Eight boys and eight girls are randomly seated at a round table. What is the expected number of boys that are seated between two girls?

Solution: Let X_i be the indicator random variable for the event "boy *i* is seated between two girls", and L_i , R_i be the events "the person to the left, right of boy *i* is a girl". By the multiplication rule:

$$P(X_i = 1) = P(L_i) P(R_i | L_i) = \frac{8}{15} \cdot \frac{7}{14} = \frac{4}{15}.$$

Therefore $E[X_i]$ is also 4/15 for all *i*. By linearity of expectation, the expected number of boys seated between two girls is

$$E[X_1 + \dots + X_8] = E[X_1] + \dots + E[X_8] = 8 \cdot \frac{4}{15} = \frac{32}{15}.$$