Question #1 of 105

Which of the following would *least likely* be categorized as a multivariate distribution?

A) The days a stock traded and the days it did not trade.

B) The returns of the stocks in the DJIA.

C) The return of a stock and the return of the DJIA.

Explanation

The number of days a stock traded and did not trade describes only one random variable. Both of the other cases involve two or more random variables.

(Study Session 3, Module 10.2, LOS 10.j)

Question #2 of 105

There is an 80% chance of rain on each of the next six days. What is the probability that it will rain on exactly two of those days?

A) 0.15364.

B) 0.01536.

C) 0.24327.

Explanation

$$P(2) = 6! / [(6 - 2)! \times 2!] \times (0.8^2) \times (0.2^4) = 0.01536 = 6 \text{ nCr } 2 \times (0.8)^2 \times (0.2)^4$$

(Study Session 3, Module 10.1, LOS 10.f)

Question #3 of 105

Standard Normal Distribution

P(Z ≤ z) = N(z) for z ≥ 0

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319

Given a normally distributed population with a mean income of $40,000 and standard deviation of $7,500, what percentage of the population makes between $30,000 and $35,000?

A) 41.67.

B) 13.34.

C) 15.96.

Explanation

The *z*-score for $30,000 = ($30,000 – $40,000) / $7,500 or –1.3333, which corresponds with 0.0918. The *z*-score for $35,000 = ($35,000 – $40,000) / $7,500 or –0.6667, which corresponds with 0.2514. The difference is 0.1596 or 15.96%.

(Study Session 3, Module 10.2, LOS 10.l)

Question #4 of 105

Which of the following could be the set of all possible outcomes for a random variable that follows a binomial distribution?

A) (-1, 0, 1).

B) (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11).

C) (1, 2).

Explanation

This reflects a basic property of binomial outcomes. They take on whole number values that must start at zero up to the upper limit *n*. The upper limit in this case is 11.

(Study Session 3, Module 10.1, LOS 10.f)

Question #5 of 105

In a multivariate normal distribution, a correlation tells the:

A) relationship between the means and variances of the variables.

B) overall relationship between all the variables.

C) strength of the linear relationship between two of the variables.

Explanation

This is true by definition. The correlation only applies to two variables at a time.

(Study Session 3, Module 10.2, LOS 10.j)

Question #6 of 105

Standard Normal Distribution

$P(Z \leq z) = N(z)$ for $z \geq 0$

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389

John Cupp, CFA, has several hundred clients. The values of the portfolios Cupp manages are approximately normally distributed with a mean of $800,000 and a standard deviation of $250,000. The probability of a randomly selected portfolio being in excess of $1,000,000 is:

A) 0.1057.

B) 0.3773.

C) 0.2119.

Explanation

Although the number of clients is discrete, since there are several hundred of them, we can treat them as continuous. The selected random value is standardized (its z-value is calculated) by subtracting the mean from the selected value and dividing by the standard deviation. This results in a z-value of (1,000,000 – 800,000) / 250,000 = 0.8. Looking up 0.8 in the z-value table yields 0.7881 as the probability that a random variable is to the left of the standardized value (i.e., less than $1,000,000). Accordingly, the probability of a random variable being to the right of the standardized value (i.e., greater than $1,000,000) is 1 – 0.7881 = 0.2119.

(Study Session 3, Module 10.2, LOS 10.l)

Question #7 of 105

Cumulative z-table:

z	0.00	0.01	0.02	0.03
1.6	0.9452	0.9463	0.9474	0.9484
1.7	0.9554	0.9564	0.9573	0.9582
1.8	0.9641	0.9649	0.9656	0.9664

Monthly sales of hot water heaters are approximately normally distributed with a mean of 21 and a standard deviation of 5. What is the probabilility of selling 12 hot water heaters or less next month?

A) 96.41%.

B) 3.59%.

C) 1.80%.

Explanation

Z = (12 – 21) / 5 = -1.8

From the cumulative *z*-table, the probability of being more than 1.8 standard deviations below the mean, probability x < -1.8, is 3.59%.

(Study Session 3, Module 10.2, LOS 10.l)

Question #8 of 105

The standard normal distribution is *most* completely described as a:

A) normal distribution with a mean of zero and a standard deviation of one.

B) distribution that exhibits zero skewness and no excess kurtosis.

C) symmetrical distribution with a mean equal to its median.

Explanation

The standard normal distribution is defined as a normal distribution that has a mean of zero and a standard deviation of one. The other choices apply to any normal distribution.

(Study Session 3, Module 10.2, LOS 10.l)

Question #9 of 105

A stock priced at $100 has a 70% probability of moving up and a 30% probability of moving down. If it moves up, it increases by a factor of 1.02. If it moves down, it decreases by a factor of 1/1.02. What is the probability that the stock will be $100 after two successive periods?

A) 21%.

B) 42%.

C) 9%.

Explanation

For the stock to be $100 after two periods, it must move up once and move down once: $100 × 1.02 × (1/1.02) = $100. This can happen in one of two ways: 1) the stock moves up during period one and down during period two; or 2) the stock moves down during period one and up during period two. The probability of either event is 0.70 × 0.30 = 0.21. The combined probability of either event is 2(0.21) = 0.42 or 42%.

(Study Session 3, Module 10.1, LOS 10.g)

Question #10 of 105

Which of the following statements about probability distributions is *least* accurate?

A) In a binomial distribution each observation has only two possible outcomes that are mutually exclusive.

B) A probability distribution is, by definition, normally distributed.

C) A probability distribution includes a listing of all the possible outcomes of an experiment.

Explanation

Probabilities must be zero or positive, but a probability distribution is not necessarily normally distributed. Binomial distributions are either successes or failures.

(Study Session 3, Module 10.1, LOS 10.a)

Question #11 of 105

The farthest point on the left side of the lognormal distribution:

A) can be any negative number.

B) is bounded by 0.

C) is skewed to the left.

Explanation

The lognormal distribution is skewed to the right with a long right hand tail and is bounded on the left hand side of the curve by zero.

(Study Session 3, Module 10.3, LOS 10.n)

Question #12 of 105

If random variable *Y* follows a lognormal distribution then the natural log of *Y* must be:

A) denoted as e^x.

B) lognormally distributed.

C) normally distributed.

Explanation

For any random variable that is lognormally distributed its natural logarithm (ln) will be normally distributed.

(Study Session 3, Module 10.3, LOS 10.n)

Question #13 of 105

A casual laborer has a 70% chance of finding work on each day that she reports to the day labor marketplace. What is the probability that she will work three days out of five?

A) 0.3192.

B) 0.6045.

C) 0.3087.

Explanation

$P(3) = 5! / [(5 – 3)! \times 3!] \times (0.7^3) \times (0.3^2) = 0.3087 = 5 \rightarrow 2nd \rightarrow nCr \rightarrow 3 \times 0.343 \times 0.09$

(Study Session 3, Module 10.1, LOS 10.f)

Question #14 of 105

Which of the following statements about probability distributions is *least* accurate?

A) A discrete random variable is a variable that can assume only certain clearly separated values resulting from a count of some set of items.

B) A binomial probability distribution is an example of a continuous probability distribution.

C) The skewness of a normal distribution is zero.

Explanation

The binomial probability distribution is an example of a *discrete* probability distribution. There are only two possible outcomes of each trial and the outcomes are mutually exclusive. For example, in a coin toss the outcome is either heads or tails.

The other responses are both correct definitions.

(Study Session 3, Module 10.1, LOS 10.a)

Question #15 of 105

A probability function:

A) is often referred to as the "cdf."

B) only applies to continuous distributions.

C) specifies the probability that the random variable takes on a specific value.

Explanation

This is true by definition.

(Study Session 3, Module 10.1, LOS 10.c)

Question #16 of 105

A stock portfolio has had a historical average annual return of 12% and a standard deviation of 20%. The returns are normally distributed. The range –27.2 to 51.2% describes a:

A) 99% confidence interval.

B) 95% confidence interval.

C) 68% confidence interval.

Explanation

The upper limit of the range, 51.2%, is (51.2 – 12) = 39.2 / 20 = 1.96 standard deviations above the mean of 12. The lower limit of the range is (12 – (-27.2)) = 39.2 / 20 = 1.96 standard deviations below the mean of 12. A 95% confidence level is defined by a range 1.96 standard deviations above and below the mean.

(Study Session 3, Module 10.2, LOS 10.k)

Question #17 of 105

An investment has a mean return of 15% and a standard deviation of returns equal to 10%. If returns are normally distributed, which of the following statements is *least* accurate? The probability of obtaining a return:

A) greater than 25% is 0.32.

B) greater than 35% is 0.025.

C) between 5% and 25% is 0.68.

Explanation

Sixty-eight percent of all observations fall within +/- one standard deviation of the mean of a normal distribution. Given a mean of 15 and a standard deviation of 10, the probability of having an actual observation fall within one standard deviation, between 5 and 25, is 68%. The probability of an observation greater than 25 is half of the remaining 32%, or 16%. This is the same probability as an observation less than 5. Because 95% of all observations will fall within 20 of the mean, the probability of an actual observation being greater than 35 is half of the remaining 5%, or 2.5%.

(Study Session 3, Module 10.2, LOS 10.k)

Question #18 of 105

Assume a discrete distribution for the number of possible sunny days in Provo, Utah during the week of April 20 through April 26. For this discrete distribution, p(x) = 0 when x cannot occur, or p(x) > 0 if it can. Based on this information, what is the probability of it being sunny on 5 days and on 10 days during the week, respectively?

A) A positive value; infinite.

B) A positive value; zero.

C) Zero; infinite.

Explanation

The probability of it being sunny on 5 days during the week has some positive value, but the probability of having sunshine 10 days within a week of 7 days is zero because this cannot occur.

(Study Session 3, Module 10.1, LOS 10.b)

Question #19 of 105

Which of the following random variables assigns an equal probability to each possible outcome?

A) Binomial random variable.

B) Discrete uniform random variable.

C) Bernoulli random variable.

Explanation

A discrete uniform random variable has a finite set of possible outcomes, each with an equal probability. A Bernoulli random variable has two possible outcomes (success or failure) that may or may not have equal probabilities. A binomial random variable is the number of successes in a given number of trials of a Bernoulli random variable.

(Study Session 3, Module 10.1, LOS 10.e)

Question #20 of 105

A stock increased in value last year. Which will be greater, its continuously compounded or its holding period return?

A) Its continuously compounded return.

B) Neither, they will be equal.

C) Its holding period return.

Explanation

When a stock increases in value, the holding period return is always greater than the continuously compounded return that would be required to generate that holding period return. For example, if a stock increases from \$1 to \$1.10 in a year, the holding period return is 10%. The continuously compounded rate needed to increase a stock's value by 10% is Ln(1.10) = 9.53%.

(Study Session 3, Module 10.3, LOS 10.o)

Question #21 of 105

A stock portfolio's returns are normally distributed. It has had a mean annual return of 25% with a standard deviation of 40%. The probability of a return between -41% and 91% is *closest to*:

A) 95%.

B) 90%.

C) 65%.

Explanation

A 90% confidence level includes the range between plus and minus 1.65 standard deviations from the mean.

(91 – 25) / 40 = 1.65 and (-41 – 25) / 40 = -1.65.

(Study Session 3, Module 10.2, LOS 10.k)

Question #22 of 105

In addition to the usual parameters that describe a normal distribution, to completely describe 10 random variables, a multivariate normal distribution requires knowing the:

A) 10 correlations.

B) 45 correlations.

C) overall correlation.

Explanation

The number of correlations in a multivariate normal distribution of *n* variables is computed by the formula ((n) × (n-1)) / 2, in this case (10 × 9) / 2 = 45.

(Study Session 3, Module 10.2, LOS 10.j)

Question #23 of 105

Consider a random variable X that follows a continuous uniform distribution: 7 ≤ X ≤ 20. Which of the following statements is *least* accurate?

A) F(12 ≤ X ≤ 16) = 0.307.

B) F(10) = 0.23.

C) F(21) = 0.00.

Explanation

F(21) = 1.00. For a cumulative distribution function, the expression F(x) refers to the probability of an outcome less than or equal to x. In this distribution all the possible outcomes are between 7 and 20. Therefore the probability of an outcome less than or equal to 21 is 100%.

The other choices are true.

- F(10) = (10 – 7) / (20 – 7) = 3 / 13 = 0.23
- F(12 ≤ X ≤ 16) = F(16) – F(12) = [(16 – 7) / (20 – 7)] – [(12 – 7) / (20 – 7)] = 0.692 – 0.385 = 0.307

(Study Session 3, Module 10.1, LOS 10.h)

Question #24 of 105

A multivariate normal distribution that includes three random variables can be completely described by the means and variances of each of the random variables and the:

A) correlations between each pair of random variables.

B) correlation coefficient of the three random variables.

C) conditional probabilities among the three random variables.

Explanation

A multivariate normal distribution that includes three random variables can be completely described by the means and variances of each of the random variables and the correlations between each pair of random variables. Correlation measures the strength of the linear relationship between two random variables (thus, "the correlation coefficient of the three random variables" is inaccurate).

(Study Session 3, Module 10.2, LOS 10.j)

Question #25 of 105

Multivariate distributions can describe:

A) continuous random variables only.

B) discrete random variables only.

C) either discrete or continuous random variables.

Explanation

Multivariate distributions can describe discrete or continuous random variables.

(Study Session 3, Module 10.2, LOS 10.j)

Question #26 of 105

The mean and standard deviation of returns on three portfolios are listed below in percentage terms:

- Portfolio X: Mean 5%, standard deviation 3%.
- Portfolio Y: Mean 14%, standard deviation 20%.
- Portfolio Z: Mean 19%, standard deviation 28%.

Using Roy's safety first criteria and a threshold of 3%, which of these is the optimal portfolio?

A) Portfolio X.

B) Portfolio Y.

C) Portfolio Z.

Explanation

According to the safety-first criterion, the optimal portfolio is the one that has has the largest value for the SFRatio (mean – threshold) / standard deviation.

For Portfolio X, (5 – 3) / 3 = 0.67.

For Portfolio Y, (14 – 3) / 20 = 0.55.

For Portfolio Z, (19 – 3) / 28 = 0.57.

(Study Session 3, Module 10.3, LOS 10.m)

Question #27 of 105

A stock price decreases in one period and then increases by an equal amount in the next period. The investor calculates a holding period return for each period and calculates their arithmetic mean. The investor also calculates the continuously compounded rate of return for each period and calculates the arithmetic mean of these. Which of the arithmetic means will be greater?

A) The mean of the continuously compounded returns.

B) The mean of the holding period returns.

C) Neither, because both will equal zero.

Explanation

The holding period returns will have a positive arithmetic mean. For example, a fall from 100 to 90 is a decrease of 10%, but a rise from 90 to 100 is an increase of 11.1%.

The continuously compounded returns will have an arithmetic mean of zero. Using the same example values, ln(90/100) = –10.54% and ln(100/90) = 10.54%.

(Study Session 3, Module 10.3, LOS 10.o)

Question #28 of 105

The safety-first criterion focuses on:

A) SEC regulations.

B) shortfall risk.

C) margin requirements.

Explanation

The safety-first criterion focuses on shortfall risk which is the probability that a portfolio's value or return will fall below a given threshold level. The safety-first criterion minimizes the probability of falling below the threshold level or return.

(Study Session 3, Module 10.3, LOS 10.m)

Question #29 of 105

A client will move his investment account unless the portfolio manager earns at least a 10% rate of return on his account. The rate of return for the portfolio that the portfolio manager has chosen has a normal probability distribution with an expected return of 19% and a standard deviation of 4.5%. What is the probability that the portfolio manager will keep this account?

A) 0.977.

B) 0.950.

C) 0.750.

Explanation

Since we are only concerned with values that are below a 10% return this is a 1 tailed test to the left of the mean on the normal curve. With $\mu = 19$ and $\sigma = 4.5$, $P(X \geq 10) = P(X \geq \mu - 2\sigma)$ therefore looking up -2 on the cumulative Z table gives us a value of 0.0228, meaning that (1 – 0.0228) = 97.72% of the area under the normal curve is above a Z score of -2. Since the Z score of -2 corresponds with the lower level 10% rate of return of the portfolio this means that there is a 97.72% probability that the portfolio will earn at least a 10% rate of return.

(Study Session 3, Module 10.2, LOS 10.k)

Question #30 of 105

The number of ships in the harbor is an example of what kind of variable?

A) Indiscrete.

B) Discrete.

C) Continuous.

Explanation

A discrete variable is one that is represented by finite units.

(Study Session 3, Module 10.1, LOS 10.a)

Question #31 of 105

Which of the following is *least likely* a probability distribution?

A) Roll an irregular die: p(1) = p(2) = p(3) = p(4) = 0.2 and p(5) = p(6) = 0.1.

B) Zeta Corp.: P(dividend increases) = 0.60, P(dividend decreases) = 0.30.

C) Flip a coin: P(H) = P(T) = 0.5.

Explanation

All the probabilities must be listed. In the case of Zeta Corp. the probabilities do not sum to one.

(Study Session 3, Module 10.1, LOS 10.a)

Question #32 of 105

Which of the following is *least likely* to be an example of a discrete random variable?

A) The rate of return on a real estate investment.

B) The number of days of sunshine in the month of May 2006 in a particular city.

C) Quoted stock prices on the NASDAQ.

Explanation

The rate of return on a real estate investment, or any other investment, is an example of a continuous random variable because the possible outcomes of rates of return are infinite (e.g., 10.0%, 10.01%, 10.001%, etc.). Both of the other choices are measurable (countable).

(Study Session 3, Module 10.1, LOS 10.b)

Question #33 of 105

Mei Tekei just celebrated her 22nd birthday. When she is 27, she will receive a $100,000 inheritance. Tekei needs funds for the down payment on a co-op in Manhattan and has found a bank that will give her the present value of her inheritance amount, assuming an 8.0% stated annual interest rate with continuous compounding. Will the proceeds from the bank be sufficient to cover her down payment of $65,000?

A) Yes, Tekei will receive $68,058.

B) Yes, Tekei will receive $67,028.

C) No, Tekei will only receive $61,878.

Explanation

Because the rate is 8% compounded continuously, the effective annual rate is $e^{0.08}$ - 1 = 8.33%. To find the present value of the inheritance, enter N=5, I/Y=8.33, PMT=0, FV=100,000 CPT PV = 67,028.

Alternatively, $100{,}000e^{-0.08(5)}$ = 67,032.

(Study Session 3, Module 10.3, LOS 10.o)

Question #34 of 105

Given a holding period return of R, the continuously compounded rate of return is:

A) $e^R - 1$.

B) ln(1 – R) – 1.

C) ln(1 + R).

Explanation

This is the formula for the continuously compounded rate of return.

(Study Session 3, Module 10.3, LOS 10.o)

Question #35 of 105

A normal distribution can be completely described by its:

A) mean and variance.

B) mean and mode.

C) skewness and kurtosis.

Explanation

The normal distribution can be completely described by its mean and variance.

(Study Session 3, Module 10.2, LOS 10.i)

Question #36 of 105

Bill Phillips is developing a Monte Carlo simulation to value a complex and thinly traded security. Phillips wants to model one input variable to have negative skewness and a second input variable to have positive excess kurtosis. In a Monte Carlo simulation, Phillips can appropriately use:

A) both of these variables.

B) neither of these variables.

C) only one of these variables.

Explanation

One of the advantages of Monte Carlo simulation is that an analyst can specify any distribution for inputs.

(Study Session 3, Module 10.3, LOS 10.p)

Question #37 of 105

A random variable that has a countable number of possible values is called a:

A) probability distribution.

B) discrete random variable.

C) continuous random variable.

Explanation

A discrete random variable is one for which the number of possible outcomes are countable, and for each possible outcome, there is a measurable and positive probability. A continuous random variable is one for which the number of outcomes is not countable.

(Study Session 3, Module 10.1, LOS 10.b)

Question #38 of 105

If a stock's return is normally distributed with a mean of 16% and a standard deviation of 50%, what is the probability of a negative return in a given year?

A) 0.3745.

B) 0.0001.

C) 0.5000.

Explanation

The selected random value is standardized (its z-value is calculated) by subtracting the mean from the selected value and dividing by the standard deviation. This results in a z-value of (0 – 16) / 50 = -0.32. Changing the sign and looking up +0.32 in the z-value table yields 0.6255 as the probability that a random variable is to the right of the standardized value (i.e. more than zero). Accordingly, the probability of a random variable being to the left of the standardized value (i.e. less than zero) is 1 – 0.6255 = 0.3745.

(Study Session 3, Module 10.2, LOS 10.l)

Question #39 of 105

Which of the following is NOT an assumption of the binomial distribution?

A) The expected value is a whole number.

B) The trials are independent.

C) Random variable X is discrete.

Explanation

The expected value is n × p. A simple example shows us that the expected value does not have to be a whole number: n = 5, p = 0.5, n × p = 2.5. The other conditions are necessary for the binomial distribution.

(Study Session 3, Module 10.1, LOS 10.f)

Question #40 of 105

A stock priced at $20 has an 80% probability of moving up and a 20% probability of moving down. If it moves up, it increases by a factor of 1.05. If it moves down, it decreases by a factor of 1/1.05. What is the expected stock price after two successive periods?

A) $20.05.

B) $21.24.

C) $22.05.

Explanation

If the stock moves up twice, it will be worth $20 × 1.05 × 1.05 = $22.05. The probability of this occurring is 0.80 × 0.80 = 0.64. If the stock moves down twice, it will be worth $20 × (1/1.05) × (1/1.05) = $18.14. The probability of this occurring is 0.20 × 0.20 = 0.04. If the stock moves up once and down once, it will be worth $20 × 1.05 × (1/1.05) = $20.00. This can occur if either the stock goes up then down or down then up. The probability of this occurring is 0.80 × 0.20 + 0.20 × 0.80 = 0.32. Multiplying the potential stock prices by the probability of them occurring provides the expected stock price: ($22.05 × 0.64) + ($18.14 × 0.04) + ($20.00 × 0.32) = $21.24.

(Study Session 3, Module 10.1, LOS 10.g)

Question #41 of 105

Which of the following portfolios provides the optimal "safety first" return if the minimum acceptable return is 9%?

Portfolio	Expected Return (%)	Standard Deviation (%)
1	13	5
2	11	3
3	9	2

A) 2.

B) 1.

C) 3.

Explanation

Roy's safety-first criterion requires the maximization of the SF Ratio:

SF Ratio = (expected return – threshold return) / standard deviation

Portfolio	Expected Return (%)	Standard Deviation (%)	SF Ratio
1	13	5	0.80
2	11	3	0.67
3	9	2	0.00

Portfolio #1 has the highest safety-first ratio at 0.80.

(Study Session 3, Module 10.3, LOS 10.m)

Question #42 of 105

Which of the following statements regarding the distribution of returns used for asset pricing models is *most* accurate?

A) Lognormal distribution returns are used for asset pricing models because they will not result in an asset return of less than -100%.

B) Lognormal distribution returns are used because this will allow for negative returns on the assets.

C) Normal distribution returns are used for asset pricing models because they will only allow the asset price to fall to zero.

Explanation

Lognormal distribution returns are used for asset pricing models because this will not result in asset returns of less than 100% because the lowest the asset price can decrease to is zero which is the lowest value on the lognormal distribution. The normal distribution allows for asset prices less than zero which could result in a return of less than -100% which is impossible.

(Study Session 3, Module 10.3, LOS 10.n)

Question #43 of 105

A portfolio manager is looking at an investment that has an expected annual return of 10% with a standard deviation of annual returns of 5%. Assuming the returns are approximately normally distributed, the probability that the return will exceed 20% in any given year is *closest* to:

A) 4.56%.

B) 2.28%.

C) 0.0%.

Explanation

Given that the standard deviation is 5%, a 20% return is two standard deviations above the expected return of 10%. Assuming a normal distribution, the probability of getting a result more than two standard deviations above the expected return is 1 – Prob(Z ≤ 2) = 1 – 0.9772 = 0.0228 or 2.28% (from the Z table).

(Study Session 3, Module 10.2, LOS 10.k)

Question #44 of 105

The difference between a Monte Carlo simulation and a historical simulation is that a historical simulation uses randomly selected variables from past distributions, while a Monte Carlo simulation:

A) uses a computer to generate random variables.

B) projects variables based on *a priori* principles.

C) uses randomly selected variables from future distributions.

Explanation

A Monte Carlo simulation uses a computer to generate random variables from specified distributions.

(Study Session 3, Module 10.3, LOS 10.q)

Question #45 of 105

The annual rainfall amount in Yucutat, Alaska, is normally distributed with a mean of 150 inches and a standard deviation of 20 inches. The 90% confidence interval for the annual rainfall in Yucutat is *closest* to:

A) 110 to 190 inches.

B) 117 to 183 inches.

C) 137 to 163 inches.

Explanation

The 90% confidence interval is μ ± 1.65 standard deviations.

150 – 1.65(20) = 117 and 150 + 1.65(20) = 183.

(Study Session 3, Module 10.2, LOS 10.l)

Question #46 of 105

Which of the following could *least likely* be a probability function?

A) X:(1,2,3,4) p(x) = x / 10.

B) X:(1,2,3,4) p(x) = (x^2) / 30.

C) X:(1,2,3,4) p(x) = 0.2.

Explanation

In a probability function, the sum of the probabilities for all of the outcomes must equal one. Only one of the probability functions in these answers fails to sum to one.

(Study Session 3, Module 10.1, LOS 10.c)

Question #47 of 105

The probability that a normally distributed random variable will be more than two standard deviations above its mean is:

A) 0.9772.

B) 0.4772.

C) 0.0228.

Explanation

1 – F(2) = 1 – 0.9772 = 0.0228.

(Study Session 3, Module 10.2, LOS 10.k)

Question #48 of 105

Claude Bellow, CFA, is an analyst with a real-estate focused investment firm. Today, one of the partners e-mails Bellow the following table and requests that he look into the reward-to-variability ratios of two asset classes. The table below gives five years of annual returns for Marley REIT (real estate investment trust) and a large urban apartment building. Marley REIT invests in commercial properties. The risk-free rate is 5.0% and the firm's threshold rate for this type is investment is 5.7%.

(*Note:* For this question, calculate the mean returns using the *arithmetic mean*.)

Table 1: Annual returns (in %)					
Asset	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Marley REIT	15.0	8.0	13.0	9.0	13.0
Apartment Bldg	10.0	-1.0	8.0	8.0	9.0

One of the office assistants begins to "run some numbers," but wis then called away to an important meeting. So far, the assistant has calculated the standard deviation of the apartment building returns at 3.97% and the standard deviation of the REIT returns at 2.65%. (He assumed that the returns given represent the entire population of returns.) Now, Bellow must finish the work.

Bellow should conclude that the:

A) REIT has a higher excess return per unit of risk than the apartment building has per unit of risk.

B) partner is asking Bellow to select the investment with the minimal probability that the return falls below 5.70%.

C) safety-first ratio for the REIT is 2.49.

Explanation

Another name for the reward-to-variability ratio is the Sharpe ratio, and the Sharpe ratio measures the excess return per unit of risk. So, the question is asking us to identify which investment has the highest Sharpe ratio. The formula is:

$$\text{Sharpe Ratio} = \frac{\overline{r_p} - \overline{r_f}}{\sigma_p}$$

where: $\overline{r_p}$ = portfolio return; $\overline{r_f}$ = risk free return; σ = standard deviation

The Sharpe Ratio measures the excess return per unit of risk.

For the apartment building:

- The standard deviation of apartment building returns is 3.97%.
- The mean expected return of the apartment building = (10 – 1 + 8 + 8 + 9) / 5 = 6.8%
- Thus, the **Sharpe Ratio$_{\text{Apt}}$** = (6.80% - 5.00%) / 3.97% = **0.45.**

For the REIT:

- The standard deviation of the REIT returns is 2.65%.
- The mean expected return of the REIT = (15 + 8 + 13 + 9 + 13) / 5 = 11.6%
- Thus, the **Sharpe Ratio$_{\text{REIT}}$** = (11.60% – 5.00%) / 2.65% = **2.49.**

Thus, the REIT has a higher Sharpe ratio and thus a higher excess return per unit of risk than the apartment building has per unit of risk. Investors prefer a large Sharpe ratio because it is assumed that they prefer return to risk.

The other statements are false. Remember that the partner asked about the reward-to-variability ratio. The safety-first ratio is very similar to the Sharpe ratio, except that the safety-first ratio replaces the risk-free rate term with the threshold rate. Thus, the safety-first ratio for the REIT = [(11.6% – 5.7%) / 2.65%] = 2.23. If the partner had asked about the safety-first ratio, he would have been asking Bellow to select the investment with the minimal probability that the return falls below 5.70%. As shown in the calculation of the REIT Sharpe Ratio, the REIT's excess return over the risk free rate = 11.6% – 5.0% = 6.60%.

(Study Session 3, Module 10.3, LOS 10.m)

Question #49 of 105

Given *Y* is lognormally distributed, then ln *Y* is:

A) the antilog of *Y*.

B) a lognormal distribution.

C) normally distributed.

Explanation

If *Y* is lognormally distributed, then ln *Y* is normally distributed.

(Study Session 3, Module 10.3, LOS 10.n)

Question #50 of 105

In a normal distribution, the:

A) mean is less than the mode.

B) mean is greater than the median.

C) median equals the mode.

Explanation

In a normal distribution, the mean, median, and mode are all equal.

(Study Session 3, Module 10.2, LOS 10.i)

Question #51 of 105

Assume an investor purchases a stock for $50. One year later, the stock is worth $60. After one more year, the stock price has fallen to the original price of $50. Calculate the continuously compounded return for year 1 and year 2.

	Year 1	Year 2
A)	-18.23%	-18.23%
B)	18.23%	16.67%
C)	18.23%	-18.23%

Explanation

Given a holding period return of R, the continuously compounded rate of return is: ln(1 + R) = ln($Price_1$/$Price_0$). Here, if the stock price increases to $60, r = ln(60/50) = 0.18232, or **18.23%**.

Note: Calculator keystrokes are as follows. First, obtain the result of 60/50, or 1. On the TI BA II Plus, enter 1.20 and then click on LN. On the HP12C, 1.2 [ENTER] g [LN] (the LN appears in blue on the %T key).

The return for year 2 is ln(50/60), or ln(0.833) = *negative* 18.23%.

(Study Session 3, Module 10.3, LOS 10.o)

Question #52 of 105

Which of the following portfolios provides the best "safety first" ratio if the minimum acceptable return is 6%?

Portfolio	Expected Return (%)	Standard Deviation (%)
1	13	5
2	11	3
3	9	2

A) 1

B) 2

C) 3

Explanation

Roy's safety-first criterion requires the maximization of the SF Ratio:

SF Ratio = (expected return – threshold return) / standard deviation

Portfolio	Expected Return (%)	Standard Deviation (%)	SF Ratio
1	13	5	1.40
2	11	3	1.67
3	9	2	1.50

Portfolio #2 has the highest safety-first ratio at 1.67.

(Study Session 3, Module 10.3, LOS 10.m)

Question #53 of 105

Assume 30% of the CFA candidates have a degree in economics. A random sample of three CFA candidates is selected. What is the probability that none of them has a degree in economics?

A) 0.027.

B) 0.343.

C) 0.900.

Explanation

The probability of 0 successes in 3 trials is: [3! / (0!3!)] $(0.3)^0$ $(0.7)^3$ = 0.343

(Study Session 3, Module 10.1, LOS 10.f)

Question #54 of 105

Which of the following statements about probability distributions is *most* accurate?

A) A binomial distribution counts the number of successes that occur in a fixed number of independent trials that have mutually exclusive (i.e. yes or no) outcomes.

B) A continuous uniform distribution has a lower limit but no upper limit.

C) A discrete uniform random variable has varying probabilities for each outcome that total to one.

Explanation

Binomial probability distributions give the result of a single outcome and are used to study discrete random variables where you want to know the probability that an exact event will happen. A continuous uniform distribution has both an upper and a lower limit. A discrete uniform random variable has equal probabilities for each outcome.

(Study Session 3, Module 10.1, LOS 10.a)

Question #55 of 105

A group of investors wants to be sure to always earn at least a 5% rate of return on their investments. They are looking at an investment that has a normally distributed probability distribution with an expected rate of return of 10% and a standard deviation of 5%. The probability of meeting or exceeding the investors' desired return in any given year is *closest to:*

A) 84%.

B) 98%.

C) 34%.

Explanation

The mean is 10% and the standard deviation is 5%. You want to know the probability of a return 5% or better. 10% - 5% = 5% , so 5% is one standard deviation less than the mean. Thirty-four percent of the observations are between the mean and one standard deviation on the down side. Fifty percent of the observations are greater than the mean. So the probability of a return 5% or higher is 34% + 50% = 84%.

(Study Session 3, Module 10.2, LOS 10.k)

Question #56 of 105

Approximately 95% of all observations for a normally distributed random variable fall in the interval:

A) $\mu \pm 3\sigma$.

B) $\mu \pm \sigma$.

C) $\mu \pm 2\sigma$.

Explanation

Approximately 95% of the outcomes for a normally distributed random variable are within two standard deviations of the mean, so the correct answer is $\mu \pm 2\sigma$.

(Study Session 3, Module 10.2, LOS 10.k)

Question #57 of 105

The cumulative distribution function for a random variable X is given in the following table:

x	*F(x)*
5	0.15
10	0.30
15	0.45
20	0.75
25	1.00

The probability of an outcome greater than 15 is:

A) 45%.

B) 75%.

C) 55%.

Explanation

A cumulative distribution function (cdf) gives the probability of an outcome for a random variable less than or equal to a specific value. For the random variable X, the cdf for the outcome 15 is 0.45, which means there is a 45% probability that X will take a value less than or equal to 15. Therefore, the probability of a value greater than 15 equals 100% – 45% = 55%.

(Study Session 3, Module 10.1, LOS 10.d)

Question #58 of 105

A dealer in a casino has rolled a five on a single die three times in a row. What is the probability of her rolling another five on the next roll, assuming it is a fair die?

A) 0.001.

B) 0.200.

C) 0.167.

Explanation

The probability of a value being rolled is 1/6 regardless of the previous value rolled.

(Study Session 3, Module 10.1, LOS 10.a)

Question #59 of 105

A multivariate distribution is *best* defined as describing the behavior of:

A) two or more independent random variables.

B) a random variable with more than two possible outcomes.

C) two or more dependent random variables.

Explanation

A multivariate distribution describes the relationships between two or more random variables, when the behavior of each random variable is dependent on the others in some way.

(Study Session 3, Module 10.2, LOS 10.j)

Question #60 of 105

A food retailer has determined that the mean household income of her customers is $47,500 with a standard deviation of $12,500. She is trying to justify carrying a line of luxury food items that would appeal to households with incomes greater than $60,000. Based on her information and assuming that household incomes are normally distributed, what percentage of households in her customer base has incomes of $60,000 or more?

A) 2.50%.

B) 15.87%.

C) 5.00%.

Explanation

Z = ($60,000 – $47,500) / $12,500 = 1.0

From the table of areas under the normal curve, 84.13% of observations lie to the left of +1 standard deviation of the mean. So, 100% – 84.13% = 15.87% with incomes of $60,000 or more.

(Study Session 3, Module 10.2, LOS 10.l)

Question #61 of 105

A random variable follows a continuous uniform distribution over 27 to 89. What is the probability of an outcome between 34 and 38?

A) 0.0645.

B) 0.0719.

C) 0.0546.

Explanation

$P(34 \leq X \leq 38) = (38 - 34) / (89 - 27) = 0.0645$

(Study Session 3, Module 10.1, LOS 10.h)

Question #62 of 105

Cumulative Z-Table

z	0.04	0.05
1.8	0.9671	0.9678
1.9	0.9738	0.9744
2.0	0.9793	0.9798
2.1	0.9838	0.9842

The owner of a bowling alley determined that the average weight for a bowling ball is 12 pounds with a standard deviation of 1.5 pounds. A ball denoted "heavy" should be one of the top 2% based on weight. Assuming the weights of bowling balls are normally distributed, at what weight (in pounds) should the "heavy" designation be used?

A) 14.22 pounds.

B) 15.08 pounds.

C) 14.00 pounds.

Explanation

The first step is to determine the *z*-score that corresponds to the top 2%. Since we are only concerned with the top 2%, we only consider the right hand of the normal distribution. Looking on the cumulative table for 0.9800 (or close to it) we find a *z*-score of 2.05. To answer the question, we need to use the normal distribution given: 98 percentile = sample mean + (*z*-score)(standard deviation) = 12 + 2.05(1.5) = 15.08.

(Study Session 3, Module 10.2, LOS 10.l)

Question #63 of 105

The probability density function of a continuous uniform distribution is *best* described by a:

A) line segment with a 45-degree slope.

B) line segment with a curvilinear slope.

C) horizontal line segment.

Explanation

By definition, for a continuous uniform distribution, the probability density function is a horizontal line segment over a range of values such that the area under the segment (total probability of an outcome in the range) equals one.

(Study Session 3, Module 10.1, LOS 10.h)

Question #64 of 105

A discount brokerage firm states that the time between a customer order for a trade and the execution of the order is uniformly distributed between three minutes and fifteen minutes. If a customer orders a trade at 11:54 A.M., what is the probability that the order is executed after noon?

A) 0.250.

B) 0.750.

C) 0.500.

Explanation

The limits of the uniform distribution are three and 15. Since the problem concerns time, it is continuous. Noon is six minutes after 11:54 A.M. The probability the order is executed after noon is (15 – 6) / (15 – 3) = 0.75.

(Study Session 3, Module 10.1, LOS 10.h)

Question #65 of 105

Joan Biggs, CFA, acquires a large database of past returns on a variety of assets. Biggs then draws random samples of sets of returns from the database and analyzes the resulting distributions. Biggs is engaging in:

A) historical simulation.

B) discrete analysis.

C) Monte Carlo simulation.

Explanation

This is a typical example of historical simulation.

(Study Session 3, Module 10.3, LOS 10.q)

Question #66 of 105

The number of days a particular stock increases in a given five-day period is uniformly distributed between zero and five inclusive. In a given five-day trading week, what is the probability that the stock will increase exactly three days?

A) 0.333.

B) 0.167.

C) 0.600.

Explanation

If the possible outcomes are X:(0,1,2,3,4,5), then the probability of each of the six outcomes is 1 / 6 = 0.167.

(Study Session 3, Module 10.1, LOS 10.e)

Question #67 of 105

A drawback of historical simulation is it:

A) depends on the accuracy of the random number generator.

B) may not account for very rare events.

C) assumes that the outcomes of events are normally distributed.

Explanation

There are two major problems with historical simulation. The first is that it cannot account for events that do not occur in the sample. The other drawback is that the analyst cannot change the parameters of the distribution to examine how small changes might affect the asset's behavior.

(Study Session 3, Module 10.3, LOS 10.q)

Question #68 of 105

A multivariate distribution:

A) specifies the probabilities associated with groups of random variables.

B) applies only to binomial distributions.

C) gives multiple probabilities for the same outcome.

Explanation

This is the definition of a multivariate distribution.

(Study Session 3, Module 10.2, LOS 10.j)

Question #69 of 105

A stock priced at $10 has a 60% probability of moving up and a 40% probability of moving down. If it moves up, it increases by a factor of 1.06. If it moves down, it decreases by a factor of 1/1.06. What is the expected stock price after two successive periods?

A) $11.24.

B) $10.03.

C) $10.27.

Explanation

If the stock moves up twice, it will be worth $10 × 1.06 × 1.06 = $11.24. The probability of this occurring is 0.60 × 0.60 = 0.36. If the stock moves down twice, it will be worth $10 × (1/1.06) × (1/1.06) = $8.90. The probability of this occurring is 0.40 × 0.40 = 0.16. If the stock moves up once and down once, it will be worth $10 × 1.06 × (1/1.06) = $10.00. This can occur if either the stock goes up then down or down then up. The probability of this occurring is 0.60 × 0.40 + 0.40 × 0.60 = 0.48. Multiplying the potential stock prices by the probability of them occurring provides the expected stock price: ($11.24 × 0.36) + ($8.90 × 0.16) + ($10.00 × 0.48) = $10.27.

(Study Session 3, Module 10.1, LOS 10.g)

Question #70 of 105

Which of the following statements about a normal distribution is *least* accurate?

A) The distribution is completely described by its mean and variance.

B) Approximately 34% of the observations fall within plus or minus one standard deviation of the mean.

C) Kurtosis is equal to 3.

Explanation

Approximately 68% of the observations fall within one standard deviation of the mean. Approximately 34% of the observations fall within the mean plus one standard deviation (or the mean minus one standard deviation).

(Study Session 3, Module 10.2, LOS 10.i)

Question #71 of 105

A stated interest rate of 9% compounded continuously results in an effective annual rate *closest to*:

A) 9.42%.

B) 9.20%.

C) 9.67%.

Explanation

The effective annual rate with continuous compounding = $e^r - 1 = e^{0.09} - 1 = 0.09417$, or 9.42%.

(Study Session 3, Module 10.3, LOS 10.o)

Question #72 of 105

Which of the following statements about the normal probability distribution is *most* accurate?

A) The normal curve is asymmetrical about its mean.

B) Sixty-eight percent of the area under the normal curve falls between the mean and 1 standard deviation above the mean.

C) Five percent of the normal curve probability is more than two standard deviations from the mean.

Explanation

The normal curve is symmetrical about its mean with 34% of the area under the normal curve falling between the mean and one standard deviation above the mean. Ninety-five percent of the normal curve is within two standard deviations of the mean, so five percent of the normal curve falls outside two standard deviations from the mean.

(Study Session 3, Module 10.1, LOS 10.a)

Question #73 of 105

Which of the following qualifies as a cumulative distribution function?

A) F(1) = 0.5, F(2) = 0.25, F(3) = 0.25.

B) F(1) = 0, F(2) = 0.25, F(3) = 0.50, F(4) = 1.

C) F(1) = 0, F(2) = 0.5, F(3) = 0.5, F(4) = 0.

Explanation

Because a cumulative probability function defines the probability that a random variable takes a value equal to or less than a given number, for successively larger numbers, the cumulative probability values must stay the same or increase.

(Study Session 3, Module 10.1, LOS 10.d)

Question #74 of 105

The average amount of snow that falls during January in Frostbite Falls is normally distributed with a mean of 35 inches and a standard deviation of 5 inches. The probability that the snowfall amount in January of next year will be between 40 inches and 26.75 inches is *closest* to:

A) 79%.

B) 68%.

C) 87%.

Explanation

To calculate this answer, we will use the properties of the standard normal distribution. First, we will calculate the Z-value for the upper and lower points and then we will determine the approximate probability covering that range. *Note:* This question is an example of why it is important to memorize the general properties of the normal distribution.

Z = (observation – population mean) / standard deviation

- $Z_{26.75}$ = (26.75 – 35) / 5 = -1.65. (1.65 standard deviations to the left of the mean)
- Z_{40} = (40 – 35) / 5 = 1.0 (1 standard deviation to the right of the mean)

Using the general approximations of the normal distribution:

- 68% of the observations fall within ± one standard deviation of the mean. So, 34% of the area falls between 0 and +1 standard deviation from the mean.
- 90% of the observations fall within ± 1.65 standard deviations of the mean. So, 45% of the area falls between 0 and +1.65 standard deviations from the mean.

Here, we have 34% to the right of the mean and 45% to the left of the mean, for a total of **79%.**

(Study Session 3, Module 10.2, LOS 10.l)

Question #75 of 105

The mean return of a portfolio is 20% and its standard deviation is 4%. The returns are normally distributed. Which of the following statements about this distribution are *least* accurate? The probability of receiving a return:

A) between 12% and 28% is 0.95.

B) in excess of 16% is 0.16.

C) of less than 12% is 0.025.

Explanation

The probability of receiving a return greater than 16% is calculated by adding the probability of a return between 16% and 20% (given a mean of 20% and a standard deviation of 4%, this interval is the left tail of one standard deviation from the mean, which includes 34% of the observations.) to the area from 20% and higher (which starts at the mean and increases to infinity and includes 50% of the observations.) The probability of a return greater than 16% is 34 + 50 = 84%.

Note: 0.16 is the probability of receiving a return *less* than 16%.

(Study Session 3, Module 10.2, LOS 10.k)

Question #76 of 105

A normal distribution is completely described by its:

A) variance and mean.

B) median and mode.

C) mean, mode, and skewness.

Explanation

By definition, a normal distribution is completely described by its mean and variance.

(Study Session 3, Module 10.2, LOS 10.i)

Question #77 of 105

For a certain class of junk bonds, the probability of default in a given year is 0.2. Whether one bond defaults is independent of whether another bond defaults. For a portfolio of five of these junk bonds, what is the probability that zero or one bond of the five defaults in the year ahead?

A) 0.7373.

B) 0.0819.

C) 0.4096.

Explanation

The outcome follows a binomial distribution where n = 5 and p = 0.2. In this case p(0) = 0.8^5 = 0.3277 and p(1) = 5 × 0.8^4 × 0.2 = 0.4096, so P(X=0 or X=1) = 0.3277 + 0.4096.

(Study Session 3, Module 10.1, LOS 10.f)

Question #78 of 105

Standardizing a normally distributed random variable requires the:

A) mean, variance and skewness.

B) natural logarithm of X.

C) mean and the standard deviation.

Explanation

All that is necessary is to know the mean and the variance. Subtracting the mean from the random variable and dividing the difference by the standard deviation standardizes the variable.

(Study Session 3, Module 10.2, LOS 10.l)

Question #79 of 105

Three portfolios with normally distributed returns are available to an investor who wants to minimize the probability that the portfolio return will be less than 5%. The risk and return characteristics of these portfolios are shown in the following table:

Portfolio	Expected return	Standard deviation
Epps	6%	4%
Flake	7%	9%
Grant	10%	15%

Based on Roy's safety-first criterion, which portfolio should the investor select?

A) Grant.

B) Epps.

C) Flake.

Explanation

Roy's safety-first ratios for the three portfolios:

Epps = (6 - 5) / 4 = 0.25

Flake = (7 - 5) / 9 = 0.222

Grant = (10 - 5) / 15 = 0.33

The portfolio with the largest safety-first ratio has the lowest probability of a return less than 5%. The investor should select the Grant portfolio.

(Study Session 3, Module 10.3, LOS 10.m)

Question #80 of 105

Many analysts prefer to use Monte Carlo simulation rather than historical simulation because:

A) it is much easier to generate the required variables.

B) past distributions cannot address changes in correlations or events that have not happened before.

C) computers can manipulate theoretical data much more quickly than historical data.

Explanation

While the past is often a good predictor of the future, simulations based on past distributions are limited to reflecting changes and events that actually occurred. Monte Carlo simulation can be used to model based on parameters that are not limited to past experience.

(Study Session 3, Module 10.3, LOS 10.q)

Question #81 of 105

If X has a normal distribution with μ = 100 and σ = 5, then there is approximately a 90% probability that:

A) P(91.8 < X < 108.3).

B) P(90.2 < X < 109.8).

C) P(93.4 < X < 106.7).

Explanation

100 +/- 1.65 (5) = 91.75 to 108.25 or P (P(91.75 < X < 108.25).

(Study Session 3, Module 10.2, LOS 10.i)

Question #82 of 105

A probability distribution is *least likely* to:

A) contain all the possible outcomes.

B) have only non-negative probabilities.

C) give the probability that the distribution is realistic.

Explanation

The probability distribution may or may not reflect reality. But the probability distribution must list all possible outcomes, and probabilities can only have non-negative values.

(Study Session 3, Module 10.1, LOS 10.a)

Question #83 of 105

The continuously compounded rate of return that will generate a one-year holding period return of -6.5% is *closest* to:

A) -5.7%.

B) -6.7%.

C) -6.3%.

Explanation

Continuously compounded rate of return = ln(1 – 0.065) = -6.72%.

(Study Session 3, Module 10.3, LOS 10.o)

Question #84 of 105

The mean and standard deviation of returns for three portfolios are listed below in percentage terms.

Portfolio X: Mean 5%, standard deviation 3%.

Portfolio Y: Mean 14%, standard deviation 20%.

Portfolio Z: Mean 19%, standard deviation 28%.

Using Roy's safety-first criteria and a threshold of 4%, select the optimal portfolio.

A) Portfolio Y.

B) Portfolio X.

C) Portfolio Z.

Explanation

Portfolio Z has the largest value for the SFRatio: (19 – 4) / 28 = 0.5357.

For Portfolio X, the SFRatio is (5 – 4) / 3 = 0.3333.

For Portfolio Y, the SFRatio is (14 – 4) / 20 = 0.5000.

(Study Session 3, Module 10.3, LOS 10.m)

Question #85 of 105

If a random variable *x* is lognormally distributed then ln *x* is:

A) defined as e^x.

B) abnormally distributed.

C) normally distributed.

Explanation

For any random variable that is normally distributed its natural logarithm (ln) will be lognormally distributed. The opposite is also true: for any random variable that is lognormally distributed its natural logarithm (ln) will be normally distributed.

(Study Session 3, Module 10.3, LOS 10.n)

Question #86 of 105

For a given stated annual rate of return, compared to the effective rate of return with discrete compounding, the effective rate of return with continuous compounding will be:

A) higher.

B) the same.

C) lower.

Explanation

A higher frequency of compounding leads to a higher effective rate of return. The effective rate of return with continuous compounding will, therefore, be greater than any effective rate of return with discrete compounding.

(Study Session 3, Module 10.3, LOS 10.o)

Question #87 of 105

If the threshold return is higher than the risk-free rate, what will be the relationship between Roy's safety-first ratio (SF) and Sharpe's ratio?

A) The SF ratio will be higher.

B) The SF ratio may be higher or lower depending on the standard deviation.

C) The SF ratio will be lower.

Explanation

Since each ratio has the standard deviation of returns in the denominator, the difference depends upon the effect on the numerator. Since both the risk-free rate (in the Sharpe ratio) and the threshold rate (in the SF ratio) are subtracted from the expected return, a larger threshold rate would result in a smaller SF ratio value.

(Study Session 3, Module 10.3, LOS 10.m)

Question #88 of 105

Which of the following random variables would be *most likely* to follow a discrete uniform distribution?

A) The outcome of a roll of a standard, six-sided die where X equals the number facing up on the die.

B) The outcome of the roll of two standard, six-sided dice where X is the sum of the numbers facing up.

C) The number of heads on the flip of two coins.

Explanation

The discrete uniform distribution is characterized by an equal probability for each outcome. A single die roll is an often-used example of a uniform distribution. In combining two random variables, such as coin flip or die roll outcomes, the sum will not be uniformly distributed.

(Study Session 3, Module 10.1, LOS 10.e)

Question #89 of 105

Over a period of one year, an investor's portfolio has declined in value from 127,350 to 108,427. What is the continuously compounded rate of return?

A) -14.86%.

B) -13.84%.

C) -16.09%.

Explanation

The continuously compounded rate of return = $\ln(S_1 / S_0)$ = ln(108,427 / 127,350) = –16.09%.

(Study Session 3, Module 10.3, LOS 10.o)

Question #90 of 105

The lower limit of a normal distribution is:

A) negative one.

B) zero.

C) negative infinity.

Explanation

By definition, a true normal distribution has a positive probability density function from negative to positive infinity.

(Study Session 3, Module 10.2, LOS 10.i)

Question #91 of 105

Which of the following is a discrete random variable?

A) The amount of time between two successive stock trades.

B) The number of advancing stocks in the DJIA in a day.

C) The realized return on a corporate bond.

Explanation

Since the DJIA consists of only 30 stocks, the answer associated with it would be a discrete random variable. Random variables measuring time, rates of return and weight will be continuous.

(Study Session 3, Module 10.1, LOS 10.a)

Question #92 of 105

In a continuous probability density function, the probability that any single value of a random variable occurs is equal to what?

A) 1/N.

B) Zero.

C) One.

Explanation

Since there are infinite potential outcomes in a continuous pdf, the probability of any single value of a random variable occurring is 1/infinity = 0.

(Study Session 3, Module 10.1, LOS 10.c)

Question #93 of 105

The Night Raiders, an expansion team in the National Indoor Football League, is having a challenging first season with a current win loss record of 0 and 4. However, the team recently signed four new defensive players and one of the team sponsors (who also happens to hold a CFA charter) calculates the probability of the team winning a game at 0.40. Assuming that whether the team wins a game is independent of whether it wins any other game, the probability that the team will win 6 out of the next 10 games is *closest* to:

A) 0.350.

B) 0.417.

C) 0.112.

Explanation

Use the formula for a binomial random variable to calculate the answer to this question. We will define "success" as the team winning a game. The formula is:

$$p(x) = P(X = x) = [\text{number of ways to choose x from n}] \times p^x \times (1 - p)^{n-x},$$

where [number of ways to choose x from n] = n! / [(n - x)! × x!].

Here, $p(x) = P(X = 6) = [10! / (10 – 6)! \times 6!] \times 0.40^6 \times (1 – 0.40)^{10-6} = 210.0 \times 0.00410 \times 0.12960 = 0.11159$, or approximately 0.112.

To calculate factorial using your financial calculator: On the TI, factorial is [2nd] ¡→ [*x!*]. On the HP, factorial is [g] → [n!]. To compute 10! on the TI, enter [10] → [2nd] → [*x!*] = 3,628,800. On the HP, use [10] → [ENTER] → [g] → [n!].

(Study Session 3, Module 10.1, LOS 10.f)

Question #94 of 105

Possible outcomes for a discrete uniform distribution are the integers 2 to 9 inclusive. What is the probability of an outcome less than 5?

A) 62.5%.

B) 37.5%.

C) 50.0%.

Explanation

This distribution has eight discrete outcomes, each with an equal probability of 1/8 or 12.5%. Because three of the eight outcomes are less than 5, the probability of an outcome less than 5 is 3/8 or 37.5%.

(Study Session 3, Module 10.1, LOS 10.f)

Question #95 of 105

A cumulative distribution function for a random variable *X* is given as follows:

x	*F(x)*
5	0.14
10	0.25
15	0.86
20	1.00

The probability of an outcome less than or equal to 10 is:

A) 39%.

B) 14%.

C) 25%.

Explanation

A cumulative distribution function (cdf) gives the probability of an outcome for a random variable less than or equal to a specific value. For the random variable *X*, the cdf for the outcome 10 is 0.25, which means there is a 25% probability that *X* will take a value less than or equal to 10.

(Study Session 3, Module 10.1, LOS 10.d)

Question #96 of 105

For a normal distribution, what *approximate* percentage of the observations fall within ±3 standard deviation of the mean?

A) 95%.

B) 66%.

C) 99%.

Explanation

For normal distributions, approximately 99% of the observations fall within ±3 standard deviations of the mean.

(Study Session 3, Module 10.2, LOS 10.k)

Question #97 of 105

A grant writer for a local school district is trying to justify an application for funding an after-school program for low-income families. Census information for the school district shows an average household income of $26,200 with a standard deviation of $8,960. Assuming that the household income is normally distributed, what is the percentage of households in the school district with incomes of less than $12,000?

A) 5.71%.

B) 15.87%.

C) 9.92%.

Explanation

Z = ($12,000 – $26,200) / $8,960 = –1.58.

From the table of areas under the standard normal curve, 5.71% of observations are more than 1.58 standard deviations below the mean.

(Study Session 3, Module 10.2, LOS 10.l)

Question #98 of 105

If a stock decreases from $90 to $80, the continuously compounded rate of return for the period is:

A) -0.1250.

B) -0.1178.

C) -0.1000.

Explanation

This is given by the natural logarithm of the new price divided by the old price; ln(80 / 90) = -0.1178.

(Study Session 3, Module 10.3, LOS 10.o)

Question #99 of 105

Which of the following statements describes a limitation of Monte Carlo simulation?

A) Simulations do not consider possible input values that lie outside historical experience.

B) Variables are assumed to be normally distributed but may actually have non-normal distributions.

C) Outcomes of a simulation can only be as accurate as the inputs to the model.

Explanation

Monte Carlo simulations can be set up with inputs that have any distribution and any desired range of possible values. However, a limitation of the technique is that its output can only be as accurate as the assumptions an analyst makes about the range and distribution of the inputs.

(Study Session 3, Module 10.3, LOS 10.p)

Question #100 of 105

If a smooth curve is to represent a probability density function, what two requirements must be satisfied? The area under the curve must be:

A) one and the curve must not fall below the horizontal axis.

B) zero and the curve must not fall below the horizontal axis.

C) one and the curve must not rise above the horizontal axis.

Explanation

If a smooth curve is to represent a probability density function, the total area under the curve must be one (probability of all outcomes equals 1) and the curve must not fall below the horizontal axis (no outcome can have a negative chance of occurring).

(Study Session 3, Module 10.1, LOS 10.c)

Question #101 of 105

A stock that pays no dividend is currently priced at €42.00. One year ago the stock was €44.23. The continuously compounded rate of return is *closest to*:

A) –5.17%.

B) –5.04%.

C) +5.17%.

Explanation

$$\ln\left(\frac{S_1}{S_0}\right) = \ln\left(\frac{42.00}{44.23}\right) = \ln(0.9496) = -0.0517 = -5.17\%$$

(Study Session 3, Module 10.3, LOS 10.o)

Question #102 of 105

A random variable X is continuous and bounded between zero and five, X:(0 ≤ X ≤ 5). The cumulative distribution function (cdf) for X is F(x) = x / 5. Calculate P(2 ≤ X ≤ 4).

A) 0.50.

B) 0.40.

C) 1.00.

Explanation

For a continuous distribution, P(a ≤ X ≤b) = F(b) – F(a). Here, F(4) = 0.8 and F(2) = 0.4. Note also that this is a uniform distribution over 0 ≤ x ≤ 5 so Prob(2 < x < 4) = (4 – 2) / 5 = 40%.

(Study Session 3, Module 10.1, LOS 10.d)

Question #103 of 105

Which of the following represents the mean, standard deviation, and variance of a standard normal distribution?

A) 0, 1, 1.

B) 1, 1, 1.

C) 1, 2, 4.

Explanation

By definition, for the standard normal distribution, the mean, standard deviation, and variance are 0, 1, 1.

(Study Session 3, Module 10.2, LOS 10.l)

Question #104 of 105

If X follows a continuous uniform distribution over the interval $1 < X < 26$, the probability that X is between 5 and 15 is *closest* to:

A) 40%.

B) 10%.

C) 60%.

Explanation

Because this distribution is uniform, the probability of an outcome between 5 and 15 is the ratio of that interval to the entire interval from 1 to 26.

$(15 - 5) / (26 - 1) = 10 / 25 = 0.40$.

(Study Session 3, Module 10.1, LOS 10.h)

Question #105 of 105

Monte Carlo simulation is necessary to:

A) approximate solutions to complex problems.

B) reduce sampling error.

C) compute continuously compounded returns.

Explanation

This is the purpose of this type of simulation. The point is to construct distributions using complex combinations of hypothesized parameters.

(Study Session 3, Module 10.3, LOS 10.p)