CHAPTER 3

PROBABILITY CONCEPTS

1. (B) 1.7%.

Explanation

The standard deviation is the positive square root of the variance. The variance is the expected value of the squared deviations around the expected value, weighted by the probability of each observation. The expected value is: (0.5) × (0.12) + (0.3) × (0.1) + (0.2) × (0.15) = 0.12. The variance is: (0.5) × $(0.12 - 0.12)^2$ + (0.3) x $(0.1 - 0.12)^2$ + (0.2) × $(0.15 - 0.12)^2$ = 0.0003. The standard deviation is the square root of 0.0003 The standard deviation is the square root of 0.0003 = 0.017 or 1.7%.

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

2. (B) 55%.

Explanation

Prob (interest rates increase) + Prob(inflation is over 2%) – Prob(interest rates increase) inflation is over 2%) × Prob(inflation is over 2%) = 0.4 + 0.3 – 0.5 × 0.3 = 55%.

(Study Session 1, module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

3. (C) 34%.

Explanation

From the table, the number of trucks with both airbags and bucket seats is 75. The probability is that number as a percentage of the total number of trucks, 220. 75 / 220 = 0.34.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

4. (C) 0.72

Explanation

This requires the addition formula. From the information: P(cut interest rates) = 0.50 and P(DJIA increase) = 0.67, P(DJIA increase | cut interest rates) = 0.90.

The joint probability is 0.50 x 0.90 = 0.45. Thus P (cut interest rates or DJIA increase) = 0.50 + 0.67 - 0.45 = 0.72.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

5. (C) **67%**

Explanation:

Using the total probability rule, the unconditional probability of bankruptcy is (0.2)(0.6) + (0.3) (0.4) + (0.4)(0.2) + (0.1) (0.1) = 0.33. The probability that Madison, Inc. does not go bankrupt is 1 - 0.33 = 0.67 = 67%.

(Study Session 1, Module 3.2, LOS 3.g)

Related Material

SchweserNotes - Book 1

6. (A) **refining a forecast because of the occurrence of some other event.**

Explanation

Conditional expected values are contingent upon the occurrence of some other event. The expectation changes as new information is revealed.

(Study Session 1, Module 3.2, LOS 3.i)

Related Material

SchweserNotes - Book 1

7. (A) **360.**

Explanation

The number of different ways to assign these labels is:

$$\frac{10!}{2! \times 7! \times 1!} = \frac{3,628,800}{2 \times 5,040 \times 1} = 360$$

(Study Session 1, Module 3.3, LOS 3.n)

Related Material

SchweserNotes - Book 1

8. (C) **15%**

Explanation

This is a joint probability. From the information: P(Bear Market given inverted yield curve) = 0.75 and P(inverted yield curve) = 0.20. The joint probability is the product of these two probabilities: (0.75)(0.20) = 0.15.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

9. (A) 34,650.

Explanation

This problem is a labeling problem where the 12 employees will be assigned one of three labels (groups). Each group will have four employees. This requires the labeling formula.

Number of ways = $N! / (N_1! + N_2! + N_3!)$

There are [(12!) / (4! × 4! × 4!)] = 34,650 was to group the employees.

(Study Session 1, Module 3.3, LOS 3.n)

Related Material

SchweserNotes - Book 1

10. (A) 5.5%.

Explanation

$[0.30 \times (0.15 - 0.066)^2 + 0.70 \times (0.03 - 0.066)^2]^{1/2} = 5.5\%$.

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

11. (C) 20%.

Explanation

The joint probability is the probability that both events, in this case the economy being good and the occurrence of a bull market, happening at the same time. It is computed by multiplying the unconditional probability of a good economy (40%) by the conditional probability of a bull market given a good economy (50%): 0.40 × 0.50 = 0.20 or 20%.

State of the Economy (Unconditional Probability)	Market Given State of the Economy (Conditional Probability)	Probability of a Particular State of the Economy AND Market Occurring (joint Probability)
Good 40%	Bull 50%	**Good + Bull = 40% × 50% = 20%**
	Normal 30%	Good + Normal = 40% × 30% = 12%
	Bear 20%	Good + Bear = 40% × 20% = 8%
Bad 60%	Bull 20%	Bad + Bull = 60% × 20% = 12%
	Normal 30%	Bad + Normal = 60% × 30% = 18%
	Bear 50%	Bad + Bear = 60% × 50% = 30%

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

12. (B) Expected returns.

Explanation

The correlations and standard deviations cannot give a measure of central tendency, such as the expected value.

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

13. (B) 0.014.

Explanation

E(I) = (0.25 × 0.16) + (0.45 × 0.02) + (0.30 × -0.10) = 0.0190.

E(S) = (0.25 × 0.24) + (0.45 × 0.03) + (0.30 × -0.15) = 0.0285.

Covariance = [0.25 × (0.16 – 0.0190) × (0.24 – 0.0285)] + [0.45 × (0.02 – 0.0190) (0.03 – 0.0285)] + [0.30 × (-0.10 – 0.0190) × (-0.15 – 0.0285)] = 0.0138.

(Study Session 1, Module 3.3, LOS 3.l)

Related Material

SchweserNotes - Book 1

14. (A) 0.85.

Explanation

This requires the addition formula, P(callable) + P(warrants) - P(callable and warrants) = P(callable or warrants) = 14/20 + 5/20 - 2/20 = 17/20 = 0.85.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

15. (C) 8.9%

Explanation

Using the multiplication rule: (0.25)(0.42) - (0.25)(0.15)(0.42) = 0.08925 or 8.9%

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

16. (C) total probability rule.

Explanation

The total probability rule is used to calculate the unconditional probability of an event from the conditional probabilities of the event, given a mutually exclusive and exhaustive set of outcomes. The rule is expressed as:

$P(A) = P(A \mid B_1)P(B_1) + P(A \mid B_2)P(B_2) + \ldots + P(A \mid B_n)P(B_n)$

(Study Session 1, Module 3.2, LOS 3.g)

Related Material

SchweserNotes - Book 1

17. (B) **mutually exclusive.**

Explanation

If two events cannot occur simultaneously, the events are mutually exclusive. The high temperature tomorrow cannot be both below 32 and above 40.

If two events are independent, the occurrence of one event does not affect the probability of occurrence of the other. Because these events are mutually exclusive, they cannot be independent; if one of them occurs, the probability of the other is zero.

For two events to be exhaustive, they must encompass the entire range of possible outcomes (that is, their probabilities sum to 100%). Here this is not the case as there are possible outcomes where the high temperature is between 32 and 40.

(Study Session 1, Module 3.1, LOS 3.b)

Related Material

SchweserNotes - Book 1

18. (C) **047.**

Explanation

Using the total probability rule, we can calculate the unconditional probability of an increase in earnings as follows:

$P(H_I) = P(H_I \mid E) \times P(E) + P(HI \mid Ep) \times P(Ep)$

where:

P(E) = 0.55, the unconditional probability of a good economy

P(Ep) = 0.45, the unconditional probability of a poor economy

$P(H_I \mid E)$ = 0.6, the probability of an increase in Home Builder Inc.'s earnings given a good economy

$P(H_I \mid E_P)$ = 0.3, the probability of an increase in Home Builder Inc.'s earnings given a poor economy

$P(H_I) = 0.60 \times 0.55 + 0.30 \times 0.45 = 0.33 + 0.135 = 0.465 \approx 0.47.$

Related Material

SchweserNotes - Book 1

19. (B) **88%.**

Explanation

The addition rule for probabilities is used to determine the probability of at least one event among two or more events occurring, in this case a car being red or having a radio. To use the addition rule, the probabilities of each individual event are added together, and, if the events are not mutually exclusive, the joint probability of both events occurring at the same time is subtracted out:

P(red or radio) = P(red) + P(radio) - P(red and radio) = 0.40 + 0.76 - 0.28 = 0.88 or 88%.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

20. (C) 60%

Explanation

A joint probability is the probability that two events occur when neither is certain or a given. Joint probability is calculated by multiplying the probability of each event together. (0.75) x (0.80) = 0.60 or 60%.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

21. (A) 0.

Explanation

We will use the multiplication rule to calculate this probability.

P(1, 2, 3, 4) = P(1) x P(2) x P(3) x P(4)

= 0.85 x 0.50 x 0.30 x 0.15 = 0.019125

Number of offers expected to meet the criteria = 0.019125 x 20 = 0.3825, or 0.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

22. (C) 4.18%.

Explanation

The standard deviation of the portfolio is found by:

$[W_1^2\ \sigma_1^2\ W_2^2\ \sigma_2^2 + 2W_1W_2\sigma_1\sigma_2r_{1,2}]^{0.5}$, or $[(0.75)^2(0.102)^2 + (0.25)^2\ (0.139)^2 + (2)(0.75)(0.25)(0.102)(0.139)(-1.0)]^{0.5}$ = 0.0418, or 4.18%.

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

23. (C) 10.04&

Explanation

Find the weighted average return (0.10)(-5) + (0.30)(-2) + (0.50)(10) + (0.10)(31) = 7%.

Next, take differences, square them, multiply by the probability of the event and add them up. That is the variance. Take the square root of the variance for Std. Dev. $(0.1)(-5 - 7)^2 + (0.3)\ (-2 - 7)^2 + (0.5)(10 - 7)^2 + (0.1)(31 - 7)^2$ = 100.8 = variance.

$100.8^{0.5}$ = 10.04%.

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

24. (A) 3.5%.

Explanation

In order to calculate the standard deviation of the company returns, first calculate the expected return, then the variance, and the standard deviation is the square root of the variance.

The expected value of the company return is the probability weighted average of the possible outcomes: (0.20)(0.20) + (0.50)(0.15) + (0.30)(0.10) = 0.145.

The variance is the sum of the probability of each outcome multiplied by the squared deviation of each outcome from the expected return: $(0.2)(0.20 - 0.145)^2 + (0.5)(0.15 - 0.145)^2 + (0.3)(0.1-0.145)^2 = 0.000605 + 0.0000125 + 0.0006075 = 0.001225$.

The standard deviation is the square root of 0.001225 = 0.035 or 3.5%.;

(Study Session 1, Module 3.3, LOS 3.l)

Related Material

SchweserNotes - Book 1

25. (C) is equal to the probability of rolling a 3 on the first roll.

Explanation

Because each event is independent, the probability does not change for each roll. For a six-sided die the probability of rolling a 3 (or any other number from 1 to 6) on a single roll is 1/6.

(Study Session 1, Module 3.2, LOS 3.f)

Related Material

SchweserNotes - Book 1

26. (C) 32%.

Explanation

Because a good economy and a bad economy are mutually exclusive, the probability of a bull market is the sum of the joint probabilities of (good economy and bull market) and (bad economy and bull market): (0.40 x 0.50) + (0.60 x 0.20) = 0.32 or 32%.

State of the economy (Unconditional Probability)	Market Given State of the Economy (Conditional Probability)	Probability of a Particular State of the Economy AND market Occuring (Joint Probability)
Good 40%	Bull 50%	**Good + Bull=40% x 30% = 12%**
	Normal 30%	Good + Bear = 40% x 20% = 8%
	Bear 20%	Good + Bear = 40% x 20% = 8%
Bad 60%	Bull 20%	**Bad + Normal = 60% x 30% = 18%**
	Normal 30%	Bad + Normal = 60% x 20% =18%
	Bear 50%	Bad + Bear = 60% x 50% = 30%

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

27. (A) 264%.

Explanation

The standard deviation of the portfolio is found by:

$[W_1^2\ \sigma_1^2 W_2^2\ \sigma_2^2 + 2W_1W_2\sigma_1\sigma_2 p_{1,2}]^{0.5}$

$= [(0.40)^2(0.0015) + (0.60)^2\ (0.0021) + (2)(0.40)(0.60)(0.0387)(0.0458)(-0.35)]^{0.5}$

= 0.0264, or 2.64%.

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

28. (B) 0.0769.

Explanation

If the probability against the event occurring is twelve to one, this means that in thirteen occurrences of the event, it is expected that it will occur once and not occur twelve times. The probability that the event will occur is then: 1/13 = 0.0769.

(Study Session 1, Module 3.1, LOS 3.c)

Related Material

SchweserNotes - Book 1

29. (B) 0.00.

Explanation:

If two events are mutually exclusive, it is not possible to occur at the same time. Therefore, the $P(A \cap B) = 0$.

(Study Session 1, Module 3.1, LOS 3.b)

Related Material

SchweserNotes - Book 1

30. (C) +0.65.

Explanation

The correlation coefficient = Cov (X,Y)/[(Std Dev. X)(Std. Dev. Y)] = 18.17 / 28 = 0.65

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

31. (B) The Multiplication Rule.

Explanation

The multiplication rule is used to determine the joint probability of two events. The addition rule is used to determine the probability that at least one of two events will occur. The total probability rule is utilized when trying to determine the unconditional probability of an event.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

32. (A) 0.00144.

Explanation

r = Cov(C,D) / (σ_C x σ_D)

$\sigma_C = (0.0009)^{0.5} = 0.03$

$\sigma_D = (0.0036)^{0.5} = 0.06$

0.8(0.03)(0.06) = 0.00144

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

33. (B) 0.24.

Explanation

Here we are calculating a joint probability. We know there is a 40% chance that Y rises and a 60% chance the Z rises if Y also rises (conditional probability). To find the probability that both rise, we simply multiply these probabilities together.

P(Y) = 0.40, P(Z I Y) = 0.60. Therefore, P(YZ) = P(Y)P(Z I Y) = 0.40(0.60) = 0.24.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

34. (C) 29.4%.

Explanation

The formula for the standard deviation of a 2-stock portfolio is:

$s = [W_A^2 s_A^2 + W_B^2 s_B^2 + 2W_A W_B s_A s_B r_{A,B}]^{1/2}$

$s = [(0.8^2 \times 0.34^2) + (0.2^2 \times 0.16^2) + (2 \times 0.8 \times 0.2 \times 0.34 \times 0.16 \times 0.67)]^{1/2}$

$= [0.073984 + 0.001024 + 0.0116634]^{1/2} = 0.0866714^{1/2} = 0.2944$, or approximately 29.4%.

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

35. (C) $57.00

Explanation

The expected value if the overall market decreases is 0.4($60) + (1 - 0.4)($55) = $57.

(Study Session 1, Module 3.2, LOS 3.j)

Related Material

SchweserNotes - Book 1

36. (B) P(X I Y) = P(X).

Explanation

Note that events being independent means that they have no influence on each other. It does not necessarily mean that they are mutually exclusive. Accordingly,

P(X or Y) = P(X) + P(Y) - P(X and Y). By the definition of independent events, P(X I Y) = P(X).
(Study Session 1, Module 3.2, LOS 3.f)
Related Material
SchweserNotes - Book 1

37. (A) 0.350.
Explanation
The correlation coefficient is: Cov(A,B) / [(Std Dev A)(Std Dev B)] = 0.009 / [(√0.02)(√0.033)] = 0.350.
(Study Session 1, Module 3.3, LOS 3.k)
Related Material
SchweserNotes - Book 1

38. (C) 56%.
Explanation
P(AB) = P(A I B)P(B) = 0.7 x 0.8 = 0.56.
(Study Session 1, Module 3.1, LOS 3.e)
Related Material
SchweserNotes - Book 1

39. (C) 0.42.
Explanation
Because the events are mutually exclusive and exhaustive, the unconditional probability is obtained by taking the sum of the two joint probabilities:
P(X) = P(X I Y) x P(Y) + P(X I Z) x P(Z) = 0.4 x 0.9 + 0.6 x 0.1 = 0.42.
(Study Session 1, Module 3.2, LOS 3.g)
Related Material
SchweserNotes - Book 1

40. (B) 11.55%
Explanation
The expected return on Portfolio A is a probability-weighted average of 17%, 14%, 12%, and 8%.
Expected return = (0.15)(0.17) + (0.20)(0.14) + (0.25)(0.12) + (0.40)(0.08) = 0.1155 or 11.55%.

Scenario	Probability	Return on Portfolio A	Return on Portfolio B
A	15%	17%	15 x 17%
B	20%	14%	20% x 14%
C	25%	12%	25% x 12%
D	40%	8%	40% x 8%
Probability Weighted Average Return ∑ **Probability x Weight**			**11.55%**

(Study Session 1, Module 3.2, LOS 3.h)

Related Material

SchweserNotes - Book 1

41. (B) 0.333.

Explanation

The unconditional probability is the weighted average of the conditional probabilities where the weights are the probabilities of the conditions. In this problem the three conditions fall short, meet, or exceed its earnings forecast are all equally likely. Therefore, the unconditional probability is the simple average of the three conditional probabilities: (0.2 + 0.3 + 0.5) + 3.

(Study Session 1, Module 3.2, LOS 3.g)

Related Material

SchweserNotes - Book 1

42. (C) derived from analyzing past data.

Explanation

An empirical probability is one that is derived from analyzing past data. For example, a basketball player has scored at least 22 points in each of the season's 18 games. Therefore, there is a high probability that he will score 22 points in tonight's game.

(Study Session 1, Module 3.1, LOS 3.b)

Related Material

SchweserNotes - Book 1

43. (B) One to nine.

Explanation

The answer can be determined by dividing the probability of the event by the probability that it will not occur: (1/10) / (9/10) = 1 to 9. The probability of the event occurring is one to nine, i.e. in ten occurrences of the event, it is expected that it will occur once and not occur nine times.

(Study Session 1, Module 3.1, LOS 3.c)

Related Material

SchweserNotes - Book 1

44. (B) 16.5%.

Explanation

E(r) = (0.70 x 0.12) + (0.30 x 0.40 x 0.30) + (0.30 x 0.60 x 0.25) = 0.165.

(Study Session 1, Module 3.2, LOS 3.h)

Related Material

SchweserNotes - Book 1

45. (B) 0.80.

Explanation

P(AB) = P(A I B) x P(B)

0.68 / 0.85 = 0.80

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

46. (C) 0.167.

Explanation

This is a joint probability. From the information: P(beta > 1) = 0.500 and P(comp. stock / beta > 1) = 0.333. Thus, the joint probability is the product of these two probabilities: (0.500) x (0.333) = 0.167.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

47. (A) joint probability of two events.

Explanation

The multiplication rule of probability is stated as: P(AB) = P(A I B) x P(B), where P(AB) is the joint probability of events A and B.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

48. (B) independent.

Explanation

Each draw has the same probability, which is not affected by previous outcomes. Therefore each draw is an independent event.

(Study Session 1, Module 3.2, LOS 3.f)

Related Material

SchweserNotes - Book 1

49. (B) The combination formula determines the number of different ways a group of objects can be drawn in a specific order from a larger sized group of objects.

Explanation

The permutation formula is used to find the number of possible ways to draw r objects from a set of n objects when the order in which the objects are drawn matters. The combination formula ("n choose r") is used to find the number of possible ways to draw r objects from a set of n objects when order is not important. The other statements are accurate.

(Study Session 1, Module 3.3, LOS 3.n)

Related Material

SchweserNotes - Book 1

50. (B) Four to one.

Explanation

The answer can be determined by dividing the probability of the event by the probability that it will not occur: (1/5) / (4/5) = 1 to 4. The odds against the event occurring is four to one, i.e. in five occurrences of the event, it is expected that it will occur once and not occur four times.

(Study Session 1, Module 3.1, LOS 3.c)

Related Material

SchweserNotes - Book 1

51. (B) 0.85.

Explanation

There are 130 total analysts and 40 CEOs who think it will have a positive impact. (130 + 40) / 200 = 0.85.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

52. (A) 4.53%.

Explanation

$E(R_A) = 11.65\%$

$\sigma^2 = 0.0020506 = 0.15(0.18 - 0.1165)^2 + 0.2(0.17 - 0.1165)^2 + 0.25(0.11 - 0.1165)^2 + 0.4(0.07 - 0.1165)^2$

$\sigma = 0.0452836$

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

53. (B) 0.625.

Explanation

Using the total probability rule, we can compute the

P(B): $P(B) = [P(B \mid A) \times P(A)] + [P(B \mid A^C) \times P(A^C)]$

$P(B) = [0.5 \times 0.4] + [0.2 \times 0.6] = 0.32$

Using Bayes' formula, we can solve for

P(A I B): $P(A \mid B) = [\,P(B \mid A) \div P(B)\,] \times P(A) = [0.5 \div 0.32] \times 0.4 = 0.625$

(Study Session 1, Module 3.3, LOS 3.m)

Related Material

SchweserNotes - Book 1

54. (C) 91%.

Explanation

P(new office) = 64% (unconditional probability)

P(new office and coffee shop) = 58% (joint probability)

We are trying to calculate the conditional probability P(coffee shop I new office). P(new office and coffee shop) = P(new office) x P(coffee shop I new office)

P(coffee shop I new office) = P(new office and a coffee shop) / P(new office), or 58% / 64% = 90.63%.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

55. (B) For a stock, based on prior patterns of up and down days, the probability of the stock having a down day tomorrow.

Explanation

There are three types of probabilities: a priori, empirical, and subjective. An empirical probability is calculated by analyzing past data.

(Study Session 1, Module 3.1, LOS 3.b)

Related Material

SchweserNotes - Book 1

56. (A) 6.6%.

Explanation

The expected portfolio return is a probability-weighted average:

State of the Economy	Probability	Return on Portfolio	Probability Return
Boom	0.30	1.5%	0.3x 15% = 4.5%
Bust	0.70	3%	0.7x 3% = 2.1%
Expected Return = ∑Probability x Return			**6.6%**

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

57. (B) Three to two.

Explanation

Odds are the number of successful possibilities to the number of unsuccessful possibilities: P(E)/[1 - P(E)] or 0.6 / 0.4 or 3/2.

(Study Session 1, Module 3.1, LOS 3.c)

Related Material

SchweserNotes - Book 1

58. (A) 0.0123.

Explanation

Since there are twice as many male employees to female employees, P(male) = 2/3 and P(female) = 1/3. Therefore, the probability of selecting four female employees = $(0.333)^4$ = 0.0123.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

59. (B) 6.20%

Explanation

The standard deviation of the portfolio is found by:

$[W_1^2 \sigma_1^2 W_2^2 \sigma_2^2 + 2W_1W_2\sigma_1\sigma_2r_{1,2}]^{0.5}$, or $[(0.30)^2(0.046)^2 + (0.70)^2(0.078)^2 + (2)(0.30)(0.70)(0.046)(0.078)(0.45)]^{0.5}$ = 0.0620, or 6.20%.

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

60. (B) 0.001898.

Explanation.

S	P (S)	Return on Portfolio A	R_A - E(R_A)	Return on Portfolio B	R_B - E(R_B)	[R_A - E(R_A)] x [R_B - E(R_B)] x P(S)
A	5%	18%	6.35%	19%	6.45%	0.000614
B	20%	17%	5.35%	18%	5.45%	0.000583
C	25%	11%	- 0.65%	10%	- 2.55%	0.000041
D	40%	7%	- 4.65%	9%	- 3.55%	0.000660
		E(R_A) = 11.65%		**E(R_B) =12.55%**		**Cov(R_A,R_B) = 0.001898**

(Study Session 1, Module 3.3, LOS 3.l)

Related Material

SchweserNotes - Book 1

61. (B) 8.85%.

Explanation

The expected return is simply a weighted average return.

Multiplying the weight of each asset by its expected return, then summing, produces: E(RP) = 0.40(12) + 0.35(8) + 0.25 (5) = 8.85%.

Start of the economy	Weight	$E(R_x)$	Probability x Return
V	0.40	12%	0.4 × 12%
M	0.35	8%	0.35 × 8%
S	0.25	5%	0.25 × 5%
Expected Return = ∑Weighted × $E(R_X)$			**8.85%**

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

62. (C) $ 2.47.

Explanation

We need to calculate of probability weighted average payoff.

Since the probability of the coin landing on its edge is 0.02, the probability of each of the other two events is 0.49. The expected payoff is: (0.02 x $50) + (0.49 x $1) + (0.49 x $2) = $2.47.

Outcome	Probability	Payoff	Probability x Payoff
Edge	2 / 100 = 2%	$50	2% x $50
Heads	49%	$1	49% x $1
Tails	49%	$2	49% x $2
Expected payoff = ∑Probability × Payoff			**$2.47**

(Study Session 1, Module 3.2, LOS 3.h)

Related Material

SchweserNotes - Book 1

63. (A) only the factorial function.

Explanation

The factorial function, denoted n!, tells how many different ways n items can be arranged where all the items are included.

(Study Session 1, Module 3.3, LOS 3.n)

Related Material

SchweserNotes - Book 1

64. (A) 0.35.

Explanation

Out of a total of 200 individuals, 70 are analysts who believe legislation will positively impact the economy. We simply need to reflect this as a proportion to work out the probability.

70 analysts / 200 individuals = 0.35.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

65. (A) 0.1500.

Explanation

The expected return of a portfolio composed of n-assets is the weighted average of the expected returns of the assets in the portfolio: $((w_1) \times (E(R_1)) + ((w_2) \times (E(R_2))$ = (0.5 x 0.1) + (0.5 x 0.2) = 0.15.

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

66. (A) 0.88.

Explanation

The probability of being a nonsmoker is 240 / 300 = 0.80. The probability of not suffering from allergies is 210 / 300 = 0.70. The probability of being a nonsmoker and not suffering from allergies is 185 / 300 = 0.62. Since the question asks for the probability of being either a nonsmoker or not suffering from allergies we have to take the probability of being a nonsmoker plus the probability of not suffering from allergies and subtract the probability of being both:

0.80 + 0.70 - 0.62 = 0.88.

Alternatively: 1 - P(Smoker & Allergies) = 1 - (35 / 300) = 88.3%.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

67. (A) -12.0.

Explanation

The covariance is COV(XY) = ((0.3 x ((2 - 6) x (10 - 4)) + ((0.4 x ((6 - 6) x (2.5 - 4))) + (0.3 x ((10 - 6) x (0 - 4))) = -12.

(Study Session 1, Module 3.3, LOS 3.l)

Related Material

SchweserNotes - Book 1

68. (B) 0.0625.

Explanation

Each employee has equal chance of being male or female. Hence, probability of selecting four female employees = $(0.5)^4$ = 0.0625

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

69. (B) 360.

Explanation

This is a choose four from six problem where order is important. Thus, it requires the permutation formula: n! / (n - r)! = 6! / (6 - 4)! = 360.

With TI calculator: 6 [2nd][nPr] 4 = 360.

(Study Session 1, Module 3.3, LOS 3.n)

Related Material

SchweserNotes - Book 1

70. (B) **An event is a set of one or more possible values of a random variable.**

Explanation

Conditional probability is the probability of one event happening given that another event has happened. An outcome is the numerical result associated with a random variable.

(Study Session 1, Module 3.1, LOS 3.a)

Related Material

SchweserNotes - Book 1

71. (C) 0.92.

Explanation

The problem is just asking for the conditional probability of a defective widget given that it was produced by the new machine. Since the widget was produced by the new machine and not selected from the output randomly (if randomly selected, you would not know which machine produced the widget), we know there is an 8% chance it is defective. Hence, the probability it is not defective is the complement, 1 - 8% = 92%.

(Study Session 1, Module 3.1, LOS 3.d)

Related Material

SchweserNotes - Book 1

72. (B) 73%

Explanation

The addition rule for probabilities is used to determine the probability of at least one event among two or more events occurring. The probability of each event is added and the joint probability (if the events are not mutually exclusive) is subtracted to arrive at the solution. P(air bags or bucket seats) = P(air bags) + P(bucket seats) - P(air bags and bucket seats) = (125 / 220) + (110 / 220) - (75 / 220) = 0.57 + 0.50 - 0.34 = 0.73 or 73%.

Alternative: 1 - P(no airbag and no bucket seats) = 1 - (60 / 220) = 72.7%

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

73. (A) 0.211.

Explanation

According to Bayes' formula: P(B I default) = P(default and B) / P(default).

P(default and B) = P(default I B) x P(B) = 0.250 x 0.300 = 0.075

P(default and CCC) = P(default I CCC) x P(CCC) = 0.400 x 0.700 = 0.280

P(default) = P(default and B) + P(default and CCC) = 0.355

P(B I default) = P(default and B) / P(default) = 0.075 / 0.355 = 0.211

(Study Session 1, Module 3.3, LOS 3.m)

Related Material

SchweserNotes - Book 1

74. (B) 0.6.

Explanation

The variance is the sum of the squared deviations from the expected value weighted by the probability of each outcome.

The expected value is E(X) = 0.3 x 2 + 0.4 x 3 + 0.3 x 4 = 3.

The variance is $0.3 \times (2 - 3)^2 + 0.4 \times (3 - 3)^2 + 0.3 \times (4 - 3)^2 = 0.6$.

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

75. (A) $3.29.

State of the Economy (Unconditional Probability)	Conditional Probability	Joint Probability	EPS	Joint Probability x EPS
GOOD 60%	70%	60% x 70% = 42%	$5.00	42% x $5.00 = $2.10
	30%	60% x 30% = 18%	$3.50	18% x $3.50 = $0.63
BAD 40%	80%	40% x 80% = 32%	$1.50	32% x $1.50 = $0.48
	20%	40% x 20% =8%	$1.00	8% x $1.00 = $0.08
Expected EPS ∑ Joint Probability × EPS				**$3.29**

(Study Session 1, Module 3.2, LOS 3.h)

Related Material

SchweserNotes - Book 1

76. (B) To state a probability, a set of mutually exclusive and exhaustive events must be defined.

Explanation

Stating a probability does not require defining a mutually exclusive and exhaustive set of events. The two defining properties of probability are that the probability of an event is greater than or equal to zero and less than or equal to one, and if a set of events is mutually exclusive and exhaustive, their probabilities sum to one.

(Study Session 1, Module 3.1, LOS 3.b)

Related Material

SchweserNotes - Book 1

77. (A) the outcomes of other events.

Explanation

An unconditional probability is one that is not stated as depending on the outcome of another event.

(Study Session 1, Module 3.1, LOS 3.d)

Related Material

SchweserNotes - Book 1

78. (B) 0.81.

Explanation

We calculate the probability that at least one of the options will fall below $35 using the addition rule for probabilities (A represents Alpha, O represents Omega):

P(A or O) = P(A) + P(O) – P(A and O), where P(A and O) = P(A) x (O)

P(A or O) = 0.65 + 0.47 – (0.65 x 0.47) = approximately 0.81

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

79. (C) 0.2114.

Explanation

You are not given the covariance in this problem but instead you are given the correlation coefficient and the variances of assets A and B from which you can determine the covariance by Covariance = (correlation of A, B) × Standard Deviation of A) × (Standard deviation of B).

Since it is an equally weighted portfolio, the solution is:

$[(0.5)^2 \times 0.18] + [0.5)^2 \times 0.36] + [2 \times 0.5 \times 0.5 \times 0.6 \times (0.18^{0.5}) \times (0.36^{0.5}] =$ 0.045 + 0.09 + 0.0764 = 0.2114

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

80. (C) 60.

Explanation

We can view this problem as the number of ways to choose three analysts from five analysts when the order they are chosen matters. The formula for the number of permutations is:

$$\frac{n!}{(n-r)!} = \frac{5!}{2!} = 5 \times 4 \times 3 = 60$$

On the TI financial calculator: 5 2^{nd} nPr 3 = 60.

Alternatively, there are 5 2nd nCr 3 = 10 ways to select three of the five analysts, and for each group of selected analysts, there are 3! = 3 x 2 x 1 = 6 ways to assign them the three industries. Therefore, there are 10 x 6 = 60 ways to assign the industries to the analysts.

Related Material

SchweserNotes - Book 1

81. (A) 10.3% expected return and 16.05% standard deviation.

Explanation

$ER_{Port} = (W_{Pluto})(ER_{Pluto}) + (W_{Neptune})(ER_{Neptune})$

$= (0.65)(0.11) + (0.35)(0.09) = 10.3\%$

$GP = [(w_1)^2(\sigma_1)^2 + (w_2)^2(\sigma_2)^2 + 2w_1w_2\sigma_1\sigma_2 r_{1,2}]^{1/2}$

$= [(0.65)^2(22)^2 + (0.35)^2(13)^2 + 2(0.65)(0.35)(22)(13)(0.25)]^{1/2}$

$= [(0.4225)(484) + (0.1225)(169) + 2(0.65)(0.35)(22)(13)(0.25)]^{1/2}$

$= (257.725)^{1/2} = 16.0538\%$

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

82. (B) 37%.

Explanation

Given a set of prior probabilities for an event of interest, Bayes' formula is used to update the probability of the event, in this case that the car we already know has a radio is red. Bayes' formula says to divide the Probability of New Information given Event by the Unconditional Probability of New Information and multiply that result by the Prior Probability of the Event. In this case, P(red car has a radio) = 0.70 is divided by 0.76 (which is the Unconditional Probability of a car having a radio (40% are red of which 70% have radios) plus (60% are blue of which 80% have radios) or ((0.40) x (0.70)) + ((0.60) x (0.80)) = 0.76.) This result is then multiplied by the Prior Probability of a car being red, 0.40. The result is (0.70 / 0.76) x (0.40) = 0.37 or 37%.

(Study Session 1, Module 3.3, LOS 3.m)

Related Material

SchweserNotes - Book 1

83. (C) 28 %

Explanation

Here we are calculating a joint probability. In this case, it's that a car selected is red and has a radio. We need to multiply the unconditional probability of selecting a red car by the conditional probability of selecting a car with a radio given that it is a red car:

P(red and radio) = (P(red)) x (P(radio/red)) = (0.4) x (0.7) = 0.28 or 28%.

	Unconditional probability (A)	Conditional probability (B)	Joint probability A × B
Red	40%	Radio 70%	28% (red + Radio)
		No radio 30%	12%(Red + NO Radio)
Blue	60%	Radio 80%	48% (Blue + Red)
		No radio 20%	12%(Blue + NO Radio)
Total	**100%**		**100%**

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

84. (A) 16.82%.

Explanation

The standard deviation of two stocks that are perfectly positively correlated is the weighted average of the standard deviations: 0.5(18.9) + 0.5(14.73) = 16.82%. This relationship is true only when the correlation is one. Otherwise, you must use the formula:

$$\sigma_p = \sqrt{w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\sigma_1\sigma_2\rho_{1,2}}$$

(Study Session 1, Module 3.3, LOS 3.k)

Related Material

SchweserNotes - Book 1

85. (C) a priori probability.

Explanation

An a priori probability is based on formal reasoning rather than on historical results or subjective opinion.

(Study Session 1, Module 3.1, LOS 3.b)

Related Material

SchweserNotes - Book 1

86. (A) 1 to 4.

Explanation

For event "E," the probability stated as odds is: P(E) / [1 - P(E)]. Here, the probability that a poultry research assistant received a salary increase in excess of 2.5% = 2,000 / 10,000 = 0.20, or 1/5 and the odds are (1/5) / [1 - (1/5)] = 1/4, or 1 to 4.

(Study Session 1, Module 3.1, LOS 3.c)

Related Material

SchweserNotes - Book 1

87. (c) 69%.

Explanation

Given a set of prior probabilities for an event of interest, Bayes' formula is used to update the probability of the event, in this case that the company we have already selected will experience a decline in earnings next year. Bayes' formula says to divide the Probability of New Information given Event by the Unconditional Probability of New Information and multiply that result by the Prior Probability of the Event. In this case, P(company having a decline in earnings next year) = 0.20 is divided by 0.26 (which is the Unconditional Probability that a company having an earnings decline will have a negative ratio (90% have negative ratios of the 20% which have earnings declines) plus (10% have negative ratios of the 80% which do not have earnings declines) or ((0.90) x (0.20)) + ((0.10) x (0.80)) = 0.26.) This result is then multiplied by the Prior Probability of the ratio being negative, 0.90. The result is (0.20 / 0.26) x (0.90) = 0.69 or 69%.

(Study Session 1, Module 3.3, LOS 3.m)

Related Material

SchweserNotes - Book 1

88. (C) 1 to 1.

Explanation

Odds for an event equals the ratio of the probability of success to the probability of failure. If the probability of success is 50%, then there are equal probabilities of success and failure, and the odds for success are 1 to 1.

(Study Session 1, Module 3.1, LOS 3.c)

Related Material

SchweserNotes - Book 1

89. (C) 252.

Explanation

This is a labeling problem where there are only two labels: chosen and not chosen. Thus, the combination formula applies: 10! / (5! x 5!) = 3,628,800 / (120 x 120) = 252.

With a TI calculator: 10 [2nd][nCr] 5 = 252

(Study Session 1, Module 3.3, LOS 3.n)

Related Material

SchweserNotes - Book 1

90. (B) conditional expectation.

Explanation

This is a conditional expectation. The analyst indicates how an expected value will change given another event.

(Study Session 1, Module 3.2, LOS 3.i)

Related Material

SchweserNotes - Book 1

91. (A) 0.0069.

Explanation

For the four independent events defined here, the probability of the specified outcome is 0.5000 x 0.5000 x 0.1667 x 0.1667 = 0.0069.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

92. (B) 15.0%; 7.58%.

Explanation

Mean = (0.4)(1 0) + (0.4)(12.5) + (0.2)(30) = 15%

Var = $(0.4)(10 - 15)^2 + (0.4)(12.5 - 15)^2 + (0.2)(30 - 15)^2 = 57.5$

Standard deviation = $\sqrt{57.5} = 7.58$

(Study Session 1, Module 3.2, LOS 3.h)

Related Material

SchweserNotes - Book 1

93. (A) P(A and B) = 0.

Explanation

If the two evens are mutually exclusive, the probability of both occurring is zero.

(Study Session 1, Module 3.1, LOS 3.b)

Related Material

SchweserNotes - Book 1

94. (A) 120.00.

Explanation

The covariance is COV(XY) = (0.4 x ((20 - 26) x (0 - 30))) + ((0.6 x (30 - 26) x (50 - 30))) = 120.

(Study Session 1, Module 3.3, LOS 3.i)

Related Material

SchweserNotes - Book 1

95. (C) 0.38.

Explanation

The addition rule for probabilities is used to determine the probability of at least one event among two or more events occurring. The probability of each event is added and the joint probability (if the events are not mutually exclusive) is subtracted to arrive at the solution. P(smoker or allergies) = P(smoker) + P(allergies) - P(smoker and allergies) = (60/300) + (90/300) - (35/300) = 0.20 + 0.30 - 0.117 = 0.38.

Alternatively: 1 - Prob.(Neither) = 1 - (185/300) = 38.3%.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

96. (B) On a random draw, the probability of choosing a stock of a particular industry from the S&P 500.

Explanation

A priori probability is based on formal reasoning. It refers to a probability that can be calculated in advance based on the nature of the possible outcomes. An a priori probability does not require a history of past outcomes.

In this example, there are 500 stocks in the S&P 500 (finite outcome). Each has an equal chance of being selected. The a priori probability of selecting an airline stock would be the number of airline stocks in the index divided by 500.

The probability of the stock having a down day tomorrow based on prior patterns is an example of an empirical probability, which is a probability based on observed or historical data.

An analyst's estimate of the probability that the central bank will decrease interest rates is best characterized as a subjective probability. This is based on an individual's judgement or opinion as to the occurrence of an event.

(Study Session 1, Module 3.1, LOS 3.b)

Related Material

SchweserNotes - Book 1

97. (B) 0.75.

Explanationa

Using the information of the stock being good, the probability is updated to a conditional probability:

P(John | good) = P(good and John)   P(good).

P(good and John) = P(good | John)   P(John) = 0.5 × 0.6 = 0.3.

P(good and Andrerw) = 0.25 × 0.40 = 0.1.

P(good) = P(good and John) + P [good and Andrew) = 0.40.

P(John | good) = P(good and John) / P(good) = 0.3 / 0.4 = 0.75.

(Study Session 1, Module 3.3, LOS 3.m)

Related Material

SchweserNotes - Book 1

98. (A) 0.86.

Explanation

We calculate the probability that at least one of the bonds will be called using the addition rule for probabilities:

P(A or B) = P(A) + P(B) - P(A and B), where P(A and B) = P(A) x P(B)

P(A or B) = 0.80 + 0.30 - (0.8 x 0.3) = 0.86

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

99. (B) 64.2%.

Explanation

Using the addition rule, the probability of being accepted at Harvard or Yale is equal to: P(Harvard) + P(Yale) – P(Harvard and Yale) = 0.25 + 0.42 – 0.028 = 0.642 or 64.2%.

(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

100. (A) independent.

Explanation

If the outcome of one event does not influence the outcome of another, then the events are independent.

(Study Session 1, Module 3.2, LOS 3.f)

Related Material

SchweserNotes - Book 1

101. (B) 0.00174.

Explanation

Find the weighted average return for each stock.

Stock A: (0.10)(-5) + (0.30)(-2) + (0.50)(10) + (0.10)(0.31) = 7%.

Stock B: (0.10)(4) + (0.30)(8) + (0.50)(10) + (0.10)(0.12) = 9%.

Next, multiply the differences of the two stocks by each other, multiply by the probability of the event occurring, and sum. This is the covariance between the returns of the two stocks.

[(-0.05 – 0.07) × (0.04 – 0.09)] (0.1) + [(-0.02 – 0.07) × (0.08 – 0.09)](0.3) + [(0.10 – 0.07) × (0.10 – 0.09)](0.5) + [(0.31 – 0.07) x (0.12 – 0.09)](0.1) = 0.0006 + 0.00027 + 0.00015 + 0.00072 = 0.00174.

(Study Session 1, Module 3.3, LOS 3.l)

Related Material

SchweserNotes - Book 1

102. (A) 0.00332; 0.33360.

Explanation

For the four independent events where the probability is the same for each, the probability of all defaulting is $(0.24)^4$. The probability of all not defaulting is $(1 – 0.24)^4$.

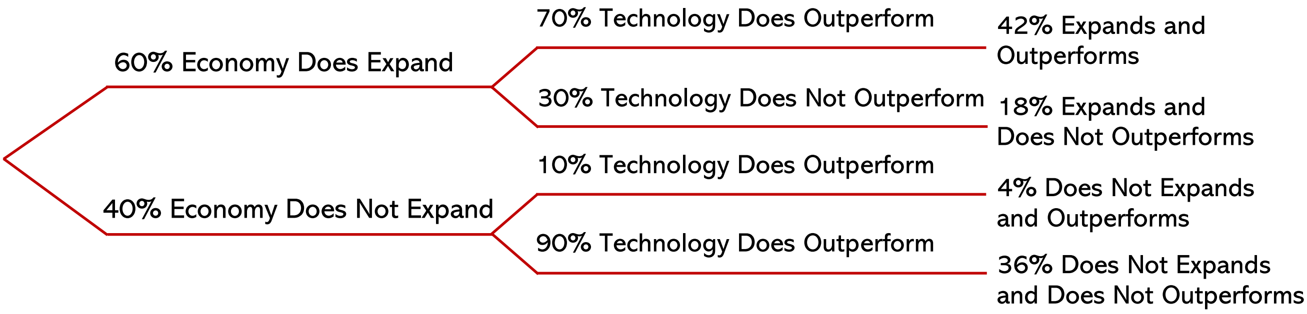
(Study Session 1, Module 3.1, LOS 3.e)

Related Material

SchweserNotes - Book 1

103. (C) 67%.

Explanation



Using the new information we can use Bayes' formula to update the probability.

P(economy does not expand | tech does not outperform) = P(economy does not expand and tech does not outperform) / P(tech does not outperform).

P(economy does not expand and tech does not outperform) = P(tech does not outperform economy does not expand) × P(economy does not expand) = 0.90 × 0.40 = 0.36.

P(economy does expand and tech does not outperform) = P(tech does not outperform economy does expand) × P(economy does expand) = 0.30 × 0.60 = 0.18.

P(economy does not expand) = 1.00 – P(economy does expand) = 1.00 – 0.60 = 0.40.

P(tech does not outperform | economy does not expand) = 1.00 – P(tech does outperform economy does not expand) = 1.00 - 0.1 0 = 0.90.

P(tech does not outperform) = P(tech does not outperform and economy does not expand) + P(tech does not outperform and economy does expand) = 0.36 + 0.1 8 = 0.54.

P(economy does not expand | tech does not outperform) = P(economy does not expand and tech does not outperform) / P(tech does not outperform) = 0.36 / 0.54 = 0.67.

(Study Session 1, Module 3.3, LOS 3.m)

Related Material

SchweserNotes - Book 1