

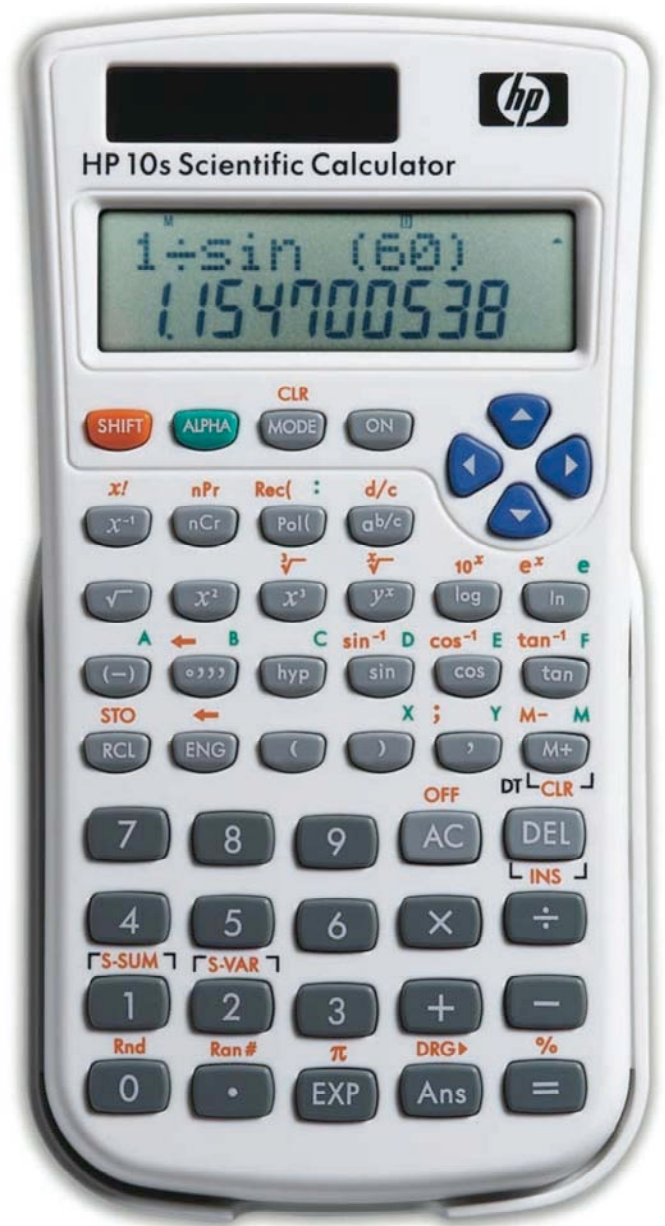


hp calculators

HP 10s Probability – Random numbers

Random numbers

Practice using random numbers



Random numbers

A truly random number will have no relationship to any number that came before it or that comes after it. Random numbers are used in computers all the time for simulations and games. In these circumstances, however, the numbers are usually generated according to an iterative pseudo-random relationship that gives the appearance of randomness.

On the HP 10s, random numbers are generated by pressing $\text{[SHIFT] [Ran #] [=]}$. The HP 10s will generate a 3 digit decimal number between 0.000 and 0.999. For all practical purposes, these values can be treated as random numbers.

Given the way the HP 10s generates random numbers, it is highly unlikely that you will see the exact sequence of random numbers as are shown in the examples below. This is not an error. These examples are for illustrative purposes only.

Practice using random numbers

Example 1: Suppose you convince a friend to play a game using random numbers on your HP 10s where if the random number is below 0.5, you will pay him \$1, but if the random number is above 0.5, he will pay you \$1. Play the game for 10 rounds. How much have you won or lost?

Solution:

$\text{[SHIFT] [Ran #] [=]}$	0.318 (Lost)
$\text{[SHIFT] [Ran #] [=]}$	0.675 (Won)
$\text{[SHIFT] [Ran #] [=]}$	0.032 (Lost)
$\text{[SHIFT] [Ran #] [=]}$	0.016 (Lost)
$\text{[SHIFT] [Ran #] [=]}$	0.373 (Lost)
$\text{[SHIFT] [Ran #] [=]}$	0.357 (Lost)
$\text{[SHIFT] [Ran #] [=]}$	0.714 (Won)
$\text{[SHIFT] [Ran #] [=]}$	0.698 (Won)
$\text{[SHIFT] [Ran #] [=]}$	0.055 (Lost)
$\text{[SHIFT] [Ran #] [=]}$	0.412 (Lost)

Answer: After 10 tries at this “game”, you have won \$3 but lost \$7. You are \$4 worse off than if you had never decided to play.


Example 2: Find the average of the next 20 random numbers on the HP 10s. What is the value you expect? What value do you actually see?

Solution: Place the HP 10s into average/standard deviation mode: [MODE] [2] [=]

$\text{[SHIFT] [Ran #] [=]}$	0.394	[M+]	$\text{[SHIFT] [Ran #] [=]}$	0.932	[M+]
$\text{[SHIFT] [Ran #] [=]}$	0.497	[M+]	$\text{[SHIFT] [Ran #] [=]}$	0.035	[M+]
$\text{[SHIFT] [Ran #] [=]}$	0.092	[M+]	$\text{[SHIFT] [Ran #] [=]}$	0.392	[M+]
$\text{[SHIFT] [Ran #] [=]}$	0.195	[M+]	$\text{[SHIFT] [Ran #] [=]}$	0.495	[M+]
$\text{[SHIFT] [Ran #] [=]}$	0.552	[M+]	$\text{[SHIFT] [Ran #] [=]}$	0.852	[M+]
$\text{[SHIFT] [Ran #] [=]}$	0.655	[M+]	$\text{[SHIFT] [Ran #] [=]}$	0.955	[M+]
$\text{[SHIFT] [Ran #] [=]}$	0.012	[M+]	$\text{[SHIFT] [Ran #] [=]}$	0.312	[M+]
$\text{[SHIFT] [Ran #] [=]}$	0.115	[M+]	$\text{[SHIFT] [Ran #] [=]}$	0.415	[M+]
$\text{[SHIFT] [Ran #] [=]}$	0.472	[M+]	$\text{[SHIFT] [Ran #] [=]}$	0.772	[M+]
$\text{[SHIFT] [Ran #] [=]}$	0.575	[M+]	$\text{[SHIFT] [Ran #] [=]}$	0.875	[M+]

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Answer: The expectation would be 0.500. We actually get  0.5225.
