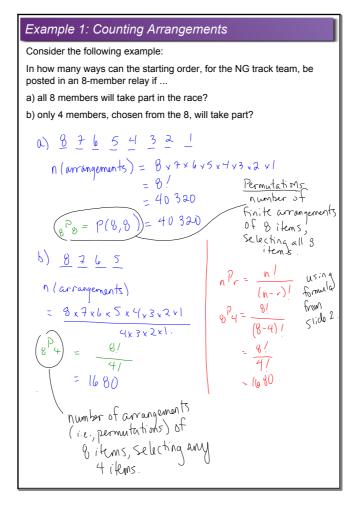
Permutations_Solving Problems with...



Formulas for Permutations

The number of permutations of n objects, taken r at a time, and without repetition is given by:

$$P(n,r) = \frac{n!}{(n-r)!} \cdot 0 \le r \le n$$

Also...

$$P(n,n) = \frac{n!}{(n-n)!}$$

$$P(n,n) = \frac{n!}{0!}$$

$$P(n,n) = \frac{n!}{1} \text{ where } 0! = 1$$

$$P(n,n) = n!$$

Permutations_Solving Problems with...

Example 2: Using Permutations to Solve Probability-related Problems

Re-consider the previous example:

In how many ways can the starting order, for the NG track team, be posted in an 8-member relay if ...

... only 4 members, chosen from the 8, will take part?

NOW...

Let's say that you'd like to know the probability that you and 3 of your friends (also on the track team) will form the starting order.

Determine this probability. Let A be the event that you and 3 friends are chosen.

$$P(A) = \frac{n(A)}{n(S)} - \frac{4!}{8!^{4}}$$

$$= \frac{2!}{8!^{4}}$$

$$= \frac{2!}{16!00}$$

$$= \frac{1}{70}$$

Example 3: Permutations with Identical Elements

List the permutations of the letters in the word, ROOM.

 $R O_1 O_2 M$

SEE pictures posted to the course webpage.

Permutations with Identical Elements

When all objects are not distinct

The number of permutations of n objects, for which there are a identical elements, b identical elements, and so on..., the number of permutations is given by the following:

$$\frac{n!}{a!b!c!...} = \frac{n \cdot p}{a!b!c!...}$$

E.g. 4., Determine the number of possible arrangements using the letters of the word, MINIMUM.

$$n(arrangements) = \frac{7}{2!} \frac{7}{3!}$$

$$= \frac{7 \times 6 \times 5 \times 4 \times 3!}{2! \cdot 3!} \qquad Nore: \frac{3!}{3!} = \frac{1}{1}$$

$$= \frac{7 \times 3 \times 5 \times 4}{2 \times 1} \qquad Nore: \frac{6}{2} = \frac{3}{1}$$

$$= 420$$

Practice Problem Set

p255 #4, 6, 7, 11, 12a, 16, 17