Definition of a Completely Randomized Design (CRD) (1)

An experiment has a **completely randomized design** if

- the number of treatments g (including the *control* if there is one) is predetermined
- the number of replicates (n_i) in the ith treatment group is *predetermined*, $i = 1, \ldots, g$, and
- each allocation of $N = n_1 + \cdots + n_g$ experimental units into g groups of size $(n_1, \ldots, n_g)$ occurs equally likely.
- Say we have 4 units: A, B, C, D and, 2 treatments w/ 2 units each. The CRD ensures the following allocations occur equally likely

$$(AB, CD),\ (AC, BD),\ (AD, BC),$$
$$(BC, AD),\ (BD, AC),\ (CD, AB).$$

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  - both groups will have 5 men and 5 women. Using a CRD, the number of men and women in the groups may not be even

Experimental Unit versus Measurement Unit

Experimental units are the smallest groupings of the experimental material that could have gotten different treatments.

Measurement units are the actual objects on which the response is measured.

- In many cases, the measurement units are just the experimental units
- Sometimes a measurement unit is only *part* of an experimental unit.

Experimental Unit versus Measurement Unit

- 12 pens of young turkeys are randomly assigned 3 different diets (20 turkeys per pen)
  - A measurement unit is one turkey, and an experimental unit is a whole pen of turkeys.
- A class full of students is assigned a certain pedagogical intervention.
  - Suppose classes of students are assigned to two different pedagogy scheme. A measurement unit is one student, and an experimental unit is a whole class of students