**Determination of Expected Profit for Newsboy for Uniform Demand**

Assume that demand is from a uniform distribution from interval \([1, 100]\)

\(\Pi(Q)\) is the expected profit for the newsboy from ordering \(Q\) units.

\(\Pr[D = j]\) denotes the probability that the demand equals \(j\), for some given value of \(j\).

\[
\Pi(Q) = \sum_{j=1}^{Q} \Pr[D = j] \times (pj + s(Q - j)) + \sum_{j=Q+1}^{100} \Pr[D = j] \times (pQ - cQ)
\]

**Explanation:**
- The first summation is over the demand realizations that are less than the order quantity \(Q\); if demand equals \(j\) and if \(j < Q\), then the newsboy will sell \(j\) units at price \(p\) and salvage \((Q-j)\) units at \(s\).
- The second summation is over the demand realizations that are more than the order quantity \(Q\); in these cases, the newsboy can only sell \(Q\) units at price \(p\).
- The last term is what the newsboy pays for ordering \(Q\) units.

If demand is from a uniform distribution from interval \([1, 100]\), then \(\Pr[D = j] = \frac{1}{100}\) for all values of \(j=1,2,...,100\).

We can approximate \(\Pi(Q)\) by assuming that demand is from a continuous distribution, uniformly distributed over the interval \((0, 100)\):

\[
\Pi(Q) = \int_{x=0}^{x=Q} \frac{px + s(Q - x)}{100} dx + \int_{x=Q}^{x=100} \frac{pQ}{100} dx - cQ
\]
\[
= (p - c)Q - (p - s) \frac{Q^2}{100}
\]