

COMBINATORICS + PROBABILITY

How many ways are there to perform an action.

Permutations - # of patterns or arrangements that can be made from a set of objects

Combinations - # of groups that can be formed from a set of objects

Linear Permutations

1) Arrange all objects $n!$
 $6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$

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

2) Arrange a small group
 chosen from a larger
 group = $n P_r$

Finisher for race from 9. 4 chosen

$9 \cdot 8 \cdot 7 \cdot 6$

$$n P_r = 9 P_4 = 3024$$

total # # to use

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

$$9 P_4 = \frac{9!}{5!} = \frac{9 \cdot 8 \cdot 7 \cdot 6 \cdot \cancel{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}}{\cancel{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}}$$

3) Alike Objects
 MISSISSIPPI

$$\frac{\text{total!}}{\text{alike! alike!}} = \frac{11!}{4! \cdot 4! \cdot 2!}$$

S I

Indistinguishable identical = 34650

4) Repeated objects OR
 Specific locations
 Draw blanks

License plates

L L L

10 10 10 10 26 26 26

$$= 175,760,000$$

COMBINATIONS - Select groups of objects

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

$${}_9C_2 = \frac{9!}{7! 2!} = \frac{9 \cdot 8}{2 \cdot 1} = \underline{\underline{36}}$$

Menu-S-3

How many ways can
a committee of
2 guys + 2 gals be
chosen from a group
6 guys + 5 gals?

$${}_6C_2 \quad {}_5C_2$$

$$15 \cdot 10$$

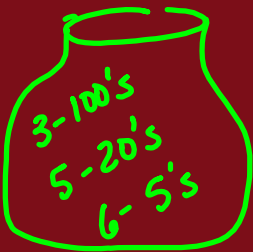
$$= 150$$

AND = Multiply

PROBABILITY = $\frac{\text{ways to succeed}}{\text{total possible outcomes}}$ ODDS = $\frac{\text{ways to succeed}}{\text{way to fail}}$

Prob (slide ons) = $\frac{2}{6} = \frac{1}{3}$

Odds (not wearing slide ons) = $\frac{4}{2} = \frac{2}{1}$



Pick 3.

Prob (3 100's) = $\frac{{}^3C_3}{{}^{14}C_3} = \frac{1}{364}$

2 100 1 20
1 100 2 5's

Prob (1 100 + 2 20's) = $\frac{{}^3C_1 \cdot {}^5C_2}{{}^{14}C_3} = \frac{30}{364}$

Odds (1 100 + 2 20's) = $\frac{15}{182}$ ^{Suc} ~~167~~

= $\frac{{}^3C_1 \cdot {}^5C_2}{182 - 15} = \frac{15}{167}$

Do Probability first!

38 DVDs - 4 defective, Select 3.
Prob (at least one good DVD) =

