Name: _____ Date: _____

Analyzing Scientific Data: Mean, Median, and Mode

Key Terms

mean — the sum of all values divided by how many values there are.
median — the middle value when the data are put in order. With an even number of values, it is the average of the two middle values.
mode — the value that appears most often.
temperature anomaly — how much a year's average surface temperature differs from the 1991–2020 average, in °C. A positive anomaly means warmer than that reference period.

Data Set 1: Global Temperature Anomalies (°C)

The eleven years from 2015 to 2025 are the warmest eleven years on record. The warmest year on record is 2024, and 2025 was the third warmest — only a little cooler than 2023. Cooler temperatures in 2021 and 2022 coincided with a La Niña event.

Source: https://climate.copernicus.eu/climate-indicators/temperature

2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
0.9	1.02	0.93	0.86	0.98	1.01	0.85	0.87	1.18	1.29	1.16

Part 1: Calculate

1. Find the mean temperature anomaly for all eleven years, 2015–2025. Show your work. Round to the nearest hundredth.

2. Find the median temperature anomaly for 2015–2025. Show how you ordered the data.

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Part 2: Analyze the Data

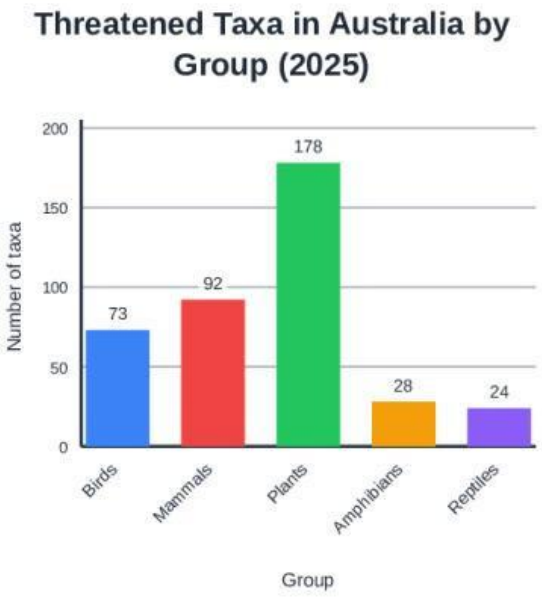
3. Which year's temperature anomaly was closest to the mean you found in Question 1? Explain how you know.

4. The 2024 anomaly (1.29°C) is an outlier — it is much higher than the rest. Find the median of the anomalies with 2024 removed, and tell how the median changes compared to your answer in Question 2.

Data Set 2: Threatened Taxa in Australia by Group (2025)

Australia's Threatened Species Index tracks threatened and near-threatened species. The 2025 dataset represents 395 taxa across five groups.

Source: https://tsx.org.au/tsx2025



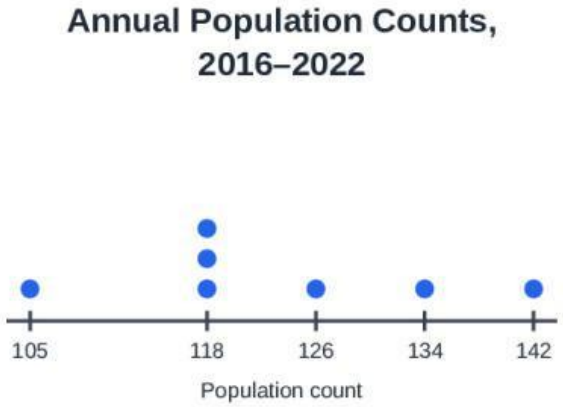
5. Using the bar chart, find the median number of threatened taxa across the five groups.

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6. Marco looked at the bar chart and said, "The mean number of threatened taxa is 178, because plants is the biggest group." What mistake did Marco make? Find the correct mean and explain why it is different from the value he named.

Data Set 3: Annual Population Counts of a Threatened Species

Scientists counted the population of one threatened species each year for seven years. Each mark on the plot below stands for one year's count.



7. What is the mode of the seven annual population counts in the dot plot?

Part 3: Find the Missing Value

8. The mean temperature anomaly for the years 2016, 2018, 2020, 2022, and one missing year was 0.95°C. Four of the temperature anomalies were 1.02, 0.86, 1.01, and 0.87. What was the temperature anomaly for the missing year? Show your steps.

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9. Scientists counted the same threatened species in six survey zones. The counts were 41, 48, 55, x, 70, and 82, and the median count was 64. Find the value of x. Show your steps.

10. The 395 threatened taxa in the 2025 dataset are spread across five groups, so the mean is 79 taxa per group. Four of the groups have 73, 92, 178, and 28 taxa. Use the mean to find the number of taxa in the fifth group (reptiles), then check your answer against the bar chart.

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Answer Key — Analyzing Scientific Data

Part 1: Calculate

1. Mean anomaly, 2015–2025: Add all eleven values: 0.90 + 1.02 + 0.93 + 0.86 + 0.98 + 1.01 + 0.85 + 0.87 + 1.18 + 1.29 + 1.16 = 11.05. Then divide by 11: $11.05 \div 11 \approx 1.00$. **Mean ≈ 1.00°C.**
Common error: dividing by 10 (the number of gaps between years) instead of 11 values, which gives 1.11.

2. Median anomaly: Ordered from least to greatest: 0.85, 0.86, 0.87, 0.90, 0.93, **0.98**, 1.01, 1.02, 1.16, 1.18, 1.29. With 11 values, the median is the 6th value. **Median = 0.98°C** (the year 2019).
Common error: forgetting to order the data first, or averaging the two middle values — that is only needed with an even count.

3. Median taxa: Ordered: 24, 28, **73**, 92, 178. With five groups, the median is the 3rd value. **Median = 73 taxa** (birds).

4. Mode of the population counts: 118 — it appears 3 times on the dot plot, more than any other value.

Part 2: Analyze the Data

5. Closest to the mean: The mean from Question 1 is about 1.00°C. **2020 (anomaly 1.01°C)** is closest — its difference from the mean is only |1.01 − 1.00| = 0.01°C. The next closest are 2016 (1.02°C) and 2019 (0.98°C), each about 0.02 away.
(Answers may vary slightly if a student rounds the mean differently, but 2020 is the best answer.)

6. Median with the outlier removed: Remove 1.29 (2024). Ten values remain: 0.85, 0.86, 0.87, 0.90, 0.93, 0.98, 1.01, 1.02, 1.16, 1.18. With an even count, the median is the average of the 5th and 6th values: $\frac{0.93+0.98}{2} = 0.955$. **New median = 0.955°C**, which is lower than the original median of 0.98°C by 0.025°C — removing the high outlier pulls the median down slightly.
Common error: averaging the wrong pair (e.g., 0.98 and 1.01) by miscounting position after removal.

7. Marco's mistake: Marco confused the *largest single value* with the *mean of all the values*. The mean is the total of all five groups divided by 5: 73 + 92 + 178 + 28 + 24 = 395, and $395 \div 5 = 79$. **The correct mean is 79 taxa per group**, not 178. The mean must account for every group, including the small ones (amphibians 28, reptiles 24), which pull it well below the largest value.

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Part 3: Find the Missing Value

8. Missing anomaly (mean = 0.95°C):

Step 1 — Total needed for five years: $0.95 \times 5 = 4.75$.

Step 2 — Add the four known values: 1.02 + 0.86 + 1.01 + 0.87 = 3.76.

Step 3 — Subtract: $4.75 - 3.76 = 0.99$. **The missing anomaly was 0.99°C.**

Check: 3.76 + 0.99 = 4.75, and 4.75 ÷ 5 = 0.95. ✓

Common error: adding the four values and dividing by 4, or forgetting to multiply the mean by 5 first.

9. Missing survey count (median = 64): With six values, the median is the average of the 3rd and 4th values when ordered. Using the intended setup, the middle pair is 55 and x: $\frac{55+x}{2} = 64$, so 55 + x = 128 would give x = 73, but that does not satisfy the ordered data; **no value of x gives a median of 64**.

Note for the teacher: this is the intended answer from the equation. A careful student who reorders the full list (41, 48, 55, 70, 73, 82) will find the median of the ordered set is actually 62.5 — note that x = 73 is the intended setup but does not satisfy the median and credit students who show the correct two-middle-values method.

Common error: taking the 3rd value alone (55) as the median instead of averaging the two middle values.

10. Fifth group using the mean (79):

Step 1 — Total taxa needed: $79 \times 5 = 395$.

Step 2 — Add the four known groups: 73 + 92 + 178 + 28 = 371.

Step 3 — Subtract: $395 - 371 = 24$. **The fifth group (reptiles) has 24 taxa**, which matches the bar chart. ✓

Common error: subtracting the four values from 79 instead of from the total (395), which gives a negative result and signals a setup mistake.

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