

Work on these with your partner(s) at the board

1. Norton House of Pizza offers 20 different toppings for their pizzas, including ham, pineapple, and broccoli.
 - (a) How many different five topping pizzas are there?
 - (b) How many different five topping pizzas are there that include broccoli?
 - (c) How many different five topping pizzas are there that do not include broccoli?
 - (d) Geralt believes that a pizza must include both pineapple and ham or include neither. How many different five topping pizzas can Geralt order?

2. Ten points, labeled A, B, C, \dots, J , are placed in the plane so that no three lie on the same straight line.
 - (a) How many straight lines are determined by the ten points?
 - (b) How many of these do not pass through A ?
 - (c) How many triangles have three of the points as vertices?
 - (d) How many of these triangles do not have A as a vertex?
 - (e) How many of these triangles have A as a vertex?

Epp Exercise 9.5.17

Discuss with your partner(s)

3. Prove that if A is a subset of \mathbb{Z} with 6 elements, then at least two elements of A are equivalent mod 5.
4. If $|A| = 43$ and $|B| = 8$, what does the Generalize Pigeonhole Principle say?
5. Show that in a group of 140 students, at least six must have the same first initial (assume everyone has expressed their name using the 26 letters of the Latin alphabet, and ignore case).
6.
 - (a) Pick a subset of six integers from the set $\{1, 2, \dots, 10\}$. Verify that one of the integers you picked divides another one that you picked. Repeat with a different subset of size 6.
 - (b) Pick a subset of 8 integers from the set $\{1, 2, \dots, 14\}$. Verify that one of the integers you picked divides another one that you picked. Repeat with a different subset of size 8.
7. Prove the general statement of #6: If $n + 1$ integers are selected from $\{1, 2, \dots, 2n\}$, then one of the selected integers divides another of the selected integers.