

## Discuss with your partner(s)

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 line 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

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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  $|A| = 25$  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).
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 7.
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.