

AP Statistics Summer Packet

Welcome to Advanced Placement Statistics. The AP Statistics course is built around four main topics: exploring data, planning a study, probability as it relates to distributions of data, and inferential reasoning. Among leaders of industry, business, government, and education, almost everyone agrees that some knowledge of statistics is necessary to be an informed citizen or a productive worker. Numbers are regularly used and misused to justify opinions on public policy. Quantitative information is the basis for decision-making in virtually every job within business and industry.

Included in this packet is a brief description of basic statistics with corresponding exercises. There are also questions in the wrap-up section which require an assimilation of statistical ideas. Lastly, there is a basic math skills section. These questions review concepts that all AP Statistics students should know before entering the class.

You are expected to complete this packet before the start of school. We also expect that you will show the work needed to get the correct answers. We will answer questions concerning the packet during the first few days of school with a test at the end of the week.

Good luck! We are looking forward to an exciting year working with students who are prepared for class and are willing to challenge themselves.

I. Measuring Central Tendency

- a. Find the mean, median, and mode of the following collection.
15, 11, 19, 15, 14, 13, 17, 11, 12, 17, 15, 14, 15

To begin, order the fourteen numbers

11, 11, 12, 13, 14, 14, 14, 15, 15, 15, 17, 17, 19

To find the **mean**, divide the sum of the numbers by 14.

$$\text{mean} = \frac{11+11+12+13+14+14+14+15+15+15+17+17+19}{14} \approx 14.4$$

The **median** is the average of the two middle numbers for even data list.

$$\text{median} = \frac{14+15}{2} = 14.5$$

For odd data list, the median is the middle number.

The **mode** is 15 because that is the number that occurs the most frequently.

- b. Find the quartiles of the collection in Example a. Then, sketch a box-and-whisker plot of the data

$$\begin{array}{c} \leftarrow 11,11,12,13,14,14,14 \rightarrow, \leftarrow 15,15,15,17,17,19 \rightarrow \\ \text{Lower Half} \qquad \qquad \qquad \text{Upper Half} \end{array}$$

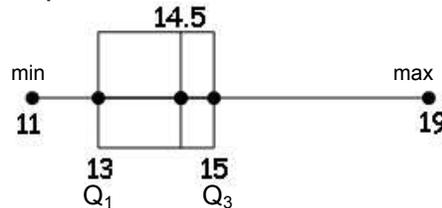
The **first quartile** is 13 (the median of the lower half)

The **second quartile** is 14.5 (the median)

The **third quartile** is 15 (the median of the upper half)

The **range** is the difference of the highest and lowest data points. That is, the range is $19-11 = 8$.

A **box-and-whisker plot** for the data labels the endpoints of the data and marks the quartiles. It is shown below.



Exercises

- Find the mean, median, mode, and range of the following collection of scores on a test.
32, 72, 81, 95, 98, 58, 77, 75, 83, 97, 45, 89, 93, 57,
82, 97, 52, 75, 79, 78, 99, 98, 54, 75, 85, 61, 55, 86
- Find the first, second, and third quartiles of the collection of data in Exercise 1.
- Construct a box-and-whisker plot of the collection of data in Exercise 1.
- Complete #1-3 for the following set of data. The weights (in pounds) of eleven children are as follows: 39, 52, 40, 45, 46, 55, 48, 40, 43, 47, 44

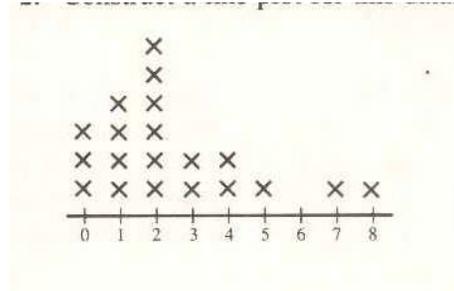
II. Organizing Data

At a car dealership, the number of new cars sold in a week by each salesperson was as follows:
5, 8, 2, 0, 2, 4, 7, 4, 1, 1, 2, 2, 0, 1, 2, 0, 1, 3, 3, 2

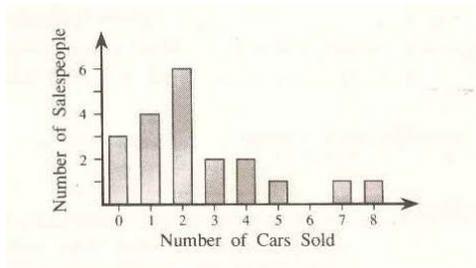
a. Construct a frequency distribution for this data.

Number	Tally	Frequency
8		1
7		1
6		0
5		1
4		2
3		2
2		6
1		4
0		3

b. Construct a line plot for this data



c. Construct a bar graph that shows the number of salespeople who sold 0-8 cars.



Exercises

1. Twenty-eight students in a class were asked how many cars their family owned. The results were as follows:

2, 2, 3, 2, 1, 2, 2, 4, 3, 2, 0, 1, 0, 1, 1, 2, 2, 3, 2, 3, 3, 5, 1, 1, 3, 0, 1, 2

Construct a frequency distribution and a line plot for this data.

2. Each of the members of a recent high school graduating class was asked to name his/her favorite among these subjects: English, foreign language, history, mathematics, science. The results are shown in the table. Construct a bar graph that shows these results.

English	62
Foreign Language	40
History	40
Mathematics	18
Science	33

III. Constructing Stem-and-Leaf Plots and Histograms

I. Construct a stem-and-leaf plot for the unordered data

63, 52, 84, 83, 51, 32, 58, 35, 45, 41, 65, 75, 59, 67, 25, 46

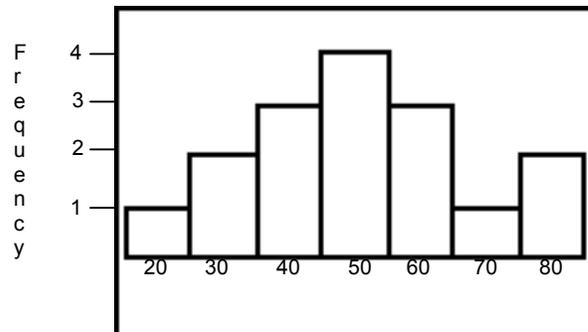
A stem-and-leaf plot orders data in increasing or decreasing order.

	Increasing		Decreasing
2	5	8	3, 4
3	2, 5	7	5
4	1, 5, 6	6	3, 5, 7
5	1, 2, 8, 9	5	1, 2, 8, 9
6	3, 5, 7	4	1, 5, 6
7	5	3	2, 5
8	3, 4	2	5

Key 9 | 6,7 = 96 and 97

II. Histograms

1. Construct and label a horizontal number line that is scaled to contain all of the values of the variable of interest.
2. Construct and label a vertical axis so that the greatest frequency can be represented.
3. Construct the bars of equal width that are centered above each value. The heights of the bars represent the frequencies of the values.



Exercises

1. Construct a stem-and-leaf plot for the data

15, 59, 66, 42, 48, 23, 70, 81, 35, 51, 68, 29, 77, 92, 85, 16, 37, 59, 61, 76, 40, 25, 86, 11, 34, 52, 16, 22, 89, 55, 47, 39, 27, 42, 46, 51, 24, 69, 78, 91, 90, 65

2. Construct a histogram for the above data.

IV. Using the TI-83 Calculator

1. Entering data into a list: **STAT**→ **1: Edit**→ enter data in appropriate list
2. To clear a list: **highlight the list name and hit clear**. The list is empty when you see the dashes.
3. To sort a list in ascending order: **STAT**→ **2: SortA (L₁)**
4. To find the mean of a list: **2nd STAT**→ **MATH** →**3: mean (L₁)**
5. To find the median of a list: **2nd STAT**→ **MATH** →**4: median (L₁)**

Exercises

1. Enter the above data from Exercise 1 in a list.
2. Sort the data in ascending order and find the mode.
3. Find the mean of the data.
4. Find the median of the data.
5. Find the sum of the data.

V. Wrap-up

Complete these problems after completing the packet.

Task 1: Write two specific survey questions that you would ask voters in the next senatorial election in your state. Choose the type of question and response (yes/no, scale of 1 to 5, numerical responses, etc.) that would be most appropriate for the issues involved. What relationships would be expected when the responses are analyzed?

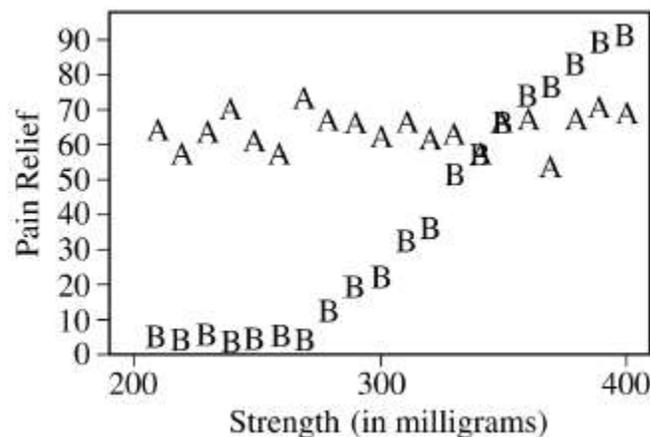
Task 2: Find a set of numbers that will satisfy the following conditions:

- The median of a set of 20 numbers is 24.
- The range is 42.
- To the nearest whole number the mean is 24.
- No more than three numbers are the same.

Show your strategy.

Task 3: Two pain relievers, A and B, are being compared for relief of post surgical pain. Twenty different strengths (doses in milligrams) of each drug were tested. Eight hundred post surgical patients were randomly divided into 40 different groups. Twenty groups were given drug A. Each group was given a different strength. Similarly, the other twenty groups were given different strengths of drug B. Strengths used ranged from 210 to 400 milligrams. Thirty minutes after receiving the drug, each patient was asked to describe his or her pain relief on a scale of 0 (no decrease in pain) to 100 (pain totally gone).

The strength of the drug given in milligrams and the average pain rating for each group are shown in the scatterplot below. Drug A is indicated with A's and drug B with B's.



(a) Based on the scatterplot, describe the effect of drug A and how it is related to strength in milligrams.

(b) Based on the scatterplot, describe the effect of drug B and how it is related to strength in milligrams.

(c) Which drug would you give and at what strength, if the goal is to get pain relief of at least 50 at the lowest possible strength? Justify your answer based on the scatterplot.

VI. More Problems

Evaluate the following expressions.

1) $\sqrt{10^2 + 20^2 + 30^2}$

- a) 13.1
- b) 24.5
- c) 37.5
- d) 60

2) $\frac{112 - 100}{4.5}$

- a) 2.67
- b) 3.0
- c) 12.0
- d) 47.1

3) $\sqrt{\frac{12}{100} + \frac{20}{150}}$

- a) $\sqrt{\frac{32}{250}}$
- b) .25
- c) .5
- d) .128

4) $\frac{3}{4} + \frac{1}{8} + \frac{5}{16}$

- a) $\frac{9}{28}$
- b) $\frac{9}{16}$
- c) $\frac{19}{16}$
- d) $\frac{9}{8}$

5) $\frac{3^5 * 3^{-2}}{3^2}$

- a) $\frac{1}{3}$
- b) 3
- c) 27
- d) 81

6) $\frac{\log_4 12 + \log_4 \frac{4}{3}}{\log_9 3}$

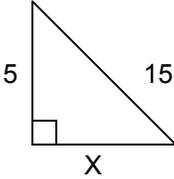
- a) 1.6
- b) 2.5
- c) 3.0
- d) 4.0

7) $\log(1000)$

- a) 2
- b) 3
- c) 100
- d) 1000

8) $\ln(100)$

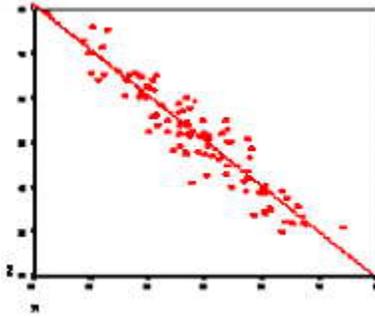
- a) undefined
- b) 0.5
- c) 2.0
- d) 4.6

- 9) Solve $1.5 = \frac{x-90}{\frac{15}{\sqrt{9}}}$
- a) 4.3
b) 85
c) 97.5
d) 118.2
- 10) A line has the equation $y = 2x - 3$. Does the point (4, 3) lie on this line.
- a) yes
b) no
- 11) A quart of juice is 10% real juice. Write the formula for the percentage of real fruit juice in a punch mixture with J quarts of juice and S quarts of soda.
- a) $.1J$
b) $.1(J + S)$
c) $\frac{J}{.1(J + S)}$
d) $\frac{.1J}{(J + S)}$
- 12) Two points (2,-1) and (5, 5) lie on a line. What is the equation of the line?
- a) $y = 2x - 5$
b) $y = 2x - 1$
c) $y = 3x + 6$
d) $y = 3x - 2$
- 13) What is the slope of a line that is perpendicular to the line $y = \frac{5}{2}x + 2$
- a) $\frac{-5}{2}$
b) 5
c) -2
d) $\frac{-2}{5}$
- 14) Find the missing side (x) of the triangle below.
- 
- a) 10
b) 14.14
c) 15.81
d) 20
- 15) For the function: $f(x) = 2x^2 - 10x + 5$ find $f(0.5)$
- a) 1
b) $\frac{1}{2}$
c) 5
d) 25
- 16) What is the minimum value of the function: $f(x) = 2x^2 - 10x + 5$?
- a) 5
b) 0
c) -7.5
d) 2.5
- 17) Consider a linear function: $y = a + bx$. If $f(2) = -5$ and $f(7) = 10$, what is $f(-4)$?
- a) -23
b) -17
c) 7
d) 11
- 18) A state university has 25,000 students: 0.1 percent of these students are majoring in mathematics. How many math majors are there at this university?
- a) 2.5
b) 25
c) 250
d) 2500

- 19) In the US, 1 person out of every 250 has worked in the fast food industry, and 6 out of every 15,000 have management experience in fast food. What percentage of workers with fast food experience has also served as managers?
- a) 16%
 - b) 10%
 - c) 6%
 - d) 1%
- 20) You invest \$1000 at 5% interest compounded annually. How much will you have after 7 years?
- a) \$1035
 - b) \$1350
 - c) \$1400
 - d) \$3500
- 21) You invest \$1000 at 5% interest compounded annually. In how many years will you have \$2000 in your account?
- a) 2 years
 - b) 5 years
 - c) 10 years
 - d) 14 years
- 22) You hold a bag filled with 7 green, 5 red, and 8 blue marbles. What is the probability of selecting a blue marble at random?
- a) $\frac{2}{5}$
 - b) $\frac{1}{10}$
 - c) $\frac{8}{13}$
 - d) $\frac{12}{10}$
- 23) You hold a bag filled with 7 green, 5 red, and 8 blue marbles. How would you calculate the probability of selecting first a green marble, then a red one, if you do not replace the first marble drawn before selecting the second?
- a) $\frac{7}{20} \cdot \frac{5}{19}$
 - b) $\frac{7}{20} \cdot \frac{13}{20}$
 - c) $\frac{20}{7} \cdot \frac{20}{5}$
 - d) $\frac{7}{20} \cdot \frac{5}{20}$
- 24) A mini-lottery involves selecting 2 numbers between 1 and 10. What is the probability of correctly picking the two numbers?
- a) $\frac{2}{10}$
 - b) $\frac{1}{30}$
 - c) $\frac{2}{90}$
 - d) $\frac{2}{100}$

- 25) A famous advertisement reads "4 out of 5 dentists surveyed recommend Brand X Sugarless gum for their patients who chew gum." What is the best interpretation of this claim?
- That 80% of dentists recommend that their patients chew gum.
 - That of the 5 dentists surveyed, 4 of them recommend Brand X gum.
 - That while dentists don't generally recommend that their patients chew gum, for those that insist on doing so, 80% of them recommend Brand X.
 - 80% of all dentist patients chew gum.
- 26) Pepsi has long been famous for their "blind taste test." What exactly does the word "blind" mean in this setting?
- That only blind people were allowed to perform the taste test.
 - That the person tasting the drinks was blindfolded.
 - That the person tasting the drinks didn't want to know which brand they were tasting.
 - That the person giving the drinks didn't know which brand they were giving.
- 27) The probability of flipping a coin and getting heads is 0.5. What does this mean?
- Every time you flip a coin, you'll get exactly 0.5 heads.
 - Over time, you can expect 50% of all coin tosses to be heads.
 - For every two coins you toss, you'll get one head.
 - You have to toss a coin more than 10 times to see these results, but once you do, you'll get an equal number of heads and tails.
- 28) What is the mean of a set of data?
- The average.
 - The number that occurs most often.
 - The 'middle' value.
 - The number of times a certain number occurs.
- 29) Which pair of variables has a strong positive correlation?
- Outside temperatures and cold remedy sales.
 - Daylight during winter and latitude in the northern hemisphere.
 - Hours you worked at a fast food restaurant and the amount of your paycheck.
 - The price of coffee in China and the number of visitors per day at Euro Disney.

30) What does the scatterplot below indicate?



- a. A strong positive correlation.
 - b. A weak positive correlation.
 - c. Little or no correlation.
 - d. A weak negative correlation.
 - e. A weak positive correlation.
- 31) At the beginning of the season, the Standard Deviations (America's newest NFL team) are given odds of winning the Super Bowl of 20:1. What does it mean?
- a. That it's almost a sure thing that they'll win the Super Bowl.
 - b. That the chances are 19/20 that they'll win the Super Bowl.
 - c. That if they played 21 seasons, they'd be expected to win the Super Bowl 1 time.
 - d. That the chances are 19/20 that they won't win the Super Bowl.
- 32) Which of the following is NOT a plausible probability?
- a. 0
 - b. 0.0001
 - c. 0.50
 - d. 0.998
 - e. 1.01