The following were changed at the resolution center at the convention:12 D or E, 19 A

1. **D**. Plug the data into a list. The mean is 7.25 and the median is 7.5. To find the standard deviation, subtract the mean from each value, square the differences, add them up, divide by (n-1), or 7 in this case, and take the square root. When you do this process, you get a variance of $\frac{247}{14}$. When you take the square root, you get $\frac{\sqrt{3458}}{14}$. Plugging the values into the expression produces $(7.25)(7.5)\left(\frac{\sqrt{3458}}{14}\right)=\frac{435\sqrt{3458}}{112}$.

2. **C**. The formula for χ^2 is $\sum\frac{(obs-\exp)^2}{\exp}$. The expected values for this problem are 15.75 Orange, 18.9 Red, 22.05 Yellow and 6.3 Pink. Plugging the values in produces $\frac{(14-15.75)^2}{15.75}+\frac{(17-18.9)^2}{18.9}+\frac{(22-22.05)^2}{22.05}+\frac{(10-6.3)^2}{6.3}=\frac{7}{36}+\frac{361}{1890}+\frac{25}{220500}+\frac{1369}{630}$. The sum of the four fractions is the solution.

3. **C**. When you put the original numbers into a Venn diagram, the diagram does not work because the total number of students in it total 90, not 120 students. You must subtract 10 from each of the numbers that represent two of the classes and do the Venn diagram again. Therefore, there are 12 students in Biology and Chemistry, 11 students in Biology and Physics and 10 in all three classes. Since there are 57 students in Biology, there are 24 students in Biology only.

4. **B**. There are 59 students in Physics. When you create the diagram for question 3, the breakdown of Physics is 23 in Physics only, 10 in all three classes, 11 in Physics and Biology and 15 in Physics and Chemistry. So the solution is $\frac{36}{59}$.

5. **D**. There are two z-scores. They are $\frac{90-77}{4.2}\approx 3.10$ *and* $\frac{65-77}{4.2}\approx -2.86$. You round both to two decimal places so you can use the z chart to answer the question. The proportion for the z score of 3.10 is .9990. Since we're looking for greater than, the solution is (1-.9990) = .0010. The proportion for the z score of -2.86 is .0021. The final solution is the sum of the two parts, so .0010 + .0021 = .0031.

6. **B**. Median and interquartile range are resistant measures. The other three are influenced by outliers.

7. **C**. The probability of pick a face card or a prime number is $\frac{28}{52}$ (2, 3, 5, 7, J, Q, K). So the probability of losing is $\frac{24}{52}$. Therefore, in order for the game to be fair, $\frac{24}{52}(x)=\frac{28}{52}(12)$. Solving for x produces the solution.

8. **A**. The mean of a binomial situation is np, or (180)(.65) = 117. The standard deviation of a binomial situation is $\sqrt{np(1-p)}$, or $\sqrt{180(.65)(.35)}=\sqrt{\frac{819}{20}}=\frac{3\sqrt{91}}{2\sqrt{5}}=\frac{3\sqrt{455}}{10}$.

9. **D**. First, find the raw score using the formula $1.645=\frac{raw-23}{\frac{4}{\sqrt{300}}}\rightarrow raw=23.37989648$

When you plug the raw score in with the alternate mean, you get the following:
$\frac{23.37989648-23.5}{\frac{4}{\sqrt{300}}}=-.5200635095\approx-.52$. When you look up this z-score in the chart, you get a result of .3015. The alternative is greater than, so the final solution is 1 - .3015, which is the result.

10. **B**. Since the distribution is skewed to the right, the mean is affected by the high outliers. Therefore, the mean is greater than the median.

11. **C**. Multiply X by its corresponding P(X). The sum of the products is the solution.

12. **D**. Subtract the mean (4.41) from each value. Square the differences and multiply those squared differences by their corresponding P(X). Find the sum of those products and the result is 2.7419. The standard deviation is the square root of that, which is 1.655868352, which rounds to 1.66.

13. **A**. The formula for the line of best fit is $y-\bar{y}=r\left(\frac{s_y}{s_x}\right)(x-\bar{x})$. Plugging in produces

$y-84=.81\left(\frac{7}{4}\right)(x-53)\rightarrow y-84=\frac{567}{400}(x-53)\rightarrow y=\frac{567}{400}x+\frac{3549}{400}$.

14. **E**. You are not given that the two variables are independent, therefore you can not calculate the standard deviation.

15. **B**. Symmetric histograms can have more than one peak. The mean is larger than the median when the distribution is skewed to the right. All normal curves are symmetric and bell-shaped.

16. **D**. To increase the standard deviation from 5 to 8, you multiply by 1.6. When you multiply the mean of 70 by 1.6, you get 112. You must subtract 32 to get to the new mean of 80. So the transformation equation is y = 1.6x – 32. When you plug Jane's score of 80 into the equation, you get the solution as a result.

17. **B**. The set of sample means is approximately normal with a mean of 225 and a standard deviation of $\frac{30}{\sqrt{45}}$. The z scores of 210 and 230 are $\frac{210-225}{\frac{30}{\sqrt{45}}}\approx-3.35$ and $\frac{230-225}{\frac{30}{\sqrt{45}}}\approx1.12$. The probability that the mean absences in the sample are between 210 and 230 is .8686 - .0004 = .8682.

18. **C**. A smaller sample size will increase the margin of error.

19. **C**. A complete census doesn't necessarily establish a cause and effect relationship.

20. **A**. The confidence interval is a T interval. Plugging the values in produces
$500\pm\frac{2.064(12)}{\sqrt{25}}=500\pm4.9536=(495.0464,504.9536)$. The solution is the answer when the values are rounded to three decimal places.

21. **D**. The formula for $P(A'|B') = \frac{P(A' \cap B')}{P(B')} \rightarrow \frac{26}{63} = \frac{P(A' \cap B')}{\frac{63}{100}} \rightarrow P(A' \cap B') = .26$. Therefore, $P(A \cup B) = .74$. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$, so when you plug the values in, you get $.74 = .48 + .37 - P(A \cap B) \rightarrow P(A \cap B) = .11$. Therefore, the value of $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{.11}{.37} = \frac{11}{37}$.

22. **B**. You must set up a proportion between the rows or the columns. $\frac{n}{65} = \frac{52}{100}$ *or* $\frac{n}{52} = \frac{65}{100}$. In either case, you get the solution.

23. **C**. Different samples give different sample statistics, all of which are estimates for the population parameter, and sampling error is present.

24. **E**. Type II error = 1 – Power. There is a different Type II error for each possible correct value for the population parameter, so there is not enough information to answer the question.

25. **B**. First, find the z score for 21 ounces. $\frac{21-24}{4} = \frac{-3}{4}$. Using the chart, the probability of this is .2266. The z score for 15 ounces is -2.25. Using the chart produces a probability of .0122. So the conditional probability of being greater than 15 ounces given that it is less than 21 ounces is $\frac{.2266-.0122}{.2266} = \frac{.2144}{.2266} = \frac{1072}{1133}$.

26. **C**. The formula for margin of error is $m = \frac{z\sigma}{\sqrt{n}}$. Using the chart value of 1.645 for z and plugging the values in produces $1500 = \frac{(1.645)(10000)}{\sqrt{n}} \rightarrow n = 120.268 \approx 121$.

27. **A**. The formula is $(1-p)^n$. Plugging the values in produces $\left(1-\frac{24}{100}\right)^4 = \left(\frac{19}{25}\right)^4 = \frac{130321}{390625}$.

28. **B**. The formula for $P(A \cup B) = P(A) + P(B) - P(A)P(B)$, because events A and B are independent. When you plug in, you get .34 + .76 – (.34)(.76) = .8416.

29. **C**. A change in units does not affect the correlation coefficient. Correlation shows association between variables, not causation.

30. **E**. Since we were not told about the positive or negative association between the variables, the exact correlation coefficient can not be determined.