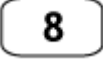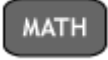# Counting Formulas in TI-83/84

When calculating probabilities for scenarios with large sample size, counting techniques are employed. These methods use factorials, permutations and combination formulas.

Factorials

$$8! = 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$$

To calculate factorials in the calculator without typing this expression into the calculator by hand, first press the number in front of the factorial (the exclamation point) which is an

[8] here, then press [MATH] , scroll over to the **PRB** or **PROB** menu, and select **4: !** and
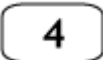
[ENTER] to calculate.
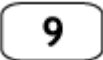
```
MATH NUM CMPLX PROB FRAC
1:rand
2:nPr
3:nCr
4:!
5:randInt(
6:randNorm(
7:randBin(
8:randIntNoRep(
```

....40320.

Permutations

Permutations have a number of related notations. The TI calculator uses nPr, where n is the number of items in the set we are selecting from, and r is the number of items being selected. Recall that permutations are employed when order matters, but repetition is not allow.

Suppose that we want to select 9 batters from a baseball team with 14 members to start the same. Since order matters, and batters cannot bat twice in the same line-up, this is a permutation problem. We need to calculate the value of $14P9$. We could use the formula

$nPr = \frac{n!}{(n-r)!}$, or we can use the permutation calculator in the TI. To do this, type [1]

[4] , then press [MATH] and scroll over to **PRB** or **PROB**, and select **2: nPr**. Then press

[9] and [ENTER] to calculate.

```
MATH NUM CMPLX PROB FRAC
1:rand
2:nPr                          ₁₄P₉
3:nCr
4:!                            .....................................726485760.
5:randInt(                     ■
6:randNorm(
7:randBin(
8:randIntNoRep(
```

Combinations

Combinations have a number of related notations. While $\binom{n}{r}$ is the most common, the TI calculator uses nCr, where n is the number of items in the set we are selecting from, and r is the number of items being selected, for consistency with the permutations notation. Recall that combinations are employed when order matters, but repetition is not allow.

Suppose that we want to select a poker hand of 5 cards from a standard deck. Since order does not matter, and we cannot get the same card twice, this is a combination problem. We need to calculate the value of $\binom{52}{5} = 52C5$. We could use the formula $nCr = \frac{n!}{r!(n-r)!}$, or we can use the combination calculator in the TI. To do this, type [5] [2] , then press [MATH] and scroll over to **PRB** or **PROB**, and select **3: nCr**. Then press [5] and [ENTER] to calculate.

```
MATH NUM CMPLX PROB FRAC
1:rand
2:nPr                          ₅₂C₅
3:nCr
4:!                            .....................................2598960.
5:randInt(                     ■
6:randNorm(
7:randBin(
8:randIntNoRep(
```