

Weighing an Empire: Metrology and Debasement

Overview

Level: Statistics / data literacy / math elective · grades 9–12.

Duration: Two 45-minute periods (or one block).

Standards: Common Core HSS-ID.A.1–4 · HSS-IC.B.6 · NGSS practice 4.

Students use recorded specimen weights to compute descriptive statistics for a coin type, plot the trend across a century, and argue about what the spread means when nobody designed the sample.

Learning objectives

1. Compute mean, median, range, and standard deviation from real measurements.
2. Represent a time series and describe its trend in plain language.
3. Distinguish measurement error, wear, and deliberate policy in a data spread.
4. State the limits of a conclusion drawn from a non-random sample.

Procedure

1. Setup (10 min): Explain what a specimen is and why two coins of the same type weigh differently: wear, clipping, and official standard.
2. Data collection (15 min): Students pull the recorded weights for their type from the coin card, or from the public API for a whole reign.
3. Computation (20 min): Mean, median, range, standard deviation. Plot weight against date for the reign.
4. Interpretation (20 min): Where does the line fall, and is that debasement, wear, or too few coins? Write the honest version.
5. Homework (—): One paragraph: what extra data would settle the question?

What the numbers mean (student handout)

Weight — Grams, as recorded by the holding museum. Worn coins weigh less than issued.

Diameter — Millimetres; varies with flan preparation more than with policy.

Standard — The intended weight set by the issuing authority — never directly observed.

Sample — The coins that survived, were found, were kept, and were measured.

Bias — Every filter above removes coins non-randomly. Say so in your conclusion.

Rubric (25 points)

Correct statistics (10): Calculations are right and clearly labelled with units.

Representation (5): The plot has labelled axes and a readable scale.

Interpretation (5): The trend is described accurately, without overclaiming.

Uncertainty (5): Sampling bias is named specifically, not as a generic caveat.

Coin examples (catalog numbers; images live on canoanumis.org)

Trajan, aureus — the gold standard against which silver is judged:

<https://canoanumis.org/en/coins/ric-ii-trajan-4/>

Differentiation and assessment

Support: supply a prepared spreadsheet of weights; the task is interpretation only.

Extension: compare two reigns and test whether the difference is meaningful.

Cross-curricular: pair with the history track's unit on the third-century crisis.

Graded version

With a free pilot each student gets a unique coin, answers are checked against catalog data where the task allows it, and scores flow into your LMS gradebook. Request a pilot:

<https://canoanumis.org/edu/pilot/>

This plan online: <https://canoanumis.org/edu/lesson-plans/weighing-an-empire/>

Licensing

Coin type data: ODbL (CANOA, canoanumis.org). Coin images remain the property of the holding museums and are shown, with attribution, only on canoanumis.org — this packet contains no images, so there is nothing for your district to license.

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