1. The water content of soil from a borrow site is normally distributed with a mean of 14.2% and a standard deviation of 2.3%. What is the probability that a sample taken from the site will have a water content above 16% or below 12%?
   (A) 0.13
   (B) 0.25
   (C) 0.37
   (D) 0.42

2. The regression equation for estimating the mean tensile strength for a type of carbon fiber is $\ln(y) = 1.09 - 0.007x$, where $y$ (the tensile strength) is measured in Gigapascals and $x$ (the length) is measured in millimeters. What is the predicted tensile strength (in Gigapascals) of a fiber 20 millimeters in length?
   (A) 0.86
   (B) 0.95
   (C) 1.63
   (D) 2.59

3. Two students are working independently on a problem. Their respective probabilities of solving the problem are 1/3 and 3/4. What is the probability that at least one of them will solve the problem?
   (A) 1/2
   (B) 5/8
   (C) 2/3
   (D) 5/6

4. A cloth bag contains six cards numbered 1 through 6. Two cards are drawn without replacement. What is the probability that the sum of the numbers on the two drawn cards is 7?
   (A) 1/12
   (B) 7/36
   (C) 1/5
   (D) 7/18

5. The scores for a final exam are distributed according to the table shown. What are the approximate mode and arithmetic mean of the scores?

   | score | frequency |
   |-------|-----------|
   | 38    | 5         |
   | 45    | 2         |
   | 69    | 7         |
   | 76    | 10        |
   | 82    | 12        |
   | 90    | 8         |
   | 91    | 19        |
   | 95    | 15        |

   (A) mode 79, mean 73
   (B) mode 82, mean 79
   (C) mode 85, mean 85
   (D) mode 91, mean 82

6. Let $X$ be a random variable with probability density function $f(x) = 2\exp(-2x)$ for $x > 0$, and is 0 everywhere else. Find the probability that $X$ is less than 1/2.
   (A) 0.368
   (B) 0.449
   (C) 0.500
   (D) 0.632

7. Let $A$ and $B$ be independent events such that $P(A) = 0.3$, $P(B) = 0.5$, and $P(A + B) = 0.65$. Find the conditional probability of $A$ given $B$, $P(A \mid B)$.
   (A) 0.15
   (B) 0.30
   (C) 0.50
   (D) 0.65

8. Let $X$ be a random variable with probability density function $f(x) = \cos x$ for $0 < x < \pi/2$, and is 0 everywhere else. Find the expected value of $X$.
   (A) 0.57
   (B) 0.79
   (C) 1.00
   (D) 1.26

9. What is the probability that either two heads or three heads will be thrown if six fair coins are tossed at once?
   (A)  0.35
   (B)  0.55
   (C)  0.59
   (D)  0.63

10. What is the sample variance of the following numbers?

   2, 4, 6, 8, 10, 12, 14

   (A)  4.32
   (B)  5.29
   (C)  8.00
   (D)  18.7

11. What is the probability of picking an orange ball and a white ball out of a bag containing seven orange balls, eight green balls, and two white balls?
   (A)  0.071
   (B)  0.103
   (C)  0.360
   (D)  0.536

12. Two fair 6-sided die are rolled at once. The probability of their sum being even is 1/2. What is the probability that the sum of the two die will be 10 or greater given the fact that their total is even?
   (A)  1/9
   (B)  1/6
   (C)  2/9
   (D)  1/3

13. What is the $t$-test (based on Student's $t$-distribution) useful for?
   (A)  testing the distribution of outcomes to see if they come from a normal distribution
   (B)  determining if the function is symmetric about zero
   (C)  comparing values about the variance
   (D)  determining if the differences between sample means is significant

14. The members of a professional engineering society wish to randomly select the cities that will serve as hosts for their next three meetings. They have a list of seven cities to choose from. How many different arrangements of three cities from the seven candidates are there if the selection is made without replacement?
   (A)  35
   (B)  210
   (C)  560
   (D)  840

15. Suppose the following data are from a normal distribution with unknown mean $\mu$ and variance $\sigma^2$: 5.3, 5.6, 5.8, 6.0, 6.4. Note that the sample standard deviation is $s$=0.415. Find the sample mean and corresponding 95% confidence interval for $\mu$.
   (A)  $\bar{x} = 5.64$, CI=(5.125, 6.155)
   (B)  $\bar{x} = 5.64$, CI=(5.276, 6.004)
   (C)  $\bar{x} = 5.82$, CI=(5.305, 6.335)
   (D)  $\bar{x} = 5.82$, CI=(5.456, 6.184)