


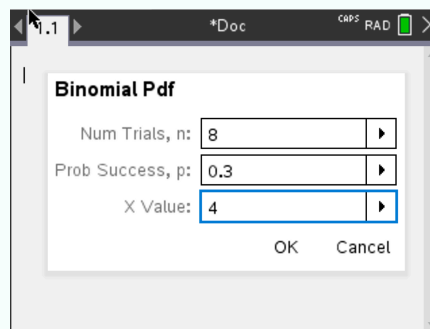
4.8 Binomial distribution

Consider $X \sim \mathcal{B}(8, 0.3)$.

4.8.1 Compute $P(X = a)$

Consider $X \sim \mathcal{B}(8, 0.3)$. Suppose you want to compute $P(X = 4)$.


- ① Create a new document, select Add Calculator
- ② Press , select Probability > Distributions > Binomial Pdf
- ③ Enter the number of trials, the probability of success and the x-value.

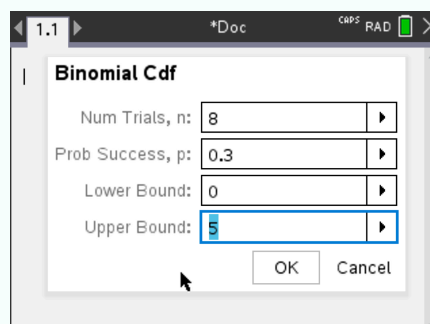


Press OK. The result should be 0.136 (rounded).

4.8.2 Compute $P(X \leq a)$

Consider $X \sim \mathcal{B}(8, 0.3)$. Suppose you want to compute $P(X \leq 5)$.

- ① Create a new document, select Add Calculator
- ② Press , select Probability > Distributions > Binomial Cdf
- ③ Enter the number of trials, the probability of success, the lower bound and the upper bound.



④ Press  and the result is displayed. The result should be 0.988708.


NB: If you wanted to compute $P(X < 5)$ instead, you would calculate $P(X \leq 4)$ (since the binomial distribution is discrete).

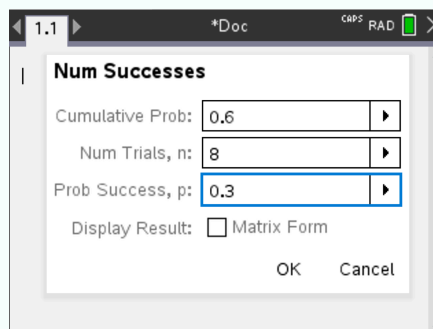
4.8.3 Find x when $P(X \leq x) \geq c$




Some calculators may not have this functionality

Consider $X \sim \mathcal{B}(8, 0.3)$. Suppose you want to find **the smallest** x for which $P(X \leq x) \geq 0.6$.

- ① Create a new document, select Add Calculator
- ② Press , select Probability > Distributions > Inverse Binomial
- ③ Enter the cumulative probability, the number of trials and the probability of success.




④ Press  and the result is displayed. The result should be 3.

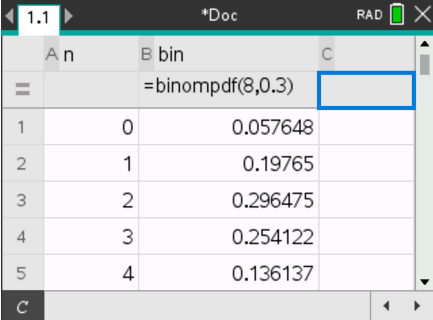


Note that **Binomial Cdf(8,0.3,3)=0.806**, which is **not** 0.6. But since **Binomial Cdf(8,0.3,2)=0.552** is smaller than 0.6, **Inverse Binomial** gives us 3 (even though 2 gives an area closer to 0.6, the calculator gives the first integer that gives an area bigger or equal to 0.6)




4.8.4 Plot a binomial distribution

To plot a binomial distribution, we will create two lists, one being the possible amount of successful trials, and the other their probability, and then plot it.

- ① Create a new document, select Add List & Spreadsheets
- ② In the first column: type n as the column name and fill the cell with numbers from 0 to n (n=8 in our case). In the second column: type bin as the column name and type **binompdf(8,0.3)** in the cell at the line '='
- ③ Type  and the probability of success for each number of trials is displayed.



A	n	B	bin	C
=			=binompdf(8,0.3)	
1	0		0.057648	
2	1		0.19765	
3	2		0.296475	
4	3		0.254122	
5	4		0.136137	

- ④ Now we need to plot the graph. Type  and , select Add Data & Statistics.
- ⑤ Select Click to add variable on the x-axis, choose n. Select Click to add variable on the y-axis, choose bin.
- ⑥ To connect data points: press , select Plot Properties > Connect Data Points. The following plot should be displayed:

