11.4 - Pascal's triangle (and the Binomial Theorem)
11.5 - Counting problems with "Not" and "Or"

Section 11.4 HW: 1, 5, 9 - 18 all

Section 11.5 HW: 5-8, 15, 17, 19, 20, 23, 29

Problem Set #1 Assigned

Sep 10-8:30 AM

<u>Warm-up - Group Work:</u>

At Matharella Pizzaria you can only order a three topping pizza. The Pizzaria claims that you can order over 600 different three topping pizzas. What is the minimum number of toppings that the Pizzaria must have in order to make this claim?

Order does not matter → Combinations

$C(n,3) \geq 600$

$\frac{n!}{3!(n-3)!} \geq 600$

$\frac{n(n-1)(n-2)}{3!} \geq 600$

$n=17$ is the cutoff. (Guess & check)

Sep 10-8:50 AM

Cards

A five-card hand is dealt from a standard deck consisting of 52 cards (13 kinds and 4 suits). How many different 5-card hands are possible?

order doesn't matter, no repeats

$C(52,5) = 2,598,960$

Sep 10-8:51 AM

Cards

How many 5-card hands consist of 3 spades and 2 hearts?

Two step task:

$\underbrace{C(13,3)}_{\text{3 spades}} \times \underbrace{C(13,2)}_{\text{2 hearts}} =$

$\frac{13\times12\times11}{3!} \times \frac{13\times12}{2!} = 286 \times 78 = 22,308$

Sep 10-8:51 AM

Cards

How many 5-card hands consist of 3 black cards and 2 red cards?

$$\underset{3\text{ black}}{C(26,3)} \times \underset{2\text{ red}}{C(26,2)} = 2600 \times 325 = 845{,}000$$

Sep 10-9:11 AM

Cards

How many 5-card hands consist of 3 black cards of the same suit and 2 red cards of the same suit?

13 spades
13 club
13 hearts
13 diamonds

① $\underbrace{2}_{\text{choose black suit}} \times \underbrace{C(13,3)}_{\text{choose the another black cards}} \left(\frac{13\cdot 12\cdot 11}{3!}\right) \times \underbrace{2}_{\text{choose red suit}} \times \underbrace{C(13,2)}_{\text{choose red cards.}} \left(\frac{13\cdot 12}{2!}\right)$

③ CH – $C(13,3)\cdot C(13,2)$
CD
SH
SD

② $\underbrace{\left(\frac{26\times 12\times 11}{3!}\right)}_{\text{black}} \times \underbrace{\left(\frac{26\times 12}{2!}\right)}_{\text{red}}$

$$\left(\frac{26\times 12\times 11}{3!}\right)\left(\frac{26\times 12}{2!}\right) = 89{,}232$$

Problem Set #1:
In how many possible ways can a full house (3 of one suit, two of another suit) be dealt?

Sep 10-9:11 AM

1 COIN

One coin is tossed.

a) How many possibilities are there? 2

(H, T)

0H - 1
1H - 1

Sep 10-8:52 AM

2 Coins

a) How many possibilities are there? 4

HH
HT
TH
TT

$\boxed{\begin{array}{l} 0H - 1 \\ 1H - 2 \\ 2H - 1 \end{array}}$

b) How many ways can you get exactly one head?

2 ways

c) How many ways can you get at least one head?

3 ways.

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3 Coins

a) How many possibilities are there?

HHH THH
HHT THT
HTH TTH
HTT TTT

$\underline{2} \times \underline{2} \times \underline{2} = 8$

0H - 1
1H - 3
2H - 3
3H - 1

b) How many ways can you get exactly ______ head(s)?

c) How many ways can you get at least one head?

7 ways

Sep 10-8:54 AM

4 Coins

a) How many possibilities are there?

$2 \times 2 \times 2 \times 2 = 16$

0H = 1 = C(4,0)
1H = 4 = C(4,1)
2H = 6 = C(4,2)
3H = 4 = C(4,3)
4H = 1 = C(4,4)

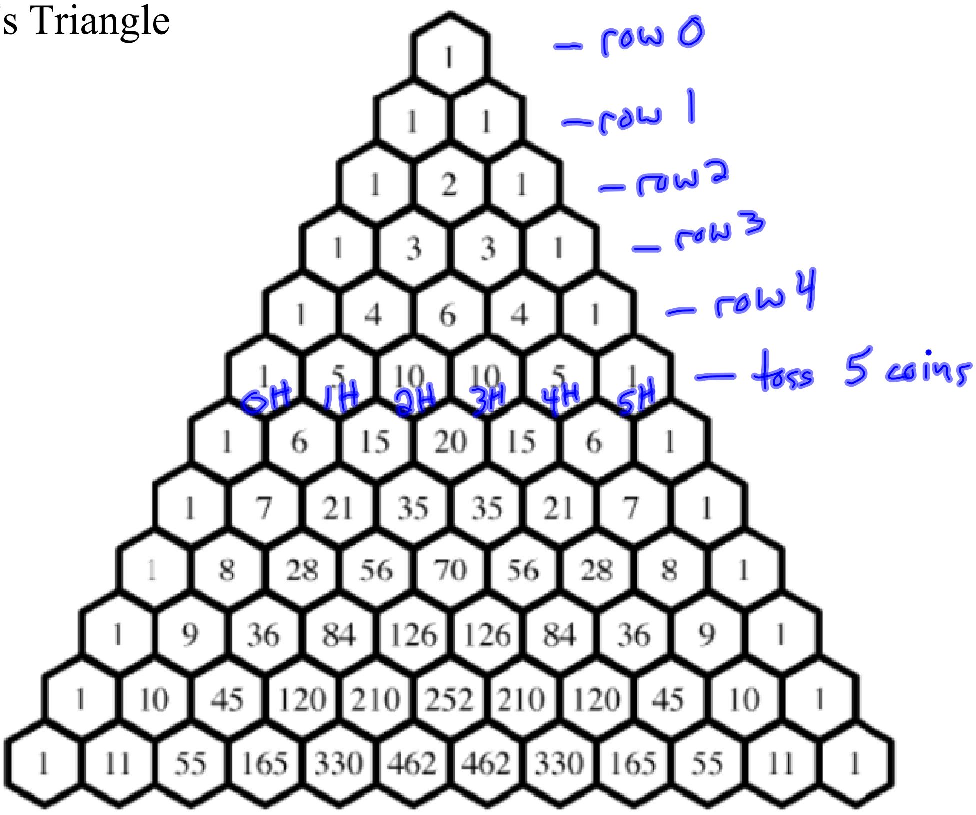
b) How many ways can you get exaclty ______ head(s)?

c) How many ways can you get at least one head?

15 ways
(16 - 1)

Sep 10-8:55 AM

Pascal's Triangle



Sep 10-8:56 AM

5 Coins

a) How many possibilities are there?

$2^5 = 32$

# of heads	Ways of getting exactly ____ heads
0H	1
1H	$5 = C(5,1)$
2H	$10 = C(5,2)$
3H	$10 = C(5,3)$
4H	$5 = C(5,4)$
5H	$1 = C(5,5)$

Sep 10-8:57 AM

Kids

A family has seven children.

How many possible ways are there to have exactly 3 girls? $C(7,3) = \frac{7 \cdot \cancel{6} \cdot 5}{\cancel{3!}} = 35$

How many possible ways are there to have at least one girl?

look at the complement ("no girls")

one way!

There are 2^7 ways to have the 7 kids (boys/girls).

$2^7 - 1 = 127$ ways to get at least one girl.

Sep 10-9:01 AM