many numbers greater than 4000 can be formed?

   b) how many 4 digit numbers would be even?

6. How many different arrangements of the word PARRAMA are possible?

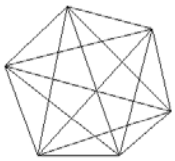
7. There are five members of the math club. In how many ways can the two person Social Committee be chosen?

8. How many ways can a basketball team of 3 players be chosen from 8 players?

Challenge problems

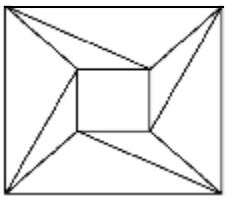
1. How many ways can the numbers 1, 2, 3, 4 and 5 be placed in a line so that neither 1 nor 5 occupy either the first or the last place in the sequence?

2. How many triangles, which have their corners on the perimeter, are there in the figure?



3. How many ways can the value 13 be expressed as the sum of exactly 3 different positive integers? For example, 13 = 1 + 4 + 8 is one such way. Note that 13 = 4 + 8 + 1 does not count as a "different" way since the same integers are involved in the sum.

4. How many 4-sided figures can be found in the drawing at right?

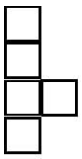
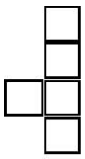
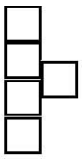


5. The sum of the first 100 terms of the sequence 1, -2, 3, 4, -5, 6, 7, -8, 9, 10… is 1750. What is the sum of the first 100 terms of the sequence 1, 2, -3, 4, 5, -6, 7, 8, -9, 10… ?

6. Ten pennies and ten nickels were arranged alternatively as PNPN...PN. A move consists of exchanging the position of two adjacent coins. What is the minimum number of moves needed to move all the pennies to one end, and all of the nickels to the other end, i.e., PPP...PN...NNN?

7. How many three digits numbers have 3 distinct digits whose product is odd?

8. A pentomino is formed by joining 5 squares so that any two that touch share a whole side.

 is a pentomino.  is the same pentomino.  is NOT a pentomino.

How many different pentominoes are there?

9. A list of 8 numbers is formed by beginning with two given numbers. Each new number in the list is the product of the two previous numbers. Find the first number if the last three are shown:
? , , , , , 16 , 64 , 1024

10. If the total length of the line is 1 inch at stage 0 and $1\frac{1}{3}$ inches at stage 1, how many inches long will the line be at stage 4? Express your answer as a mixed number in lowest terms.