

3. A drawer contains a dozen brown socks and a dozen black socks, all unmatched. A man takes socks out at random in the dark.
- How many socks must he take out to be sure that he has at least two socks of the same color?
 - How many socks must he take out to be sure that he has at least two black socks?
5. Undergraduate students at a college belong to one of four groups depending on the year in which they are expected to graduate. Each student must choose one of 21 different majors. How many students are needed to assure that there are two students expected to graduate in the same year who have the same major?
7. Show that among any group of five (not necessarily consecutive) integers, there are two with the same remainder when divided by 4.
9. Let n be a positive integer. Show that in any set of n consecutive integers there is exactly one divisible by n .
11. What is the minimum number of students, each of whom comes from one of the 50 states, who must be enrolled in a university to guarantee that there are at least 100 who come from the same state?
13. Let (x_i, y_i, z_i) , $i = 1, 2, 3, 4, 5, 6, 7, 8, 9$, be a set of nine distinct points with integer coordinates in xyz space. Show that the midpoint of at least one pair of these points has integer coordinates.
15. a) Show that if five integers are selected from the first eight positive integers, there must be a pair of these integers with a sum equal to 9.
- b) Is the conclusion in part (a) true if four integers are selected rather than five?

17. How many numbers must be selected from the set $\{1, 2, 3, 4, 5, 6\}$ to guarantee that at least one pair of these numbers add up to 7?
19. A company stores products in a warehouse. Storage bins in this warehouse are specified by their aisle, location in the aisle, and shelf. There are 50 aisles, 85 horizontal locations in each aisle, and 5 shelves throughout the warehouse. What is the least number of products the company can have so that at least two products must be stored in the same bin?