

CE 4101 Application of Engineering Fundamentals Spring 2013
Probability and Statistics

Student Name (Printed) : _____

1. The fill volume of bag cement is an important quality characteristic? Past experience has shown that the volumes are approximately normally distributed. A sample of 5 bags is collected and the fill volumes measured. The standard deviation is estimated using the sample. What is the 95% confidence interval for the mean fill volume?
 - (A) $\bar{X} \pm 1.960 \frac{s}{\sqrt{n}}$
 - (B) $\bar{X} \pm 2.132 \frac{s}{\sqrt{n}}$
 - (C) $\bar{X} \pm 2.571 \frac{s}{\sqrt{n}}$
 - (D) $\bar{X} \pm 2.776 \frac{s}{\sqrt{n}}$
2. A bag contains four black balls and six yellow balls. What is the probability of getting one black ball and one white ball in two consecutive draws from the bag without replacement?
 - (A) 0.0
 - (B) 0.48
 - (C) 0.53
 - (D) 1.0
3. The second stage of a two stage rocket is attached to the first stage using 5 bolts, each of which has a single bolt-cutter that are meant to fire simultaneously to detach the stages. If any of the five cutters fail, then the system fails. If the bolt cutters operate independently of one another, and each has a probability of 0.9997 of successfully cutting their bolt, what is the probability that the stage separation will be successful?
 - (A) 1.0000
 - (B) 0.9997
 - (C) 0.9985
 - (D) 0.9953

4. Four fair coins are flipped once. What is the probability of obtaining three heads and one tail?

(A) $\frac{1}{4}$

(B) $\frac{3}{8}$

(C) $\frac{1}{2}$

(D) $\frac{3}{2}$

5. What is the sample variance of the data set $\{0.5, 0.8, 0.75, 0.52, 0.6\}$?

(A) 0.0146

(B) 0.0183

(C) 0.1128

(D) 0.1209

6. An item's cost distribution is given in the table below

cost(\$)	probability
1	0.07
2	0.23
3	0.46
4	0.17
5	0.04
6	0.03

What is the approximate expected cost?

(A) \$3.1

(B) \$3.0

(C) \$2.9

(D) \$2.5

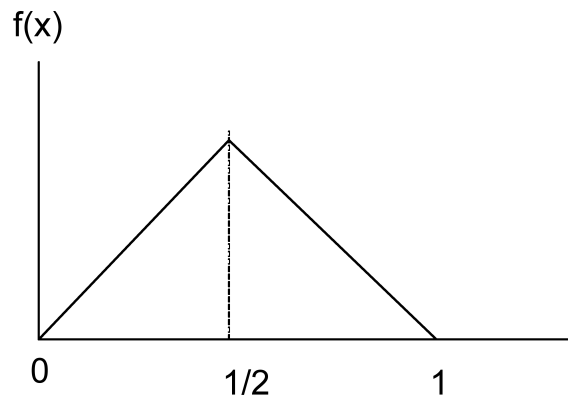


Figure 1: Probability density function $f(x)$

7. For the probability density function in Figure ?? what is the probability of the random variable x being less than $\frac{1}{2}$?
- (A) 0.22
 - (B) 0.44
 - (C) 0.50
 - (D) 0.66
8. 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

9. A bag contains four black balls and six white balls. What is the probability of getting one black ball and one white ball in two consecutive draws from the bag without replacement?
- (A) 0.040
 - (B) 0.24
 - (C) 0.27
 - (D) 0.53
10. Which parameter(s) in the linear regression model $y = \beta_0 + \beta_1 x$ can tell us if there is a linear relationship between x and y ?
- (A) β_0 only
 - (B) β_1 only
 - (C) Both β_0 and β_1
 - (D) Neither β_0 nor β_1