

Iditarod Dogs Count!

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Discipline / Subject: Mathematics/Statistics

Topic: Measures of Central Tendency and Dispersion

Grade Level: Undergraduate; Grades 6 through 12 with indicated modifications

Resources / References / Materials Teacher Needs:

TI83 calculator or better

Lesson Summary:

Fun data enables students to painlessly learn mean, median, mode, and range. Typically, for a university class of 25 students, the lesson requires under 15 minutes; the exercise is intended to be repeated several times over the course of the Iditarod dog sled race. Sample table, calculations, and exam question attached.

Standard's Addressed: (Local, State, or National)

1. California State University, Long Beach (undergraduate), "Probability and Statistics for Teachers," MTED105 (Math Education)
2. California, "Statistics, Data Analysis, and Probability," 6th grade 1.1 Compute the range, mean, median, and mode of data sets.

Learning Objectives:

The students will be able to:

University and Grades 6-12

1. Calculate mean, median, mode, range.
2. Improve data organization skills, including tallying.

University only

3. Calculate midrange.
4. Calculate percentiles.

Assessment:

The student performs tallying and calculations, as expanded below.

Homework: The student looks up a recent race update to use as data. Use only five or 10 mushers, for example.

Exam question: Provide students with detailed musher standings to use as data. Use only 10 or 20 mushers, for example.

Procedural ActivitiesUniversity and Grades 6-12

0. Each student selects a musher before the start of the Iditarod and brings to each class the number of dogs for that team as listed in the current standings update. If the team scratches, the student is to select another team to track.
1. On the projector (or board), the lecturer draws a table with four columns: column1 is x_j (# of dogs, one row for each of 0 to 16), column2 is blank (tally the number of students reporting x_j dogs), column3 is n_j (tally result), and column4 is $x_j n_j$ (column1 x column3). The top row contains the headings; the bottom row contains the sums.
2. Tally whilst students, in turn, call out the number of dogs for their musher.
3. After the tallying is complete, determine mean, median, mode, and range.

University only

4. Calculate: midrange and a random percentile.

Materials Students Need:

TI83 calculator or better

www.iditarod.com or newspaper that publishes the Iditarod mushers list and current standings updates.

Technology Utilized to Enhance Learning:

The students perform calculations manually. However, the calculator allows them to facilely check their work.

Other Information:

The first time the lesson is used, the lecturer should perform, explain, and show all work. In repeat lessons, gradually engage the students in these tasks.

Modifications for Special Learners/ Enrichment Opportunities:University and Grades 6-12

Modifications for Special Learners: Some students have difficulty grasping subscripts used in the table. If so, though less stringent, consider omitting subscripts.

University only

Enrichment: Explore why the mean is not necessarily equal to a possible dog count (for example, if it is not an integer). Discuss if the data represents a sample or a population. If it is a sample, discuss if the data is a random sample.

Grades 6-12 only

Modifications: Exclude university-only areas. Limit tallies, as class attention allows, to 5 or 10 mushers, instead of those from the entire class.

Enrichment: Some university-only areas may be used in some situations.

Additional Information

This lesson was designed for an undergraduate mathematics education class for future K through 8 teachers. All too frequently, these future teachers have marginally adequate mathematics skills with minimal statistics exposure. Consequently, in MTED105, the students must both be introduced to statistical concepts that were supposed to have been mastered before college, and be equipped to subsequently teach these exact concepts. As a consequence, this lesson plan is not restricted for university use.

Sample table and calculations for 10 students with dog counts as follows, is below.

9 9 9 9 9 10 14 14 14 16

| x_i | | n_i | $x_i n_i$ |
|----------------------------|--|-----------|--------------------|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | 5 | $9 \times 5 = 45$ |
| 10 | | 1 | $10 \times 1 = 10$ |
| 11 | | | |
| 12 | | | |
| 13 | | | |
| 14 | | 3 | $14 \times 3 = 42$ |
| 15 | | | |
| 16 | | 1 | $16 \times 1 = 16$ |
| Σ | | 10 | 113 |

mean = $\Sigma x_i n_i / \Sigma n_i = 113 / 10 = 11.3$

median = $(x_i \text{ with obs5} + x_i \text{ with obs6}) / 2 = (9 + 10) / 2 = 9.5$

mode = 9

range = maximum - minimum = $16 - 9 = 7$

midrange = $(\text{maximum} + \text{minimum}) / 2 = (16 + 9) / 2 = 12.5$

44th percentile

0.44×10 observations = 4.4, which is not an integer. Therefore, the next larger integer, 5, is the observation selected.

44th%ile = $x_i \text{ with obs5} = 9$

Table 1. Iditarod 31 (2003) Final Standings.

| rank | musher | dogs | days |
|------|-------------------|------|-------|
| 01 | Robert Sørli | 8 | 9.66 |
| 02 | Ramy Brooks | 7 | 9.73 |
| 03 | Jeff King | 11 | 9.97 |
| 04 | Martin Buser | 10 | 10.15 |
| 05 | Ken Anderson | 7 | 10.26 |
| 06 | Linwood Fiedler | 8 | 10.29 |
| 07 | Ramey Smyth | 6 | 10.30 |
| 08 | John Baker | 8 | 10.31 |
| 09 | Ed Iten | 8 | 10.46 |
| 10 | Sonny Lindner | 8 | 10.51 |
| 11 | Rick Swenson | 10 | 10.53 |
| 12 | Mitch Seavey | 9 | 10.59 |
| 13 | Jon Little | 9 | 10.63 |
| 14 | Aliy Zirkle | 8 | 10.72 |
| 15 | Ray Redington Jr. | 8 | 10.79 |
| 16 | Aaron Burmeister | 7 | 10.85 |
| 17 | Bruce Lee | 8 | 10.92 |
| 18 | DeeDee Jonrowe | 8 | 10.99 |
| 19 | Jessica Hendricks | 9 | 11.11 |
| 20 | Jessie Royer | 7 | 11.17 |
| 21 | Vern Halter | 9 | 11.23 |
| 22 | Tim Osmar | 12 | 11.25 |
| 23 | Paul Gebhardt | 10 | 11.37 |
| 24 | Jim Lanier | 7 | 11.47 |
| 25 | Melanie Gould | 10 | 11.58 |
| 26 | Clint Warnke | 8 | 11.58 |
| 27 | Cim Smyth | 7 | 11.61 |
| 28 | Robert Bundtzen | 9 | 11.64 |
| 29 | Randy Chappel | 10 | 11.64 |
| 30 | Lynda Plettner | 8 | 11.96 |
| 31 | Mike Williams | 12 | 12.05 |
| 32 | Cali King | 12 | 12.31 |
| 33 | Cindy Gallea | 10 | 12.33 |
| 34 | Palmer Sagoonick | 8 | 12.52 |
| 35 | Jack Berry | 7 | 12.53 |
| 36 | Tyrell Seavey | 10 | 12.63 |
| 37 | Bill Pinkham | 6 | 12.73 |
| 38 | Gerald Sousa | 6 | 13.02 |
| 39 | Carla Kelly | 12 | 13.07 |
| 40 | Jim Gallea | 9 | 13.21 |
| 41 | Frank Sihler | 9 | 14.03 |
| 42 | Kelly La Marre | 7 | 14.46 |
| 43 | Ben Stamm | 9 | 14.46 |
| 44 | Russell Bybee | 11 | 15.23 |

Question: Iditarod Dog Counts (20 points)

For all parts: From Table 1, consider the number of dogs for only the last 20 mushers.

Part 1 (8 points)

Tally to form a table for the number of dogs.

Part 2 (8 points)

Find the mean, mode, median, range, midrange.

Part 3 (4 points)

Find the 44th percentile.

Part 4 (4 bonus points)

Just to complete the Iditarod is a feat! After more than 15 days, Russell Bybee was the last musher to arrive successfully in Nome, Alaska in 2003. What is the name of the award that the last-to-finish dog sled team wins?