

30  
30 points

Michelle Kou will probably do  
well on this quiz

Per: 6

Where applicable, express your answers in permutation, combination, and/or factorial notation. No need to evaluate to a number.

1. Mr. Hahn wants to proudly display his video game collection on the shelf above his computer. He owns 3 shooter games, 5 strategy games, and 2 catch-monsters-and-have-them-fight-other-monsters games. How many ways can he line them up if...[2 each] *the games are distinguishable.*

- a. There are no restrictions?

$$\boxed{10!}$$

- b. He only has room on the shelf for 5 games?

$$\boxed{10 \cdot 9 \cdot 8 \cdot 7 \cdot 6} \cdot {}_{10}P_5$$

- c. He has room for all 10, but wants to keep the games of the same genre together?

$$\boxed{3! \cdot 3! \cdot 5! \cdot 2!}$$

2. ATM codes consists of 4 digits (0 – 9 are possible. It MAY start with 0, and repetition is allowed). [1 each]

- a. How many different ATM codes are possible?  $\boxed{10^4}$

- b. How many different ATM codes without using a "6"?  $\boxed{9^4}$

- c. How many ATM codes contain at least 1 "6"?  $\boxed{10^4 - 9^4}$

- d. How many ATM codes contain exactly 2 6's?  $\boxed{\binom{4}{2} 9^2}$

$$\boxed{6 \quad 6} \quad \boxed{6 \quad 6} \quad \boxed{6 \quad 6} \quad \boxed{6 \quad 6}$$

3. Coach K wants to split his 10 basketball players into two teams of 5. Intuitively he thinks that there are "10 Choose 5" ways of doing this. Unfortunately he is wrong.

- a. Explain the error in his thinking. [1]

He is double-counting because for example, the players are numbered  
1 2 3 4 5 6 7 8 9 10.

choosing the five players 1, 2, 3, 4, 5 to create one team is counted &  
choosing the 5 players 6, 7, 8, 9, 10 is also counted both both of these result in the  
same teams.

- b. How many ways can Coach K split his 10 players into two teams of 5? [1]

$$\boxed{\frac{\binom{10}{5}}{2}}$$

*10*

4. Mrs. Tantod is coaching a baseball team with 15 players on the roster. [2 each]

a. How many ways can she pick the 9 players to start the game (without determining positions)?

$$\boxed{\binom{15}{9}}.$$

b. Once the starters have been selected, how many ways can she put the 9 starters into a batting order?

$$\boxed{9!}.$$

c. After the game, all 15 players form a circle around Mrs. Tantod to hear her inspiring post-game speech. How many ways are there for the players to stand in a circle such that Leia and her twin Luke are NOT next to each other?

$$\frac{15!}{15} \text{ ways} \quad \text{Leia \& Luke next to each other} \quad \boxed{14! - 13! \cdot 2}$$

5. Out of a standard deck of 52 cards, you draw a random hand of 6 cards. What is the probability that you get... [2 each]

a. 4 Jacks?

$$\frac{1 \cdot \binom{48}{2}}{\binom{52}{6}} = \boxed{\frac{\binom{48}{2}}{\binom{52}{6}}}.$$

b. 3 of one value, and 3 of another?

$$\boxed{\frac{\binom{13}{2} \binom{4}{3} \binom{4}{3}}{\binom{52}{6}}}.$$

c. 2 of one value, and 4 of another? JT QQQQ

$$\boxed{\frac{\binom{13}{1} \binom{4}{2} \binom{12}{1}}{\binom{52}{6}}}.$$

6. If you randomly select a 5-digit number (In 5-digit numbers, the 1<sup>st</sup> digit cannot be 0), what is the probability that your number will contain only odd digits? [2]

$$\begin{array}{l} \text{total: } 9 \cdot 10^4 \\ \text{only odd: } 5^5 \end{array} \quad \overline{1} \overline{3} \overline{5} \overline{7} \overline{9} \quad \overline{1} \overline{3} \overline{5} \overline{7} \overline{9} \quad \boxed{\frac{5^5}{9 \cdot 10^4}}.$$

7. Given the letters of the word PREMONITION (11 letters in the word, with 2 O's, 2 N's, and 2 I's)... [2 each]

a. How many ways can I rearrange the letters to create a distinct sequence of letters?

$$\boxed{\frac{11!}{2!2!2!}}.$$

b. How many of the ways from (a) have the letters PRE together (but not necessarily in order)?

$$\begin{array}{ccccccc} \text{(PRE)} & M & O & N & I & T & \\ & & O & N & I & & \end{array} \quad \boxed{\frac{9!3!}{2!2!2!1!}}$$

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