Statistics Team Solutions

1. **1.07**. Type the data into a list on the graphing calculator and produce the following results: the mean (A) is 4.61, the standard deviation (B) is 1.46 to two decimal places, the first quartile (C) is 4, the median (D) is 5 and the third quartile (E) is 6. The exact value is 4.61+1.46-4+5-6= 1.07.

2. $\mathbf{\frac{97}{179}}$. First find the totals of the rows, columns and overall chart. The value of A is $\frac{91}{358}$. The value of B is $\frac{212}{358}$. The value of C is $\frac{165}{358}$. The value of D is $\frac{260}{358}$. The value of E is $\frac{14}{358}$. Plugging in produces $\frac{91+212+165-260-14}{358}=\frac{194}{358}=\frac{97}{179}$.

3. **205.912863**. Using Table A (the z score table), each part is as follows: part A is .0030. Part B is .0006. Part C is .9925. Part D is .0241. Plugging the values in produces a result of 205.91286307054, which to six decimal places is the answer.

4. **23.0256** or $\mathbf{\frac{14391}{625}}$. The value of part A is the mean of the colors, which is 52. The degrees of freedom is (n-1) or 5, for part B. The critical value from the chart with a df of 5 and a .05 level is 11.07. Part D, the chi square value is 5. Plugging the values in gives the answer.

5. **.50492** or $\mathbf{\frac{12623}{25000}}$. The value of A is a binomial distribution. It is $_{10}C_5(.34)^5(.66)^5 = .143389$ to 6 decimal places. The value of B is involving a cumulative binomial distribution. It is 1-binomcdf (15, .28, 6) = .096537 to 6 decimal places. The value of C is a geometric distribution. It is $(.72)^4(.28) = .075247$ to 6 decimal places. The value of D is $(1-.34)^4 = .189747$ to 6 decimal places. The sum of the four parts equal the answer.

6. $\mathbf{\frac{35}{22}}$. First you must subtract three from each of the numbers involving two classes because the original numbers won't work in the Venn diagram. So the Venn diagram regions are 10-Math only, 4-Math and Science, 5-Math and History, 3-all three, 12-Science only, 2-Science and History, 8-History only, 6- none. Using the information, part A is $\frac{7}{25}$ because 14 of the 50 students take 2 or more classes. Part B is $\frac{5}{11}$, because there are 22 students in Math and 10 are in Math only. Part C is $\frac{4}{25}$, because 8 of the 50 students are take science only. Part D is $\frac{1}{2}$, because 28 students don't take Math and 14 students are in Science (Science only + (Science and History)). Plugging the values in gives the solution.

7. $\mathbf{\frac{-4757\sqrt{1261}}{1261}}$. The mean of (X+Y) is 134. The standard deviation of (X+Y) is $2\sqrt{13}$. The mean of (2X – 3Y) is -142. The standard deviation of (2X – 3Y) is $2\sqrt{97}$. Plugging the values in gives a fraction of $\frac{-19028}{4\sqrt{1261}} = \frac{-4757}{\sqrt{1261}}$. When you rationalize the fraction, you get the solution.

8. $\mathbf{\frac{2252}{45}}$. The first ten positive composite numbers are 4, 6, 8, 9, 10, 12, 14, 15, 16, 18. Type the data set into a list and produce the mean of 11.2, the median of 11 and the IQR of 7. To find the exact value of the variance, subtract the mean from each value, square the differences, add them up, and divide by (n-1). The value of the variance is $\frac{938}{45}$. The sum of the other three numbers is 29.2. The total is the answer.

9. $\mathbf{\frac{11581}{1400}}$. You need to create two z-scores from the given information. Those equations are $\frac{62 - mean}{sd} = -1.43 \quad and \quad \frac{90 - mean}{sd} = 1.66$. The z-scores are found using the z-score table (Table A). Solving the equations algebraically gives a mean of $\frac{23162}{309}$ and a standard deviation of $\frac{2800}{309}$. Plugging in gives the answer in lowest terms.

10. **128.78** or $\mathbf{\frac{6439}{50}}$. To find parts A and B, you must plug the information into the line of best fit formula. The results are as follows: $y - 81 = (.7)\left(\frac{3}{5}\right)(x - 76)$ which then becomes $y - 81 = .42(x - 76) \Rightarrow y - 81 = .42x - 31.92$. The final equation in slope intercept form is $y = .42x + 49.08$. So A= .42 and B= 49.08. For part C, plug 63 in for x and get a y value of 75.54. For part D, plug 79 in for x and get a y value of 82.26. The value of the residual is (observed –predicted) = 86-82.26= 3.74. The sum of the four parts equals the answer as a decimal or fraction.

11. **(-.041618, .291618)**. The formula for a 2 proportion confidence interval is $(p_1 - p_2) \pm z\sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}$. Plugging the numbers in gives the following:

$$\left(\frac{60}{80} - \frac{30}{48}\right) \pm 1.96\sqrt{\frac{\frac{3}{4} \bullet \frac{1}{4}}{80} + \frac{\frac{5}{8} \bullet \frac{3}{8}}{48}} = \frac{1}{8} \pm 1.96\sqrt{.0072265625} = \frac{1}{8} \pm .1666180137$$

$= (-.0416180137, .2916180137)$ which when rounded to six decimal places for each interval gives the solution.

12. $\mathbf{\frac{767}{386}}$. To find the mean of the scores, type the scores into a list or find the sum and divide by 40. Either way, the mean is 2.95. To find the variance, subtract the mean from each value, square the differences, add the differences up and divide by (n-1), or 39 in this case. The sum of the differences is 57.9 and when you divide that by 39, in lowest terms, the variance is $\frac{193}{130}$. When you divide the mean by the variance the solution in lowest terms is the answer.