

1. **Problem**

An industry-leading company seeks a qualified candidate for a management position. A management consultancy carries out an assessment center which concludes in making a positive or negative recommendation for each candidate: From previous assessments they know that of those candidates that are actually eligible for the position (event E) 74% get a positive recommendation (event R). However, out of those candidates that are not eligible 73% get a negative recommendation. Overall, they know that only 13% of all job applicants are actually eligible.

What is the corresponding fourfold table of the joint probabilities? (Specify all entries in percent.)

- (a) $P(E \cap R)$
- (b) $P(\bar{E} \cap R)$
- (c) $P(E \cap \bar{R})$
- (d) $P(\bar{E} \cap \bar{R})$

Solution

Using the information from the text, we can directly calculate the following joint probabilities:

$$\begin{aligned} P(E \cap R) &= P(R|E) \cdot P(E) = 0.74 \cdot 0.13 = 0.0962 = 9.62\% \\ P(\bar{E} \cap \bar{R}) &= P(\bar{R}|\bar{E}) \cdot P(\bar{E}) = 0.73 \cdot 0.87 = 0.6351 = 63.51\%. \end{aligned}$$

The remaining probabilities can then be found by calculating sums and differences in the fourfold table:

	R	\bar{R}	sum
E	9.62	3.38	13.00
\bar{E}	23.49	63.51	87.00
sum	33.11	66.89	100.00

- (a) $P(E \cap R) = 9.62\%$
- (b) $P(\bar{E} \cap R) = 23.49\%$
- (c) $P(E \cap \bar{R}) = 3.38\%$
- (d) $P(\bar{E} \cap \bar{R}) = 63.51\%$