

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

SSS	SSF	SFS	SFF
FSS	FSF	FFS	FFF

The probability of getting 1 failure then 2 successes or
 $P(\text{FSS}) = 1/8$

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

$$\begin{aligned}P(2) &= P(\text{SSF}) + P(\text{SFS}) + P(\text{FSS}) \\&= 1/8 + 1/8 + 1/8 \\&= 3/8\end{aligned}$$

$$\text{or } 3 * P(\text{SSF}) = 3(1/8) = 3/8$$

So Let $p = P(S)$ and $q = P(F)$

r (# of successes) $P(r)$

0 $P(0) =$  $=$ 

1 $P(1) =$  $=$ 

2 $P(2) =$ 

3 

How else could we find the coefficient?

The probability of r successes for any number of trials is

$$P(r) = {}_nC_r p^r q^{n-r}$$



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?

$n =$ $r =$ $p =$ $q =$

$P(5) =$ 

approx =

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

Ex 2: $P(\text{at least 5 successes}) = P(r \geq 5)$

$$P(5) + P(6) + P(7) + \dots$$

How about another way



Calculator Way....

Make a chart:

$$r > a \quad 1 - \text{Binom}(n, p, ?)$$

$$r \geq a \quad 1 - \text{Binom}(n, p, ?)$$

$$r < a \quad \text{Binom}(n, p, ?)$$

$$r \leq a \quad \text{Binom}(n, p, ?)$$

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 nearest hundredth = 0.88 ANSWER

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 $\frac{1}{3}$, 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.

For $r = 3$:	$\binom{5}{3} \cdot \left(\frac{1}{3}\right)^3 \cdot \left(\frac{2}{3}\right)^2 = .1646090535$
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

