

Name \_\_\_\_\_

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 1) An office building worth \$1 million when completed in 2000 is being depreciated linearly over 50 years. What will be the book value of the building in 2040? (Assume the scrap value is \$0) 1) \_\_\_\_\_
- A) \$600,000
  - B) \$200,000
  - C) \$700,000
  - D) \$800,000
  - E) Other

- 2) A manufacturer has a monthly fixed cost of \$35,000 and a production cost of \$6 for each unit produced. The product sells for \$12/unit. Compute the profit (loss) corresponding to the production level of 12,000 units. 2) \_\_\_\_\_
- A) \$39,000      B) \$35,000      C) \$37,000      D) \$36,000      E) Other

- 3) The management of the Titan Tire Company has determined that the weekly demand and supply functions for their Super Titan tires are given by: 3) \_\_\_\_\_

$$p = 144 - x^2$$

$$p = 48 + .5x^2$$

respectively, where  $p$  is measured in dollars and  $x$  is measured in units of a thousand. Find the equilibrium quantity and price.

- A) The equilibrium quantity is 7000 tires and the equilibrium price is \$144.
- B) The equilibrium quantity is 8000 tires and the equilibrium price is \$80.
- C) The equilibrium quantity is 5000 tires and the equilibrium price is \$48.
- D) The equilibrium quantity is 8000 tires and the equilibrium price is \$90.
- E) The equilibrium quantity is 6000 tires and the equilibrium price is \$70.

**FULL SOLUTION.** Write the entire solution that provides the answer to the question. Show your work.  
**Solve the problem.**

4) The price  $p$  and  $x$ , the quantity of a certain product sold, obey the demand equation

$$p = -\frac{1}{100}x + 100, \quad 0 \leq x \leq 10000.$$

a) Express the revenue  $R$  as a function of  $x$ . a) \_\_\_\_\_

b) What is the revenue if 450 units are sold? b) \_\_\_\_\_

c) What quantity  $x$  maximizes revenue? What is the maximum revenue? c) \_\_\_\_\_

d) What price should the company charge to maximize revenue? d) \_\_\_\_\_

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 5) The price of a new car is \$20,000. Assume an individual makes a down payment of 25% toward the purchase of the car and secures financing for the balance at the rate of 8%/year compounded monthly. What monthly payment will he be required to make if the car is financed over a period of 54 months? (Round your answer to two decimal points)
- A) \$355.22      B) \$331.69      C) \$355.22      D) \$331.69      E) Other
- 6) Referring to problem 6, what will be the total interest charged for the duration of the 54 months loan?
- A) \$2,911.26  
B) \$2,119.26  
C) \$2,947.10  
D) \$1,525.20  
E) Other
- 7) Find the accumulated amount A if the principal,  $P = \$8,000$  is invested at the interest rate  $r = 3\%$  per year for  $t = 10.5$  years compounded semiannually. Round your answer to two decimal places
- A) \$10,836.46  
B) \$10,886.23  
C) \$10,869.17  
D) \$10,913.19  
E) \$10,936.46
- 8) A municipal bond bought for \$1300 has accumulated \$50 in interest over a period of 9 months. What rate of (simple) interest did the bond pay?
- A) 5.13%      B) 75%      C) 3.11%      D) 4.81%      E) 4.38%

**FULL SOLUTION. Write the entire solution that provides the answer to the question. Show your work.**

- 9) If Dan deposits money into an account that earns 5.5% per year compounded continuously, how long will it take for his investment to be tripled?(Round your answer to one decimal place) 9) \_\_\_\_\_

10) A couple decides on the following savings plan for their child's college education. When the child is 6 months old, and semi-annually thereafter, they will deposit \$310 into a savings account paying 10% interest compounded semi-annually. After the child's tenth birthday, having made 20 such payments, they will stop making deposits and let the accumulated money earn interest, at the same rate, for 8 more years, until the child is 18 years old and ready for college. How much money (to the nearest dollar) will be in the account when the child is ready for college?

10) \_\_\_\_\_

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

- 11) To help plan the number of meals to be prepared in a college cafeteria, a survey was conducted, and the following data were obtained: 11) \_\_\_\_\_
- 130 students ate breakfast
  - 184 students ate lunch
  - 275 students ate dinner
  - 70 students ate breakfast and lunch
  - 112 students ate breakfast and dinner
  - 92 students ate lunch and dinner
  - 59 students ate all three meals

How many of the students ate exactly two meals in the cafeteria?

- A) 166                      B) 78                      C) 33                      D) 97                      E) 61

**Solve the problem.**

- 12) A student must choose 1 of 5 mathematics electives, 1 of 7 science electives, and 1 of 5 programming electives. How many possible course selections are there? 12) \_\_\_\_\_
- A) 350 course selections
  - B) 35 course selections
  - C) 175 course selections
  - D) 17 course selections
  - E) Other

- 13) In how many ways can a committee of three men and four women be formed from a group of 11 men and 11 women? 13) \_\_\_\_\_
- A) 110
  - B) 54,450
  - C) 7,840,800
  - D) 554,400

- 14) How many different words (real or imaginary) can be formed from the letters in the word ATLANTA? 14) \_\_\_\_\_
- A) 5040
  - B) 420
  - C) 1
  - D)  $7 nCr 1$
  - E) Other

- 15) Two light bulbs are selected at random from a lot of 24, of which 4 are defective. What is the probability that at least 1 of the light bulbs is defective? 15) \_\_\_\_\_
- A) 0.672
  - B) 0.047
  - C) 0.849
  - D) 0.109
  - E) 0.312

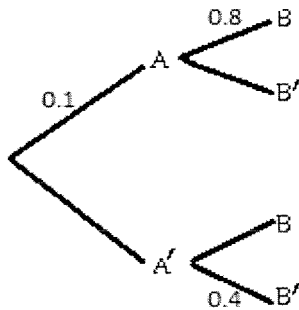
- 16) A pair of six-sided dice is rolled and the number that appears on the upward face of each die is recorded. What is the probability that the sum of the numbers is even? 16) \_\_\_\_\_
- A)  $2/3$
  - B)  $1/2$
  - C)  $1/3$
  - D)  $1/4$
  - E)  $1/36$

- 17) The number of accidents that occur at a certain intersection known as "Five Corners" on a Friday afternoon between the hours of 3 P.M. and 6 P.M., along with the corresponding probabilities, are shown in the following table. Find the expected number of accidents during the period in question. 17) \_\_\_\_\_

Accidents	0	1	2	3	4
Probability	.913	.04	.02	.02	.007

- A) 0.168      B) 0.143      C) 0.218      D) 0.203      E) 0

- 18) Refer to the tree diagram below to find  $P(A \text{ and } B')$ . 18) \_\_\_\_\_



- A) .08      B) .36      C) .02      D) .6      E) .9

- 19) A desk lamp produced by Luminar was found to be defective. The company has three factories where the lamps are manufactured. The percentage of the total number of desk lamps produced by each factory and the probability that a lamp manufactured by that factory is defective are shown in the accompanying table. What is the probability that the defective lamp was manufactured in factory II? 19) \_\_\_\_\_

Factory	Percent of Total Production	Probability of Defective Component
I	0.30	0.01
II	0.30	0.015
III	0.40	0.01

- A) 0.035      B) 0.261      C) 0.348      D) 0.391      E) 0.114

**FULL SOLUTION. Write the entire solution that provides the answer to the question. Show your work.**

20) Determine whether the given events A and B are independent if  $P(A) = .6$ ,  $P(B) = .4$  and  $P(A \cap B) = .24$ . Explain your answer mathematically. 20) \_\_\_\_\_



- 1) B
- 2) C
- 3) B

4) a) (40%)  $R(x) = \left(-\frac{1}{100}x + 100\right) * x = -\frac{1}{100}x^2 + 100x$

b) (10%)  $R(450) = \$42,975.00$

c) (25%) The maximum value is obtained at the vertex of the parabola:  
 the maximum quantity:  $-b/(2a) = -100/2/(-1/100)=5000$   
 the maximum revenue:  $R(5000) = 250,000$

d) (25%) The price when  $x=5000$  is  $-1/100*5000+100=50$

- 5) B
- 6) A
- 7) E
- 8) A

9) (30%) The formula that needs to be used is  $A = Pe^{rt}$

(25%) Then  $3P = Pe^{.055t}$

(25%) So  $\ln(3) = \ln(e^{.055t})$

(20%)  $t = \ln(3) / .055 = 19.97$  years

10) (50%)  $A = 310 \left[ \frac{(1 + .1/2)^{20} - 1}{.1/2} \right] = 10,250.4457$

(40%)  $A = 10,250.4457 * (1 + .1/2)^{16} = 22,375.437$

(10%) Round off: \$22,375

- 11) D
- 12) C
- 13) B
- 14) B
- 15) E
- 16) B
- 17) A
- 18) C
- 19) D
- 20)

.4\*.6 = .24 which does equal .24. The events are independent.

## Finance Formulas

Simple Interest Formula:  $A = P(1 + rt)$

Compound Interest Formula:  $A = P\left(1 + \frac{r}{m}\right)^{mt}$

Continuously Compounded Interest Formula:  $A = Pe^{rt}$

Effective Rate Formula for Compounded Interest:

$$r_{eff} = \left(1 + \frac{r}{m}\right)^m - 1$$

Effective Rate Formula for Continuously Compounded Interest:

$$r_{eff} = e^r - 1$$

Future Value Formula:  $S = R \left[ \frac{\left(1 + \frac{r}{m}\right)^{mt} - 1}{\frac{r}{m}} \right]$

Present Value Formula:  $P = R \left[ \frac{1 - \left(1 + \frac{r}{m}\right)^{-mt}}{\frac{r}{m}} \right]$

$$\left(n = mt \text{ and } i = \frac{r}{m}\right)$$

Note: There are alternate ways of writing the above formulas by making the substitution  $n=mt$  and  $i=r/m$ . These forms are equivalent and they will produce identical results.