

# The High Stakes World of Statistics (Part 1)

1998 Cerebellum Corporation • 800-VCR-REVV

## I. Statistical Problems

### A. What is statistics

1. Big picture
  - a. Science of amassing data, taking a portion of it, and seeing what that portion tells us about the whole
2. Little picture
  - a. actual statistics themselves

### B. Statistical problems

1. Population
  - a. inferences
2. Sample
3. Sampling
4. Elements of a statistical problem
  - a. Identify question and population
  - b. Determine design of the experiment
  - c. Determine collection of data and analysis
  - d. Make inferences
  - e. Test reliability

## II. Organizing, Summarizing, and Displaying Data

### A. Graphical methods

1. Relative Frequency Histogram
  - a. Classes
    - i. range
  - b. Class width
  - c. Class boundaries
    - i. lowest class should contain lowest measurement
    - ii. no measurements should fall on boundaries
    - iii. significant digits

### d. Class frequency

- e. Class relative frequency
- f. Class frequency and probability

### 2. Distribution Curve (a.k.a. Normal or Bell Curve)

### 3. Stem & Leaf Display

### B. Numerical methods

#### 1. Parameters and Statistics

#### 2. Measures of Central Tendency

- a. Describe and locate the center of the data

#### b. Mean

- i. sample mean  $-\bar{x}$
- ii. population mean  $-\mu$

#### c. Median

#### d. Mode

#### 3. Measures of variability

- a. Dispersion of the data set

#### b. Range

#### c. Deviation

#### d. Variance

- i. variance for a population  $-\sigma^2$

- ii. variance for a sample  $-\sigma^2$

#### e. Standard deviation

- i. standard deviation for a population  $-\sigma$

- ii. standard deviation for a sample  $-\sigma$

- iii. Empirical Rule

#### 4. Measures of relative standing

- a. Where measurements lie in relation to one another

#### b. Z-score

#### c. Outliers

#### d. Percentiles

## Formulas — Part 1:

### Stuff for Histograms

---

Class width:  $\frac{\text{Range}}{\# \text{ of classes you want}}$

Class relative frequency:  $\frac{\text{class frequency}}{\text{total \# of measurements (n)}}$

### Numerical Methods

---

#### Measures of Central Tendency

Mean of a sample ( $\bar{x}$ ):  $\bar{x} = \frac{\sum x}{n}$

Mean of a Population ( $\mu$ ):  $\mu = \frac{\sum x}{n}$

#### Measures of Variability

Range: largest value – smallest value

Deviation:  $x - \bar{x}$

Variance of a sample ( $s^2$ ):  $s^2 = \frac{\sum (x - \bar{x})^2}{n - 1}$

Variance of a population ( $\sigma^2$ ):  $\sigma^2 = \frac{\sum (x - \mu)^2}{n}$

Standard Deviation of a sample (S):  $s = \sqrt{s^2}$

Standard Deviation of a population ( $\sigma$ ):  $\sigma = \sqrt{\sigma^2}$

#### Measures of Variability

Z-score:  $Z = \frac{x - \bar{x}}{s}$

# z-score table

<b>Z</b>	<b>.00</b>	<b>.01</b>	<b>.02</b>	<b>.03</b>	<b>.04</b>	<b>.05</b>	<b>.06</b>	<b>.07</b>	<b>.08</b>	<b>.09</b>
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817

## statistical problems

- data
- statistical tests
- population
- inferences
- sample
- elements of a

### statistical problem

- identifying the question and population
- design of an experiment
- data analysis
- making inferences
- testing reliability
- data sets
- measurements
- descriptive statistics

## graphical methods

- relative frequency histogram
  - classes
  - class width
  - class boundaries
  - class frequency
  - probability

- range
- significant digits
- distribution curve
- stem and leaf display

## numerical methods

- statistics and parameters

## measures of central tendency

- mean
  - $\bar{x}$
  - $\mu$
- median
- mode

## measures of variability

- range
- deviation
- variance
  - $\sigma^2$
  - $s^2$
- standard deviation
  - 
  - $s$

## measures of relative standing

- z-score
- outlier
- percentiles