

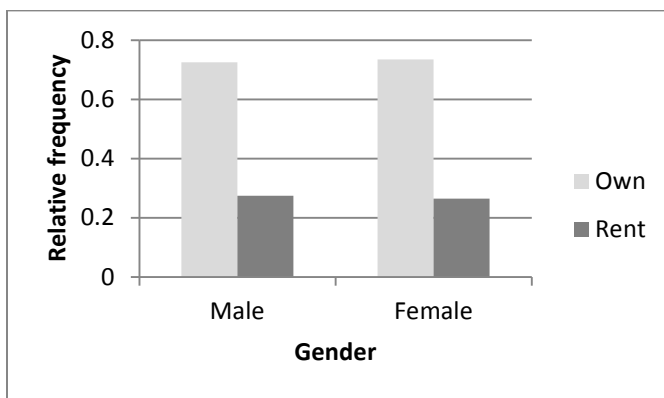
Chapter 1 FRAPPY! Scoring Guidelines

Intent of the question The primary goals of this question are to assess a student's ability to: (1) calculate one value in a conditional distribution; (2) make an appropriate graph to compare two conditional distributions; (3) describe the relationship between two categorical variables; (4) justify when one relationship is stronger than another relationship.

Model Solution

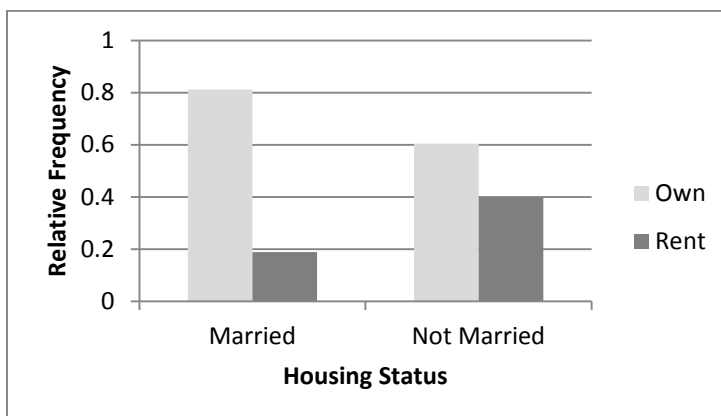
(a) $132/182 = 0.725 = 72.5\%$

(b) For females, $122/166 = 73.5\%$ own their own home. A graph is shown below.



(c) There doesn't seem to be much of an association between gender and housing status. The percentage of each gender that owns their home is roughly the same, although it is slightly higher for females (73.5% vs. 72.5%). Knowing a person's gender provides very little additional information about their housing status.

(d) A graph of housing status for married and not married respondents is shown below. Because the percent of married respondents who own their home ($172/212 = 81.1\%$) is quite a bit larger than the percent of not married respondents ($82/136 = 60.3\%$), there seems to be an association between marital status and housing status. This association is stronger than the association between gender and housing status because the difference in percents who own a home is greater for marital status ($81.1\% - 60.3\% = 20.8\%$) than for gender ($73.5\% - 72.5\% = 1\%$).



Scoring

Parts (a), (b), (c), and (d) are scored essentially correct (E), partially correct (P), or incorrect (I).

Part (a) is scored as follows

Essentially correct (E) if the response correctly calculates the percentage of males that own their home and shows work.

Partially correct (P) if the response correctly calculates the percentage of males that own their home but does not show work

OR

Shows work and uses 132 in the numerator but uses either 254 or 348 in the denominator.

Incorrect (I) otherwise.

Part (b) is scored as follows

Essentially correct (E) if the response includes an appropriate type of graph (bar graph, segmented bar graph, pie chart) that

- Is reasonably accurate
- Includes proper labels
- Makes it easy to compare the conditional distribution of housing status for each gender (e.g., uses relative frequency for both distributions)

Partially correct (P) if the response includes an appropriate type of graph (bar graph, segmented bar graph, pie chart) that has exactly 2 of the required features listed above.

Incorrect (I) if the response includes an appropriate type of graph (bar graph, segmented bar graph, pie chart) that has 0 or 1 of the required features listed above

OR

is not an appropriate type of graph (e.g., boxplot)

Part (c) is scored as follows

Essentially correct (E) if the response correctly compares appropriate conditional distributions and concludes that there is no association or a very weak association because the distributions are so similar.

Partially correct (P) if the response correctly states that there is no association or a weak association but does not explain that the conditional distributions are very similar

OR

the response states that there is an association because the frequencies (or relative frequencies) for the two genders are different

Incorrect (I) if the response doesn't compare appropriate conditional distributions

Note: A response that only states that both genders are more likely to own than rent does not sufficiently describe the distributions as "very similar" and should be scored partially correct (P).

Part (d) is scored as follows

Essentially correct (E) if the response says that the association between marital status and housing status is stronger and

- Describes the association between marital status and housing status using numerical or graphical evidence (e.g., 81% of marrieds own vs. only 60% of non-marrieds).
- Compares the two associations using numerical or graphical evidence (e.g., the difference in percent owning is much larger for married and not married than the difference for male and female).

Partially correct (P) if the response says that the association between marital status and housing status is stronger and has exactly 1 of the required components listed above.

Incorrect (I) otherwise.

Each essentially correct (E) part counts as 1 point. Each partially correct (P) part counts as $\frac{1}{2}$ point. If a response is between two scores (for example, $2\frac{1}{2}$ points), use a holistic approach to decide whether to score up or down, depending on the overall strength of the response and communication, particularly in parts (a) and (d). However, a response that earns a P in part (d) cannot receive a 4.

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|---|----------------------|
| 4 | Complete Response |
| 3 | Substantial Response |
| 2 | Developing Response |
| 1 | Minimal Response |