

8.4 Histograms
Application
UNIT: MANAGING CREDIT & FUNDAMENTALS OF STATISTICS

# Name:

# **APPLICATION:** Representing Data on Student Loans, Housing, and High-Cost Lenders

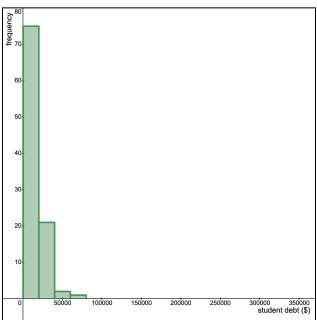
#### Level 1

## Federal Student Loan Balance by Age

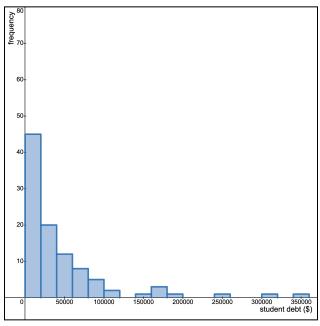
Let's use histograms to analyze student loan balances for different age groups.

The histograms below show the student loan balances of borrowers under 25 and borrowers aged 35-49. Both histograms pull a representative sample of 100 borrowers using data from <u>Federal Student Aid</u>.

#### Student Debt for Borrowers <25 Years Old



#### **Student Debt for Borrowers 35-49 Years Old**



- Summarize: How does student loan debt compare for borrowers aged 35-49 and borrowers below 25?
- 2. For each of the following statements, respond true, false, or can't be determined. Then, write one sentence using math vocabulary and/or numbers to support your response.
  - a. The median student debt is higher for borrowers aged 35-49 than borrowers under 25.
  - b. The standard deviation of student debt for borrowers under 25 is higher than the standard deviation of student debt for borrowers aged 35-49.

- c. There was one borrower aged 35-49 with a loan balance of exactly \$300,000.
- d. For borrowers aged 35 49, the mean loan balance is greater than the median loan balance.
- 3. Make an inference: Why is the mean student debt higher for borrowers aged 34-49 year olds than for borrowers under 25?
- 4. Challenge: Write your own statement about the data sets and identify it as true, false, or unanswerable.

#### Level 2

## **Part 1: Representing and Comparing Housing Costs**

Let's use data analysis to look at the cost of housing in different states. We're going to compare the monthly costs of renting and owning a home in Michigan and California, using a representative sample from the US Census' 2020 <u>American Community Survey</u>.

## **ACTIVITY: Card Sort: Histograms and Box Plots**

1. Match each histogram to the corresponding box plot. Record two of your matches below and write one sentence explaining your reasoning using numbers and/or math vocabulary.

a. Histogram \_\_\_\_\_ matches with boxplot \_\_\_\_\_.
Explanation:

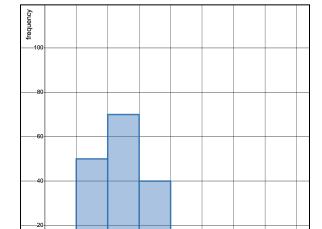
b. Histogram \_\_\_\_\_ matches with boxplot \_\_\_\_\_.Explanation:

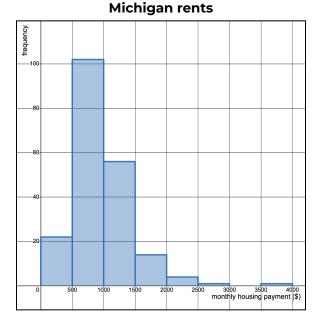
monthly housing payment (\$)

Two of the histograms from the Card Sort are shown below. They represent the distribution of monthly mortgage costs in Michigan, compared to monthly rent costs in Michigan.

Michigan mortgages

Michigan rents





- 2. For each of the following statements, respond true, false, or can't be determined. Then, write one sentence using math vocabulary and/or numbers to support your response.
  - a. The average (mean) mortgage is higher than the median mortgage in Michigan.

	b.	The standard deviation of Michigan mortgages is higher than the standard deviation of Michigan rents.
	C.	There were 50 people surveyed with a monthly mortgage payment of \$750.
	d.	The median Michigan rent is between \$500 and \$1000.
	e.	The median rent is higher than the median mortgage in Michigan.
5.	Challe	nge: Write your own statement about the data sets and identify it as true, false, or

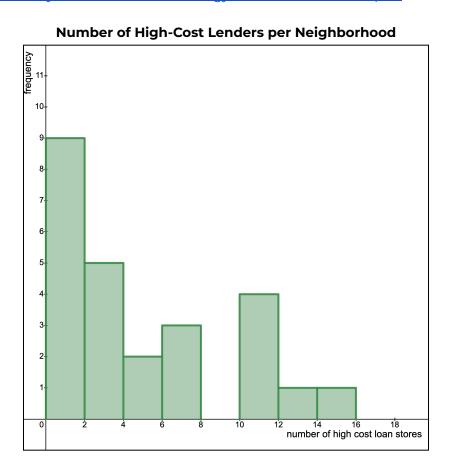
unanswerable.

# Level 3

## **High Cost Loans**

Payday loans, car title loans, and flex loans are high-cost loans that can trap consumers in debt with effective interest rates as high as 500% APR. Research indicates that high-cost loans are often targeted at communities of color, low-income communities, and people with limited access to other lines of credit.

Let's examine a case study about the city of Memphis, using data on 25 neighborhoods (defined by zip codes) from the <u>Hope Policy Institute and Black Clergy Collaborative of Memphis</u>.



- 1. Estimate: what is the median number of high-cost lenders in a Memphis neighborhood?
- 2. Describe the distribution of the data. Make one observation about high-cost lenders in Memphis

- 3. The table below shows data on the number of high-cost loan stores for each Memphis neighborhood, as well as the median earnings for each neighborhood. Using the data in the table, create two histograms to compare the earnings in neighborhoods with more than 2 high-cost lenders and the earnings in neighborhoods with 2 or fewer high-cost lenders.
  - a. First, create a histogram of the median earnings in neighborhoods with ≤ 2 high-cost lenders
  - b. Next, create a histogram of the median earnings in neighborhoods with > 2 high-cost lenders

Zip code	# of high-cost loan stores	Median earnings
38139	0	\$74,282
38138	0	\$61,263
38135	0	\$40,035
38107	0	\$27,222
38105	0	\$26,555
38108	0	\$21,341
38103	1	\$53,786
38106	1	\$24,384
38126	1	\$14,222
38117	2	\$44,298
38112	2	\$28,504
38125	3	\$36,322
38133	3	\$41,753
38141	3	\$32,414
38114	4	\$20,797
38127	5	\$23,704
38134	6	\$28,873
38104	6	\$37,063
38109	6	\$24,333
38111	11	\$27,690
38122	11	\$30,452
38128	11	\$27,185
38118	11	\$22,967
38115	12	\$26,524
38116	15	\$26,861
City total	114	\$29,776

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neighborhood median earnings

4. Write a paragraph summarizing your findings. How do the two histograms compare? What does that tell you about high-cost lending in Memphis?

In your response, make sure to...

- Include a topic sentence summarizing how the two histograms compare
- Describe a specific measure of center (ie. mean or median of the data)
- Use relevant vocabulary to describe the distribution (ie. the shape or standard deviation)
- Support your reasoning with specific numeric values

5. Ellis calculates that the median of the provided incomes for all 25 neighborhoods is \$27,690. Why is the median they found different than the median given for the city of Memphis?