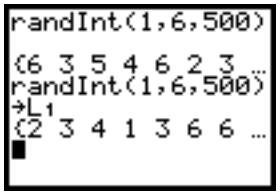
CHAPTER 10 Calculator Notes for the TI-83 Plus and TI-84 Plus

Note 10A • Dice Simulation

(If your calculator has the application **Prob Sim**, see **Note 10A/App** for an alternative way to simulate dice.)

Recall that you can simulate the throw of a die using the random integer command, **randInt(1,6,*n*)**, where *n* is the number of throws. See **Note 1L** for help with the **randInt(** command. To store the outcomes into a list, say list L1, press STO→ 2nd [L1].

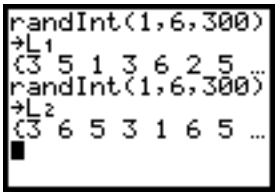


Follow these steps to simulate the sums for 300 throws of a pair of dice:

a. Store 300 throws of a die into list L1, **randInt(1,6,300)→L1**.

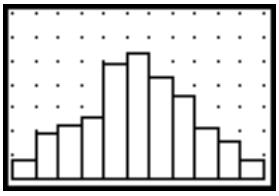
b. Store 300 throws of a die into list L2, **randInt(1,6,300)→L2**.

c. Define list L3 as the sum of lists L1 and L2.



Notice in the second screen that the definition of list L3 uses quotation marks, ALPHA ["], and the list name has a diamond, ♦, beside it. The quotation marks make the definition dynamic so that the values in list L3 will automatically update if list L1 or list L2 changes. The diamond indicates that the list is dynamic.

d. You can display a histogram to show the distribution of the sums in list L3. See **Note 2C** for help with histograms.



[2, 13, 1, 0, 70, 10]

Note 10A/App • Dice Simulation with the Prob Sim App

(See **Note 10A** if your calculator does not have the application **Prob Sim**.)

To start the application, press APPS, select **Prob Sim**, and press any key. Follow these steps to simulate the sums for 300 throws of a pair of dice:

a. From the Simulation menu, select **2.Roll Dice**.

b. Press ZOOM to go to the Settings menu. Enter these settings and then press GRAPH to choose **OK**:

Trial Set:300	The number of trials to perform at once.
Dice:2	The number of dice to use.
Sides:6	The number of sides on each die.
Graph:Freq	The graph can show frequency or probability.
StoTbl:All	The table can store all, the last 50, or none of the trials.
ClearTbl:Yes	The data clear when you do the experiment again.
Update:50	The number of trials after which the graph updates.

c. Press WINDOW to roll the dice. The application will simulate 300 throws of a pair of dice and will show a bar graph of the sums. The bar graph will update every 50 rolls.

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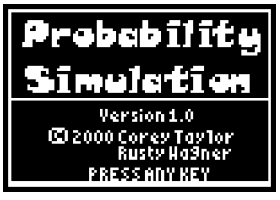
d. When the 300 throws are complete, you can arrow left or right to trace the bar graph and see the frequency of each sum.

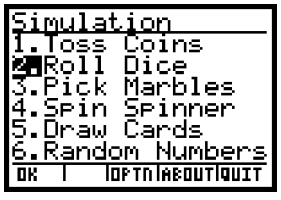
e. If you press GRAPH, the bar graph will change to a table. You can arrow up or down to see the number on each die, D1 and D2, as well as the sum. Pressing GRAPH again changes the table back to a bar graph.

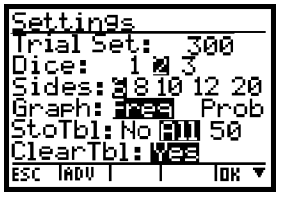
f. If you press TRACE, you have the option to save the data into four lists: ROLL for the roll number, D1 for the numbers on die 1, D2 for the numbers on die 2, and SUM for the sum of the dice. Press GRAPH to save the data, or press Y= to escape without saving.

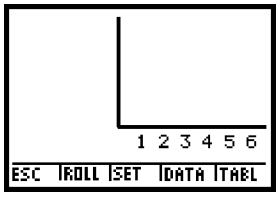
g. Exit the program by pressing Y= to escape the dice simulation. Press Y= again to remove the trials from memory, and then press GRAPH to quit and Y= to confirm.

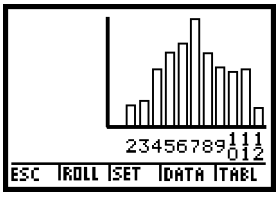
As is obvious from the Simulation menu, you can use the **Prob Sim** application to simulate many other probability situations. When you are in the Settings menu, press WINDOW to set advanced settings, such as the "weight" of a side, which can make the probability of one event greater than another.

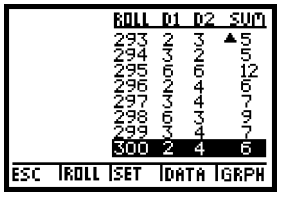








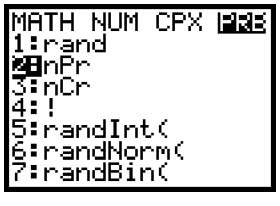


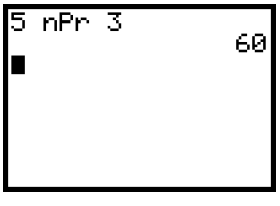


Note 10B • Permutations

To find numbers of permutations, use the **nPr** command. To find the **nPr** command, press MATH **PRB 2:nPr**. First enter the value of *n*, the number of objects. Then enter the **nPr** command, and enter the value of *r*, the number of objects chosen. Then press ENTER.

For example, to find the number of arrangements of 5 objects chosen 3 at a time, enter **5 nPr 3**. The answer shows that there are 60 arrangements.

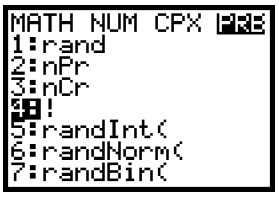


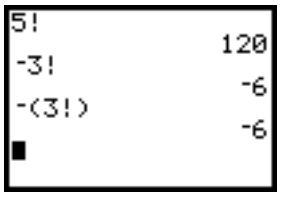


Note 10C • Factorials

To find the factorial command, press MATH PRB 4:!. For example, to find 5!, press 5 MATH PRB 4:! ENTER.

In the order of operations, factorial has higher precedence than negation, so $-3!$ is equivalent to $-(3!)$.

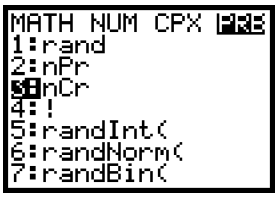


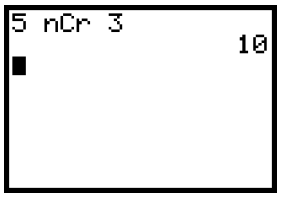


Note 10D • Combinations

To find numbers of combinations, use the nCr command. To find the nCr command, press MATH PRB 3:nCr. First enter the value of *n,* the number of objects. Then enter the nCr command, and enter the value of *r,* the number of objects chosen. Then press ENTER.

For example, to find the number of groupings of 5 objects chosen 3 at a time, enter 5 nCr 3. The answer shows that there are 10 different groupings.





Note 10E • Binomial Probability

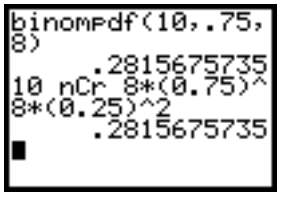
Single Probability

To calculate the probability of any number of successes in a probability experiment, use the binomial probability distribution function command, binompdf(. To find the binompdf(command, press 2nd [DISTR] A:binompdf(.

The binompdf(command requires three arguments: the number of trials, the probability of a success for each trial, and the number of successes.

For example, binompdf(10,.75,8) finds the probability of 8 successes out of 10 trials where the probability of each success is 0.75.

The binompdf(command is a shortcut for calculating the value of one term of a binomial expansion. That is, binompdf(10,.75,8) is the same as ${}_{10}C_8 \cdot (0.75)^8 \cdot (0.25)^2$.



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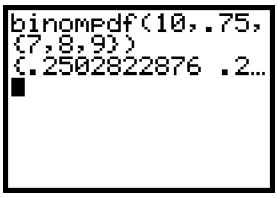
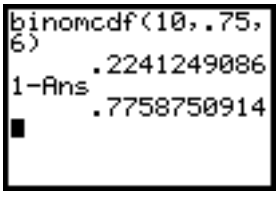
To find more than one probability at the same time, use the **binompdf(** command and enter the number of successes as a list.



Cumulative Probability

The binomial cumulative distribution function command, **binomcdf(**, is similar to the **binompdf(** command, but it sums the binomial probabilities from 0 successes to the desired number. To find the **binomcdf(** command, press 2nd [DISTR] **B:binomcdf(**.

For example, **binomcdf(10,.75,6)** finds the probability of 6 or fewer successes out of 10 trials where the probability of each success is 0.75. To find the probability of more than 6 successes, subtract the previous answer from 1.



Note 10F • Sequences into Lists

With the calculator in any mode, you can use the **seq(** command to generate a nonrecursive sequence. To find the **seq(** command, press 2nd [LIST] OPS **5:seq(**.

The **seq(** command requires four arguments: an expression, a variable counter, the starting value of the counter, and the ending value of the counter. The counter increases in increments of 1 unless an optional fifth argument specifies a different increment.

For example, **seq(X²,X,2,6)** generates the sequence of perfect squares 2^2 through 6^2. As another example, **seq(X,X,11,99,2)** generates the odd integers from 11 to 99. To store the sequence into a list, you can use the store key, STO→, from the Home screen, or enter a sequence definition into the Stat Edit screen. Entering the definition in quotation marks, ALPHA ["], keeps the definition dynamic and allows you to edit it easily.