1. \[ 2y = x + 4 \]
   \[ 3y = x + 5 \]

2. \[
\begin{align*}
    & \text{Let } x = \# \text{ balcony tickets} \\
    & y = \# \text{ main floor tickets} \\
    & \{ x + y \geq 2700 \\
    & 15x + 35y \geq 55000, \quad x \geq 0, \quad y \geq 0
\end{align*}
\]

3. First, find the feasible region and find all corner points.
   Second, evaluate \( A \) at corner points.
   \[
   A = 3x + 2y \\
   A(4,4) = 8 \\
   A(3,1) = 33 + 21 = 54 \\
   A(6,0) = 18 \\
   \therefore \text{max } A = A(4,4) = 8
\]

4. \[
\begin{align*}
    & \text{Let } x = \# \text{ desk lamps made} \\
    & y = \# \text{ floor lamps made} \\
    & \{ 0.8x + 1.2y \leq 1440 \\
    & 4x + 3.5y \leq 5600, \quad x \geq 0, \quad y \geq 0
\end{align*}
\]
   Maximize \( P = 5x + 6y \)
   \[
   \begin{align*}
   & (0,1200); \quad P = 7200 \\
   & (840,640); \quad P = 4800 + 3840 = 8640 \\
   & (1400,0); \quad P = 7000 \\
   \therefore \text{Max } P = P(840,640) = 8640
\end{align*}
\]

5. \[
\begin{align*}
    & x + y + z \leq 70 \\
    & 230x + 330y + 120z \leq 22000, \quad x \geq 0, y \geq 0, z \geq 0
\end{align*}
\]
   Maximize \( P = 60x + 80y + 35z \)

6. \[
\begin{align*}
    & A = \{ 2, 4, 6, 8, 10 \} \\
    & B = \{ 2, 5, 8, 11 \} \\
    & A \cap B = \{ 2, 8 \} \\
    & A' \cap B' = (A \cup B)' = \{ 1, 3, 7, 9 \}
\end{align*}
\]

7. \[
\begin{align*}
    & n(A \cup B) = n(A) + n(B) - n(A \cap B) \\
    & 26 = 13 + n(B) - 7 \\
    \therefore n(B) = 20
\end{align*}
\]

8. \[
\begin{align*}
    & (a) 5 \cdot 4 \cdot 3 = 60 \\
    & (b) 5 \cdot 5 \cdot 5 = 125 \\
    & (c) 5 \cdot 5 \cdot 3 = 75
\end{align*}
\]

9. \[
\begin{align*}
    & 4 \cdot 3 \cdot 2 \cdot 1 = 24 \\
    & 2 \cdot 2 \cdot 2 = 8 \\
\end{align*}
\]
   \# ways to order \# ways within each couple = 384 ways.

10. \[
\begin{array}{cccc}
    1 & 1 & 1 & 211 \\
    1 & 1 & 2 & 213 \\
    1 & 1 & 3 & 231 \\
    1 & 2 & 1 & 311 \\
    1 & 2 & 2 & 312 \\
    1 & 3 & 1 & 321 \\
    1 & 3 & 2 & 321
\end{array}
\]
   \# ways = 13 ways.