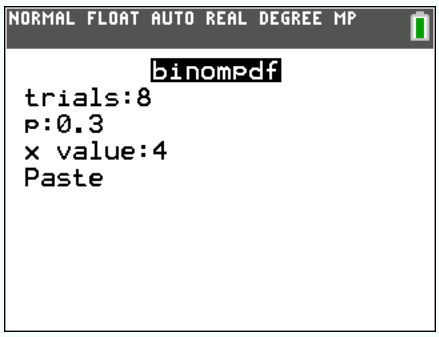
4.8 Binomial distribution

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

4.8.1 Compute $\mathbf{P}(X = a)$ with `binompdf` function

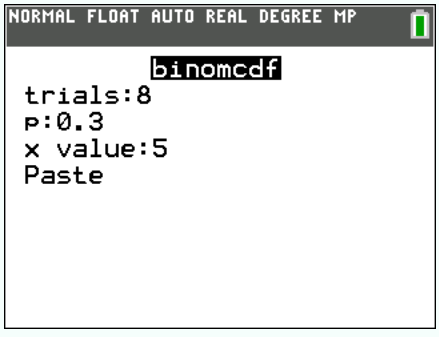
Consider $X \sim \mathcal{B}(8, 0.3)$. Suppose you want to compute $\mathbf{P}(X = 4)$. To do this, press 2nd , distr vars , `binompdf(`. Choose `x value:4`:



Press `Paste`, entry solve enter . The result should be 0.136 (rounded).

4.8.2 Compute $\mathbf{P}(X \leq a)$ with `binomcdf` function

Consider $X \sim \mathcal{B}(8, 0.3)$. Say you want to compute $\mathbf{P}(X \leq 5)$. To do this, press 2nd , distr vars , `binomcdf(`. Choose `x value:5`:



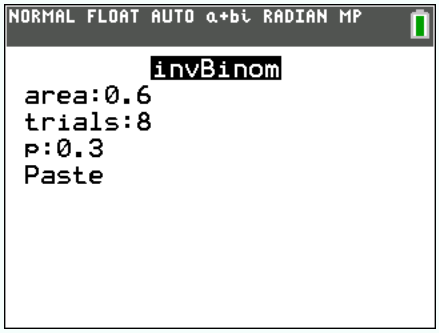
Press `Paste`, entry solve enter . The result should be 0.989 (rounded).

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

4.8.3 Find x when $\mathbf{P}(X \leq x) = c$ with `invBinom` function

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 $\mathbf{P}(X \leq x) \geq 0.6$. Press 2nd , vars (distr) , `invBinom(`, and fill the parameters as follows:



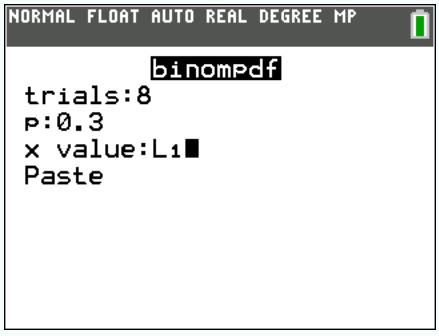
Press enter (entry solve) . The result should be 3.

Note that `binomcdf(8,0.3,3)=0.806`, which is **not** 0.6. But since `binomcdf(8,0.3,2)=0.552` is smaller than 0.6, `invBinom` 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)

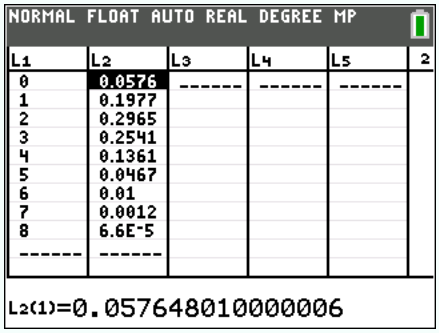
4.8.4 Plot a binomial distribution

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.

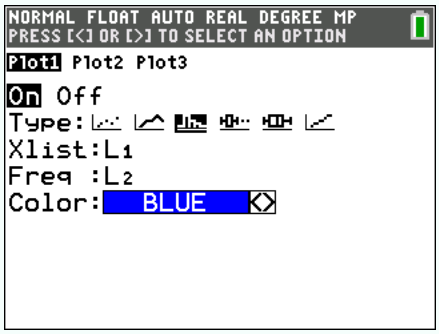
① Create a list L_1 of integers from 0 to n (here: $n = 8$) (press stat (list) , `Edit...` to enter the list). Place the cursor on L_2 and press 2nd , vars (distr) , `binompdf`. Choose L_1 (by pressing 2nd , 1 (L1 Y)) for `x value`:



Press **Paste** and entry solve enter . The following should be displayed:



② Press 2nd , stat plot f1 y= 1: to be able to plot the binomial distribution. Choose the following as parameters:



Color can be changed

Press table f5 graph (see 2.3.2 on page 37 if it is not displayed correctly). The following should be displayed: