Ch 3.7 Combinations and Permutations

Fundamental Counting Rule -for a sequence of an event, you take the # ways the 1st event can occur times the # ways the second event can occur and so on.

Ex1a) 2 Character Code with the first a letter and the second a number:

Ex1b) 5 letter password and repitition isn't allowed.

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Ex1c) How many different license plates can be made with 4 letters and 2 numbers.

Try: 5 digit code with 3 numbers and 2 letters:

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Factorial Symbol: ! denotes the product of decreasing positive whole numbers.

$4! = 4 \times 3 \times 2 \times 1 = 24$

Look at your calculator to find the symbol

Factorial Rule: a collection of n different items can be arranged in n! different ways.

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Ex2a)Doctor has 5 exam rooms, how many different ways can 5 patients be in the room?

Ex2b) 9 players, how many different batting orders are possible?

Try: 4 friends go to eat, how many differnt ways can they be seated?

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Permutations- the number of different arrangements, but order is taken into account.

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

Ex3a) 4 finalists and 2 are picked at a time.

ex) 1 queen and the other is the runner up: Allie, Chelsea, Whitney, and Kara

$_4P_2 = \frac{4!}{(4-2)!} = 12$ ways

* Can thinking of the counting rule: 4 first choice and 3 to pick from the second choice.

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Ex3b) Baseball scout has a list of 15 players. He has to pick the top 5. In how many different ways can he select them?

$_{15}P_5 = \frac{15!}{(15-5)!} = 360,360$ ways

*countng rule 15 x 14 x 13 x 12 x 11= 360,360

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Ex4)Permutation when items are identical:

$$\frac{n!}{p!q!r!....}$$

4a) How many different ways can you rearrange the letters in the word STATISTICS?

10 letters
3 S's x 3 T's x 2 I's

$\frac{10!}{3!3!2!} = 50{,}400$

Ex4b) How many in MATHEMATICS?

$\frac{11!}{2!2!2!} = 4{,}989{,}600$

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TRY: How many different ways can the letters in TRIGONOMETRY be arranged?

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Combinations-where order is NOT important

formula: $_nC_r = \frac{n!}{r!(n-r)!}$

Ex5a) 9 members need to form 3 committees with 3 people on each committee.

$_9C_3 = \frac{9!}{3!(9-3)!} = 84$ combinations

If three people were selected as president, v.p., and secretary, how many would there be?
$_9P_3 = 9!/(9-3)! = 504$

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Ex5b) 20 kids on the team and 5 awards are given out at the banquet, how many different ways could it be done.(mvp, mtd's, rushing,etc.)

$_{20}C_5 = \frac{20!}{5!(20-5)!} = 15{,}504$

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Try: How many different poker hands can you have (your given 5 cards)?

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Ex5c) N.Y. lotto first prize 6# combo select # 1-51:
P(winning if order doesn't matter)

$_{51}C_6 = 18{,}009{,}460$ P(winning) = $\frac{1}{18{,}009{,}460}$

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Ex5d) Co ships 12 monitors with 3 being deffective.
P(select 5 with 2 deffects)

P(3 good and 2 deffects) = $\frac{3}{12} \times \frac{2}{11} \times \frac{9}{10} \times \frac{8}{9} \times \frac{7}{8}$ =.0318

${}_5C_2 = \frac{5!}{2!(5-2)!} = 10$ number ways it can occur

answer is (.0318)10= .318

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