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

1. **B**. The formula for margin of error for proportion intervals is $z\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$. In this problem, $m = .02,\ z = 1.96,\ and\ \hat{p} = .52$. Solving for n gives you 2397.1584. The ln (2397.1584)=7.782, so the tenths digit of the natural log is 7.

2. **C**. Since $\frac{P(A\cap B)}{P(B)} = \frac{P(A\cap B)}{P(A)},\ P(A) = P(B)$. $\frac{P(A\cap B)}{P(A)} = 0.4,\ So\ P(A\cap B) = 0.4P(A)$

Therefore, $P(A\cup B) = P(A) + P(A) - 0.4P(A) = .4$. Solving for P(A), P(A)=P(B)=0.25 and $P(A\cap B) = .4(.25) = 0.1$. Solving for the two conditional probabilities wanted, each fraction by use of a venn diagram is $\frac{\frac{3}{20}}{\frac{3}{4}} + \frac{\frac{3}{20}}{\frac{3}{4}} = \frac{\frac{3}{10}}{\frac{3}{4}} = \frac{2}{5}$.

3. **C**. By binomial distributions, $P(X \geq 2) = {}_3C_2(p)^2(1-p) + {}_3C_3(p)^3$. When simplified, the problem is $3p^2(1-p) + p^3 = 3p^2 - 3p^3 + p^3 = 3p^2 - 2p^3$.

4. **A**. The probability of drawing a box is $\frac{1}{3}$. Then each probability of drawing a red ball from each box. So the sum of the three choices is $\frac{1}{3}\left(\frac{2}{5}\right) + \frac{1}{3}\left(\frac{3}{4}\right) + \frac{1}{3}\left(\frac{4}{9}\right) = \frac{287}{540}$.

5. **B**. Using the union probability formula where A=prime and B=spade, the result is as follows: $P(A\cup B) = \frac{16}{52} + \frac{13}{52} - \frac{4}{52} = \frac{25}{52}$. A=(2, 3, 5, 7) In each suit. B=13 spades. 4 cards in common.

6. **C**. The sum of Allison's first six tests is 82(6)=492. The 88% average after 10 tests has a sum of 880. 880-492=388. 388/4=97.

7. **B**. By binomial distributions, we have ${}_{500}C_7(.02)^7(.98)^{493} = .0898886495 = .0899$ to 4 dp.

8. **D**. Using the line of best fit formula with means and standard deviations, we have the following:

$$(y-95) = \left(\frac{3}{4}\right)\left(\frac{6}{3}\right)(x-62) \to y - 95 = \frac{3}{2}(x-62) \to y - 95 = \frac{3}{2}x - 93 \to y = \frac{3}{2}x + 2$$

9. **C**. The only way the problem is not solved is if they all don't solve it. So the solution is 1-P(no one solves it). That solution is $1 - \left(\frac{3}{4}\right)\left(\frac{2}{3}\right)\left(\frac{1}{2}\right) = 1 - \frac{1}{4} = \frac{3}{4}$.

10. **D**. Median is the only resistant measure of the four choices. Others influenced by outliers.

11. **B**. Doing the Venn diagram and subtracting 40 from each of the two class totals because they were counted twice, gives you 40 in all three, 30 math and english and 50 math and science. Those add to 120, leaving 10 people who do math only.

12. **C**. Using the same venn diagram, there are 200 people taking Science. 40 take all three, 50 math and science and 20 english and science for a total of 110, leaving 90 for science only. So the probability is 90/200, which simplifies to 9/20.

13. **D**. The first statement is true because sample data comes from the population. The second statement is not necessarily true. The third statement is true.

14. **A**. The mean of the distribution is 550. Subtract the mean from each value, square the differences, and multiply by the probability gives the following variance:
$(-10)^2(.1)+(-5)^2(.25)+0+(5^2)(.25)+(10)^2(.1)=32.5$. The standard deviation is the square root of the variance. $\sqrt{32.5}=5.700877125=5.70$ to 2 dp.

15. **A**. The first statement is true. The second statement is not because standard deviation can equal zero. The third statement is false because variance is standard deviation squared.

16. **B**. Calculating the chi-square using the formula $\sum\frac{(obs-\exp)^2}{\exp}$, gives the following:
$$\frac{(13-15)^2}{15}+\frac{(20-10)^2}{10}+\frac{(5-10)^2}{10}+\frac{(5-5)^2}{5}+\frac{(4-5)^2}{5}+\frac{(3-5)^2}{5}=13.76666667=13.77$$ (2dp)

17. **D**. The raw score is 75, the mean is 60, and the z-score is 1.27 because of the percentage of 10.2. (1-.102=.8980). Plugging the numbers into the z-score formula gives the following:
$\frac{75-60}{sd}=1.27$. Solving for the standard deviation gives 11.81102362=11.81 to 2 dp.

18. **C**. Factoring P(X=1) out of P(X=1, Y=1)+P(X=1, Y=2)=0.2 give P(X=1)(P(Y=1)+P(Y=2))=.2
Since P(Y=1)+P(Y=2)=1, P(X=1)=0.2. Therefore, by division, P(Y=2)= .06/.2=0.3

19. **C**. Using the formula for proportion margin of error, $\frac{z(.5)}{\sqrt{n}}=m$, gives the following:
$$\frac{1.645(.5)}{\sqrt{n}}=.04\rightarrow .8225=.04\sqrt{n}\rightarrow 20.5625=\sqrt{n}\rightarrow n=422.8164063\approx 423$$

20. **A**. You should be able to get the results of the students directly or through other sources.

21. **E**. The first statement is false because the errors are related. The second statement is false because the null can't be true and false at the same time. The third statement is false.

22. **C**. A placebo is a control treatment in which members of the control group do not realize whether or not they are getting the experimental treatment.

23. **D**. Using two z-score formulas for 80 and 90 with a standard deviation of $\sqrt{\frac{386}{40}}$, you get z-scores of 2.25 and -.97 to two decimal places, getting you decimals of .9878 and .1660 using the z-score chart. Subtract the two results and round and you get the solution.

24. **B**. Percentage of variation is r squared. .84 squared =.7056 which rounds to .71

25. **A**. The formula for proportion confidence intervals is $\hat{p} \pm z\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$. Given that $\hat{p} = \frac{243}{537}, \quad z = 1.96, \quad n = 537$, the result is

$$\frac{243}{537} \pm (1.96)\sqrt{\frac{\frac{243}{537}\left(1-\frac{243}{537}\right)}{537}} = .4525139665 \pm .0420989675 = (.410414999, .494612934)$$

which, when rounded to six decimal places, is (.410415, .494613).

26. **C**. The second statement is false. A significance level does not need to be stated.

27. **A**. Typing the results into a graphing calculator list gives a mean of 7.230769231 which rounds to 7.23 and a standard deviation of 2.178213806 which rounds to 2.18.

28. **D**. The first fifteen prime positive integers are 2,3,5,7,11,13,17,19,23,29,31,37,41,43,47. Typing those into a list produces a max of 47, a min of 2, a median of 19 and an IQR of 30. Subbing into the expression gives $\frac{(47-2)(19)}{30} = \frac{57}{2}$.

29. **B**. It is a one sample t-test. Changing the time into seconds produces the following t- score: $\frac{1012-1020}{\frac{25}{\sqrt{30}}} = -1.752712184$. Using the calculator appropriately gives a p-value of .0451095779, which rounds to .05.

30. **E**. You are not told that the variables X and Y are independent in the problem. Therefore, you can not find the standard deviation.