

DTP-Math-Circle: Session 1—Counting

Sept 02 2022

2 Arranging books, picking teams, walking to work...

1. There are five books to be lined up on a shelf. But two of them are identical copies of the same edition of the same book. How many different-looking arrangements can be made on the shelf?

What if there are ten books on a shelf, of which three are identical editions of the same book?

There are now two identical copies each of five different books. How many visually-different arrangements can be made on the shelf?

2. There are six friends, two of them get to be on the quiz team. In how many ways can the team be chosen?

The next day, it turns out that there is a carrom competition and four of them can be on the carrom team. How many ways can the team be chosen?

Compare the answers? Can you see what's going on?

3. A man works in a building located seven blocks east and eight blocks north of his home. (See the figure below.) Thus in walking to work each day he goes fifteen blocks. All the streets in the rectangular pattern are available to him for walking. In how many different ways can he go from home to work, walking only fifteen blocks?

Can you see how this connects with the question of arranging books on a shelf?

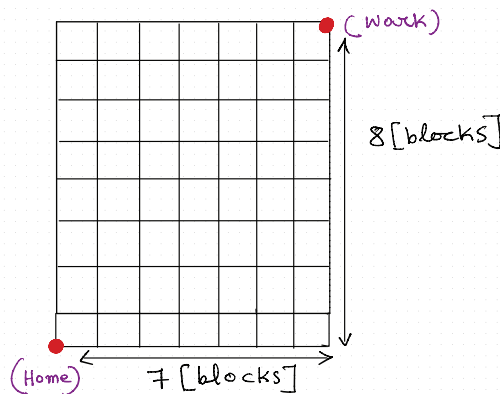


Figure 1: Walking to work in a city

4. There is a piece of graph paper with a 4×4 arrangement of squares on it. If you want to pick one rectangle and shade it, how many different choices do you have? Of these, how many are actually squares?

Can you see how this connects to the other questions you've solved? Can you then generalize to larger pieces of graph paper, or a standard chess board?

5. Mr and Mrs Zeta want to give their baby a first and a middle name so that the monogram on the baby's crib (first initial, middle initial, last name initial) will be in alphabetical order with no letters repeated. How many such monograms are possible.