Choose the best answer. Write a <u>CAPITAL</u> letter in the blank provided. Show ALL your work NEATLY on this exam for partial credit.

_____1.   The monthly fixed cost for Michelin Tires is $28,000 and it costs the company $18 to make each tire. Moreover, Michelin Tires sells each tire to the retail stores for $25 each. Find the monthly break-even point for Michelin Tires.
  A. (28,000 tires, $1,000,000)   B. (28,000 tires, $100,000)
  C. (4,000 tires, $100,000)   D. (4,000 tires, $1,000,000)

_____2.   The radioactive element polonium decays according to the law $Q(t) = Q_0\left(2^{-t/140}\right)$, where Q_0 is the initial amount and the time t is measured in days. If the amount of polonium left after 560 days is 40 mg, what was the initial amount present?

  A. 642 mg   B. 640 mg   C. 635 mg   D. 629 mg

_____3.   Find the effective rate corresponding to the given nominal rate of 5% compounded semiannually.

  A. 5.13%   B. 5.06%   C. 5.00%   D. 5.09%

_____4.   Let E and F be two events that are mutually exclusive and suppose $P(E) = 0.4$ and $P(F) = 0.2$. Compute $P(E \cap F)$.

  A. 0.5   B. 0.0   C. 0.9   D. 0.4   E. 0.08

_____5. How long will it take for $8700 to grow to $16,200 at an interest rate of 10.9% if the interest is compounded continuously?

A. 5.70 yr B. 0.57 yr C. 570.36 yr D. 0.06 yr

_____6. The temperature of a cup of coffee t minutes after it is poured is given by $T = 70 + 100\ e^{-0.0446\,t}$, where T is measured in degrees Fahrenheit.

    i. What was the initial temperature of the coffee when it was poured?

    ii. When will the coffee be cool enough to drink at 120°F?

A. i. 170°F B. i. 165.6°F C. i. 170°F D. i. 162.6°F
   ii. 7.8 min   ii. 15.54 min   ii. 15.54 min   ii. 7.8 min

_____7.   A survey of 900 athletes playing basketball or soccer revealed that 700 athletes play basketball and 400 athletes play both basketball and soccer. How many athletes play soccer?

A. 500   B. 700   C. 600   D. 300   E. 900   F. 100

_____8.   A pair of fair dice is cast. Let E denote the event that the number falling uppermost in the first die is 1 and let F denote the event that the sum of the numbers falling uppermost is 4. Determine if E and F are independent events.

(1,1)   (1,2)   (1,3)   (1,4)   (1,5)   (1,6)
(2,1)   (2,2)   (2,3)   (2,4)   (2,5)   (2,6)
(3,1)   (3,2)   (3,3)   (3,4)   (3,5)   (3,6)
(4,1)   (4,2)   (4,3)   (4,4)   (4,5)   (4,6)
(5,1)   (5,2)   (5,3)   (5,4)   (5,5)   (5,6)
(6,1)   (6,2)   (6,3)   (6,4)   (6,5)   (6,6)

A.   not independent   B.   independent

_____9.   Find the condition on the numbers a and b such that the table below gives the probability distribution of the random variable X.

x	-2	-1	0	1	2	3
$P(X=x)$	0.2	a	0.1	0.1	b	0.2

A. $a + b = 0.6$ B. $a + b = 0.4$ C. $a + b = 0.7$
D. $a - b = 0.4$ E. $a - b = 0.7$ F. $a - b = 0.6$

_____10.   The probability that a student owns a television is 0.75, and the probability that a student has a television and HBO is 0.18. Find the probability that the student has HBO given that a student owns a television.

A. 0.21   B. 0.195   C. 0.175   D. 0.24

_____11.   A kitchen faucet manufacturer has decided to come out with a new and improved faucet. The fixed cost for the production of this new kitchen faucet line is $16,600 and the variable costs are $67 per faucet. The company expects to sell the faucets for $153. Find a function $P(x)$ for the total profit from the production and sale of x faucets.

A. $P(x) = 153x - 16,600$ B. $P(x) = 86x + 16,600$

C. $P(x) = 86x$ D. $P(x) = 86x - 16,600$

_____12.   Four delegates from three different countries are attending a meeting at the United Nations. They will be sitting as shown in the following diagram.

1	2	3	4
5	6	7	8
9	10	11	12

If delegates from the same country must be sitting in the same row, how many arrangements are possible?

A. 78   B. 82,944   C. 4   D. 1   E. 11880   F. 1320   G. 220

_____13.   In a sweepstakes sponsored by United Supermarket, 100,000 entries have been received. If 4 grand prizes, 20 first place prizes, 33 second place prizes, and 590 third place prizes are to be awarded, what is the probability that a person, who has submitted one entry, will win a prize?

A. 0.00717   B. 0.01347   C. 0.00647   D. 0.00654

_____14. A local charity group is putting together a fundraiser to help support the poor. They are offering a date package which includes a nice dinner for two and a pair of tickets to the theater's current play. The demand equation for this package is given by

$p(x) = 60 - 2x^2$, and the supply equation for this package is given by

$p(x) = x^2 + 9x + 30$, where x represents the quantity of tickets, in thousands, and $p(x)$ represents the price of the tickets, in dollars. Find the market equilibrium. That is, determine how many tickets will be sold and how much the charity will charge for them.

A. 1500 tickets, $7.50 per ticket   B. 2500 tickets, $67.00 per ticket
C. 3000 tickets, $57 per ticket   D. 2000 tickets, $52 per ticket
E. 2000 tickets, $67.50 per ticket

_____15. In order to purchase a home, a family borrows $70,000 at 12% compounded monthly for 15 years. What is the monthly payment?

A. $46.67   B. $700.00   C. $902.99   D. $840.12

_____16. The Barona Inn has a maximum capacity of 100 rooms. The daily profit function for Barona Inn is given by $P(x) = -10x^2 + 1760 x - 50000$, where x is the number of rooms rented out and $P(x)$ is the profit, in dollars. How many rooms should be rented out to maximize the daily profit? What is the maximum daily profit realizable?

A. 68 units, $27,440 per day   B. 88 units, $88,000 per day
C. 78 units, $27,200 per day   D. 20 units, $25,440 per day
E. 88 units, $27,440 per day

_____17. If Bob deposits $5000 at the end of each year for 13 years into an account paying 6% interest compounded annually, find the final amount he will have on deposit.

A. $105,075.33   B. $84,349.71   C. $94,410.69   D. $89,410.69

_____18. The Morales are planning to refinance their home. The outstanding principal on their original loan is $80,000 and was to be amortized in 215 equal monthly installments at an interest rate of 9%/year compounded monthly. The new loan they expect to secure is to be amortized over the same period at an interest rate of 7.4%/year compounded monthly. How much less can they expect to pay over the life of the loan in interest payments by refinancing the loan at this time?

A. $16,790.80   B. $16,756.98   C. $16,695.97   D. $16,733.45

_____19. Gary has $180,000 in his retirement account at his present company. Because he is assuming a position with another company, Gary is planning to roll over his assets to a new account. Gary also plans to put $3,000/quarter into the new account until his retirement 22 years from now. If the account earns interest at the rate of 8%/year compounded quarterly, how much will Gary have in his account at the time of his retirement?

A. $1,667,389.40   B. $1,680,651.66   C. $1,876,442.38

D. $1,645,466.93   E. $1,735,076.83

There were 90 male guests at a party. The number of men in each of four age categories, A, B, C, and D, is given in the table. The table also gives the probability that a man in the respective age category will keep his paper money in order of denomination.

Age	Number of Men	Probability of Men who Keep Paper Money in Order of Denomination in their Wallet
A: 21 – 34	30	0.90
B: 35 – 44	25	0.64
C: 45 – 54	15	0.80
D: 55 and over	20	0.80
Total	90	

A man's wallet was retrieved and the paper money in it was kept in order of denomination. What is the probability that the wallet belonged to a male guest between the ages of 35 and 44?

A. 0.9446   B. 0.4151   C. 0.4531   D. 0.2254

Finance Formulas

$$A = P(1 + rt) \quad \text{Simple Interest}$$

$$A = P(1 + i)^n \quad \text{Compound Interest}$$

$$A = Pe^{rt} \quad \text{Compound Continuously}$$

$$r_{eff} = \left(1 + \frac{r}{m}\right)^m - 1 \quad \text{Effective Rate, Compound}$$

$$r_{eff} = e^r - 1, \quad \text{Effective Rate, Continuous}$$

$$S = R\left[\frac{(1+i)^n - 1}{i}\right] \quad \text{Future Value}$$

$$P = R\left[\frac{1 - (1+i)^{-n}}{i}\right] \quad \text{Present Value}$$

$$i = \frac{r}{m}$$

$$n = mt$$