Pop Quiz

Number your paper 1 through 10.

Who do you think will pass?

Who will get the highest?

### **Binomial Distribution**

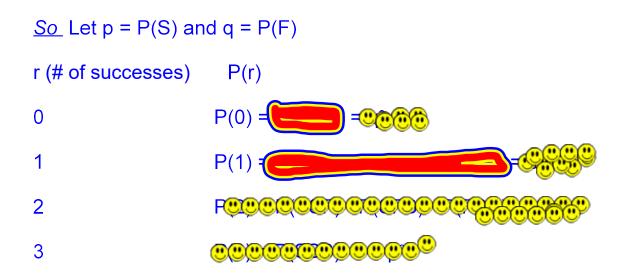
If you have 3 trials in a probability with possibilities being either a success or failure your sample space is

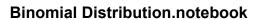
The probability of getting 1 failure then 2 successes or P(FSS) = 1/8

What if the question were 1 F (in no particular order) and 2 successes

$$P(2) = P(SSF) + P(SFS) + P(FSS)$$
  
= 1/8 + 1/8 + 1/8  
= 3/8

or 
$$3 * P(SSF) = 3(1/8) = 3/8$$





How else could we find the coefficient?

The probability of r successes for any number of trials is  $P(r) = {}_{n}C_{r} \;\; p^{r}q^{n-r}$ 

binomial coefficient

Ex: If P(S) = .3 (or p = .3) and you have a random sample of 12 people who tried to jump above 13 inches, what's the probability of 5 people reaching 13 inches?

There's a .158 chance there are exactly 5 successes and 7 failures

Ex 2: P (at least 5 successes) = P 
$$(r \ge 5)$$

$$P(5) + P(6) + P(7) + ...$$

How about another way



Calculator Way....

# Make a chart:

r > a 1 - Binom(n,p,?)

 $r \ge a$  1 - Binom(n,p,?)

r < a Binom(n,p,?)

 $r \le a$  Binom(n,p,?)

## Examples: (answers rounded to the nearest hundredth)

1. A family consists of 3 children. What is the probability that at most 2 of the children are boys?



#### Solution:

"At most" 2 boys implies that there could be 0, 1, or 2 boys. The probability of a boy child (or a girl child) is 1/2.

For $r = 0$ :	$\binom{3}{0} \cdot \left(\frac{1}{2}\right)^0 \cdot \left(\frac{1}{2}\right)^3 = .125$	
For $r = 1$ :	$\binom{3}{1} \cdot \left(\frac{1}{2}\right)^1 \cdot \left(\frac{1}{2}\right)^2 = .375$	
For $r = 2$ :	$\binom{3}{2} \cdot \left(\frac{1}{2}\right)^2 \cdot \left(\frac{1}{2}\right)^1 = .375$	
Sum:	.125 + .375 + .375 = .875 rounded to the <i>nearest hundredth</i> = 0.88 <b>ANSWER</b>	

2. Team A and Team B are playing in a league. They will play each other five times. If the probability that team A wins a game is 1/3, what is the probability that team A will win at least three of the five games?



### Solution:

"At least" 3 wins implies 3, 4, or 5 wins.

	At least 5 with implies 5, 4, or 5 withs.		
	For $r = 3$ :	$\binom{5}{3} \cdot \left(\frac{1}{3}\right)^3 \cdot \left(\frac{2}{3}\right)^2 = .1646090535$	
30	For $r = 4$ :	$\binom{5}{4} \cdot \left(\frac{1}{3}\right)^4 \cdot \left(\frac{2}{3}\right)^1 = .0411522634$	
	For $r = 5$ :	$\binom{5}{5} \cdot \left(\frac{1}{3}\right)^5 \cdot \left(\frac{2}{3}\right)^0 = .0041152263$	
	Sum:	rounded to the nearest hundredth = 0.21 ANSWER	

Do wkst