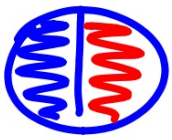
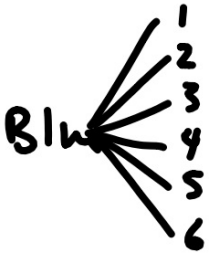
Precalc 13.1

Use the fundamental counting principle to solve problems
Distinguish between dependent and independent events
Solve permutation problems
Solve combination problems



activity:
magnet books (if time)
faculty photos
students in a row
Cheese and Tomato Spider

tree diagram



independent events

dependent events

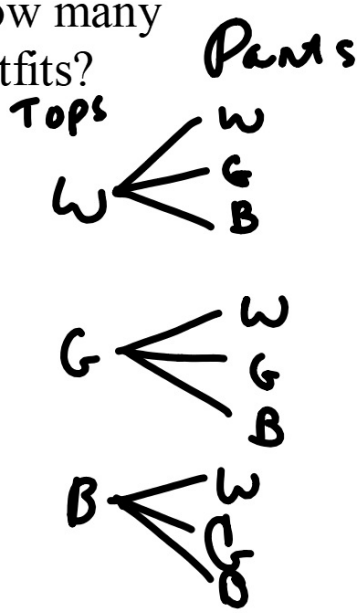
Fundamental counting principle

combinatorics

permutation

combination

How many outfits?



tree
diagram

EDUCATION Ivette is a freshman at the University of Miami. She is planning her fall schedule for next year. She has a choice of three mathematics courses, two science courses, and two humanities courses. She can only select one course from each area. How many course schedules are possible?

3M 2S 2H

Faculty photos

Eyes	Nose	Mouth
3	3	3

Fundamental

~~Basic~~ Counting Principle	Suppose one event can be chosen in p different ways, and another independent event can be chosen in q different ways. Then the two events can be chosen successively in $p \cdot q$ ways.

FCP = $a \cdot b \cdot c \ldots$

Independent does this choice change the options for the next choice? (no)

Example 1 **Vickie works for a bookstore. Her manager asked her to arrange a set of five best-sellers for a display. The display is to be set up as shown below. The display set is made up of one book from each of 5 categories. There are 4 nonfiction, 4 science fiction, 3 history, 3 romance, and 3 mystery books from which to choose.**

432

a. Are the choices for each book independent or dependent events? (does it change the options for the next choice?)

b. How many different ways can Vickie choose the books for the display?

Cheese & Tomato

dependent: Does this choice change the options for the next choice? (yes)

$3 \cdot 2 \cdot 1 = 6$

students sit in a row

A B C B A C C A B

A C B B C A C B A

(Does it change the options for the next choice?)

Example 2 During a judging of a horse show at the Fairfield County Fair, there are three favorite horses: Rye Man, Oiler, and Sea of Gus.

R O S

a. Are the selection of first, second and third place from the three horses independent or dependent events?

b. Assuming there are no ties and the three favorites finish in the top three places, how many ways can the horses win first, second and third places?

3 2 1

ROS ORS SOR
RSO OSR SRO

Does it change the options for the next choice?

3 **The board of directors of B.E.L.A. Technology Consultants is composed of 10 members.**

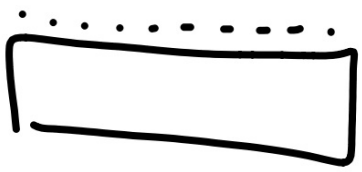
a. How many different ways can all the members sit at the conference table as shown? $10!$

b. In how many ways can they elect a chairperson, vice-chairperson, treasurer, and secretary, assuming that one person cannot hold more than one office?

C VC T S

$10 \cdot 9 \cdot 8 \cdot 7$

5040



Permutation EFGH ← order matters

Combination EFGH ← not ordered

Ps SP

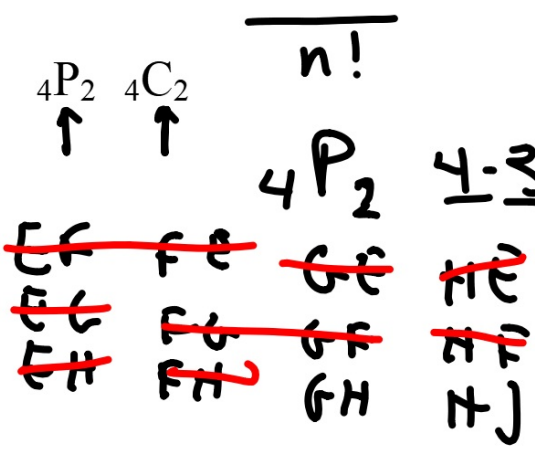
$\frac{n!}{\quad}$

${}_4P_2$ ${}_4C_2$

${}_4P_2$ $\frac{4 \cdot 3}{\quad}$ → 12

1 ${}_4C_2$ $= \frac{4 \cdot 3}{2!}$

6



ordered

unordered

Does order matter in a pizza?

4 **ART** In 1999, The National Art Gallery in Washington, D.C., opened an exhibition of the works of John Singer Sargent (1856–1925). The gallery's curator wanted to select four paintings out of twenty on display to showcase the work of the artist. How many groups of four paintings can be chosen?

$_{20}C_4$

17-53 odd

"groups of... committees of..."

5 At Grant Senior High School, there are 15 names on the ballot for junior class officers. Five will be selected to form a class committee.

a. How many different committees of 5 can be formed?

b. In how many ways can a committee of 5 be formed if each student has a different responsibility?

c. If there are 8 girls and 7 boys on the ballot, how many committees of 2 boys and 3 girls can be formed?