SHOW ALL WORK   *Keep four decimal places in most calculations*

1. [10] Find the **mean** and the **standard deviation** of the sample below.

    3   5   -1   8   7   - 4

2.   The travel times in minutes of an SRS of 17 people are as follow:
        12   15   18   36   18   12   24   12   19   11   9   17   15   12   27   18   6

    1)   [10] Find the five-number summary.

    2)   [6] Is there any outlier in this data set? If any, which value? Use 1.5 IQR rule.

3.   In an instant lottery, your chances of winning are 0.2. If you play the lottery five times and the outcomes are independent. Let X be the number of winnings, then X has binomial distribution with n = 5, p = 0.2. Find the probabilities below.
    1) [6] The probability that you win exactly two times.

    2) [6] The probability that you win at least one time.

4. If X is binomial with n=20, p=0.25
    1) [4]Find the mean and standard deviation of X.

    2) [4] Use the normal approximation to find the probability P(5 ≤ X ≤ 10)

5. The weights of newborn children in United States vary according to the normal distribution with mean **7.5** pounds and standard deviation **1.25** pounds.
    1) [4] The government classifies a newborn as having low birth weight if the weight is less than **5.5** pounds. What is the probability that a baby chosen at random weights less than 5.5 pounds at birth?

    2) [5] The normal weights of newborns is between 5.5 and 10 pounds. What is the probability that a baby chosen at random weights between 5.5 and 10 pounds at birth?

    3) [5] Random chose 4 newborns. What is the probability that the average weights is between 5.5 and 10 pounds?

6. At a college, all entering freshmen must take one and only one foreign language class, chosen from the languages Spanish, French, Swahili, Chinese, and Arabic. The probability distribution for the language studied by a randomly selected freshman is summarized in the following table;

language	Spanish	French	Swahili	Chinese	Arabic
probability	?	0.12	0.09	0.19	0.12

1) [5] Find the probability that the freshman is studying Spanish.

2) [5] Find the probability that the freshman is studying French or Arabic.

7. Find the probabilities.
    1) [5] Event A occurs with probability 0.4, and event B occurs with probability 0.5, A and B are independent. Find $P (A$ and $B)$.

    2) [5] C and D are two events. Given P(C) =0.6, P(D)= 0.3, and P(C and D) =0.2. Find P(C or D).

8. You measure the lifetime of a random sample of 64 tires of a certain brand. The sample mean is $\bar{x}$ = 50 months. Suppose that the lifetimes for tires of this brand follow a normal distribution with unknown mean μ and standard deviation σ = 5 kg.
    1) [4] To make a confidence interval for μ do you use T-procedure or Z-procedure? (Circle one)
        a) T- procedure   b) Z-procedure

    2) [8] Make a 99% confidence interval for μ.

9. A quality control engineer would like to estimate μ, the mean life of battery made by the firm. A random sample of 41 batters yielded a sample mean $\bar{x}$ = 47.5 hours and sample standard deviation s = 1.4 hours.

   1) [4] To make a confidence interval for μ, which procedure do you use? (circle one)

      a) T-test   b) Z-test

   2) [8] Make a 95% confidence interval for μ.

10. Suppose two type of concrete, a graded aggregate and a no-fines aggregate, are being considered for a certain road. The table summarizes data from an experiment carried out to compare the thermal conductivity of these two types of concrete.

Type	Sample size	Average thermal conductivity	sample standard deviation
Graded	n_1 = 22	$\bar{x}_1$ =0.486	s_1 =0.187
No-fines	n_2 = 23	$\bar{x}_2$ =0.359	s_2 =0.158

   Let μ_1 = mean thermal conductivity of graded aggregate concrete.
   Let μ_2 = mean thermal conductivity of no-fines aggregate concrete.
   1) [2] To do a hypotheses test which procedure should be used? (circle one)
   a) One sample t-test b) two sample t-test c) matched-pairs t-test

   2) [12] At 0.05 significant level test: $\mu_1 > \mu_2$. (Show all 4 steps)

11. Zogby international claim that 44% of people in the United States support making cigarettes illegal. You asked a random of 200 people, and found 98 people support this law. You suspect that the proportion is not 44% and want to test the hypothesis: H_0: p=44% H_a:p ≠ 44%

    1) [2] Calculate the sample proportion $\hat{p}$.

    2) [4] Calculate the test statistic.

    3) [4] Find the p-value.

    4) [2] Give your conclusion at α=0.05 significant level.

12. Because elderly people may have difficulty standing to have their height measured, a study looked at predicting overall height from height to the knee (in centimeters).
The correlation r = 0.89.

Variable	Mean	standard deviation
Height to the knee x	$\bar{x}$ =50.5	s_x =6.03
Overall height y	$\bar{y}$ = 166.9	s_y =16.62

    1) [8] Find the intercept and slope of the least square line.

    2) [3] Write the equation of the regression line.

    3) [3] Use the equation of the regression line to predict the response variable when x = 47.4.

13. [8] Find the p-value (exactly for z-test using table A, and a range for t-test using table C).

    1) Testing $\mu = 8$ versus $H_a : \mu \neq 8$; sample size $n = 30$, test statistic $z = -1.94$.

    2) Testing $\mu = 8$ versus $H_a : \mu > 8$; sample size $n = 30$, test statistic t = 1.94.

14. A random sample of 800 people was asked about the number of cars or trucks they own (one, two, or at least three) and the type of community they lived in (rural, suburban, urban). It is desired to test whether there was any relationship between the number of cars or trucks people own and the type of community they lived in. The two-way table follows.

		Rural	Suburban	Urban	total
One	Observed	30	57	133	220
	Expected	(63.8)	(87.18)	(69.03)	
	Cell chisq	[17.91]	[10.45]	[59.28]	
Two	Observed	118	155	97	370
	Expected	(107.3)	(146.61)	(116.09)	
	Cell chisq	[1.07]	[ ]	[3.14]	
at least three	Observed	84	105	21	210
	Expected	( )	(83.21)	(65.89)	
	Cell chisq	[ ]	[5.71]	[30.58]	
total		232	317	251	800

    1) [6] Find the value of the expected count that is not given in the table. Find the 2 cell chi square contribution that need to be computed. Show work.

    2) [12] Do a 4 step of hypotheses. Show how the appropriate table is used ($\alpha = 0.05$).

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15. [30] Circle the correct answer
1) If there is an extreme high outlier in your data, which summary would you use?
   A) Mean and standard deviation   B) five-number summary
2) If events A and B are disjoint, then they are independent.
   A) True   B) False
3) Which correlation value indicates the strongest linear relationship?
   A) r= - 0.95   B) r = 0.81   C) r = - 0.56   D) r = 0.87
4) The magazine *High Times* has a website that once asked visitors whether recreational marijuana use should be legal.
   A) Stratified   B) Convenience   C) Voluntary response sampling
5) A researcher random selects 100 male students and 110 female students. Identify the type of sampling is used.
   A) Stratified   B) Convenience   C) Voluntary response sampling
6) Based on the data collected from 1997 to 2007, the correlation of organic food sales and number of autism diagnosed r= 0.9971. Because the correlation is high, so we may conclude that organic food cause autism.
   A) True   B) False
7) Which of the following is an example of a matched pairs design?
   A) A teacher compares the pretest and posttest scores of students.
   B) A teacher compares the scores of students using a computer-based method of instruction, with the scores of other students using a traditional method of instruction.
   C) A teacher compares the scores of students in her class on a standardized test with the national average score
8) The probability that a random chosen birth is a boy is about 0.52. Let x be the number of births until the first boy is born in a large hospital. X has a binomial distribution.
   A) True   B) False
9) Scores of SAT Critical Reading follow the Normal distribution with mean μ = 495 and standard deviation σ=116. Scores of SAT Math follow Normal distribution with mean μ = 511 and standard deviation σ=120. Tom scored 553 on SAT Critical Reading, and 559 on SAT Math. On which test Tom scored relatively higher?
   A) SAT Math   B) SAT Critical Reading   C) same

10) How large a sample would you need to estimate population proportion *p* with margin of error 0.04 with 95% confidence? Assume that you don't know anything about the value of *p*.
   A) 600   B) 2400   C) 601   D) 4801