Directions: Answer the following five problems in the space given showing all relevant work - please write neatly!

- 1. (4 + 1.5 + 2.5 + 2 = 10 points) To study whether cell phones interfere with the operation of heart pacemakers, some interference was detected by an electrocardiogram with a certain model cell phone in 7 out of 40 pacemaker users.
 - (a) Construct the **90%** confidence interval for the population percentage. Do *not* use the conservative approach for this part. Show all work.

Answer _____

(b) Briefly and clearly interpret the interval you found in part (a).

(c) *Using the conservative approach*, construct the **90%** confidence interval for the population percentage. Show all work.

Answer

(d) Determine the sample size needed so that the *Margin of Error* in part (c) is **no greater than 0.10**.

- 2. (3.5 + 1.5 = 5 points) If an eleven-sided die is thrown and the number of dots is observed, then the expected number of dots is 6 (six) and the variance is 10 (ten).
 - (a) If the die is thrown 40 times, then the average number of dots has the expected value of ______ dots

and the standard deviation (error) of dots	Show your needed calculations and justifications.
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- (b) Will the histogram of all such averages of 40 numbers from this distribution (approximately) resemble a Normal curve? (circle correct choice) Yes No Why or why not?
- 3. (2 + 3.5 + 2.5 = 8 points) An airline flies small aircraft with a capacity of 50 passengers and a load limit of 10,750 lbs. It is known that the weights of passengers (with luggage) follow the normal curve with mean of 200 lbs. and standard deviation of 40 lbs.

(a) About 95% of such <i>passengers</i> (with luggage) weigh between	and lbs
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(b) About 95% of the time the <i>total weight</i> of 50 passengers will be between	and lb)S.
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(c) The probability that 50 passengers will overload such an aircraft is about . Show your work.

4. (1.75 + 2.5 + 2.5 + 2 + 1.25 = 10 points) Suppose X and Y are discrete random variables with joint probability function as follows:

		Y		
		2	3	4
	0	1/24	3/24	2/24
Χ	2	2/24	6/24	4/24
	3	5/24	1/24	0/24

Clearly *showing all work*, compute the following:

(a) E(X + Y) =_____

(b) **COV(X,Y)** = _____

(c) **CORR(X,Y)** = _____

(d) VAR(X + Y) = _____

(e) Are X and Y independent? _____ *Give your clear justification.*

5. (0.75 + 0.75 + 0.5 + 1 + 2 + 1 + 1.5 + 1 + 1.5 = 10 points) A shoe company, wanting to compare two materials (material A and material B) for use on the soles of boys' shoes, performs a study involving 10 boys. Each boy is given a pair of shoes with the sole of one shoe made from material A and with the sole of the other shoe made from material B. The table (attached) contains the data from this study, where the data represent the amount of wear on each shoe. Researchers feel average wear for material B should exceed average wear for material A. Note that for these data, the Welch's formula (14.2) yields **17.986**. Using $\alpha = 5\%$ and the appropriate t-test, perform the relevant hypothesis test. Show all work.

(a) Do we need to assume normality in order to use this test here?

(b) Of the following, circle the number and name corresponding to the correct type of t-test to be used here

(1) Welch's two-sample t-test (2) paired t-test (3) Equal-variance two-sample t-test (4) proportion Z test

(c) Null hypothesis				
(d) Alternative hypothesis				
(e) Calculated value of the test s	tatistic _			
(f) Degrees of freedom associate	ed with test st	atistic		
(g) P-value				
(h) Conclusion (circle correct ch	noice) ((1) Reject the Null	(2) Fail to Reject the N	Jull (3) Other
(i) Detailed conclusion (be speci	fic and clear)		

(j) (Extra Credit: max. 1.5 points) Calculate the p-value associated with the sign-test for these data showing all work

Table for Exercise 5

Boy	Material A	Material B	B – A
1	13.2	14.0	0.8
2	8.2	8.8	0.6
3	10.9	11.2	0.3
4	14.3	14.2	- 0.1
5	10.7	11.8	1.1
6	6.6	6.4	- 0.2
7	9.5	9.8	0.3
8	10.8	11.3	0.5
9	8.8	9.3	0.5
10	13.3	13.6	0.3
AV	10.63	11.04	0.41
SD	2.45	2.52	0.39

Space for your calculations (clearly label corresponding the problem number)