Mathematics I Resources for EOC Remediation

S.ID – Interpreting Categorical and Quantitative Data:

HSS-ID.A.1

HSS-ID.A.2

HSS-ID.A.3

HSS-ID.B.5

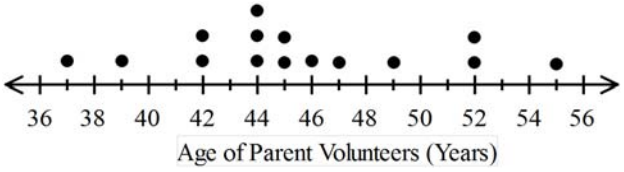
The information in this document is intended to demonstrate the depth and rigor of the Nevada Academic Content Standards. The items are **not** to be interpreted as indicative of items on the EOC exam. These are a collection of standard-based items for students and **only** include those standards selected for the Math I EOC examination.

Initial Draft: March 2017

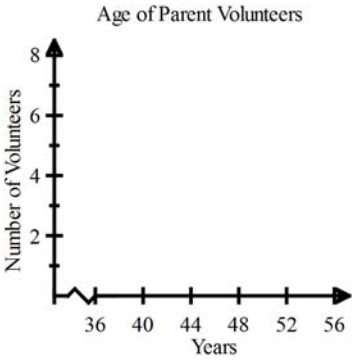
S.ID Interpreting Categorical and Quantitative Data

HSS-ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).

1. The graph represents the ages of the parents who volunteered for Bighorn High School's Career Day.

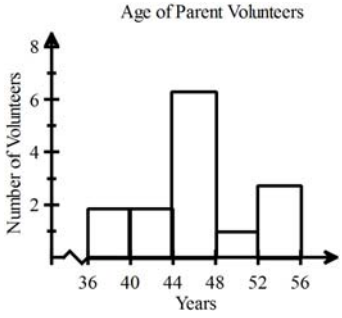


Part 1: Create a histogram to represent the data on the given graph.

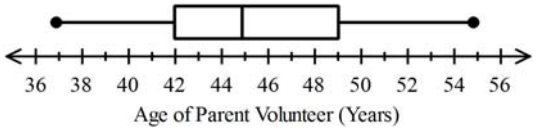


Part 2: Create a boxplot to represent the data.

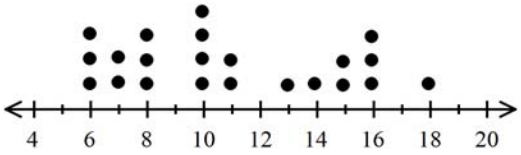
Answer: Part 1:



Part 2:

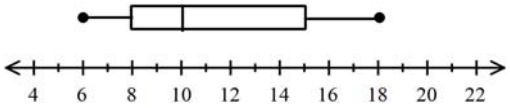


2. **Part 1:** Create a boxplot for the data shown below.



Part 2: Where is the mean in relation to the median? Justify your response.

Answer: Part 1:

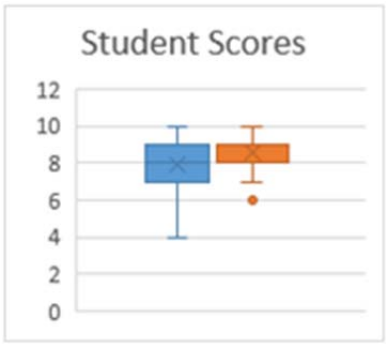


Part 2: Since the data is skewed right, the mean will be greater than the median.

3. Mr. Hall and Penley both teach algebra classes. In the spirit of competition, they both want to compare their Quiz 1 result that each of their classes took and determine which class did the best. The scores indicate the number of correct out of 10 possible points.
   - Mr. Hall's class: 8, 7, 4, 10, 9, 8, 9, 7, 9, 6, 10
   - Mr. Penley's class: 9, 9, 7, 6, 10, 10, 8, 9, 8, 9, 9

   You are asked to create a box plot for each class and develop two statements that could be used as part of an analysis to compare the two classes.

   Answer: Answers will vary depending on what items they are looking at. Students are to compare and contrast both classes and arrive at a conclusion as to how each class did. An example of answers: Almost ¾ of Mr. Penley's class scored better than the top ½ of Mr. Hall's class. They should compare shape, center and spread – for example, Mr. Penley's class had less variability and a greater measure of center.



4. Your algebra class is covering a lesson on statistics. As part of an activity, you and your activity partner are each given a bag of pennies. You are asked to create a graph representing the given set of data (pennies).

YOUR BAG OF PENNIES
Year of the Pennies

1980	1985
1980	1986
1982	1987
1982	1989
1985	1989
1985	1990

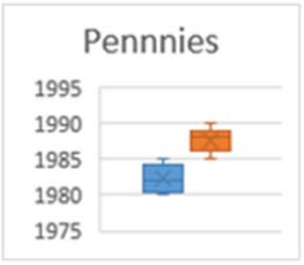
YOUR PARTNER'S BAG OF PENNIES
Year of the Pennies

1980	1985
1980	1987
1980	1987
1980	1989
1983	1989
1983	1990

You and your partner are to choose a graph that best describes each of your data sets (dot plot, histogram, and box plot).

- What representation did you choose and why?
- Comparing the two sets of data, what conclusion can you reach about each set of the sets of pennies? Compare and develop two statements on your findings.

Answer: Answers will vary depending on what items they are looking at. Students are to compare both sets of pennies and arrive at possible conclusions as to which set they think has the older pennies, etc. Example: Students graph set data and compare. One of the statements could be that "my partner's pennies are newer, because…"



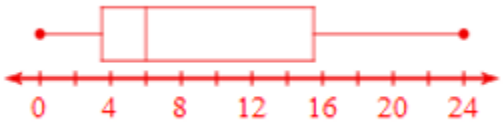
5. **Part 1:** Create a boxplot representing the data given below.

Hits in a tennis game: 4, 10, 3, 9, 5, 3, 5, 5, 18, 13, 3, 24, 19, 0, 19

Part 2: Where is the mean in relation to the median? Justify your answer.

Answer: **Part 1:** See the graph.

Part 2: The mean will be higher than the median because the data is skewed to the right. Larger values will make the mean increase.

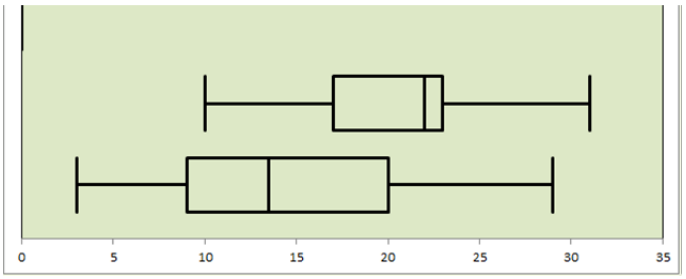


6. The lists below give the number of men and women enrolled in an art class across a group of colleges.

   Men: 10,12,15,9,22,3,9,7,16,29,22,18
   Women: 22,31,19,22,15,10,22,18,30,11,21,23

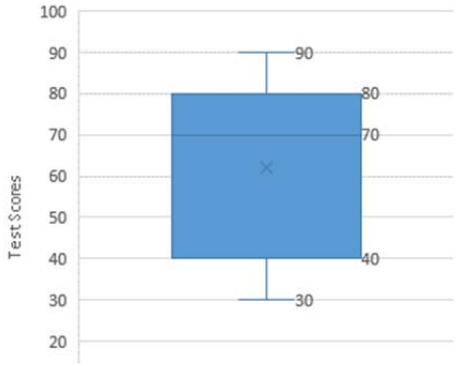
   Use the data listed above to make a double box-and-whisker plot of the enrollment of men and women in the art classes. Then, find the range and interquartile range of each set of data. Use your results to make a conclusion about the variability of the two data sets.

Answer: Men: Range =26, IQR=11;
Women: Range =21, IQR=6.
The range and IQR for men is greater than the range and IQR for woman, which indicates that the data is more spread out for men and they have larger variability.



7. Draw a box plot for the following test information:
   - The median is $\frac{3}{4}$ of the distance between the first and third quartiles.
   - The range is 60 and the lowest score was 30.
   - The interquartile range is $\frac{2}{3}$ of the total range.
   - The median is 70.

Answer:



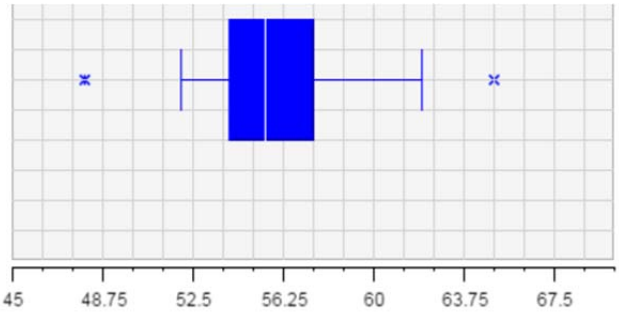
8. Use the following information for the two parts of this problem.

President's Age at Inauguration

President	Age	President	Age
George Washington	57	Warren G. Harding	55
Franklin Pierce	48	Lyndon B. Johnson	55
Jimmy Carter	52	Benjamin Harrison	55
John Quincy Adams	57	William McKinley	54
Woodrow Wilson	56	Dwight D. Eisenhower	62
James Buchanan	65	James Monroe	58
Herbert Hoover	54	Harry S. Truman	60
Martin Van Buren	54	James Madison	57

Part 1: Create a boxplot of the data shown above.
Part 2: Determine if the given information contains any outliers. Show all work.

Answer: **Part 1:** see graph



Part 2: 1.5(3.5) = 5.25
Lower Outlier cutoff = 54 – 5.25 = 48.75, so there is a lower outlier at 48. (Franklin Pierce)
Upper Outlier cutoff = 57.5 + 5.25 = 62.75, so there is an upper outlier at 65. (James Buchanan)

HSS-ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

1. In many large cities, businesses charge a fee to use their parking lots. The table shows the hourly rates for typical city lots in medium-sized cities on the east coast and the west coast of the USA. Which coast has a larger standard deviation?

East Coast	$2.50	$3.25	$1.25	$2.25	$3.75
West Coast	$2.25	$3.50	$4.25	$4.00	$3.25

Answer: East Coast

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2. You need to order pizzas for a school event that starts at 6:00 pm. There are four equally yummy pizza companies to choose from. Based on the information in the chart, which company is most likely to deliver your pizzas on time? Justify your reasoning.

	Average Number of Weekly Deliveries	Average Delivery Time	Standard Deviation
Pizza Company A	198	47 minutes	7.4 minutes
Pizza Company B	225	47 minutes	2.1 minutes
Pizza Company C	272	49 minutes	4.6 minutes
Pizza Company D	178	52 minutes	10.3 minutes

Answer: Pizza Company B because even though Pizza Company A has the same average delivery time, Pizza Company B has a smaller standard deviation so they will have more deliveries close to the average time.

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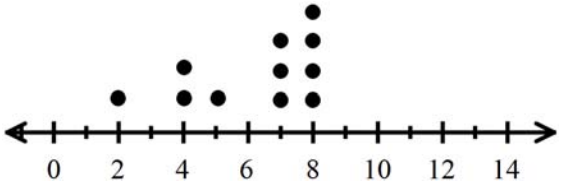
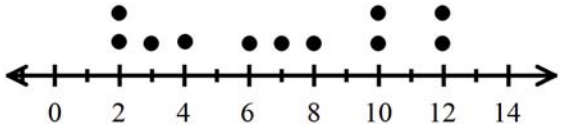
3. Compare the medians, means and standard deviations of the two data sets.

Data Set 1:



Data Set 2:



Answer: The mean of data set 1 is smaller than the mean of data set 2. The medians of the sets are the same (both $= 7$). The standard deviation of set 1 is smaller than set 2.

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4. Which of the following is true about these two data sets?

{71, 71, 75, 83, 91, 92} and {73, 75, 76, 83, 87, 90}

A. The ranges are equal.
B. The variances are equal.
C. The medians are equal.
D. The means are equal.

Answer: D

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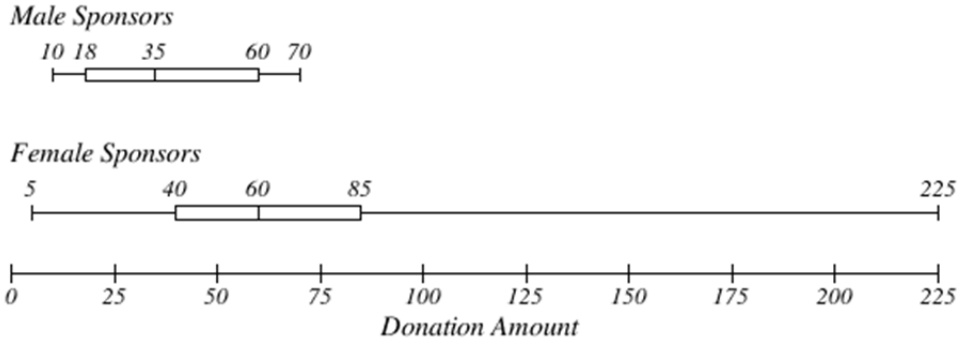
5. KNPR is doing their membership drive during this month. The local newspaper surveyed 25 female and 25 male sponsor members to learn the amount of money they donated. The survey is summarized in the following table.

	Female	Male
Minimum	$5	$10
Maximum	$225	$70
Quartile 1	$40	$18
Median	$60	$35
Quartile 3	$85	$60
Mean	$65	$40

Part 1: Create two box plots to display the amount donated by gender.

Part 2: Compare the two sets of data using critical points, a measure of central tendency, and variance to justify conclusions.

Answer: Part 1:



Part 2: Male Sponsors: Range = 60, IQR = 42, Median = 35 and the Mean = 40. The data does not have a large range. The mean and median costs are very similar because the shape of the data is fairly symmetric. Female Sponsors: Range = 220, IQR = 45, Median = 60, and the Mean = 80. The data has a large range. The mean and median costs are different because the data is skewed to the right. This skewness increases the mean. The data is not grouped close to the median and is spread throughout the 1st and 3rd quartiles.

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6. Which of the following sets of four numbers has the smallest possible standard deviation? Justify your answer mathematically.

A. 2, 3, 5, 8
B. 6, 6, 7, 8
C. 3, 4, 6, 7
D. 1, 3, 5, 7

Answer: Choice C has the smallest range and the values in choice C are closest to the mean which is 6.75.

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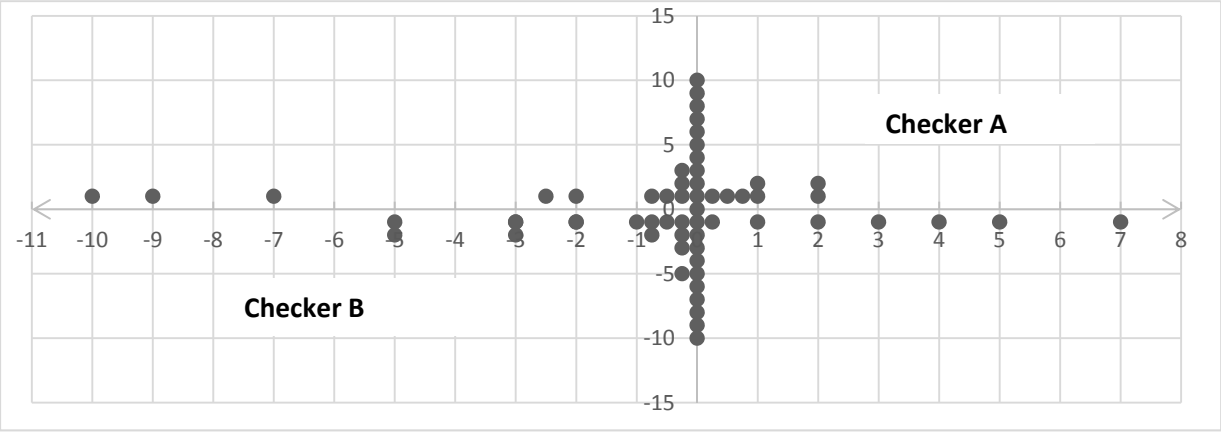
7. Checker A and Checker B work at a grocery store. The store tracks if there cash drawers are over the amount they should have, under the amount they should have, or are exactly correct. The dot plot below compares the data collected from the two checkers.



- Negative numbers represent the amount the drawer was under the correct value.
- Positive numbers represent the amount the draw was over the correct value.
- Zero indicates that the checker's draw had the correct value.

Part 1: Compare the mean of Checker A with the mean of Checker B.
Part 2: Compare the standard deviation of Checker A with the standard deviation for Checker B. Justify your reasoning.
Part 3: If you were a customer, which checker would you prefer and why? If you were the store, which checker would you prefer and why?

Answer: Part 1: Checker A's graph is skewed left. Checker B is more symmetric with a slight skew right. Therefore, the mean for Checker A would be less than the mean for Checker B. **Part 2:** The standard deviation for checker A is 2.8. The standard deviation for checker B is 2.4. The spread of the points for both checkers is very similar, just in different directions. Checker A's points are spread out with 6 points to the right of zero (positive) and 10 points to the left of zero having negative values. For checker B, there are 7 points to the right of zero that are positive and 12 points to the left of zero that are negative. However those twelve points are closer together than those of checker A. Therefore, the standard deviation for checker A would be slightly higher. **Part 3:** As a customer, I would prefer checker A because her drawer is over by less than that of checker B which means that I would lose less money due to incorrect checkout. If I was the store owner, I would want Checker B because the drawer is over by larger amounts and under by lesser amounts.

8. Lily and Violet recorded their scores on their last five math quizzes.

Lily	80	85	85	90	95
Violet	75	80	90	95	100

Part 1: Which student shows greater variability? Explain.
Part 2: Which student has a greater mean? Justify.

Answer: **Part 1:** Violet. The data is more spread out. Her range is 25 compared to Lily's 15.
Part 2: Violet. Her mean is 88 compared to Lily's at 87.

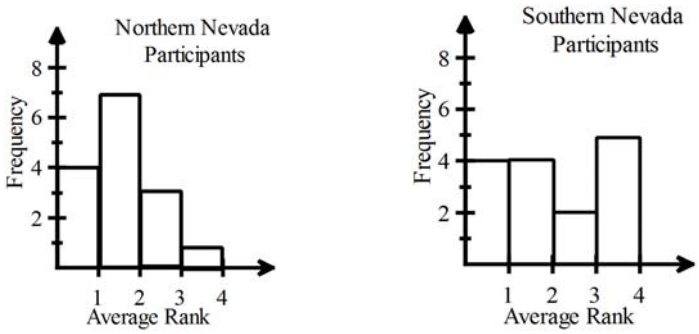
9. The following are the IQ scores of students in a mathematics class:
92, 84, 112, 85, 96, 114, 121, 80, 100, 94, 92

Compare central tendency measures to determine if the distribution is skewed left or right.

Answer: The mean = 97.3 and the median = 94 for the data set. Since the Mean > Median, the data will be skewed right.

HSS-ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

1. Yoga class participants from Northern Nevada and Southern Nevada were surveyed about their skill levels. 15 different surveys were conducted in each part of the state. The following information about the results applies to all surveys.
    - Participants rank their skills on a scale of $0 - 4$.
    - A rating of 0 indicates that the individual has no yoga skills.
    - A rating of 4 indicates that the individual is an expert.



Which statements are best supported by the data sets? Select **ALL** that apply.

A. Southern participants have more similar skills than Northern participants.
B. Northern participants have more similar skills than southern Participants.
C. The median skill rank for Northern participants is higher than the median skill rank for Southern participants.
D. The median skill rank for Northern participants is about the same as the median skill rank for Southern participants.
E. The median skill rank for Northern participants is lower than the median skill rank for Southern participants.

Answer: B and D

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2. Given the values 7, 13, 17, 24, 56, 63, 86, which of the following would affect the mean of the values but not the median?
    A. Multiplying all the numbers by 2.
    B. Increasing the value 63 by any amount.
    C. Removing any value except for 24.
    D. Adding 10 to any of the values less than 24.

Answer: B

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3. The stem and leaf plots show the ages of 20 randomly surveyed people on two different days at the Circus-Circus Adventure Dome amusement park. Compare and contrast the ages of people at the Adventure Dome on the two different days.

DAY ONE

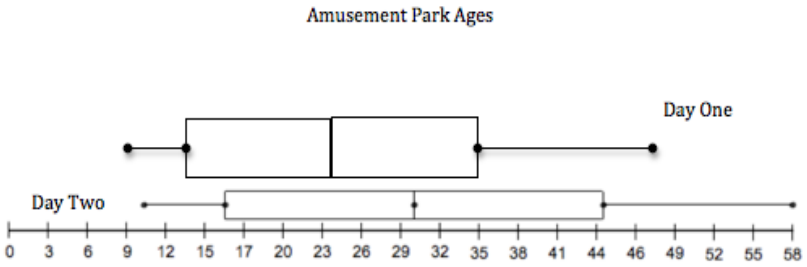
0	9 9
1	1 1 3 3 4
2	0 2 2 4 7
3	1 2 4 5 5
4	2 8 8

DAY TWO

1	0 1 1 2 3 6
2	1 3 4 8
3	0 8 8 9
4	2 4 5 9
5	2 8

Key: 1 | 0 = 10

Answer: On day one, the average age is 25 years and the median age is 23 years. On day two, the average age is 30.2 years and the median age is 29 years. We can conclude that attendees are older on day 2 by analyzing the mean or the median values. The shape of ages on Day One is approximately symmetric, whereas the shape of the distribution on Day Two is skewed to the right. The variability of ages on Day Two is much greater than the variability of ages on Day One. This can be seen by looking at the range, IQR or standard deviation.



4. There are five friends at a park, ages 13, 13, 14, 15 and 16. If another 13-year old meets them at the park, what changes will occur? Select **ALL** that apply.

   A. The median will decrease.
   B. The median will stay the same.
   C. The median will increase.
   D. The mean will decrease.
   E. The mean will stay the same.
   F. The mean will increase.
   G. The standard deviation will decrease.
   H. The standard deviation will stay the same
   I. The standard deviation will increase.

Answer: A, D and G

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5. Utilizing the following data set, determine the three measures of central tendency: median, mean and mode. Then, decide which measure of central tendency would be best to report to describe this data set and explain your choice.

   54, 45, 46, 51, 38, 55, 51, 47, 46, 42, 52, 55, 98, 37, 48, 52, 57

Answer: Mean: 74, Median: 51, Mode: 46, 51, and 55. The best measure of central tendency would be the **median** to discount the outlier, 98.

S.ID Interpreting Categorical and Quantitative Data

HSS-ID.B.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. *(Modeling Standard)

1. A sampling of students were asked if they agree or disagree with their school's hat policy. The results are shown in the two-way frequency table.

	Male	Female	
Agree	17	37	
Disagree	26	15	

Part A: How many students participated in the survey?

Part B: If a female is selected at random, is she more likely to agree or disagree with the hat policy? Justify your response.

Part C: Do more students agree or disagree with the hat policy? Justify your response.

Part D: Did more males or females participate in the survey?

Answer: **Part A:** 95 students, **Part B:** Agree, because more females agree with the policy or because 37 out of 52 females agree with the policy or because 71% of the females agree with the policy, **Part C:** Agree, because the marginal frequency of agreeing is 54 and the marginal frequency of disagreeing is 41. Or, because the total number of those that agree is 54 and those that disagree is 41, **Part D:** More females in the survey. Males = 43, Females = 52.

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2. Middle school students were asked about their ice cream flavors preferences. The responses are summarized in the table below.

	Likes vanilla	Doesn't like vanilla	Total
Likes chocolate	30	43	73
Doesn't likes chocolate	65	9	74
Total	95	52	147

Part A: What percent of students don't like both chocolate and vanilla?

Part B: What percent of the students like vanilla?

Answer: **Part A:** $\approx$ 6.1%, **Part B:** $\approx$ 64.6%

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3. PBS surveyed 50 adults about their favorite major T.V. channel (ABC, NBC, and CBS). The following were the results.

Men	**Women**
Two men liked CBS	Sixteen men liked CBS
Ten men liked NBC	Eight out of thirty liked ABC
Eight liked ABC	

Part 1: Find the marginal frequency for men, ABC, NBC, and CBS

Part 2: Find the joint frequency for women who like NBC.

Part 3: Find the relative frequency for men and women.

Answer:

	CBS	NBC	ABC	Total
Men	2	10	8	20
Women	16	6	8	30
Total	18	16	16	50

	CBS	NBC	ABC	Total
Men	0.10	0.50	0.40	1.00
Women	0.53	0.20	0.27	1.00
Total	0.36	0.32	0.32	1.00

4. A high school held an election for school president. A total of 460 students voted. Jose won the election with 225 votes. In the freshman class, 35 out of 127 students voted for Sarah. 200 freshmen voted. Paul received twice as many votes from freshman than sophomores. Create a table that represents the situation.

	Jose	Sarah	Paul	Total
Freshman				
Sophomores				
Total				

Answer:

	Jose	Sarah	Paul	Total
Freshman	93	**35**	72	**200**
Sophomores	132	92	36	260
Total	**225**	**127**	108	**460**

5. A school has two campuses. The two-way frequency table shows the number of students and teachers in each campus.

	Students	Teachers	Total
East Campus	1600	109	4709
West campus	1250	72	1322
Total	2850	181	3031

Part A: Find the ratio of students to teachers at East campus Round your answer to the nearest hundredth.

Part B: Find the ratio of students to teachers at West campus. Round your answer to the nearest hundredth.

Part C: Which campus has a lower student to teacher ratio?

Answer: **Part A:** $\frac{109}{1600}$, **Part B:** $\frac{72}{1250}$, **Part C:** $\frac{109}{1600} > \frac{72}{1250}$, so that means the West campus has a lower student to teacher ratio.

6. The following table shows the number of students taking Spanish and / or French. Fill in the missing sections and calculate the relative frequency of students who take Spanish and do not take French.

	Take French	Do not take French	Total
Take Spanish	14		
Do not take Spanish	10	3	13
Total		26	

Answer: Do not take French: 23 Total take French: 24
Total take Spanish: 37 Grand total: 50
Rel. freq. of students who take Spanish and do not take French: 23/37 = 62%

7. The following table shows the number of people who like / do not like country music and hip-hop music. Fill in the missing sections and calculate the relative frequency of students who do not like country music and do like hip-hop.

	Like hip-hop music	Do not like hip-hop music	Total
Like country music	57		78
Do not like country music	13	9	
Total			

Answer: Do not like hip-hop: 21 Total do not like country: 22
Total like hip-hop: 70 Total do not like hip-hop: 30
Grand total: 100
Rel. freq. of students who do not like country music and do like hip-hop: 13/22 = 59%

8. Construct a two-way table using the following information:
   - 326 of the respondents were over the age of 65.
   - For respondents 65 years old or younger, three times as many purchased foreign cars than cars built in the USA.
   - 350 of the respondents purchased a car made in the USA.
   - Twice as many respondents purchased a foreign car instead of a car made in the USA.

Answer:

	Respondents > 65 years	Respondents ≤ 65 years	Total
Foreign Car	157	543	700
USA	169	181	350
	326	724	1050

9. Using the information below, fill in the data below, and determine the marginal frequencies of the two-way table shown below.
   - A survey of 120 students enrolled in pre-calculus or college prep math found that 45% of them prefer algebra rather than geometry.
   - Of the students who prefer algebra, $\frac{1}{3}$ are enrolled in college prep math.
   - Of the 120 students surveyed, 50 were enrolled in pre-calculus.

	Algebra	Prefer Geometry	Prefer Total
Enrolled in Pre-Calc			
Enrolled in College Prep Math			
Total			

Answer:

	Prefer Algebra	Prefer Geometry	Total
Enrolled in Pre-Calc	36	14	50
Enrolled in College Prep Math	18	52	70
Total	54	66	120

10. Men and women were asked if they preferred cats or dogs. Use the following data to construct a two-way frequency table.
    - There were $\frac{2}{3}$ as many men preferring cats as there were women preferring dogs.
    - There were $\frac{7}{3}$ as many women preferring cats than preferring dogs.
    - There were $\frac{4}{3}$ as many men preferring dogs than women preferring dogs.
    - The survey consisted of 256 respondents

    How many women took the survey?

Answer:

	Men	Women	Total
Dogs	64	48	112
Cats	32	112	144
Total	96	160	256

There were 160 women surveyed.

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11. Use the following information to determine the number of Honors Geometry students that scored either a 3 or 4 on the Geometry EOC test.
    - 6% of honors students taking the geometry EOC test scored a 1 (below expectations).
    - There were four times as many non-honors students as honors students taking the geometry EOC test.
    - 24% of the honors students taking the Geometry EOC test scored a 2(approaching expectations)
    - A total of 13,400 students took the Geometry EOC

Answer:

Ratio of honors to non-honors students is 1:4. 1,876 honors students scored a 3 or 4 on the Geometry EOC.

	1	2	3 or 4	Total
Honors	6%	24%	1876	2,680
Non-Honors				10,720
Total				13,400

S.ID Interpreting Categorical and Quantitative Data

12. A study compared the on-time performance for three bus companies. A table with the joint and marginal frequencies of the result is shown.

    Determine which company has the best on-time performance. Explain how to identify the company that performed best.

	On-time	Late	Total
Cross-Country Bus	0.38	0.05	0.43
Express Way Lines	0.32	0.03	0.35
Red Dog Transit	0.18	0.04	0.22
Total	0.88	0.12	1

A. Cross-Country Bus has the best on-time performance; Divide the joint relative frequency of on-time arrival by the marginal relative frequency to find the best performance.
B. Red Dog Transit has the best on-time performance; Divide the joint relative frequency of on-time arrival by the marginal relative frequency to find the best performance.
C. Cross-Country Bus has the best on-time performance; identify the greatest joint relative frequency of on-time arrivals to find the best performance.
D. Express Way Lines has the best on-time performance; Divide the joint relative frequency of on-time arrival by the marginal relative frequency to find the best performance.

Answer: D. For the best on time, find the on time "rate".
CCB: 0.38/0.43=0.884; EWL: 0.32/0.35=0.914; RDT: 0.18/0.22=0.818