

## Quiz 5

1. State the
- multiplication rule*
- .

(3 pts.)

In an experiment with  $n$  stages if there are  $a_i$  options in stage  $i$  then there are a total of  $a_1 \cdot a_2 \cdot \dots \cdot a_n$  possible options in the experiment.

2. A group of 20 people are wearing a shirt, pants, and shoes which are each one of three colors red, green or blue. For example, one person may have a red shirt, red pants, and green shoes. Suppose

15 are wearing something blue,

10 are wearing something red,

8 are wearing something green,

4 are wearing something red and something green.

How many people are wearing something blue and something that is either green or red? How many are wearing only blue? (10 pts.)

Let  $B, G, R$  denote the sets of people wearing something blue, green, or red, respectively.

Then  $|R \cup G| = |R| + |G| - |R \cap G| = 10 + 8 - 4 = 14,$

← desired quantity.

and  $|B \cup R \cup G| = 20 = |B| + |R \cup G| - |B \cap (R \cup G)|$

9 people

So  $|B \cap (R \cup G)| = 15 + 14 - 20 = 9$

3. Forty-three students attend a conference in a small town in Germany. The local inn only has sixteen rooms. How many beds must there be in each room so that no students have to share a bed? Assume the same number of beds in each room. You must fully justify your answer to receive full credit. (7 pts.)

$$\frac{43}{16} \text{ students} = \lceil 2.6875 \rceil = 3 \text{ rooms}$$

Some room will have at least 3 students by the pigeonhole principle.

There needs to be at least 3 beds per room.