Warmup: More FCP (Fundamental Counting Principle)

(*for warmups from now on, we'll be submitting to BB. So, either start up a blank word Doc, or use scrap paper. There's a folder in BB for you to submit to*).

Near the end of class last time, one of your awesome classmates asked about 10-digit PINs (**P**ersonal **I**dentification **N**umbers). If you recall, we had already talked about 4- and 6- digit PINs, and how long it would take to crack into, say, a phone protected by one. You all agreed that more digits in a PIN was more secure, so let's explore that now!

Below this, I've given you two mathematical expressions. First, figure out what they're equal to! Use technology for either one, for sure, if you like.

10^{10} $10!$

1. (**1 point**) Which of those numbers up there would be the answer to the question "How many possible 10-digit PINs are there where
    a. each digit can be 0,1,2,3,4,5,6,7,8, or 9 and
    b. all digits are ***distinct***?

2. (**1 point**) What's the ***other*** number giving you the number of?

3. (**1 point**) How many PINs in 4 have *at least one pair* of repeated numbers somewhere in the ten digits? As an example, **3745127890** has a repeated "7". Hint: you don't need to do a bunch of new math! You've done the heavy lifting already in 3 and 4. ☺

4. (**2 points**) Suppose you need to protect something with a 10-digit PIN. In making up your PIN, would you choose to repeat a digit somewhere in the PIN, or make all 10 digits distinct? Explain your choice!