Math 10B, Quiz 4

1. (12 points) A coffee shop sells five sizes of coffee. How many ways are there to order 10 coffees? Make sure to clearly explain your answer.

2. (1 point) There are more ways to put 10 distinguishable balls into 5 indistinguishable boxes so that each box has at most one ball than there are to put 5 distinguishable balls into 5 indistinguishable boxes so that each box has at most one ball. ○ True   ○ False

3. (1 point) Recall that $S(n, k)$ is the number of ways to put n distinguishable balls into k indistinguishable boxes when every box must have at least one ball. True or false: $S(n+1, k+1) = S(n, k+1) + kS(n, k)$. (It is not necessary to remember the formula from class to solve this problem. Try doing small examples, thinking about what each term means combinatorially, etc.)

   ○ True   ○ False

4. (1 point) On an exam, a question asks whether the following statement is true: "If there are 32 books on a bookshelf and 7 are marked then there must be two marked books with less than three books in between them." The student claims that the statement is true, reasoning as follows: consider the 32 books as objects and the 7 marked books as boxes. Since $\lceil \frac{32}{7} \rceil > 1$, the pigeonhole principle says that there are two marked books with less than 3 books in between.

   ○ The statement is correct and the student's reasoning is valid.

   ○ The statement is correct but the student's reasoning is not valid.

   ○ The statement is not correct and the student's reasoning is not valid.