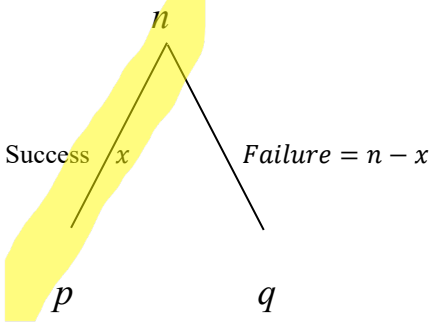
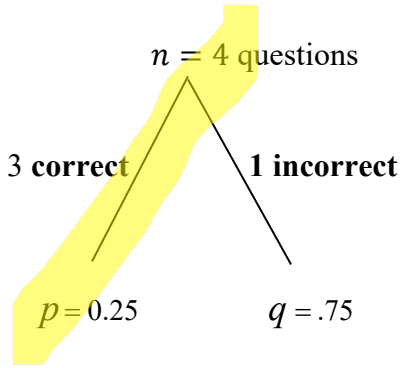
Steps in finding binomial probability through examples

1. Draw a triangle, put **n** = number of subjects or observation at the **top**,
2. Label each branch as success (what the question wants you to find) and failures (the opposite).
3. Put x = number of successes on the left branch and $n - x$ on the right branch
4. Put **p** (probability of success) at the **bottom of left branch** and **q = 1 - p** (probability of failure) at the **bottom of right branch.**
5. Use the formula $P(x) = nCx\ p^x(1-p)^{n-x}$.



Example 1: If you guess all 4 multiple choice quiz (4 choices for each question), What is the probability that you **exactly guess 3 questions correctly**?
Success is to guess correctly so $p = 1/4 = 0.25$ and failure is to guess incorrectly $q = 3/4 = 0.75$



$4C_3(0.25)^3(1-0.25)^{4-3} = 4(0.25)^3(0.75)^1 = 4(.015625)(.75) = 0.04688$= **4.688%**

By TI 83/84 = binompdf(4,.25,3) **= 0.04688**

Find the probability of none, 1, 2, 3 and 4 correct answers and check again the below answers.

x	P(x)
0	0.31641
1	0.42188
2	0.21094
3	0.04688
4	0.00391

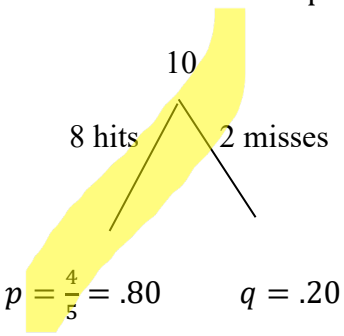
What is the **expected or average/mean** number of corrected guesses? $= \mu = np = 10(1/4) = 10(.25) = 2.5$

What is the **standard deviation** of corrected guesses? $\sigma = \sqrt{npq} = \sqrt{10(.25)(.75)} = 1.369$

2. A marksman finds that on the average he hits the target 4 times out of 5 or 80%.

If he fires 10 shots, what is the probability of having 8 hits?

Success is hit so n=10 p= $4/5 = 0.8$ and **failure is miss** q = $1/5 = 0.20$



$10C_8(0.80)^8(1-.80)^{10-8} = 10C_8(0.8)^8(0.20)^2 = 45(.1678)(.04) = 0.302$ = **30.2%**

Using TI 83 **binompdf***(10,4/5.8)* = ***0.302***

What is the **expected** number of hits? = $\mu = np = 10(4/5) = 10(.8) = 8$

What is the **standard deviation** of the number of hits? $\sigma = \sqrt{npq} = \sqrt{10(0.8)(0.2)} = 1.27$

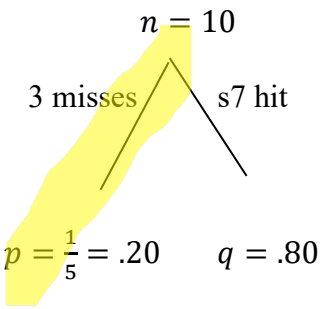
b) Having more than 9 hits means 9 and 10 hits:

$10C_9(0.80)^9(1-.80)^{10-9} = 10C_9(0.8)^9(0.20)^1 = 10(.1342)(.02) = 0.2680$ = **26.8%**

$10C_{10}(0.80)^{10}(1-.80)^{10-10} = 10C_{10}(0.8)^{10}(0.20)^0 = 1(.1074)(1) = 0.1074$ = **10.74%**

Using TI 83 **binompdf***(10,4/5.9)* + **binompdf***(10,4/5.10)* = **26.8% +10.74% = 37.54%**

c) Only 3 misses? **Success is to miss** so $p = 1/5 = 0.2$ and **failure is hit** $q = 4/5 = 0.8$

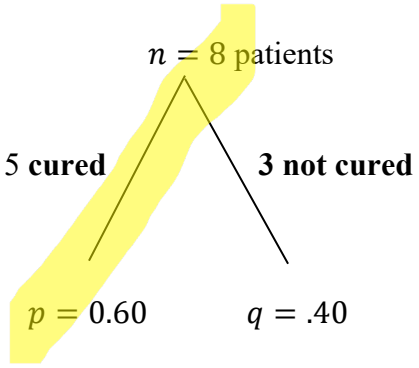


$10C3_8(0.20)^3(1-.20)^{10-3} = 10C_3(0.20)^3(0.80)^7 = 120(.08)(.2097) = 0.2013$ = **20.13%**

Using TI 833: **binompdf***(10,1/5.3)* = ***0.2013 = 20.13%***

What is the **expected** number of misses? = $\mu = np = 10(1/5) = 10(.2) = 2$

3) If a medicine cures 60% of the people who take it, what is the probability that of the eight people who take the medicine, 5 will be cured? **Success** is to being cured so $p = 0.6$ and failure is not being cured $q = 0.4$



$8C_5(0.60)^5(1-0.6)^{8-5} = 56(0.6)^5(0.40)^3 = 3003(.07776)(.064) = 0.27869$= **27.87%**

By TI 83/84 = binompdf*(8,0.6,5)* **= *0.2787=27.87%***

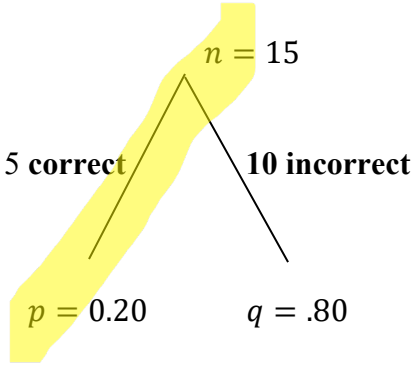
Find the probability of none, 1, 2, 3 4, 5 ,6,7 and 8 cured patients and check again the below answers.

x	P(x)
0	0.00066
1	0.00786
2	0.04129
3	0.12386
4	0.23224
5	0.27869
6	0.20902
7	0.08958
8	0.0168

What is the **expected or average/mean** number of cured patients? $= \mu = np = 8(0.6) = 4.8$

What is the **standard deviation** of cured patients? $\sigma = \sqrt{npq} = \sqrt{8(0.6)(0.4)} = 1.386$

4) If you guess all 15 questions on a quiz with 5 choices, what is the probability that you answer only 5 questions correctly?
Success is to guess correctly so $p = 1/5 = 0.20$ and failure is to guess incorrectly $q = 3/4 = 0.75$



$15C_5(0.20)^5(1-0.2)^{15-5} = 15C_5(0.2)^5(0.80)^{10} = 3003(.000032)(.1074) = 0.1031$= **10.31%**

By TI 83/84 = binompdf*(15,0.2,5)* **= 0.1031**

What is the **expected or average/mean** number of corrected guesses? $= \mu = np = 15(1/2) = 7.5$