

Primary Division: Problems III

P3.1. Gavin, Alan and Jack all play an online football simulation game. In order to improve their teams, they purchase 21 packs of players, each pack containing six players. These players are split into two categories: Gold and Silver. Seven of the packs contain only Gold players, seven contain only Silver players, and the remaining seven packs each contain an even split of Gold and Silver players. The boys also decided that no individual should be allowed to have more than three packs of the same type.

How should they distribute the packs to ensure each person obtains the same number of Gold and Silver players?

Explain your reasoning.

Solution

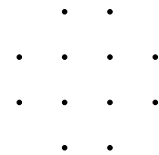
Each person has to get in total $3\frac{1}{2}$ packs of Gold and $3\frac{1}{2}$ packs of Silver players.

This means they must each receive an odd number of the mixed pack of Gold and Silver players, and as no one is allowed more than 3 of any type this means each person must receive either 1 or 3 of this type.

This means these packs must be split into lots of 1, 3 and 3.

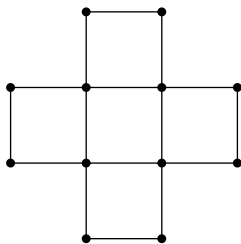
The person receiving 1 must then receive 3 of both other types, whilst the other two will only receive 2 of the other types.

P3.2. Twelve points are marked on a square grid, as shown. How many squares can be formed by joining four of these points?

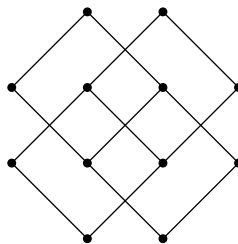


Explain your reasoning.

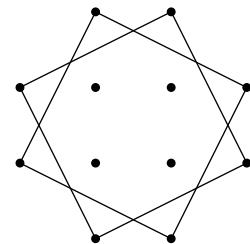
Solution



5 small squares



4 medium squares



2 large squares

Total 11 squares.

P3.3. The product of the digits of the number 318 is 24. How many 3-digit numbers have digits with product 24?

Solution

$$24 = 1 \times 2 \times 2 \times 2 \times 3$$

(a) If 1 is a digit then the other groups could be 2 and 12; 4 and 6; 8 and 3 but 12 has 2 digits and is ruled out.

So possible digits are:	1-4-6	giving	146, 164, 416, 614, 461, 641
and	1-8-3	giving	183, 138, 813, 318, 831, 381

(b) If 2 is a digit then the other groups could be 2 and 6; 4 and 3.

So possible digits are:	2-2-6	giving	226, 262, 622
and	2-4-3	giving	243, 234, 423, 324, 432, 342

There cannot be any other groups so there are a total of 21 different 3-digit numbers with digits with a product 24.