Combinations (11.2)   *p534*   *day 3*

ex1: U2's greatest hits album has 20 tracks on it. How many ways can you pick 5 for a playlist?   order

$$\frac{20!}{15!} \quad \frac{n!}{(n-r)!} \quad _{20}P_5 = 1,860,480$$

ex2: Domino's has a choice of 20 pizza toppings. How many ways can you pick 5 for a Feast pizza?

$$\frac{_{20}P_5}{5!} = \frac{20!}{15! \, 5!} \qquad \textcircled{20} \qquad 5!$$

$$_{20}C_5$$

$$\boxed{= 15,504}$$

Combinations (11.2)   *p534*   *day 3*

ex3: Let's make a snack at Goji's.

a) There are 14 kinds of yogurt. How many ways can we pick 4?

$$_{14}C_4 = 1001$$

b) There are 26 kinds of candy toppings. How many ways can we pick 8?

$$_{26}C_8 = 1,562,275$$

c) There are 6 sauces. How many ways can we pick 2?

$$_6C_2 = 15$$

d) How many desserts can we make?

total = 1001 × 1,562,275 × 15 = 2.34×10^{10}

Combinations (11.2)   *p534*   *day 3*

If the order do<u>es</u>n't matter, we call that a **combination** instead of a permutation.

You have less ways of doing something, because ACD is the same as ADC.

You divide by the number of ways that you can rearrange the objects you have chosen, which is r!

$$_6C_3$$

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

the big question is: Does the order matter or not?

Combinations (11.2)   *p534*   *day 3*

ex4: Calculate.

a) $_5C_3$

$$\frac{5!}{2!\,3!} = 10$$

b) $_6C_4$

$$= 15$$

c) $_6C_2 \qquad \frac{6!}{4!\,2!}$

$$= 15$$

d) $\begin{pmatrix} 9 \\ 0 \end{pmatrix}$ $\frac{9!}{9!\,0!}$

$$_9C_0 = 1$$

e) $_8C_1$

$$= 8$$

f) $_9C_9$

$$= 1$$

Combinations (11.2)   *p534*   *day 3*

ex5: There are 29 runners in a cross country meet.

a) How many ways can the 5 top runners <u>finish</u>?   order

$$_{29}P_5 \doteq 14 \text{ million}$$

b) How many ways can HOT 105 pick 5 runners for a <u>random</u> free pizza coupon?

$$_{29}C_5 = 118,755$$

Combinations (11.2)   *p534*   *day 3*

ex6: There are 52 cards in a deck.   4 suits   Cl H Sp D

a) How many ways can you be dealt 5 cards for a poker hand?

$$_{52}C_5 = 2.6 \text{ million}$$

b) how many ways can you get 5 cards if the first one is the Queen of Spades?   Qu. others

$$1, \quad \frac{_{51}C_4}{} = 250000$$

c) How many ways can you get 5 cards if they are all in the same suit?

$$_{13}C_5 \times 4 = 5148$$