MATH10282: INTRODUCTION TO STATISTICS
SEMESTER 2
SOLUTIONS TO QUIZ PROBLEM 3

Suppose that $X_1, \ldots, X_n$ is a random sample from a binomial distribution with parameters m and p, where $m > n$. Then

$$\begin{aligned}
\Pr(X_1 = 1, X_2 = 2, \ldots, X_n = n) &= \Pr(X_1 = 1)\Pr(X_2 = 2)\cdots\Pr(X_n = n) \\
&= \prod_{i=1}^{n} \Pr(X_i = i) \\
&= \prod_{i=1}^{n} \binom{m}{i} p^i (1-p)^{m-i} \\
&= \left[\prod_{i=1}^{n} \binom{m}{i}\right] p^{\sum_{i=1}^{n} i} (1-p)^{\sum_{i=1}^{n}(m-i)} \\
&= \left[\prod_{i=1}^{n} \binom{m}{i}\right] p^{\frac{n(n+1)}{2}} (1-p)^{mn - \sum_{i=1}^{n} i} \\
&= \left[\prod_{i=1}^{n} \binom{m}{i}\right] p^{\frac{n(n+1)}{2}} (1-p)^{mn - \frac{n(n+1)}{2}} \\
&= \left[\prod_{i=1}^{n} \binom{m}{i}\right] \left(\frac{p}{1-p}\right)^{\frac{n(n+1)}{2}} (1-p)^{mn}.
\end{aligned}$$

So, the correct answer is d).