

# AP STATISTICS SUMMER PREP

AP Statistics is a college level course covering material traditionally taught in an introductory statistics college class. It will probably be unlike any other math course you have taken because AP Statistics is more like an **ENGLISH CLASS** with a little bit of math calculations.

You will need to be able to work with equations and concepts that you learned in Algebra 1 & 2. You also will need to be able to analyze and interpret problems with **context**. **There is more reading and writing in AP Statistics than in any other math class.** This packet will help you prepare and review for the course as well as see a preview of what is coming.

- Complete the packet for review. Round to the hundredths place when needed.
- TI-84 Plus CE calculator is recommended for this packet and class.



- This packet is due the first day of school.
- **This packet will be graded.** If you are unsure of how to solve a problem, please use your resources such as: internet, peers, etc.
- All work must be shown to receive credit. **NEVER** leave anything blank! Partial credit is given.
- Please make sure the work and answers are legible. If you cannot fit the work on the space provided, I would recommend completing the packet on a separate piece of paper.
- Knowing and understanding these concepts is KEY to your success in AP Statistics and to prepare for the AP exam.

See you soon!

Ms. Vinagre  
Monique.Vinagre@img.education

Some websites for reference:

<https://www.khanacademy.org/>

<http://www.stattrek.com>

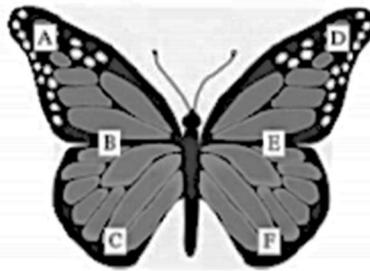
## I. CONTEXT

Statistics is the science of learning from data. So, what is data? Data are usually numbers, but they are not “just numbers”. Data are numbers with a **context**. The number 10.5, for example, carries no information by itself. But if we hear that a family friend’s new baby weighed 10.5 pounds at birth, the number now has meaning and context.

One of the things students find most surprising about their first statistics course is how much they work with **WORDS** and not just numbers like a typical math course. Students must therefore learn to **READ** for **context** and express answers (**WRITE**) in terms of **context**.

*What follows are actual questions from AP Statistics exams. Don't worry, you don't have to do any math yet(!). Just read through the AP questions and then answer the questions that follow about the **context** of the questions with **complete sentences**!*

- 1) Researchers often mark wildlife in order to identify particular individuals across time or space. A study of butterfly migration is designed to determine which location on the butterflies' wings is best for marking. The six possible locations are those shown as A through F in the figure below. The butterfly in the figure is a monarch (*Danaus plexippus*).



Because marks in certain locations may be more likely to attract predators or cause problems than marks in other locations, the goal is to determine whether the six marking locations result in equivalent chances of successful migration. To test this, researchers plan to mark 3,600 butterflies and release them, then count how many arrive displaying each marking location at the end of the migratory path.

- What type of butterfly is represented in the figure?
- How many butterflies does the researcher plan to mark and release?
- Why do the researchers need to mark butterflies in different locations?
- Describe location D on the butterfly?
- How is location A different from location D?
- Why do researchers mark wildlife?
- What is the purpose of this study?

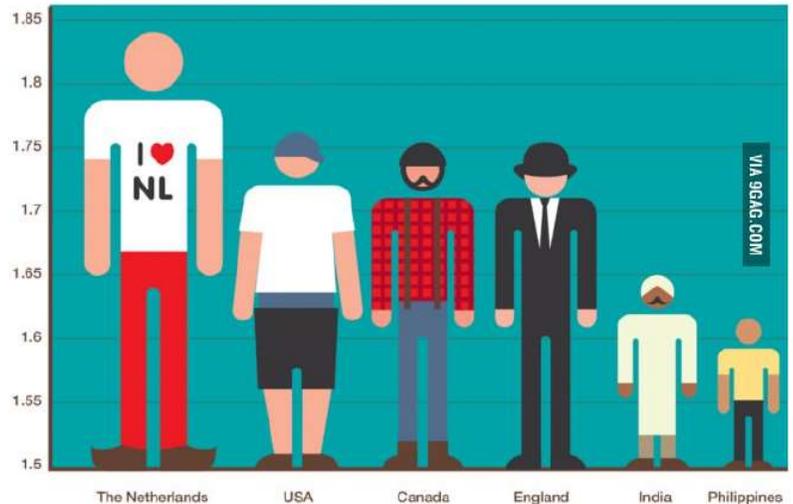
## II. INFORMATION IN THE MEDIA

In Statistics we organize and display data using graphs. You will need to know **how to read, create and interpret many graphs**. They assume you know how to interpret the data...or...*do they count on you not understanding data displays?* Hmmmmmmm?????

2)

a. What impression does this graph give you?

**LOOKING DOWN ON THE REST OF THE WORLD**  
(Average male height in m)



b. How could this graph be improved?

3) A survey was conducted of AP Statistics students music genre preferences. The results are showing the bar graph below. Use the graph to answer the questions.

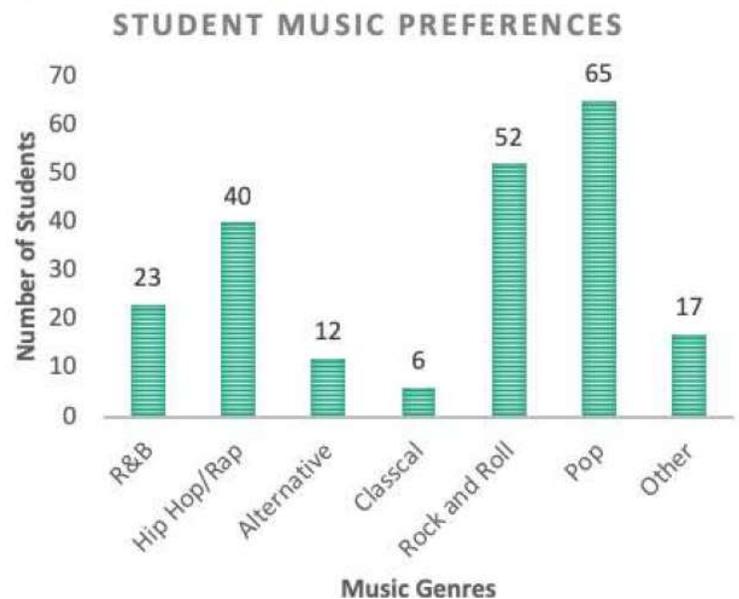
a. How many students prefer Classical?

b. Which is the most popular genre?

c. How many students were surveyed?

d. What percent preferred rock and roll?

e. How many students preferred R&B or Pop?



DO NOT round until **FINAL** answer.  
Use proper calculator mechanics.

### III. BACKGROUND ALGEBRA SKILLS

Here is a sample of the algebra concepts you will need for this course.

#### A. Solving Equations

4) Using the formula:  $z = \frac{x-\mu}{\sigma}$ , solve for ...

a.  $z$  when  $x = 200, \mu = 188, \text{ and } \sigma = 24$

b.  $\mu$  when  $z = 2, x = 135, \text{ and } \sigma = 16$

c.  $x$  when  $z = -3.35, \mu = 60, \text{ and } \sigma = 4$

d.  $\sigma$  when  $z = 2.5, x = 100, \text{ and } \mu = 102$

5) Solve for  $y$  in each equation shown below when  $x = 2$ .

a.  $\sqrt{y} = -2x + 11$

b.  $\log y = 1.2 + 0.8x$

6) Using the formula:  $b_0 = \bar{y} - b_1\bar{x}$ , solve for ...

a.  $b_0$  when  $\bar{y} = 23, b_1 = 4, \text{ and } \bar{x} = 2.5$

b.  $b_1$  when  $b_0 = 752, \bar{y} = 11, \text{ and } \bar{x} = 114$

7) Using the formula  $ME = z * \sqrt{\frac{\hat{p}\hat{q}}{n}}$ , solve for

a.  $ME$  when  $z = 2.56, \hat{p} = 0.75, \hat{q} = 0.25, \text{ and } n = 400$

b.  $n$  when  $ME = 0.05, z = 1.96, \hat{p} = 0.5 \text{ and } \hat{q} = 0.5$

## B. BASIC STATISTICS

8) What is 8 percent of 64?

9) 25 is 20% of what number?

10) 12 is thirty percent of what number?

11) The length of a rectangle is twice its width. If the perimeter is 144 meters, find the length and width.

12) What is the median of the following numbers? 10, 39, 71, 42, 39, 76, 38, 25

13) Find the mean of the set of number: 21, 3, 7, 17, 19, 31, 46, 21

14) The mean weight of five computer stations is 167.2 lbs. The weight of four of the computer stations are 158.4 lbs, 162.8 lbs, 165 lbs, and 178.2 lbs. What is the weight of the fifth computer station?

15) What is the IQR of the set of numbers: 19, 17, 31, 76, 38

16) The **standard deviation** is the average distance away from the mean.  
It is calculated using the following formula (for a sample):

$$sd = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n - 1}}$$

Where  $x_i$  = each value ,  $\bar{x}$  = mean, and  $n$  = total amount of numbers in sample  
 $\sum$  means the sum (adding them all together)

Ex. {4, 36, 10, 22, 9, 43}

$$sd = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n - 1}} = \sqrt{\frac{(4 - 16.2)^2 + (36 - 16.2)^2 + \dots + (43 - 16.2)^2}{5 - 1}} = 12.89$$

17) Find the standard deviation for the data set: 6, 10, 22, 36

### C. TYPES OF DATA AND DISPLAYS

There are two types of data: **categorical** and **quantitative**.

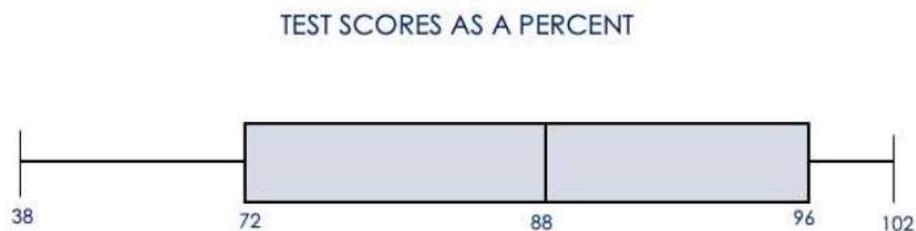
**Categorical variables** are variables that categorize individuals (place them in groups). These variables may take on values that are labels for categories. Examples are eye color (blue, hazel, etc.), gender (male or female), method of transportation to school (bike, car, bus, etc.), class rank (senior, junior, etc.).

**Quantitative variables** are numerical variables that represent an amount or quantity. There are two kinds of these: **discrete (counted, nothing in between)** and **continuous (measured, infinite)**.

18) For the examples below, identify each as either Categorical or Quantitative.

- Time it takes to get to school
- Number of people under 18 living in a household
- Hair color
- Temperature of a cup of coffee
- Gender
- Height
- Jellybean flavors
- Zip codes
- Where did you eat your last meal? (1=home, 2=restaurant, 3=other)
- What grade did you earn in your last math class: A, B, C, D, or F?

19) Interpret the boxplot.



- What was the high score on the test?
- What percent of the class scored above a 72?
- What was the median score?
- What percent of the class scored between 88 & 96?
- Do you think this test was too hard? Explain.
- Would you expect the mean to be above or below the median? Explain.

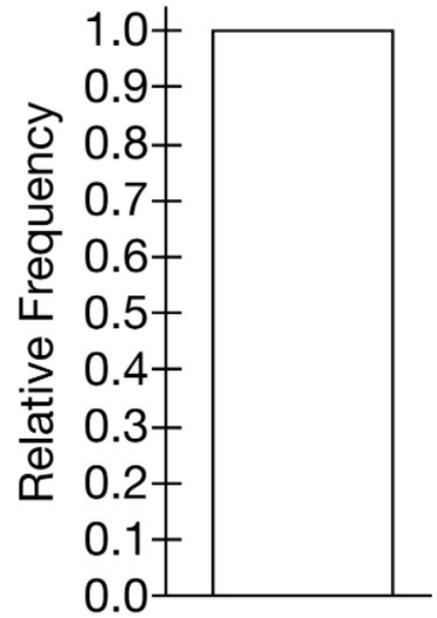
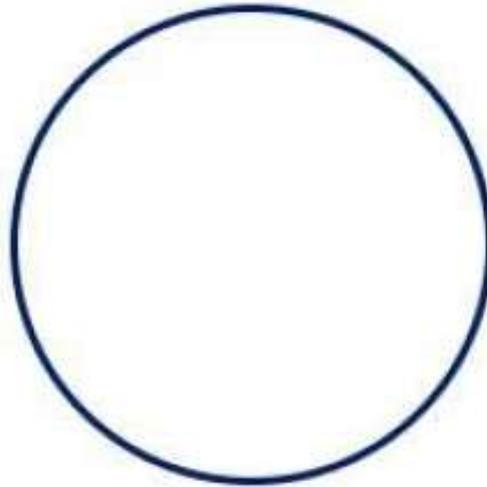
20) Create a pie chart **AND** segmented bar chart for the following data about how people get to work:

40% Bus

25% Car

10% Walk

25% Bicycle/Scooter



Which do you prefer? Explain.

21) A survey of the number of minutes it takes to get to school was taken. Make a dot plot for the data. Do not forget to label the axis.

Minutes	5	10	15	20	25	30	35	40+
# of students	5	6	10	12	8	6	3	2



22) For the set of data, make a scatterplot. Make sure to keep the context of the data by labeling the axes and choosing an appropriate title for the graphs. You should have consistent scales for both axes.

Each student measured the length of his/her right foot and height. The results are recorded below.

Foot Length (cm)	Height (cm)
24	159
22	148
19	126
23	157
20	138
24	162
28	180
25	161
17	122
24	155
26	173
22	146



23) For the data in the table show below, create a stem-and-leaf chart (using tens as stems and ones as leaves). Make sure to label and include a key.

A marketing consultant observed 50 consecutive shoppers at a supermarket. One variable of interest was how much each shopper spent in the store. Here are the data (to the nearest dollar), arranged in increasing order.

3    9    9    11    13    14    15    16    17    17  
 18    18    19    20    20    20    21    22    23    24  
 25    25    26    26    28    28    28    28    32    35  
 36    39    39    41    43    44    45    45    47    49  
 50    53    55    59    61    70    83    86    86    93

Stems | Leaves



Key (with context and units): \_\_\_\_\_

## D. PROBABILITY

$$\text{Probability } P(x) = \frac{\text{the number of achieving success}}{\text{the total number possible outcomes}}$$

**Probability** is the likelihood or chance of an event occurring.

For example, the probability of flipping a coin and it being heads is  $\frac{1}{2}$ , because there is 1 way of getting a head and the total number of possible outcomes is 2 (a head or tail). We write  $P(\text{heads}) = \frac{1}{2}$ .

- The probability of something which is certain to happen is 1. The probability of something which is impossible to happen is 0.  $0 \leq P(E) \leq 1$  (probability of event happening is between 0 and 1)
- The probability of the complement of an event (not happening) is 1 minus the probability of the event,  $P(E^c) = 1 - P(E)$ .
- Other Probability Rules:

*multiplication rules (joint probability)*

"and"

*independent*  $P(A \cap B) = P(A) * P(B)$

*mutually exclusive*  $P(A \cap B) = 0$

*addition rules (union of events)*

"or"

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

*mutually exclusive*  $P(A \cup B) = P(A) + P(B)$

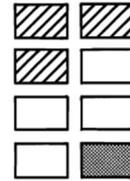
*conditional probability*

"given"

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

24) Using the cards on the right, find each probability if you choose one card at random.

- P(shaded)
- P(striped or white)
- P(not white)
- P(striped or white or shaded)



25) What is the probability of guessing the correct answer to a multiple-choice question if there are 5 choices?

26) A class of 25 students has 15 girls and 10 boys. If a student is chosen, what is the probability it is a girl?

27) There are 26 letters in the alphabet. What is the probability that a letter chosen is in the word MATHEMATICS?

28) A magician asks you to pick a card from a standard deck of 52. What is the probability you choose an ace **or** a 10?

29) Each letter of the word BANANA is written on a card. Find each probability if you pick two cards **without** replacing the first.

- P(B, then N)
- P(N, then N)
- P(A, then A)
- P(B, then B)



30) Find each probability if you pick a marble, you **replace** it, then pick a second marble.

- P(blue, then green)
- P(green, then green)
- P(green, then not green)
- P(red, then not blue)



31) Two hundred seniors were surveyed about their genders and eye color. The results are recorded below in a 2-way table. Suppose that a senior is randomly selected.

		Eye color			
		Brown	Blue	Green	Total
Gender	Male	50	40	20	110
	Female	40	40	10	90
	Total	90	80	30	200

- What is the probability that the selected student is a male?
- What is the probability that the selected student has blue eyes?
- What is the probability that the selected student is a male **and** has blue eyes?
- What is the probability that the selected student is a male **or** has blue eyes?
- What is the probability that the selected student has blue eyes, **given** that the student is male?
- What is the probability that the selected student is a male, **given** that the student has blue eyes?

32) In a group of 50 people, 20 people are healthy. Of the remaining 30 either they have high blood pressure, high cholesterol levels or both. If 10 have high blood pressure only and 15 have high cholesterol only....

(Hint: Create a 2- way table – HBP & NoHBP vs. HC & NoHC **OR** create a venn diagram – HBP vs. HC)

- How many people have high blood pressure?
- What is the probability that he/she has high blood pressure?
- What is the probability that he/she has high cholesterol?
- What is the probability that he/she has high blood pressure and high cholesterol?
- What is the probability that he/she has high blood pressure or high cholesterol?
- If the person you select has high blood pressure, what is the probability that they do not have high cholesterol?