1. **10 points** A box has balls labelled $B_1$ through $B_{20}$. Pick three balls. Let $X$ be the number of the middle ball. In other words, if we pick balls $B_5$, $B_3$ and $B_{17}$, we order them and the middle ball is $B_5$, so $X = 5$.

   (a) **2 points** Verbally describe what it means that $X = 5$.

   (b) **2 points** Find $P\{X = 5\}$.

   (c) **2 points** Find $P\{X = 9\}$.

   (d) **2 points** Find the possible values of $X$.

   (e) **2 points** Find the probability mass function of $X$; i.e., find $P\{X = n\}$. 
1. (a) There is one ball among \( \{B_1, B_2 \ldots B_4\} \), we picked \( B_5 \), and there is one ball among \( \{B_5 \ldots B_{20}\} \).

(b) \( 4 \times (20 - 5)/\binom{20}{3} \).

(c) \( 8 \times (20 - 9)/\binom{20}{3} \).

(d) \( \{2, 3 \ldots 19\} \).

(e) 
\[
p_X(n) = \begin{cases} 
\frac{(n-1)(20-n)}{\binom{20}{3}} & \text{if } n \in \{2, 3 \ldots 19\} \\
0 & \text{else}
\end{cases}
\]