9.1/9.3 Basic Combinations & Probability

Obj: 1. Use multiplication principle, permutations, & combinations.
2. Calculate probability.

Multiplication Principle:
If there are m # of ways one event can occur & n # of ways another event can occur, then there are m·n ways they both can occur.

Apr 9-9:06 AM

How many different license plate combinations are there if there are 3 letters followed by 3 #s? w/o repeating?

$26 \cdot 26 \cdot 26 \cdot 10 \cdot 10 \cdot 10$

$= 17,576,000$

$26 \cdot 25 \cdot 24 \cdot 10 \cdot 9 \cdot 8$

$= 11,232,000$

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Permutations: arrangements of objects in a specific order.

# of permutations of n objects:

$n!$

$6! = 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 720$

Apr 9-9:33 AM

How many 9 letter "words" can be formed using the letters of the word: DRAGONFLY?

$9! = 362,880$

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Permutations w/ Identical Objects:

n: objects
r: identical

# of permutations: $\frac{n!}{r!}$

BUTTERFLY : $\frac{9!}{2!} = 181,440$

BUMBLEBEE : $\frac{9!}{(3!3!)} = 10,080$

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How many ways can you plant 11 flowers in a row if 4 are red, 5 are yellow, and 2 are purple?

$$\frac{11!}{(4!5!2!)} = 6930$$

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Permutations of n objects taken r at a time:

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

$$_6P_4 = \frac{6!}{(6-4)!} = \frac{6!}{2!} = \frac{6\cdot5\cdot4\cdot3\cdot2\cdot1}{2\cdot1} = 360$$

$$_{11}P_3 = \frac{11!}{(11-3)!} = \frac{11!}{8!} = \frac{11\cdot10\cdot9\cdot8!}{8!} = 11\cdot10\cdot9 = 990$$

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How many ways can 16 actors be cast as the 7 dwarfs?

$$_{16}P_7 = \frac{16!}{(16-7)!} = \frac{16!}{9!} = 57,657,600$$

Apr 9-9:51 AM

Combinations: arrangements of objects in no specific order.

n: objects
choosing r at a time

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

Apr 9-9:53 AM

How many ways can 10 finalists be chosen from 51 contestants?

combination

$$_{51}C_{10} = \frac{51!}{10!(51-10)!} = \frac{51!}{10!41!} =$$

12,777,711,870

Apr 9-9:57 AM

How many different lottery tickets are possible if you can choose 6 #s between 1 and 46?

combination

$$_{46}C_6 = \frac{46!}{6!(46-6)!} = \frac{46!}{6!(40!)} = 9,366,819$$

Apr 9-9:59 AM

There are 10 different pizza toppings.

How many different pizzas can be ordered if we choose 3 toppings?

How many pizzas are possible if you can choose any # of toppings?

$$_{10}C_3 = \frac{10!}{3!(10-3)!} = 120$$

$$_{10}C_1 + {}_{10}C_2 + {}_{10}C_3 + \ldots + {}_{10}C_{10}$$

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Probability : $\frac{\#\text{ of desired outcomes}}{\#\text{ of possible outcomes}}$

What is the probability of tossing a head on one toss of a coin?

$\frac{1}{2}$

Apr 9-10:14 AM

A box of 12 candies has 4 vanilla & 8 chocolate. What is the probability that you pick 2 vanilla in a row? simultaneously?

$\frac{4}{12} \cdot \frac{3}{11} = \frac{12}{12 \cdot 11} = \frac{1}{11}$

$\frac{{}_4C_2}{{}_{12}C_2} = \frac{1}{11}$

Apr 9-10:18 AM

Multiplication Principle of Probability:

prob. of event A : p_1

prob of event B : p_2

if A & B are independent events

then $P(A \& B) = p_1 \cdot p_2$

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Conditional Probability: dependent events

If B depends on A

then $P(B|A) = \frac{P(A \& B)}{P(A)}$

event A: rolling an even #

event B: rolling a 2

$P(B|A) = \frac{1}{3}$

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