Part 1: Stem-and-Leaf Plots

Problem 1: House Prices in Tacoma

Stem (hundred thousands)	Leaf (ten thousands)
0	667778999
1	02447778889999
2	0011234445667889
3	00011225

The stem-and-leaf plot above shows house sale prices over the last week in Tacoma. What was the most expensive house sold? Give your answer in dollars

$ [350,000 ✓] [⚲]

Goal: Find the most expensive house sold based on the plot.

1. **Understanding the Plot:**
   - **Stem (Left Column):** Represents the "hundred thousands" place.
   - **Leaf (Right Column):** Represents the "ten thousands" place.

2. **Identify the Highest Value:**
   - Go to the bottom row to find the largest stem. The stem is **3**.
   - Look at the leaves in that row. The largest leaf (furthest right) is **5**.

3. **Calculation:**

$$\text{Total Price} = (\text{Stem} \times 100,000) + (\text{Leaf} \times 10,000)$$

$$\text{Total Price} = 300,000 + 50,000$$

$$\text{Answer} = \boxed{350,000}$$

Problem 2: Maze Times (Creating the Plot)

How long does it take to complete a challenging maze? A group of students solved a challenging maze and recorded the time (in seconds) it took to finish. The data is displayed below:

105	93	76	76	70	53	63	60	66	67
80	76	78	84	78	93	51	82	80	

a) Create a stem-and-leaf plot for this data. It is recommended that you do this first on scratch paper. When you enter the values below, please put your leaves into numerical order, from least to greatest.

```
5 ✓ | 1 ✓  3 ✓
6 ✓ | 0 ✓  3 ✓  6 ✓  7 ✓
7 ✓ | 0 ✓  6 ✓  6 ✓  6 ✓  8 ✓  8 ✓
8 ✓ | 0 ✓  0 ✓  2 ✓  4 ✓
9 ✓ | 3 ✓  3 ✓
10 ✓ | 5 ✓
```

Key: 5 | 1 = 51 ✓

b) Next, we will build a "**frequency table**" that can be used to make a **histogram**. The frequency table will break the data into groups (sometimes called "classes") and displays how many numbers from the data were in each group. Fill out the frequency table below. Hint: Your stem-and-leaf plot above put the data in order for you. Filling out the frequency table below just involves counting!

Class	Frequeny (count)
51 to 61.9	3 ✓
62 to 72.9	4 ✓
73 to 83.9	8 ✓
84 to 94.9	3 ✓
95 to 105.9	1 ✓

Goal: Organize raw time data (in seconds) into a stem-and-leaf plot.

Method:

1. **Identify Stems:** Look at the tens digits of your data (50s, 60s, etc.). These are your stems $(5, 6, 7 \ldots)$.

2. **Identify Leaves:** For each stem, find the ones digit of the corresponding numbers.

3. **Order:** Sort the leaves from smallest to largest.

Step-by-Step Breakdown:

- **Stem 5:** The numbers are $51, 53$. (Leaves: $1, 3$)

- **Stem 6:** The numbers are $60, 63, 66, 67$. (Leaves: $0, 3, 6, 7$)

- **Stem 7:** The numbers are $70, 76, 76, 76, 78, 78$. (Leaves: $0, 6, 6, 6, 8, 8$)

- **Stem 8:** The numbers are $80, 80, 82, 84$. (Leaves: $0, 0, 2, 4$)

- **Stem 9:** The numbers are $93, 93$. (Leaves: $3, 3$)

- **Stem 10:** The number is 105. (Leaf: 5)

Problem 3: Completing a Stem-and-Leaf Plot

Here is a data set:

61	69	51	56	88
66	63	82	61	63
63	56	61	70	53
55	73	66	65	74
62	59	64	73	82
61	56	56	71	67

You are examining the data with a stem-and-leaf plot. Here is the start of the plot. Finish the plot.

```
5 |  13566669
6 |  11112333456679
7 |  01334
8 |  228
```

Goal: Finish the missing row for Stem **8**.

1. **Find the Data:** Look at the grid of raw numbers. Find every number that starts with the digit **8**.

$$\text{Found:} \quad 88, 82, 82$$

2. **Extract the Leaves:** Take the last digit (the "ones" place) from these numbers.

$$\text{Leaves:} \quad 8, 2, 2$$

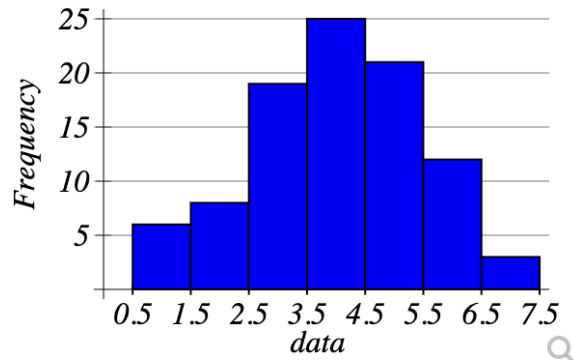3. **Sort the Leaves:** Arrange the numbers from smallest to largest.

$$2, 2, 8$$

4. **Final Answer:** Enter the sequence **228** into the text box next to stem 8.

Part 2: Histograms & Distributions

Problem 4: Determining Distribution Shape (Bell)

Determine the distribution of the data pictured below

○ Uniform

◉ Bell-shaped

○ Skewed-right

○ Skewed-left

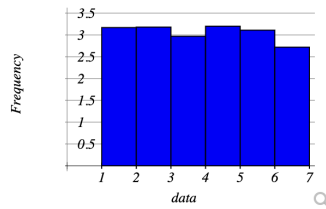**Goal:** Identify the shape of the blue histogram.
Visual Analysis:

- Look at the height of the bars.

- The bars start low on the left side.

- They rise to a peak in the exact center.

- They fall back down on the right side.

- The shape is symmetrical (mirror image).

Conclusion: This specific shape—tall in the middle and tapering off at the sides—is called **Bell-shaped** (or Normal Distribution).
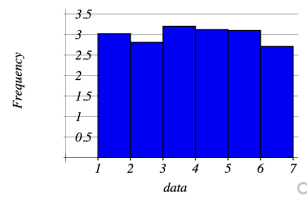
Problem 5 & 6: Determining Distribution Shape (Uniform)

Determine the distribution of the data pictured in the histogram below.

- ◉ Uniform (or *approximately* uniform)
- ○ Bell-shaped (or *approximately* bell-shaped)
- ○ Skewed-right
- ○ Skewed-left

Determine the distribution of the data pictured below

- ◉ Uniform
- ○ Bell-shaped
- ○ Skewed-right
- ○ Skewed-left

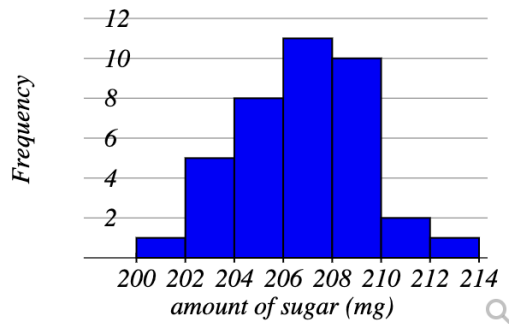**Goal:** Identify the shape of the flat histograms.
Visual Analysis:

- Look at the height of the bars.

- There is no distinct peak or valley.

- All bars are approximately the same height.

- The top of the graph looks like a flat rectangle.

Conclusion: When every outcome happens with roughly the same frequency, the distribution is called **Uniform**.

Problem 7: Sample Size Calculation

Data was collected for a sample of organic snacks. The amount of sugar (in mg) in each snack is summarized in the histogram below.

What is the sample size for this data set?

$n =$ [38] ✓ ⚙

Goal: Find the sample size (n) from the "Amount of Sugar" histogram.

Concept: In a histogram, the **sample size** is the total number of items recorded. You find this by adding up the heights of every single bar.

Calculation:

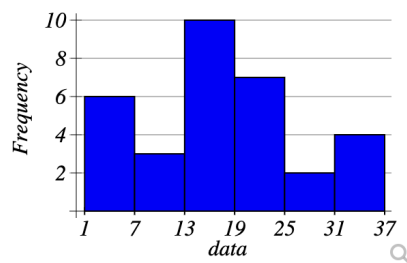1. Read the height (frequency) of each bar from left to right:

$$1, 5, 8, 11, 10, 2, 1$$

2. Sum these numbers:
$$n = 1 + 5 + 8 + 11 + 10 + 2 + 1$$
$$n = \boxed{38}$$

Problem 8: Class Width and Sample Size

Based on the histogram above, what is the class width?

Class width = 6 ✓

What is the sample size?

Sample size = 32 ✓

Question 1: Class Width

- **Definition:** The class width is the distance between the starting point of one bar and the starting point of the next bar.

- **Method:** Look at the x-axis numbers $(1, 7, 13, 19\ldots)$. Subtract the first number from the second number.

$$\text{Width} = 7 - 1 = \boxed{6}$$

Question 2: Sample Size

- **Method:** Add up the heights of all the blue bars to find the total number of data points.

$$\text{Heights: } 6, 3, 10, 7, 2, 4$$
$$\text{Total} = 6 + 3 + 10 + 7 + 2 + 4$$
$$\text{Sample Size} = \boxed{32}$$

Part 3: Frequency Tables

Problem 9: Oliver's Car Survey

Oliver has surveyed their 20 classmates about the number of cars in their household and received the following data:

1	6	1	1	0
5	3	5	4	6
4	6	6	6	6
2	3	5	6	1

Construct a frequency and relative frequency distribution table: (Round relative frequences to 2 decimal places)

Number of cars	Frequency	Relative Frequency
0	1 ✓	0.05 ✓
1	4 ✓	0.20 ✓
2	1 ✓	0.05 ✓
3	2 ✓	0.10 ✓
4	2 ✓	0.10 ✓
5	3 ✓	0.15 ✓
6	7 ✓	0.35 ✓
Total:	20 ✓	1.00 ✓

Construct a histogram:

Goal: Complete the Frequency and Relative Frequency table.

Definitions:

- **Frequency** (f): Just a simple count. How many times does the number appear in the grid?

- **Relative Frequency** (rf): The decimal percentage. Formula: $\frac{\text{Frequency}}{\text{Total}}$.

Total Count (n): There are 20 numbers in the grid.

Cars	Frequency (Count)	Relative Freq ($\frac{f}{20}$)
0	1	$1 \div 20 = \mathbf{0.05}$
1	4	$4 \div 20 = \mathbf{0.20}$
2	1	$1 \div 20 = \mathbf{0.05}$
3	2	$2 \div 20 = \mathbf{0.10}$
4	2	$2 \div 20 = \mathbf{0.10}$
5	3	$3 \div 20 = \mathbf{0.15}$
6	7	$7 \div 20 = \mathbf{0.35}$
Total	**20**	**1.00**

Problem 10: Psychology Test Scores

50 psychology students took a standardized test. The scores are summarized in the GFDT below.

Scores	Frequency
100 - 104	10
105 - 109	7
110 - 114	9
115 - 119	9
120 - 124	15

You would like to build a relative frequency distribution for this data set to easily compare it to another class of students.

What is the percent for the fifth class, 120 - 124?

Enter answer as a percent (but do not include the percent symbol).

percent = [30] ✓ ⚲ %

Goal: Find the percentage of students who scored between 120 and 124.
Step 1: Find the Total Number of Students (n) Add up the "Frequency" column:

$$n = 10 + 7 + 9 + 9 + 15$$

$$n = 50$$

Step 2: Find the Specific Frequency (f) Look at the row for "120 - 124". The frequency is:
$$f = 15$$

Step 3: Calculate the Percentage Divide the specific frequency by the total, then multiply by 100.

$$\text{Percent} = \left(\frac{15}{50}\right) \times 100$$

$$\text{Percent} = 0.30 \times 100$$

$$\text{Answer} = \boxed{30\%}$$

Part 4: Additional Frequency Distributions

Problem 11: Lottery Winners (Interval Notation)

The following data represents the age of 30 lottery winners.

21	34	35	37	37	40
40	41	41	42	44	45
45	51	51	54	57	59
60	62	62	64	65	66
67	69	69	76	76	87

Complete the frequency distribution for the data. Note: A bin of [20,30) means 20 is included, but 30 is not. The bin goes up to, but does not include 30.

Bin	Frequency		
[20,30)	1	✓	♂
[30,40)	4	✓	♂
[40,50)	8	✓	♂
[50,60)	5	✓	♂
[60,70)	9	✓	♂
[70,80)	2	✓	♂
[80,90)	1	✓	♂

Goal: Complete the frequency table using interval notation (e.g., $[20, 30)$).
Understanding the Notation:

- [**Square Bracket**]: Means the number is **included**.

- (**Parenthesis**): Means the number is **excluded**.

- **Example:** $[30, 40)$ contains numbers from 30 up to 39.99... but **not** 40. The number 40 goes into the *next* bin $[40, 50)$.

Counts:

- [**20, 30**): 21 (Count: **1**)

- [**30, 40**): 34, 35, 37, 37 (Count: **4**) *Note: 40 is excluded here.*

- [**40, 50**): 40, 40, 41, 41, 42, 44, 45, 45 (Count: **8**)

- [**50, 60**): 51, 51, 54, 57, 59 (Count: **5**)

- [**60, 70**): 60, 62, 62, 64, 65, 66, 67, 69, 69 (Count: **9**)

- [**70, 80**): 76, 76 (Count: **2**)

- [**80, 90**): 87 (Count: **1**)

Problem 12: Lottery Winners (Inclusive Classes)

The following data represents the age of 30 lottery winners.

24	33	33	34	35	36
36	36	36	37	37	38
39	42	44	44	49	49
51	52	52	52	55	60
62	64	66	70	77	83

Complete the frequency distribution for the data.

Bin	Frequency
20-29	1 ✓
30-39	12 ✓
40-49	5 ✓
50-59	5 ✓
60-69	4 ✓
70-79	2 ✓
80-89	1 ✓

Goal: Complete the frequency table using inclusive classes (e.g., 20-29).

Difference from Previous Problem: In this table, the classes do not overlap visually. "20-29" clearly includes everything from 20 to 29. The next class starts at 30.

Counts:

- **20-29:** 24 (Count: **1**)

- **30-39:** 33, 33, 34, 35, 36, 36, 36, 36, 37, 37, 38, 39 (Count: **12**)

- **40-49:** 42, 44, 44, 49, 49 (Count: **5**)

- **50-59:** 51, 52, 52, 52, 55 (Count: **5**)

- **60-69:** 60, 62, 64, 66 (Count: **4**)

- **70-79:** 70, 77 (Count: **2**)

- **80-89:** 83 (Count: **1**)

Problem 13: Finding Class Width

Data was collected for 413 randomly selected 10 minute intervals. For each ten-minute interval, the number of people entering the atrium of a large mall were recorded. The data is summarized in the table below.

Number of Guests	Frequency
140 – 149	95
150 – 159	97
160 – 169	63
170 – 179	61
180 – 189	97

What is the class width for this GFDT?

Class width = 10 ✓ ♂

Goal: Determine the class width for the Grouped Frequency Distribution Table (GFDT).

Concept: The **Class Width** is the difference between consecutive lower class limits. It represents how "wide" each step is.

Common Mistake: Do **not** subtract the numbers in the same row (e.g., $149 - 140$). This is incorrect. You must subtract vertically.

Calculation:

1. Identify the first lower limit: **140**

2. Identify the second lower limit: **150**

3. Subtract:
$$\text{Class Width} = 150 - 140 = \boxed{10}$$

(You can check this with any pair: $160 - 150 = 10$, $170 - 160 = 10$, etc.)