

TI-83/84 How To Series

Topic: Factorials, Permutations and Combinations

Used in probability, the TI-83/84 helps you solve for factorials, permutations and combinations.

Let's take each separately.

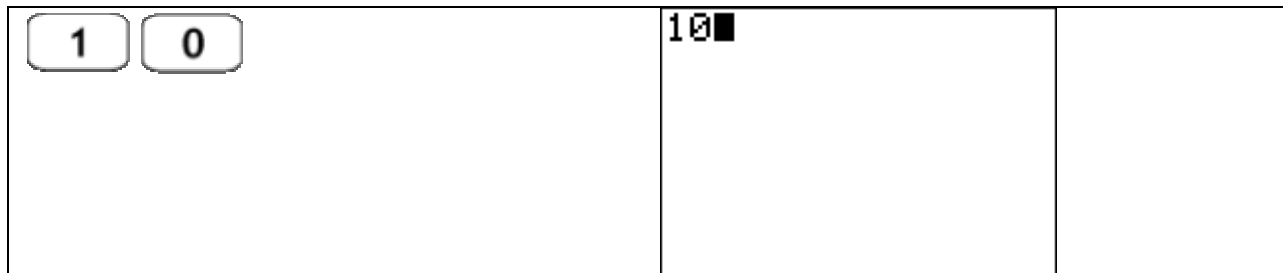
Factorials

Factorials are written as $x!$, where x can be any number. For example, if we want to find the factorial of 4 we would write $4!$ and the solution would be $4 \times 3 \times 2 \times 1 = 24$. Similarly, the factorial of 10 is written as $10!$ and the solution would be $10 \times 9 \times 8 \times 7 \times \dots \times 1 = 3628800$.

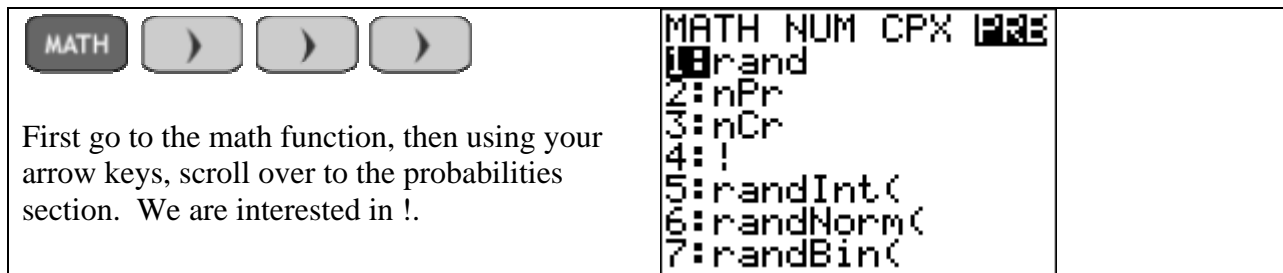
Let's try this on the calculator.

Steps

1. Solving for 10 factorial ($10!$). Enter 10 into the calculator.



2. Go to the factorial function of the calculator.



3. Select factorial (!), then solve.

<p>4 ENTER</p>	<p>10! █ 3628800</p>	
<p>That's it.</p>		

Permutations

Permutations are “a selection of objects in which the order of the objects matters” (<http://www.mathwords.com/p/permutation.htm>). Let's take a look at an example.

In how many different ways can you arrange the letters CAT.

CAT ACT CTA TCA TAC ATC 6 ways

The permutation formula helps us solve for this situation. We have a 3 letters and want to arrange all 3 letters into as many ways as possible. The permutation formula is given by:

$${}_n P_k = \frac{n!}{(n-k)!} \quad \text{where: } n = \text{the total set}$$

k = number of objects

In our case the total set is the number of letters (3) and the number of objects is how many ways we want to arrange them (3).

Therefore:

$${}_3 P_3 = \frac{3!}{(3-3)!} = 6 \quad \text{Note: } 0! = 1$$


Let's try an example on the calculator.

How many ways can 4 students from a group of 15 be lined up for a photograph?


In this case n = 15 and k = 4.

Steps


1. Enter in the n value first (15)

	15	
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2. Select probability functions from the calculator


	<pre>MATH NUM CPX PRB 1:rand 2:nPr 3:nCr 4:! 5:randInt(6:randNorm(7:randBin(</pre>	
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3. Select permutation

	15 nPr	
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4. Enter in the k value (4) and solve

	15 nPr 4	
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	15 nPr 4 32760 █	
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Solving by hand:

$${}_{14}P_4 = \frac{15!}{(15-4)!} = \frac{15!}{11!} = 32760$$

Combinations

Combinations are “a selection of objects from a collection. Order is irrelevant.”

(<http://www.mathwords.com/c/combination.htm>).

In permutations, the order is important. Therefore, CAT is not the same as ACT. In combinations the opposite is true, order does matter.

For example, let’s take ABCD. The different combinations of 3 letters are;

ABC ABD ACD BCD only 4

Notice how we did not count CBA because those letters had already been used.

We can represent this by the equation:

$${}_n C_r = \frac{n!}{r!(n-r)!} \quad \text{where: } n = \text{total number of objects}$$

r = objects from the set

In the example above n = 4 and r = 3.

Putting into the formula:

$${}_4 C_3 = \frac{4!}{3!(4-3)!} = \frac{4!}{3!(1!)} = 4$$

Let’s try an example on the calculator.

How many different committees of 4 students can be chosen from a group of 15?

In this case $n = 15$ and $r = 4$

Steps

1. Enter in the n value first (15)

<input type="text" value="1"/> <input type="text" value="5"/>	15	
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2. Select probability functions from the calculator

<input type="button" value="MATH"/> <input type="button" value=">"/> <input type="button" value=">"/> <input type="button" value=">"/>	MATH NUM CPX <input type="button" value="2nd"/> 1:rand 2:nPr 3:nCr 4:! 5:randInt(6:randNorm(7:randBin(<input type="button" value="2nd"/>	
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3. Select combination

<input type="text" value="3"/>	15 nCr	
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4. Enter in the r value of 4 and solve

<input type="text" value="4"/>	15 nCr 4	
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ENTER	15 nCr 4 1365	
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Solving by hand:

$${}_{15}C_4 = \frac{15!}{4!(15-4)!} = \frac{15!}{4!(11!)} = 1365$$