CHAPTER 4

COMMON PROBABILITY DISTRIBUTIONS

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

Explanation

The following confidence intervals give the range within which a normally distributed random variable will lie a certain percentage of the time.

68% confidence interval: $\mu \pm 1\sigma$

90% confidence interval: $\mu \pm 1.65\sigma$

95% confidence interval: $\mu \pm 1.96\sigma$

99% confidence interval: $\mu \pm 2.58\sigma$

So 95% of observations roughly lie 2 standard deviations of the mean.

(Study Session 2, Module 4.2, LOS 4.h)

Related Material

SchweserNotes - Book 1

2. (C) 55%

Explanation

A cumulative distribution function (cdf) gives the probability of an outcome for a random vairiable 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 45% probability that X will take a value less then or equal to15. Therefore, the probability of a value greater than 15 equals 100% - 45% = 55%

(Study Session 2, Module 4.1, LOS 4.b)

Related Material

SchweserNotes – Book 1

3. (A) 81.5% of all the observations will fall between 6 and 18.

Explanation

68% of all observations will fall in the interval plus or minus one standard deviation from the mean (6 to 14), so 32% of the observations will fall outside this range, with 16% greater than 14 and 16% less than 6. Because 95% will fall in the interval plus or minus two standard deviations from the mean (2 to 18), 2.5% will fall below 2. The percentage of observations between 6 (-1 standard deviations) and 18 (+2 standard deviations) is 0.5(68%) + 0.5(95%) = 81.5%.

Related Material

SchweserNotes - Book 1

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

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 2, Module 4.3, LOS 4.1)

Related Material

SchweserNotes - Book 1

5. (B) **In excess of 16% is 0.16**

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 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 observation) to the area from 20% and higher (which Starts at the mean and increases to the infinity and includes 50% of the observation.) 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 2, Module 4.2, LOS 4.h)

Related Material

SchweserNotes – Book 1

6. (B) **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 2, Module 4.1, LOS4.a)

Related Material

SchweserNotes - Book 1

7. (C) **0.40.**

Explanation

For a continuous distribution, $P(a \leq 5\ X \leq 5b) = F(b) - F(a)$. Here, $F(4) = 0.8$ and $F(2) = 0.4$. Note also that this is a uniform distribution over $0 \leq x \leq 5$

so $Prob(2 < x < 4) = (4 - 2) / 5 = 40\%$.

(Study Session 2, Module 4.1, LOS 4.b)

Related Material

SchweserNotes - Book 1

8. (B) 1.697.

Explanation

This is the critical value for a one-tailed probability of 5% and 30 degrees of freedom.

(Study Session 2, Module 4.3, LOS 4.n)

Related Material

SchweserNotes – Book 1

9. (A) discrete random variable.

Explanation

A discrete variable is one that has a finite number of possible outcomes and can be counted, like the number of rainy days in a week.

A continuous variable, on the other hand, is one that has an infinite number of possibilities and must be measured, for example, quantity of rain in a week.

(Study Session 2, Module 4.1, LOS 4.a)

Related Material

SchweserNotes - Book 1

10. (C) approximate solutions to complex problems.

Explanation

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

(Study Session 2, Module 4.3, LOS 4.p)

Related Material

SchweserNotes - Book 1

11. (B) higher

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 2, Module 4.3, LOS 4.m)

Related Material

SchweserNotes - Book 1

12. (B) ln(1 + R).

Explanation

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

(Study Session 2, Module 4.3, LOS 4.m)

Related Material

SchweserNotes - Book 1

13. (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 2, Module 4.2, LOS 4.g)

Related Material

SchweserNotes - Book 1

14. (B) **45 correlations.**

Explanation

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

(Study Session 2, Module 4.2, LOS 4.g)

Related Material

SchweserNotes - Book 1

15. (C) **0.01536.**

Explanation

P(2) = 6! / [(6 - 2)! x 2!] x (0.8^2) x (0.2^4) = 0.01536 = 6 nCr 2 x $(0.8)^2$ x $(0.2)^4$

(Study Session 2, Module 4.1, LOS 4.e)

Related Material

SchweserNotes - Book 1

16. (B) **2.28%.**

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($Z \leq 2$) = 1 - 0.9772 = 0.0228 or 2.28% (from the Z table).

(Study Session 2, Module 4.2, LOS 4.h)

Related Material

SchweserNotes - Book 1

17. (B) **The expected value is a whole number.**

Explanation

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

(Study Session 2, Module 4.1, LOS 4.e)

Related Material

SchweserNotes - Book 1

18. (B) **mean and variance.**

Explanation

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

(Study Session 2, Module 4.2, LOS 4.f)

Related Material

SchweserNotes - Book 1

19. (B) **0.167.**

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 2, Module 4.1, LOS 4.c)

Related Material

SchweserNotes - Book 1

20. (A) **59**

Explanation

When performing a statistical test on the mean of a population based on a sample of size n, the number of degrees of freedom is n - 1 since once the mean is estimated from a sample there are only n - 1 observations that are free to vary. In this case the appropriate number of degrees of freedom to use is 60 - 1 = 59.

(Study Session 2, Module 4.3, LOS 4.n)

Related Material

SchweserNotes - Book 1

21. (A) **117 to 183 inches.**

Explanation

The 90% confidence interval is $\mu \pm 1.65$ standard deviations.

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

(Study Session 2, Module 4.2, LOS 4.j)

Related Material

SchweserNotes – Book 1

22. (C) **-16.09%.**

Explanation

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

(Study Session 2, Module 4.3, LOS 4.m)

Related Material

SchweserNotes - Book 1

23. (A) 37.5%.

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 2, Module 4.1, LOS 4.c)

Related Material

SchweserNotes – Book 1

24. (B) 0.167.

Explanation

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

(Study Session 2, Module 4.1, LOS 4.a)

Related Material

SchweserNotes – Book 1

25. (A) 4.8.

Explanation

A binomial random variable has an expected value or mean equal to np.

Mean = 12(0.4) = 4.8.

Related Material

SchweserNotes - Book 1

26. (B) 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 2, Module 4.2, LOS 4.i)

Related Material

SchweserNotes - Book 1

27. (C) 0.3087.

Explanation

P(3) = 5! / [(5 - 3)! x 3!] x (0.7^3) x (0.3^2) = 0.3087

= 5 → 2^{nd} → nCr → 3 x 0.343 x 0.09

(Study Session 2, Module 4.1, LOS 4.e)

Related Material

SchweserNotes - Book 1

28. (B) symmetrical, and defined by a single parameter.

Explanation

The t-distribution is symmetrical like the normal distribution but unlike the normal distribution is defined by a single parameter known as the degrees of freedom.

(Study Session 2, Module 4.3, LOS 4.n)

Related Material

SchweserNotes - Book 1

29. (C) 9.

Explanation

The degrees of freedom in the numerator and the denominator are the sample size minus one.

(Study Session 2, Module 4.3, LOS 4.o)

Related Material

SchweserNotes - Book 1

30. (C) A binomial probability distribution is an example of a continuous probability distribution.

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 2, Module 4.1, LOS 4.a)

Related Material

SchweserNotes - Book 1

31. (B) 40%

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 2, Module 4.1, LOS 4.d)

Related Material

SchweserNotes - Book 1

32. (C) Neither, they will be equal.

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 2, Module 4.3, LOS 4.m)

Related Material

SchweserNotes - Book 1

33. (A) negative infinity.

Explanation

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

(Study Session 2, Module 4.2, LOS 4.f)

Related Material

SchweserNotes - Book 1

34. (B) Portfolio Z.

Explanation

Portfolio Z has the largest value for the SF Ratio: (19 - 4) / 28 = 0.5357.

For Portfolio X, the SF Ratio is (5 - 4) / 3 = 0.3333.

For Portfolio Y, the SF Ratio is (14 - 4) / 20 = 0.5000.

(Study Session 2, Module 4.2, LOS 4.k)

Related Material

SchweserNotes - Book 1

35. (C) 0.750.

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 2, Module 4.1, LOS 4.d)

Related Material

SchweserNotes - Book

36. (B) 3.59%.

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 2, Module 4.2, LOS 4.j)

Related Material

SchweserNotes - Book 1

37. (B) specifies the probabilities associated with groups of random variables.

Explanation

A multivariate distribution specifies the probabilities for a group of related random variables.

(Study Session 2, Module 4.2, LOS 4.g)

Related Material

SchweserNotes - Book 1

38. (A) bell shaped.

Explanation

As the degrees of freedom increase, the Chi-square and F-distributions become more symmetric and bell shaped. These distributions can only take on positive values.

(Study Session 2, Module 4.3, LOS 4.o)

Related Material

SchweserNotes - Book 1

39. (C) The t-distribution approaches the standard normal distribution as the degrees of freedom increase.

Explanation

As the number of degrees of freedom grows, the t-distribution approaches the shape of the standard normal distribution.

Compared to the normal distribution, the t-distribution has fatter tails.

The t-distribution is symmetric about the mean and so it has skewness of zero. (Study Session 2, Module 4.3, LOS 4.n)

Related Material

SchweserNotes - Book 1

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

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 2, Module 4.3, LOS 4.m)

Related Material

SchweserNotes – Book 1

41. (C) –6.7%

Explanation

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

(Study Session 2, Module 4.3, LOS 4.m)

Related Material

SchweserNotes – Book 1

42. (C) 21.19%

Explanation

z- Value = X – μ / σ

= 1,000,000 – 800,000 / 250,000 = 0.8

This tells us that $1,000,000 lies 0.8 standard deviations from the mean.

Looking up 0.8 in the z-value table gives a probability of 0.7881. This means there is a 78.81% probability that the value of a portfolio selected at random will be less than 0.8 standard deviations above the mean, or in this case, less than $1,000,000.

The probability that a portfolio selected at random is greater than $1,000,000 is, therefore, 1 - 78.81% = 21.19%
(Study Session 2, Module 4.2, LOS 4.j)
Related Material
SchweserNotes - Book 1

43. (C) F-distribution.

Explanation

The F-distribution can only take on positive values. Normal distributions and Student's t-distribution can have both positive and negative values.
(Study Session 2, Module 4.3, LOS 4.o)
Related Material
SchweserNotes - Book 1

44. (B) 95% 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 2, Module 4.2, LOS 4.h)
Related Material
SchweserNotes - Book 1

45. (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 2, Module 4.1, LOS 4.d)
Related Material
SchweserNotes - Book 1

46. (B) 9.

Explanation

Degrees of freedom for the Chi-square distribution are the sample size minus one.
(Study Session 2, Module 4.3, LOS 4.o)
Related Material
SchweserNotes - Book 1

47. (A) 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 2, Module 4.3, LOS 4.p)
Related Material
SchweserNotes - Book 1

48. (B) Yes, because the model is the property of Mega Bank.

Explanation

Smith has violated Standard IV(A) Loyalty by copying proprietary computerized information without authorization of the owner, Bright Star Bank and now Mega Bank. Even if Bright Star has been absorbed by Mega Bank, the assets of the trust department, including the model, now belong to Mega Bank, even if it chooses not to use them. Smith would have complied with the Standard if she had obtained permission from Mega Bank to copy the model.

For Further Reference:
(Study Session 2, Module 4.2, LOS 4.k)
CFA® Program Curriculum, Volume 6, page 285
CFA® Program Curriculum, Volume 6, page 285
CFA® Program Curriculum, Volume 6, page 305, 310, and 312
Related Material
SchweserNotes - Book 1

49. (A) 1

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 2, Module 4.2, LOS 4.k)
Related Material
SchweserNotes - Book 1

50. (B) 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 2, Module 4.1, LOS 4.b)
Related Material
SchweserNotes - Book 1

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

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 2, Module 4.2, LOS 4.f)

Related Material

SchweserNotes - Book 1

52. (A) **5.71%.**

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 2, Module 4.2, LOS 4.i)

Related Material

SchweserNotes - Book 1

53. (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 2, Module 4.3, LOS 4.m)

Related Material

SchweserNotes - Book 1

54. (A) **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 2, Module 4.1, LOS 4.a)

Related Material

SchweserNotes - Book 1

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

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 2, Module 4.1, LOS 4.c)

Related Material

SchweserNotes - Book 1

56. (A) median equals the mode.

Explanation

A normal distribution has a zero skew (which implies a symmetrical distribution). When skew is zero, the mean, median, and mode are all equal.

Kurtosis of a normal distribution is 3.

(Study Session 2, Module 4.2, LOS 4.f)

Related Material

SchweserNotes – Book 1

57. (C) –0.1178.

Explanation

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

(Study Session 2, Module 4.3, LOS 4.m)

Related Material

SchweserNotes – Book 1

58. (A) 15.08 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 2, Module 4.2, LOS 4.i)

Related Material

SchweserNotes – Book 1

59. (A) 15.87%

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 2, Module 4.2, LOS 4.j)

Related Material

SchweserNotes - Book 1

60. (A) Portfolio Z.

Explanation

Portfolio X: SFRatio $= \frac{12-5}{14} = 0.50$

Portfolio Y: SFRatio $= \frac{17-5}{20} = 0.60$

Portfolio Z: SFRatio $= \frac{22-5}{25} = 0.68$

According to the safety-first criterion, Portfolio Z, with the largest ratio (0.68), is the best alternative.

Related Material

SchweserNotes - Book 1

61. (A) **Portfolio X.**

Explanation

According to the safety-first criterion, the optimal portfolio is the one that has the largest value for the SF Ratio (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 2, Module 4.2, LOS 4.k)

Related Material

SchweserNotes - Book 1

62. (C) **9.42%.**

Explanation

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

(Study Session 2, Module 4.3, LOS 4.m)

Related Material

SchweserNotes - Book 1

63. (C) **2**

Explanation

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

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

Portfolio	Expected Returns %	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 2, Module 4.2, LOS 4.k)

Related Material

SchweserNotes - Book 1

64. (B) **either discrete or continuous random variables.**

Explanation

Multivariate distributions can describe discrete or continuous random variables.

(Study Session 2, Module 4.2, LOS 4.g)

Related Material

SchweserNotes - Book 1

65. (C) 2.5%.

Explanation

Using the standard normal probability distribution,

$Z = \frac{\text{observation} - \text{mean}}{\text{standard deviation}} = \frac{0-10}{5} = -2.0$, the chance of getting zero or less return (losing money) is 1 - 0.9772 = 0.0228% or 2.28%. An alternative explanation: the expected return is 10%. To lose money means the return must fall below zero. Zero is about two standard deviations to the left of the mean. 50% of the time, a return will be below the mean, and 2.5% of the observations are below two standard deviations down. About 97.5% of the time, the return will be above zero. Thus, only about a 2.5% chance exists of having a value below zero.

Related Material

SchweserNotes - Book 1

66. (A) 0.7373.

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 x 0.8^4 x 0.2 = 0.4096,

so P(X = 0 or X = 1) = 0.3277 + 0.4096.

(Study Session 2, Module 4.1, LOS 4.e)

Related Material

SchweserNotes - Book 1

67. (B) 0.343.

Explanation

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

(Study Session 2, Module 4.1, LOS 4.e)

Related Material

SchweserNotes - Book 1

68. (C) 0.977.

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 μ = 19 and σ = 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 2, Module 4.2, LOS 4.h)

Related Material

SchweserNotes - Book 1

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

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

(Study Session 2, Module 4.1, LOS 4.a)

Related Material

SchweserNotes - Book 1

70. (B) variance and mean.

Explanation

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

(Study Session 2, Module 4.2, LOS 4.f)

Related Material

SchweserNotes - Book 1

71. (B) 90%.

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 2, Module 4.2, LOS 4.h)

Related Material

SchweserNotes - Book 1

72. (B) 0.0645.

Explanation

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

(Study Session 2, Module 4.1, LOS 4.d)

Related Material

SchweserNotes - Book 1

73. (C) The rate of return on a real estate investment.

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 2, Module 4.1, LOS 4.a)

Related Material

SchweserNotes - Book 1

74. (B) P(91.8 < X < 108.3).

Explanation

100 +/- 1.65 (5) = 91.75 to 108.25 or P(91.75 < X < 108.25) = 90%.

(Study Session 2, Module 4.2, LOS 4.f)

Related Material

SchweserNotes - Book 1

75. (B) correlations between each pair of 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 2, Module 4.2, LOS 4.g)

Related Material

SchweserNotes - Book 1

76. (A) unknown variance and a normal distribution.

Explanation

The t-distribution is the appropriate distribution to use when constructing confidence intervals based on small samples from populations with unknown variance that are normally distributed. If the population is not normally distributed, no test statistic is available for small samples regardless of whether the population variance is known.

(Study Session 2, Module 4.3, LOS 4.n)

Related Material

SchweserNotes - Book 1

77. (C) Grant.

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 2, Module 4.2, LOS 4.k)

Related Material

SchweserNotes - Book 1

78. (C) greater than 25% is 0.32.

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 2, Module 4.2, LOS 4.h)

Related Material

SchweserNotes - Book 1

79. (A) cannot provide the insight that analytic methods can.

Explanation

The major limitations of Monte Carlo simulation are that it is fairly complex and will provide answers that are no better than the assumptions used and that it cannot provide the insights that analytic methods can. Monte Carlo simulation is useful for performing "what if" scenarios. One of the first steps in Monte Carlo simulation is to specify the probably distribution along with the distribution parameters. The distribution specified does not have to be normal.

Related Material

SchweserNotes - Book 1

80. (A) 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
- $F(12 \le X \le 16)$ = F(16) - F(12) = [(16 - 7) / (20 - 7)] - [(12 - 7) / (20 - 7)] = 0.692 - 0.385 = 0.307

(Study Session 2, Module 4.1, LOS 4.d)

Related Material

SchweserNotes - Book 1

81. (A) both of these variables.

Explanation

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

(Study Session 2, Module 4.3, LOS 4.p)

Related Material

SchweserNotes - Book 1

82. (A) 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 2, Module 4.2, LOS 4.j)

Related Material

SchweserNotes - Book 1

83. (B) 79%.

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 2, Module 4.2, LOS 4.j)

Related Material

SchweserNotes - Book 1

84. (C) A probability distribution is, by definition, normally distributed.

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 2, Module 4.1, LOS 4.a)

Related Material

SchweserNotes - Book 1

85. (B) **negatively skewed.**

Explanation

A lognormal distribution is positively skewed and is bounded below by zero.

If stock returns are continuously compounded, then prices follow a lognormal distribution under certain conditions.

(Study Session 2, Module 4.3, LOS 4.l)

Related Material

SchweserNotes - Book 1

86. (C) **normally distributed.**

Explanation

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

(Study Session 2, Module 4.3, LOS 4.l)

Related Material

SchweserNotes - Book 1

87. (C) **A normal distribution has excess kurtosis of three.**

Explanation

Even though normal curves have different sizes, they all have identical shape characteristics. The kurtosis for all normal distributions is three; an excess kurtosis of three would indicate a leptokurtic distribution. Both remaining choices are true.

(Study Session 2, Module 4.2, LOS 4.f)

Related Material

Schweser Notes - Book 1

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

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 2, Module 4.2, LOS 4.g)

Related Material

SchweserNotes - Book 1

89. (C) **normally distributed.**

Explanation

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

(Study Session 2, Module 4.3, LOS 4.l)

Related Material

SchweserNotes - Book 1

90. (B) 0.0228.

Explanation

1 - F(2) = 1 - 0.9772 = 0.0228.

(Study Session 2, Module 4.2, LOS 4.h)

Related Material

SchweserNotes - Book 1

91. (C) A binomial distribution.

Explanation

The binomial distribution is a discrete distribution, while the normal distribution is an example of a continuous distribution. Univariate distributions can be discrete or continuous.

Related Material

SchweserNotes - Book 1

92. (B) 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 2, Module 4.2, LOS 4.g)

Related Material

SchweserNotes - Book 1

93. (B) 84%.

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 2, Module 4.2, LOS 4.h)

Related Material

SchweserNotes - Book 1