Chapter 4 REVIEW

Name: _____

Fundamental Counting Principle (4.1)

- Fundamental Counting Principle applies for tasks connected by the word **AND:**

  MULTIPLY the number of ways each task can be performed (think about whether or not repetition is allowed)

  ____ × ____ × _____ × _____ ...

- For tasks connected by the word **OR**:

  ADD the number of ways each task can be performed (use the Principle of Inclusion and Exclusion to avoid double-counting if there is overlap)

Factorial Notation (4.2)

$$n! = n(n-1)(n-2)\ldots(3)(2)(1)$$

- this represents the number of permutations of a set of n different objects (all n of them are used)
- same as ${}_nP_n$

Permutations with Different Objects (4.3)

$${}_nP_r = \frac{n!}{(n-r)!}$$

- this represents the number of permutations (order matters) of a set of n different objects, where only r of them are used in each arrangement

Permutations with Identical Objects (4.4)

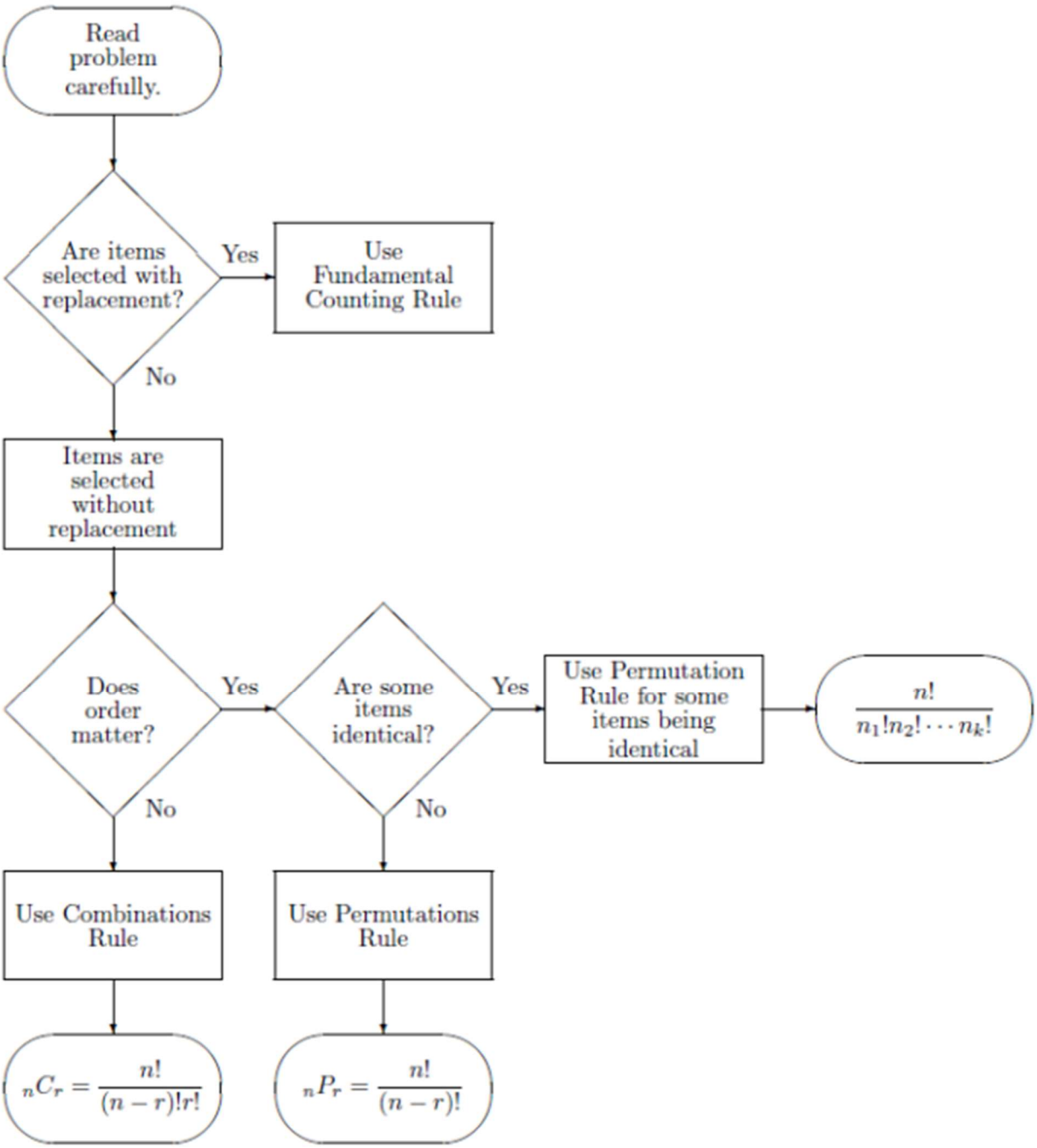
$$P = \frac{n!}{a!\,b!\,c!\ldots}$$

- this represents the number of permutations of a set of n different objects, where a are identical, another b area identical, another c are identical, and so on
- can be used for route problems

Combinations (4.5 and 4.6)

$${}_nC_r \; or \; \binom{n}{r} = \frac{n!}{r!(n-r)!}$$

- this represents the number of combinations (order does not matter) of a set of n different objects, where only r of them are used in each arrangement


Read problem carefully.
Are items selected with replacement?
Yes
Use Fundamental Counting Rule
No
Items are selected without replacement
Does order matter?
Yes
Are some items identical?
Yes
Use Permutation Rule for some items being identical
$\frac{n!}{n_1!n_2!\cdots n_k!}$
No
No
Use Combinations Rule
Use Permutations Rule
${}_nC_r = \frac{n!}{(n-r)!r!}$
${}_nP_r = \frac{n!}{(n-r)!}$