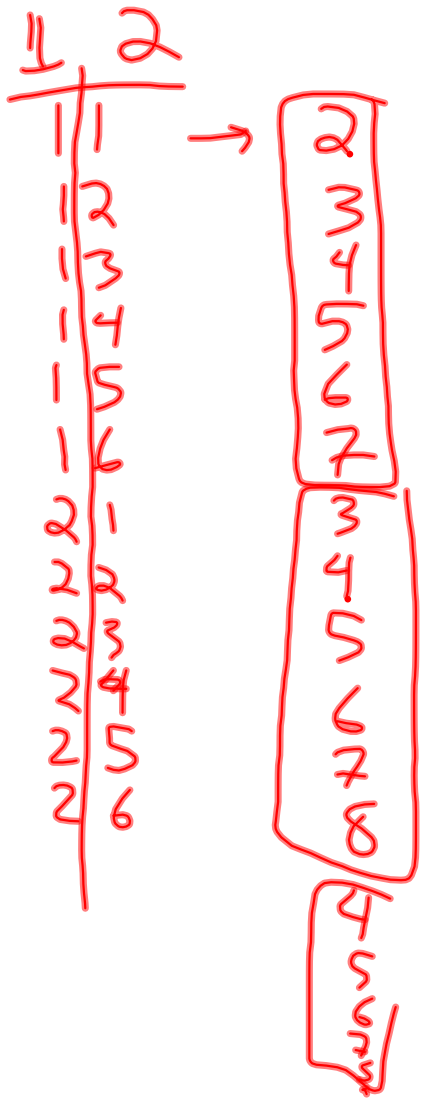
Homework Review - 13.2 + 13.1

3

R-1	W 1	B 1
R-2	2	2
3	3	3
4	4	4


1 2
1 1
1 2
1 3
1 4
1 5
1 6
2 1
2 2
2 3
2 4
2 5
2 6
2 3 4 5 6 7
3 4 5 6 7 8
4 5 6 7

④ $_3P_3 = \frac{3!}{(3-3)!} = \frac{6}{1} = 6$

$_3P_2 = \frac{3!}{(3-2)!} = \frac{6}{1} = 6$

Finding Probabilities using Combinations

An arrangement of items where order doesn't matter...

What is a combination?

ex. pocket change $.01, $.05, $.10 = $.05, $.10, $.01

How does it differ from a permutation? In a permutation, order matters.

ex. crud

CRU
RUC
CUR
URC
⋮

How can we find combinations?

AB
AC
BA
BC
CA
CB
} 6 permutations

Count ... three people (Art, Bart, Cart)

How many permutations of two?

How many combinations of two?

AB = BA
AC = CA
BC = CB
} 3 combinations

What's the Formula for Combinations?

$_nC_r = n! / ((n - r)!\, r!)$

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

Similar to permutations - but divide by all the different ways of rearranging ...

Example: A B C D E

$_5P_5 = 120$

$_5C_5 = 1$

$_5P_2 = 20$

$_5C_2 = 10$

$$_5P_5 = \frac{5!}{(5-5)!} = 120$$

$$_5C_5 = \frac{5!}{(5-5)!\,5!} = 1$$

$$_5P_2 = \frac{5!}{(5-2)!} = \frac{5!}{3!} = 5 \cdot 4 = 20$$

$$_5C_2 = \frac{5!}{(5-2)!\,2!} = \frac{5!}{3!2!} = \frac{20}{2} = 10$$

$$\frac{5 \cdot 4 \cdot \boxed{3!}}{\boxed{3!} \cdot 2!}$$

Evaluate the expression.

1. ${}_8C_4 = \frac{8!}{(8-4)!4!}$

$\frac{8!}{4!4!} = \frac{8 \cdot 7 \cdot 6 \cdot 5 \cdot 4!}{4!4!}$

$\frac{28 \cdot 7 \cdot 6 \cdot 5}{4 \cdot 3 \cdot 2} = 70$

2. ${}_5C_5$

3. ${}_{12}C_0$

4. ${}_7C_1$

5. ${}_{15}C_{11}$

$\frac{15!}{(15-11)!11!} = \frac{15 \cdot 14 \cdot 13 \cdot 12 \cdot 11!}{4 \cdot 3 \cdot 2 \cdot 11!} = 365$

6. ${}_{10}C_3$

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There are 15 students in Algebra. As a reward, Mr. Bregar will take 4 of them to play in a dumpster.

a) The first person he picks gets a free rotten egg. The second gets a turkey. The third gets a chicken. The fourth gets a potato.

Use permuations - why? – order matters for the free gifts...

How many permutations of 4 students can he pick? $_{15}P_4 = \frac{15!}{11!} = 15 \cdot 14 \cdot 13 \cdot 12 = 32760$

b) There are no rotten eggs, turkeys, chickens, or potatoes.

Use combinations - why? – order doesn't matter – everyone's in the dumpster

How many combinations of 4 students can he pick?

$$_{15}C_4 = \frac{15!}{11!\,4!} = \frac{15 \cdot \overset{7}{\cancel{14}} \cdot 13 \cdot \cancel{12}}{\cancel{4 \cdot 3 \cdot 2}} = 1365$$

Using combinations to find probabilities:

Remember the probability formula...

$$P(\text{event}) = \frac{\#\text{ of ways the event can occur}}{\text{Sample space}}$$

Generally, the total # of outcomes will be a combination (if order is NOT important!)

The # of desired outcomes depends on the problem

Example: Two pictures will get into the yearbook out of 14 possible students. What are the chances that it will be Kathy and Brandon?

$$P(\text{Kathy \& Brandon}) = \frac{\text{How many ways can that occur}}{\text{Total possible 2-person groups in the yearbook}}$$

How many ways can that occur → 1

Total possible 2-person groups in the yearbook → $_{14}C_2 = \frac{14!}{(14-2)!\,2!} = \frac{14 \cdot 13 \cdot \cancel{12!}}{\cancel{12!}\,2!} = \frac{14 \cdot 13}{2} = 91$

$$= \frac{1}{91} = 1.1\%$$

Open-Mike Night A coffee shop offers an open-mike night for poetry. Tonight, 15 people would like to read, but there is only enough time to have 7 people read.

a. Seven of the 15 people that would like to read are randomly chosen. How many combinations of 7 readers from the group of people that would like to read are possible?

$_{15}C_7 = 6435$

b. You and your friend are part of the group that would like to read. What is the probability that you and your friend are chosen? What is the probability that you are chosen first and your friend is chosen second? Which event is more likely to occur?

$$\frac{15!}{(15-7)!\,7!} = \frac{15\cdot 14\cdot 13\cdot 12\cdot 11\cdot 10\cdot 9\cdot 8!}{8!\,7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2} = \frac{13\cdot 11\cdot 5\cdot 9}{} = 6435$$

Homework:

p. 858: 2-14 even, 15-20 all, 23, 24