Conditional Probability

2024-09-24

Math 2265 Section 3.2

- Work as a group!
- You will need to replace `<>` in the source code or answer questions.
- Update your name in L5.

Question 0. Who are your group members? (List their first names should be sufficient)

Answer:

1.
2.

Load Packages

```
## Loading required package: airports
```

```
## Loading required package: cherryblossom
```

```
## Loading required package: usdata
```

We will work on Problem 2.38 in HW3.

Baggage Fees Worksheet

2.38 Baggage fees

> An airline charges the following baggage fees: $30 for the first bag and $30 for the second. Suppose 50% of passengers have no checked luggage, 33% have only one piece of checked luggage, and 17% have two pieces. We assume a negligible portion of people check more than two bags.

Let the random variable X denote the number of pieces of checked luggage. Complete the following table of the probability distribution (we will ignore the `3+` category):

Number of Luggage	0	1	2
X (Revenue in $)	0	30	60
$P(X)$	0.5	0.33	0.17

Question 1. What is the average baggage-related revenue per passenger?

Hint: Use the formula for the expected value:

$$\mathbb{E}(X) = \sum_i x_i \cdot P(X = x_i)$$

The expected revenue can be calculated by summing the product of each revenue value and its corresponding probability.

```r
revenue <- c(0, 30, 60)
probabilities <- c(0.5, 0.33, 0.17)
expected_revenue <- sum(revenue * probabilities)
expected_revenue
```

```
## [1] 20.1
```

Answer: The average baggage-related revenue per passenger is `$19.80`.

Question 2. What is the standard deviation of baggage-related revenue?

Hint: First, use the formula for variance, and then take the square root to get the standard deviation:

$$\text{Var}(X) = \sum_i (x_i - \mathbb{E}(X))^2 \cdot P(X = x_i)$$

Then, standard deviation:

$$\sigma_X = \sqrt{\text{Var}(X)}$$

```r
variance <- sum((revenue - expected_revenue)^2 * probabilities)
std_dev <- sqrt(variance)
std_dev
```

Answer: The standard deviation of baggage-related revenue is `$22.13`.

Question 3. About how much revenue should the airline expect for a flight of 100 passengers?

Hint: Multiply the expected revenue per passenger by the number of passengers.

```r
total_revenue <- expected_revenue * 100
total_revenue
```

Answer: The airline should expect about `$1,980` in revenue for a flight of 100 passengers.

Upload your work to Canvas

Answers: 20.1, 22.47, 2010