

**Difficulty:** 3/4    **Interest:** 3/4

Consider ways to place colored markers on an  $n \times m$  grid so that no two pairs of markers of the same color have the same distance between them.

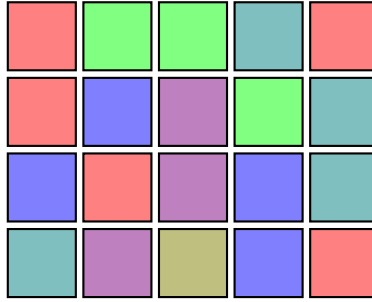


Figure 1: There are 5 markers and  $5(5-1)/2 = 10$  distinct distances between red tiles. (There is no way to place 6 tiles.) Placing another red marker would result in two pairs of red markers being the same distance apart.

**Question.** What is  $c_{n \times m}$  the greatest number of markers of a given color can be placed on the  $n \times m$  grid?

**Related.**

1. How many colors of markers are required to fill the grid?
2. What if this is done on the  $d_1$ ,  $d_\infty$ , or  $d_3$  metric?
3. What if this is done on a triangular or hexagonal grid?
4. What is the smallest board that can contain  $k$  markers?

**Note.**  $c_{n \times m}(c_{n \times m} - 1)/2 \leq A301853(n, m) - 1$ .

**References.**

Problem 34.

<https://oeis.org/A301853>