PUZZLE FUN

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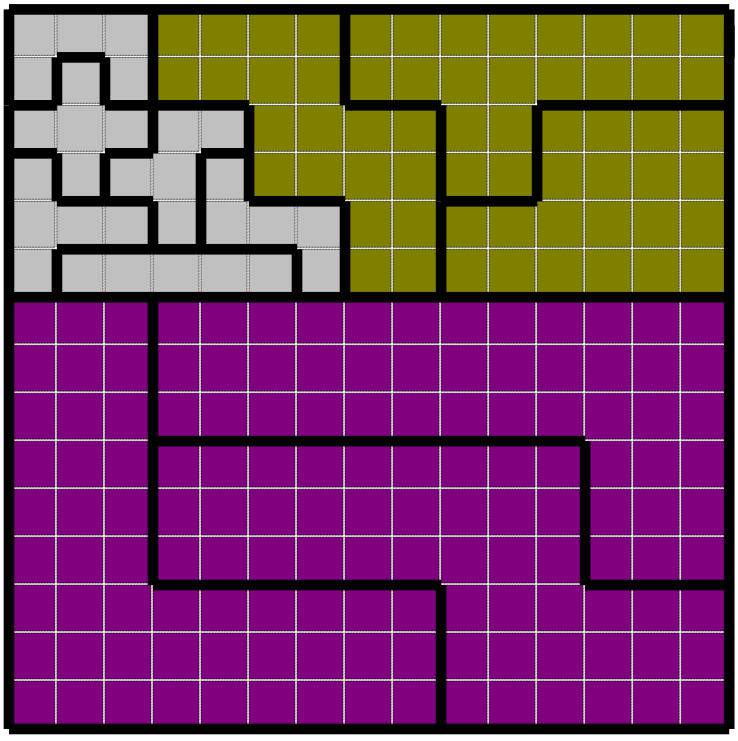
INFLATED PENTOMINOES



This new problem of pentominoes opens a big way to investigate.

With the 12 pentominoes you have to complete all the posible rectangles, and you can inflate(duplicate or triplicate)some of the pentominoes.

In this note I investigated the pentominoes with duplications and triplications.

There are 88 cases, some of them can have more than one posibility if with the area of the 12 pentominoes you can make more than 1 rectangle with posibility of be filled.

Until this moment of the 88 cases, I think that 60 are not posible, and for the other 28 I have solutions for 10 cases. The 28 cases gives 39 rectangles (if I don't forget any) with 16 solutions.

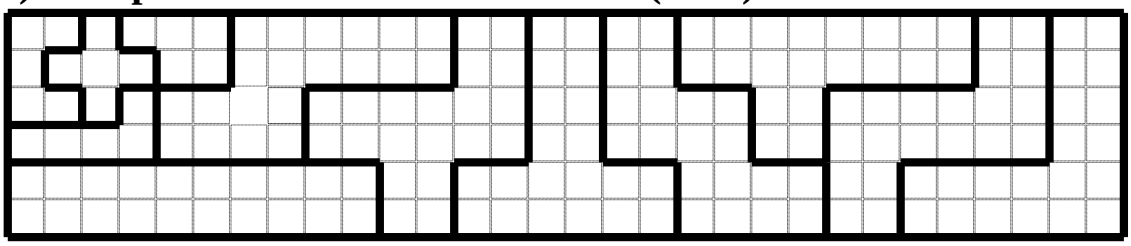
My numeration is:

1) 1 simple and 11 dobles, **2)** 2 simples and 10 dobles, ... **11)** 11 simples and 1 doble. **12)** 1 simple and 11 triples, **13)** 2 simples and 10 triples, ... **22)** 11 simples and 1 triple. **23)** 1 doble and 11 triples, **24)** 2 dobles and 10 triples ... **33)** 11 dobles and 1 triple. **34)** 1 simple, 1 doble and 10 triples, **35)** 1 simple, 2 dobles and 9 triples **36)** 2 simples, 1 doble and 9 triples, **37)** 1 simple, 3 dobles and 8 triples **38)** 2 simples, 2 dobles and 8 triples, **39)** 3 simples, 1 doble and 8 triples, **40)** 1 simple, 4 dobles and 7 triples ... **85)** 7 simples, 4 dobles and 1 triple, **86)** 8 simple, 3 dobles and 1 triple, **87)** 9 simples, 2 dobles and 1 triple, **88)** 10 simples, 1 doble and 1 triple.

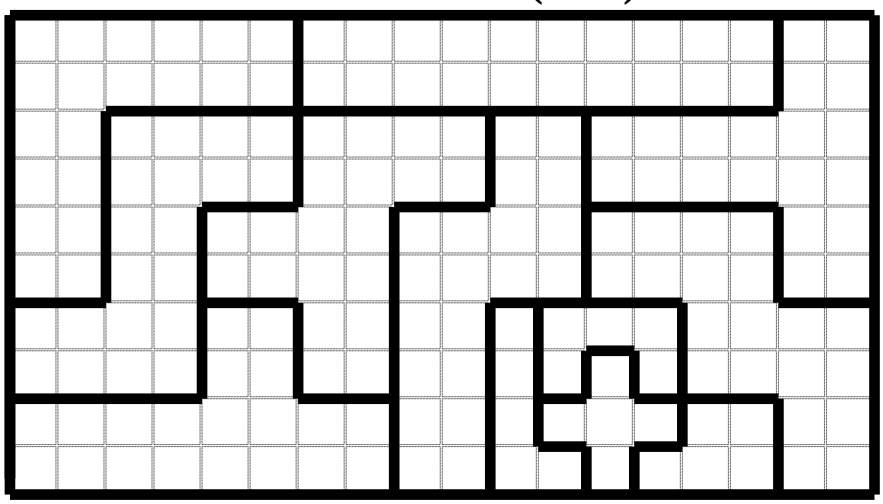
SIMPLE and DOBLE

There are 11 cases, with 5 that for me don't have solution and with the other 6 we have 12 rectangles, and I have 10 solutions.

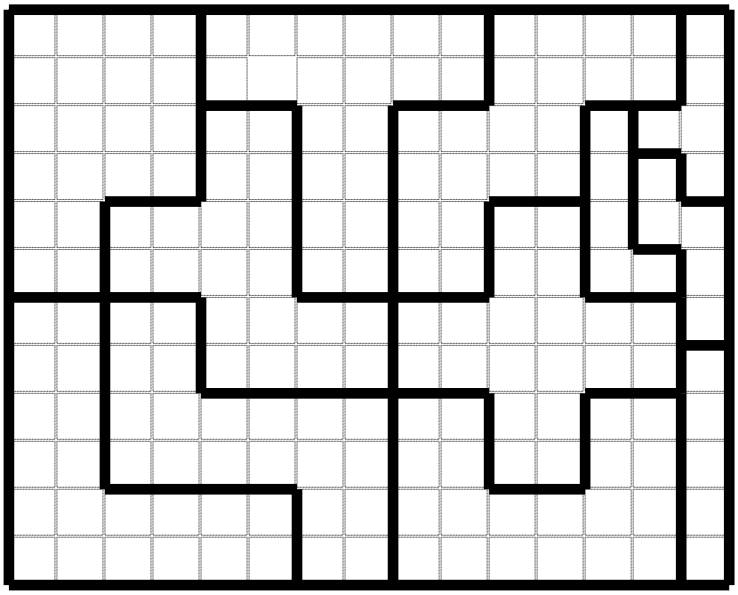
4) 4 simples and 8 dobles:180 = 6 x 30 (R.K.)



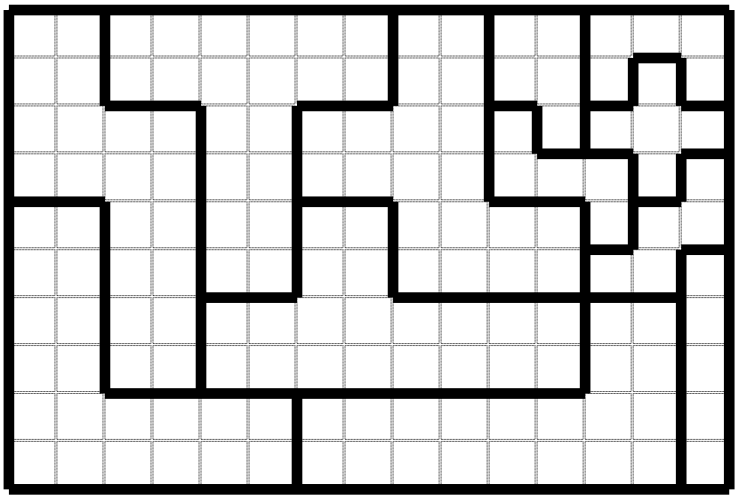
10 x 18 (R.K.)



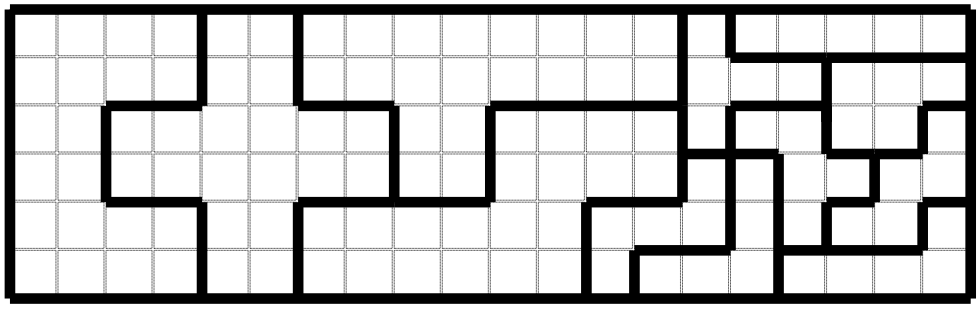
12 x 15 (R.K.)



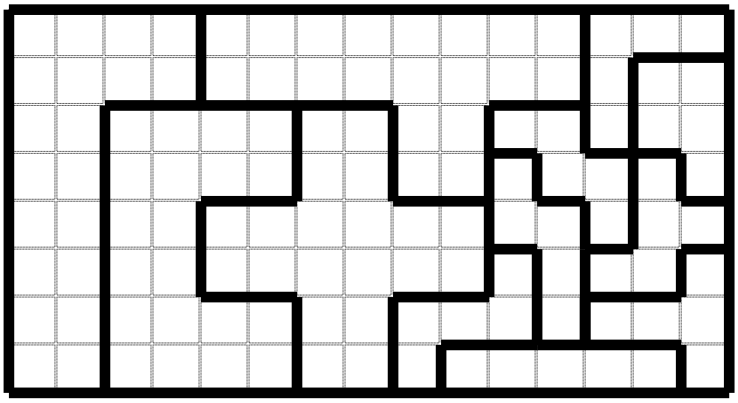
6) 6 simples and 6 dobles:150 = 10 x 15 (R.K.)



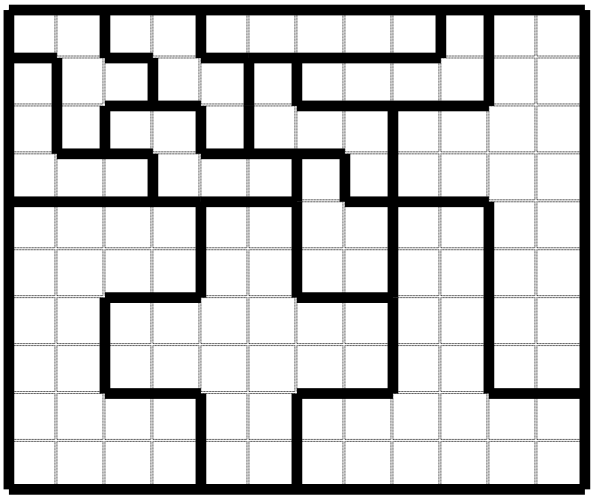
8) 8 simples and 4 dobles:120 = 6 x 20 (R.K.)



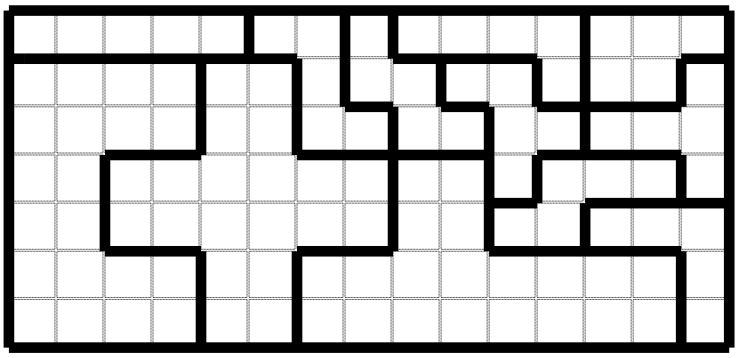
8 x 15 (R.K.)



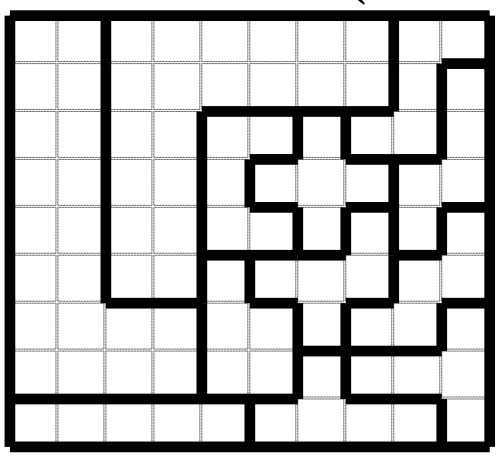
10 x 12 (R.K.)



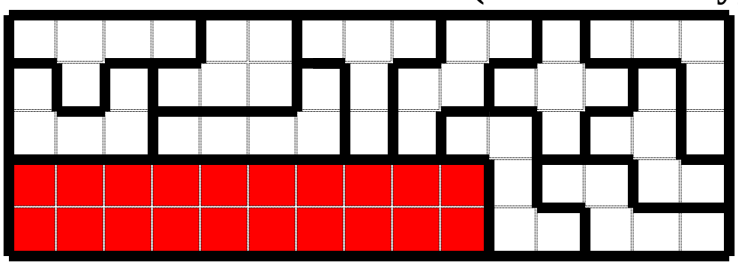
9) 9 simples and 3 dobles:105 = 7 x 15 (R.K)



10) 10 simples and 2 dobles:90 = 9 x 10 (Lea Gorodisky)



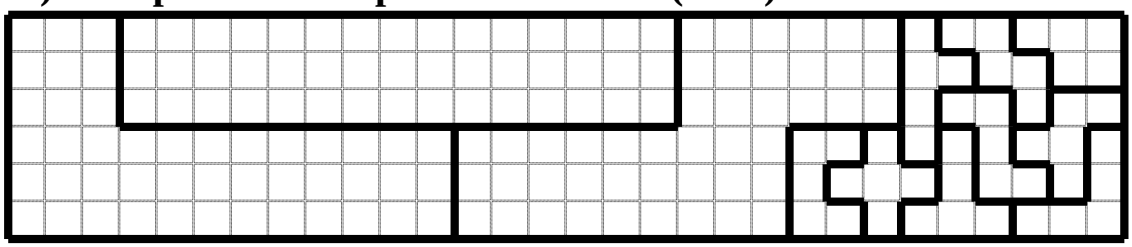
11) 11 simples and 1 dobles:75 = 5 x 15 (Lea Gorodisky)



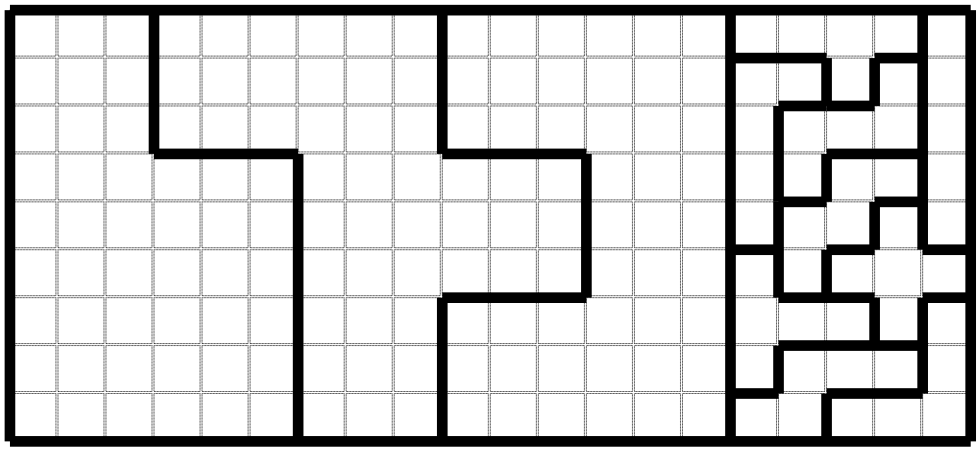
SIMPLE and TRIPLE

There are 11 cases, with 8 that for me don't have solution and with the other 3 we have 5 rectangles, and I have 4 solutions.

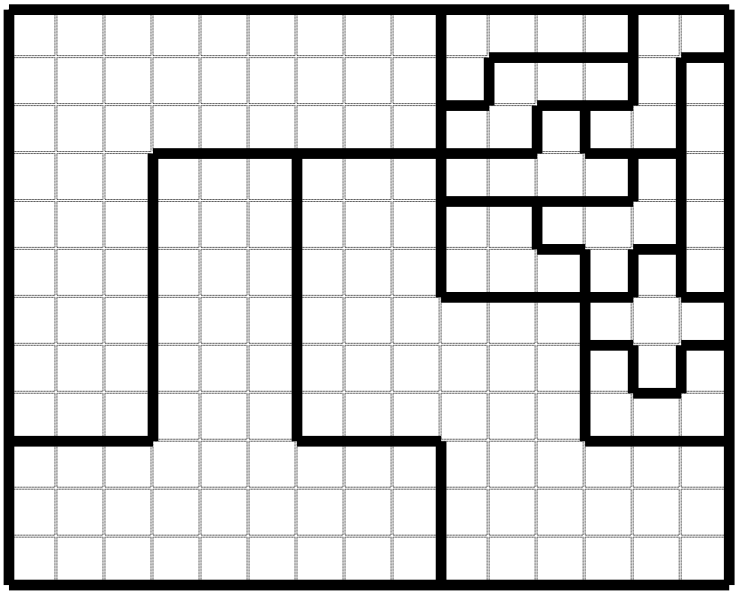
20) 9 simples and 3 triples:180 = 6 x 30 (R.K.)



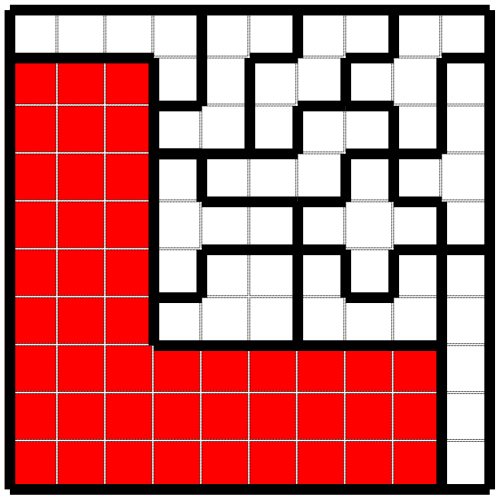
9 x 20 (R.K.)



12 x 15 (R.K.)



22) 11 simples and 1 triples:100 = 10 x 10 (Jaime Poniachik)



DOBLE and TRIPLE

There are 11 cases, but no one has solution for me.

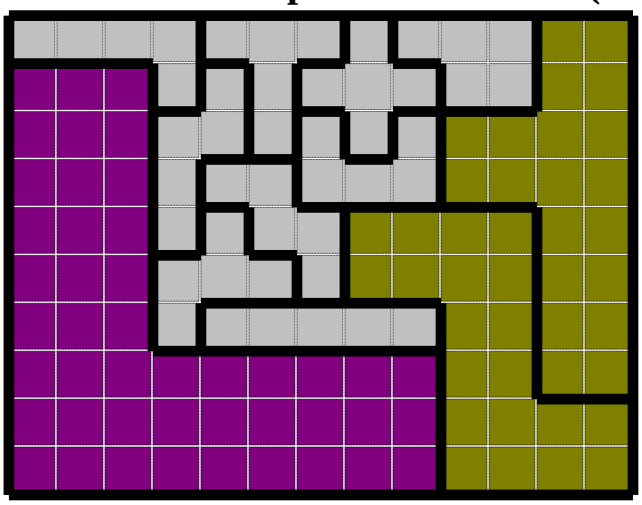
SIMPLE , DOBLE and TRIPLE

There are 55 cases, with 37 that for me don't have solution and with the other 18 we have 22 rectangles, and I have only 2 solution.

67) 6 simples, 3 dobles and 3 triples:225 = 15 x 15 (R.K.)

The solution is in the cover

87) 9 simples, 2 dobles and 1 triple:130 = 10 x 13 (R.K.)



OPEN PROBLEMS:

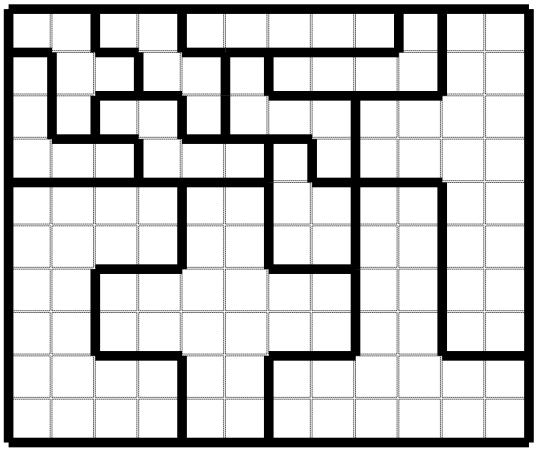
1)Well, I would like to know if you can confirm that the 60 cases don't have solutions, and find or prove that don't have the others ones.
The ones that for me have some posibility are these 23:
9) 9 simples and 3 dobles = 5 x 21.
10) 10 simples and 2 dobles = 5 x 1**8**.
21) 10 simples and 2 triples = 10 x 14.
45) 2 simples, 4 dobles and 6 triples = 18 x 20, 15 x 24, 12 x 30.
46) 3 simples, 3 dobles and 6 triples = 15 x 23.
47) 4 simples, 2 dobles and 6 triples = 15 x 22.
48) 5 simples, 1 dobles and 6 triples = 15 x 21.
51) 3 simples, 4 dobles and 5 triples = 16 x 20.
58) 4 simples, 4 dobles and 4 triples = 14 x 20.
65) 4 simples, 5 dobles and 3 triples = 15 x 17.
66) 5 simples, 4 dobles and 3 triples = 12 x 20.
68) 7 simples, 2 dobles and 3 triples = 10 x 21.
69) 8 simples, 1 dobles and 3 triples = 13 x 15.
73) 4 simples, 6 dobles and 2 triples = 10 x 23.
75) 6 simples, 4 dobles and 2 triples = 10 x 20.
77) 8 simples, 2 dobles and 2 triples = 10 x 17.
81) 3 simples, 8 dobles and 1 triples = 10 x 22 , 11 x 20.
83) 5 simples, 6 dobles and 1 triples = 10 x 19.
85) 7 simples, 4 dobles and 1 triples = 10 x 16, 8 x 20.

2)Can you find a solution with another inflated pentominoes different to the one I show here.Example: 11) with pentomino L instead of I, or 22) with P instead of V.

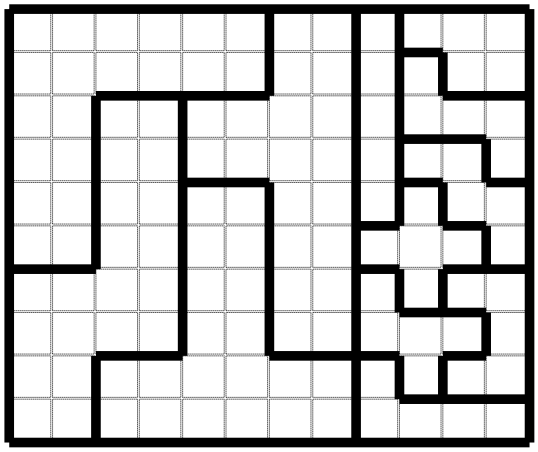
Example:

8) 8 simples and 4 dobles:120 = 10 x 12 (R.K.)

a) With U, X, T and Y inflated.



b) With V, N, T and Y inflated.



3)With the 12 uninflated (simple) pentominoes you know that there are 2 solutions for the 3 x 20 rectangle, 368 for the 4 x 15, 1010 for the 5 x 12 and 2339 for the 6 x 10. How many different solutions exist for any of the different inflated rectangles?
In each case you can subdivide it depens which is the inflated pentomino.

4)You can generalize for bigger inflated pentominoes.

5)You can generalize for 3D pentominoes.

6)You can generalize for other sets.
If you send me any solution or commentary the material will appear in the next number of PUZZLE FUN.

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