1. A
2. B
3. C
4. D
5. A
6. C
7. D
8. B
9. A
10. A
11. D
12. B
13. C
14. B
15. C
16. D
17. B
18. C
19. C
20. B
21. C
22. A
23. D
24. C
25. D
26. A
27. C
28. D
29. B
30. D

1. **A.** The positive integral factors of 256 are 1, 2, 4, 8, 16, 32, 64, 128, 256. The mean of the data is $\frac{511}{9}$. When you subtract the mean from each data value, square the differences and add them up, you get $\frac{525308}{9}$. At this point, you divide by n or 9 in this case to get $\frac{525308}{81}$.

2. **B.** In the problem, you are not told that the two variables X and Y are independent. Therefore, the formula to find the standard deviation is $\sigma_{X-Y} = \sqrt{\sigma_X^2 + \sigma_Y^2 - 2r\sigma_X\sigma_Y}$. Plugging the values in produces $\sqrt{5^2 + 2^2 - 2(.62)(5)(2)} = \sqrt{16.6} = \sqrt{\frac{83}{5}} = \frac{\sqrt{415}}{5}$.

3. **C.** When you take away the students taking exactly one science class, you are left with $2574 - 331 - 466 - 348 = 1429$. This group takes two or three science classes, because you were told everyone takes at least one science class. Therefore, if we let x represent the number of students who take all three science classes, then the equation becomes (562 – x) + (445 – x) + (646 – x) + x = 1429. Solving for x produces an solution of 112.

4. **D.** Since the median is 59 and the range is 78, the minimum value of the data set is 59-39 = 20 and the maximum is 59+39 = 98. Given that the data set is arithmetic, the minimum is the first term and the median is the fourth term. Therefore, the difference between terms is 13. That makes the 2nd term 33 and the 6th term 85. These terms represent the first and third quartile respectively. Their difference is the interquartile range.

5. **A.** The equation for the line of best fit is $y - \bar{y} = r\left(\frac{s_y}{s_x}\right)(x - \bar{x})$. Plugging in produces $y - 73 = .73\left(\frac{6}{2}\right)(x-8) \rightarrow y - 73 = 2.19(x-8) \rightarrow y = 2.19x + 55.48$.

6. **C.** Given $P(B'|A) = \frac{P(A \cap B')}{P(A)} = \frac{P(A \cap B')}{.56} = \frac{1}{4} \rightarrow P(A \cap B') = .14$. Therefore, $P(A \cap B) = .42$, $P(A \cap B') = .27$ and $P(A' \cap B') = .17$. So, $P(A'|B') = \frac{P(B' \cap A')}{P(B')} = \frac{.17}{.31} = \frac{17}{31}$.

7. **D.** The coefficient of determination is any value between 0 and 1 inclusive.

8. **B.** We create two z-scores with the information given: $\frac{56 - mean}{sd} = -.38$ *and* $\frac{78 - mean}{sd} = 1.16$. When you solve the equations by

eliminating the mean, the standard deviation equals $\frac{100}{7}$. When you plug that into one of the equations, you get an exact mean of $\frac{430}{7}$.

9. **A**. The formula for $\chi^2 = \sum \frac{(obs - \exp)^2}{\exp}$. The expected values given the percentages for the bag are 100.8 brown, 67.2 red, 67.2 blue, 50.4 yellow, 33.6 green and 16.8 orange. Plugging the values into the formula produces

$$\frac{(100-100.8)^2}{100.8} + \frac{(68-67.2)^2}{67.2} + \frac{(60-67.2)^2}{67.2} + \frac{(53-50.4)^2}{50.4} + \frac{(35-33.6)^2}{33.6} + \frac{(20-16.8)^2}{16.8} = \frac{89}{56}$$

10. **A**. To go from a standard deviation of 10 to 7, you must multiply by $\frac{7}{10}$. When you multiply the mean by that value, you get 47.6. To get to a new mean of 75, you add 27.4. So the transformation equation is $y = \frac{7}{10}x + 27.4$. When you put 80 in for Carlos' score, you get $y = \frac{7}{10}(80) + 27.4 = 83.4$.

11. **D**. The standard deviation for a two proportion z test is $\sqrt{p(1-p)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$, where $p = \frac{x_1 + x_2}{n_1 + n_2}$. Plugging the values in produces $p = \frac{125+100}{250+250} = \frac{225}{500} = \frac{9}{20}$.
Plugging in p produces

$$\sqrt{\frac{9}{20}\left(\frac{11}{20}\right)\left(\frac{1}{250} + \frac{1}{250}\right)} = \sqrt{\frac{99}{400}\left(\frac{2}{250}\right)} = \sqrt{\frac{99}{50000}} = \frac{3\sqrt{11}}{100\sqrt{5}} = \frac{3\sqrt{55}}{500}.$$

12. **B**. Given the previous information, it produces a z-score of

$$z = \frac{\frac{125}{250} - \frac{100}{250}}{\sqrt{\frac{9}{20}\left(\frac{11}{20}\right)\left(\frac{1}{250} + \frac{1}{250}\right)}} = 2.247332875.$$

Because of the two sided alternative, the p value for this test is .0246186818, which rounds to the solution.

13. **C**. Because events A and B are independent, the formula for $P(A \cap B) = P(A)P(B)$. This leads to $P(A \cap B) = (.41)(.65) = .2665$. This makes $P(A \cup B) = .41 + .65 - .2665 = .7935$. Since $P(A \cup B) = .7935$, then $P(A' \cap B') = 1 - .7935 = .2065$. Plugging the numbers into the expression produces .7935 - .2665 + .2065 = .7335.

14. **B**. This is a geometric situation because Stacy is looking for the first success of fetching and returning. The formula for the standard deviation of a geometric

distribution is $\sqrt{\frac{1-p}{p^2}}$, where p is the probability of success. Plugging the numbers in produces $\sqrt{\frac{1-.22}{(.22)^2}} = \sqrt{\frac{.78}{.0484}} = \sqrt{\frac{1950}{121}} = \frac{5\sqrt{78}}{11}$.

15. **C**. Given a 1% level, the z-score is -2.326. Plugging into the z score produces $\frac{raw-210}{\frac{15}{\sqrt{50}}} = -2.326 \rightarrow raw = 205.0658089$. Plugging this raw score in with the alternate mean produces $\frac{205.0658089-200}{\frac{15}{\sqrt{50}}} = 2.388045208$. This leads to a power of .9915308807. Type II error = 1 – Power. Therefore, the Type II error is .0084691193, which rounds to .0085.

16. **D**. This is an example of a systematic sample in which every nth person is sampled.

17. **B**. The mean of the entire process is 10 + 200 + 30 = 240 minutes and the standard deviation is $\sqrt{2^2+15^2+5^2} = \sqrt{254}$ minutes. 3.5 hours is 210 minutes and 4.5 hours is 270 minutes. There are two z-scores: $\frac{270-240}{\sqrt{254}} = 1.882367415$ and $\frac{210-240}{\sqrt{254}} = -1.882367415$. This leads to p values of .9701069919 and .0298930081 respectively. The difference between them is .9402139838, which rounds to the solution.

18. **C**. There are six treatments in this experiment. There are two brands of formula and each brand has three levels of vitamin D. Therefore, 25(6) = 150 newborn babies are needed to complete the experiment.

19. **C**. This is a matched pair t-test. Create a third column of data that is (Post – Pre). Run a one sample t-test in which the alternative is $H_a : \mu > 0$. This leads to a t value of 1.502603717 and a p value of .0835948363, which rounds to the solution.

20. **B**. The equations given the information is $np = 120$ *and* $\sqrt{np(1-p)} = \frac{2\sqrt{390}}{5}$.

You square both sides of the standard deviation to give you $np(1-p) = \frac{312}{5}$.

Substituting $n = \frac{120}{p}$ into the second equation gives

$\frac{120}{p}(p)(1-p) = \frac{312}{5} \rightarrow 120(1-p) = \frac{312}{5} \rightarrow 1-p = .52 \rightarrow p = .48$. When you plug that into the original substitution, you get $n = \frac{120}{.48} = 250$.

21. **C**. The z score needed for the problem is based on a 97% confidence interval, so we need InvNorm(.985) = 2.170090375, which rounds to 2.17. Using the previous sample of 54% as the p value leads to $.02=\frac{2.17\sqrt{(.54)(.46)}}{\sqrt{n}}\rightarrow n=2924.2269\approx 2925.$

22. **A**. This is a T confidence interval. When you run a t-interval on your calculator, you get the exact solution.

23. **D**. To determine the expected value of the game, we need to establish the amount won times the corresponding probability. This produces $5\left(\frac{1}{2}\right)+2\left(\frac{1}{2}\right)+10\left(\frac{1}{13}\right)+3\left(\frac{3}{13}\right)+5\left(\frac{4}{13}\right)+1\left(\frac{5}{13}\right)=\frac{179}{26}$. The amount invested is 10, so the profit Mr. Sleet makes is $10-\frac{179}{26}=\frac{81}{26}=3.1153\approx 3.12.$

24. **C**. The z-score needed for the confidence interval is Invnorm(.875) = 1.15035, which rounds to 1.15. Plugging into the formula produces $.58\pm 1.15\sqrt{\frac{.58\bullet .42}{100}}\rightarrow .58\pm .0567592283\rightarrow (.5232407717, .6367592283)$. When you round each end to six decimal places, you get (.523241, .636759).

25. **D**. Since 31% drive a car, 69% don't drive a car. Since 42% of drivers are male, 58% are female. The population of Oak Hill High is 50% male/50% female. (.31)(.42) = .1302 are male drivers. So .3698 are not male drivers. So, $.3698=.69x\rightarrow x=\frac{1849}{3450}$ represents the males who don't drive, so $\frac{1601}{3450}$ represents the females who don't drive. Therefore, the probability of a student not driving a car, given that they are female is $\frac{.69\left(\frac{1601}{3450}\right)}{.31(.58)+.69\left(\frac{1601}{3450}\right)}=\frac{.3202}{.5}=\frac{1601}{2500}.$

26. **A**. The value of the correlation is $\sqrt{.438244}=.662$. Plugging the values into the line of best fit produces $y-74=.662\left(\frac{8}{5}\right)(x-66)\rightarrow y-74=1.0592(x-66)\rightarrow y=1.0592x+4.0928$. Plugging Richa's score of 70 in produces $y=1.0592(70)+4.0928=78.2368$. Her residual is $82-78.2368=3.7632.$

27. **C**. This is a cumulative binomial problem, finding the probability that Stephen makes 6, 7, 8, or 9 free throws in the game. The solution is produced by $binomcdf(12,.91,9)-binomcdf(12,.91.5)=.0865993285\approx .0866.$

28. **D**. There are two z-scores: $\frac{88-76}{8}=1.5$ *and* $\frac{71-76}{8}=-.625$. The probabilities for these z-scores are .9331927713 and .2659854678. The difference between them is .6772073035, which rounds to .6772.

29. **B**. First, the probability that a student is less than 85 produces a z-score of $\frac{85-68}{5}=3.4$ which leads to a p value of .9996630192. The probability that a student is less than 78 produces a z-score of $\frac{78-68}{5}=2$ which leads to a p value of .977249938. The interval between 78 and 85 in terms of p value is .9996630192 - .977249938 = .0224130812. So, the final answer is $\frac{.0224130812}{.9996630192}=.0224206365$, which rounds to .0224.

30. **D**. The mean of the data is $\frac{306}{7}$, the median is 43.5, the interquartile range is (67 – 17) = 50 and the mode is 79. When you plug the numbers into the expression, you get $\frac{\frac{306}{7}(50)}{43.5(79)}=\frac{\frac{15300}{7}}{\frac{6873}{2}}=\frac{10200}{16037}$.