1. Suppose that for events A and B, \( P(A) = 0.5 \), \( P(A|B) = 0.2 \), \( P(B) = 0.3 \). Then \( P(A \text{ and } B) = \) 

A. 0.72.  
B. 0.06.  
C. 0.15.  
D. 0.10.  
E. impossible to determine without further information.
2. Sociologists have found that if a man is a former convict, there is a 0.6 probability that he smokes; if a man is not a former convict, there is a 0.2 probability that he smokes. In a particularly bad neighborhood, 30% of the residents are former convicts. If the police stop a man at random and find that he is carrying cigarettes, what is the probability that the man is a former convict? (Hint: first use the partition formula, or a probability tree, to find the probability that a randomly selected individual will be a smoker, then apply Bayes’ Theorem.)

\[
P(B | A) = \frac{P(A | B) \times P(B)}{P(A)}
\]

A. 0.56.
B. 0.18.
C. 0.50.
D. 0.32.
E. 0.12.

\[
P(A) = P(A | B) \times P(B) + P(A | B') \times P(B')
\]
3. A *probability distribution* is defined to be
   A. the infinite set of numbers between zero and one.
   B. a specification of the relationship between the outcomes of a random experiment and the values of a random variable.
   C. a graph such that the height of the graph at any $X_0$ represents the probability that the random variable will equal $X_0$.
   D. all the possible outcomes to a random experiment.
   E. the values a random variable can assume together with the probability of those values' occurring.
4. FUN Bank, NA, will reject an application for a mortgage if a) the payments would be more than 40% of the applicant’s gross income, OR, b) the applicant has had his current job for less than six months. Fifteen per cent of applicants have insufficient income, and twenty per cent of applicants have had their current jobs less than six months; these two characteristics are independent of one another. What is the probability that a randomly selected applicant will have his credit application rejected?

A. 23.2%
B. 3.00%
C. 1.2%
D. 40%
E. 32%.
5. Auditors are trying to establish the percentage of items on a store’s shelves whose prices are mismarked. The auditors have chosen a random sample of 16 items; if the proportion of all items mismarked is 20%, the binomial probability that 3 or more of those in the sample will be mismarked is

A. 0.7537.
B. 0.3410.
C. 0.2463.
D. 0.4019.
E. 0.6482.
6. Jamie’s tips average $47 a night; the standard deviation of tips = $18. If, over a ten-day period, we chose a sample of 49 of Jamie’s tips, the probability that \( \bar{x} \), the mean of tips in that sample, would be more than $53 is

A. 0.0668
B. 0.9900
C. 0.4013
D. 0.0043.
E. 0.0099.
7. In twenty-four randomly selected one-square-foot plots on Grandfather Mountain, biologists found the mean number of moss spiders to be 12 with sample standard deviation = 4. The density of spiders is believed to be normally distributed, so that confidence intervals can be calculated using a t value. In this case, a 99% confidence interval for the population density of moss spiders will be 12 ±  

A. 2.11  
B. 0.47  
C. 1.40  
D. 2.29  
E. none of the above.
8. The trout in the New River have normally distributed lengths. A wildlife biologist caught a sample of five New River trout. Their lengths, in inches, were: 8, 14, 13, 11, 9.

A. Find the 95% confidence interval for the population mean length, \( \mu \).
\[
\bar{x} \pm t \cdot s_x
\]
\[
s_x = \frac{s}{\sqrt{n}}
\]

B. Use these data to test the hypotheses \( H_0: \mu \leq 8 \) in vs. \( H_1: \mu > 8 \) in. Conduct your test at 5% significance level. Answer in the form “Reject because _____” or “Fail to reject because _____.”
\[
t = \frac{\bar{x} - \mu_0}{s_x}
\]
• Answers: \( x = 11, \ s = 2.549509757, \ s_{\bar{x}} = 1.140175425, \ 7.83 \leq \mu \leq 14.17 \)
• \( t_{\text{calc}} = 2.631, \ t_{\text{crit}} = 2.132, \) conclusion: reject \( H_0 \) because \( t_{\text{calc}} > t_{\text{crit}} \). The mean fish length is greater than 8 in.
9. In testing the hypotheses $H_0: \pi = 0.7$ vs. $H_1: \pi \neq 0.7$, we obtained a $z$ value of 2.17. The p-value of the test is

A. 0.70.
B. 0.9850
C. 0.0150
D. 0.0300
E. 0.0068
10. Parts is Parts (P-P) receive orders for an average of 0.3 cam shafts an hour; orders are received as a Poisson distribution. P-P guarantee that they will ship the same day that an order is received, but they hold only 4 cam shafts in inventory and cannot obtain more before the next day. What is the probability that P-P will be unable to ship all the orders received in a given 8-hour day?

A. 0.0357  
B. 0.0602  
C. 0.0959  
D. 0.9041  
E. 0.8746
11. Giselle is calculating her probability of passing her Stats I final exam. She observes that she’s had four exams in the course, and she’s passed three of them. She thus reckons that she has a 75% probability of passing the final exam. A probability formed in this way is called a (n)

A. subjective probability.
B. classical probability.
C. rational probability.
D. frequency count or empirical probability.
E. conditional probability.
12. Susan is in charge of testing for the chemical RPE in the air at ART’s factory. The allowable average over 24 hours is 50 parts per billion (ppb). She thus arranges the test $H_0: \mu \leq 50$ ppb vs. $H_1: \mu > 50$ ppb. She uses a sample of 48 liters of air, drawn at random times and locations within the plant, and from long experience knows that $\sigma = 5$ ppb so that her hypothesis test is a z test. Yesterday, Susan’s sample had a mean of 53 ppb, which generated a calculated value of $z = 4.16$. If Susan’s test is at 5% significance level, she should

A. not reject the null hypothesis since the calculated $z < \text{critical } z$.
B. note that the p-value of the test is approximately 1 (one).
C. not reject $H_0$: since the p-value $> \alpha$.
D. find $\beta$, the probability of a Type II error, and proceed from there.
E. reject $H_0$ since the p-value $< 0.05$. 
Note: The preceding questions are derived from the most commonly missed questions on my Stats I final exam over the last year. Similar questions will appear on this term’s final.
• Final Exam:
  – All material in Syllabus
  – All posted homework
  – All posted Self Tests and Class Practices
  – Formulas for the Final Exam are posted on my web site
• Final exam dates are listed on the syllabus; transfer between sections is not permitted without my permission and an awfully good reason