

# PROBABILITY REVIEW

Permutations = # of patterns that can be formed.

Combinations - # of groups

## Combinations

- 1) Dependent
- 2) No order
- 3) No replacement.

$${}_{10}P_2 = \frac{10!}{8!} = \frac{10 \cdot 9 \cdot \cancel{8 \cdot 7 \cdot 6 \cdot \dots \cdot 1}}{\cancel{8 \cdot 7 \cdot 6 \cdot \dots \cdot 1}} = 90$$

$${}_{10}C_2 = \frac{10!}{8! \cdot 2!} = \frac{\cancel{10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot \dots \cdot 1}}{\cancel{8 \cdot 7 \cdot 6 \cdot \dots \cdot 1} \cdot 2 \cdot 1} = 45$$

## Linear Permutations

- 1) All objects =  $n!$
- 2) Use a smaller amt chosen from larger amt =  $nPr$
- 3) Alike =  $\frac{\text{total!}}{\text{alike! alike!}}$
- 4) Specific locations OR Repeated Draw blanks

200 posters - Use 20

$${}_{200}P_{20} =$$

15 posters - fractal  
How many ways to arrange 15 posters?  
 $15! =$

Fractal posters — 8 small  
4 med  
Lg Med sm Lg sm Med Lg  
 $6 \cdot 4 \cdot 8 \cdot 5 \cdot 7 \cdot 3 \cdot 4$

How many groups of 20 posters can be picked from 200?  
 ${}_{200}C_{20}$

14 markers — 2 red 2 black  
2 orange 2 blue  
3 green  
3 purple  
 $\frac{14!}{2! \cdot 2! \cdot 3! \cdot 3! \cdot 2! \cdot 2!}$

How many ways can the markers be attached in one long line?

Probability = #/6-31

Combinations  
 No Repl.  
 No Order  
 Dependent

Indiv Prob  
 Repl.  
 Order  
 Indep.

Binomial prob  
 2 possible outcomes  
 Indep.  
 $H^3 M^2$

Give prob.  
 Repeat same  
 action  
 multiple  
 times

At least/most = Write out all poss.  
 Comb Binom.

Conditional  
 $P(C|F)$   
 Prob tree  
 needed  
 If

8 posters  $\begin{cases} 3 \text{ fractal} \\ 5 \text{ Math} \end{cases}$

Select 3 posters.

What is prob that you get at least 1 math poster?

$1M + 2F$  OR  $2M + 1F$  OR  $3M + 0F$   
 ${}_5C_1 \cdot {}_3C_2 + {}_5C_2 \cdot {}_3C_1 + {}_5C_3$

8 posters  $\begin{cases} 3 \text{ fractal} \\ 5 \text{ Math} \end{cases}$

Prob (fractal then math then fractal)

$\frac{3}{8} \cdot \frac{5}{7} \cdot \frac{2}{6}$

~~$\frac{1}{3} \cdot \frac{1}{5} \cdot \frac{1}{2}$~~  No!

Prob (rain) =  $\frac{3}{10}$  rain total

Odds (no rain) =  $\frac{7}{3}$  no rain

$P(F|B) = \frac{P(F \cap B)}{P(B)}$

Coefficients  
 Pascal's  $\Delta$   
 or  
 Comb

$(3x - 2y)^5$   
 $1(3x)^5(-2y)^0 + 5(3x)^4(-2y)^1 + 10(3x)^3(-2y)^2 + \dots$   
 $3^5 \quad 5 \cdot 3^4 \cdot -2 \quad 10 \cdot 3^3 \cdot (-2)^2$   
 $243x^5 - 810x^4y + 1080x^3y^2 - \dots$