Question #1 of 117

At a charity fundraiser there have been a total of 342 raffle tickets already sold. If a person then purchases two tickets rather than one, how much *more likely* are they to win?

A) 1.99.

B) 0.50.

C) 2.10.

Explanation

If you purchase one ticket, the probability of your ticket being drawn is 1/343 or 0.00292. If you purchase two tickets, your probability becomes 2/344 or 0.00581, so you are 0.00581 / 0.00292 = 1.99 times more likely to win.

(Study Session 2, Module 9.1, LOS 9.c)

Question #2 of 117

There is a 40% probability that the economy will be good next year and a 60% probability that it will be bad. If the economy is good, there is a 50 percent probability of a bull market, a 30% probability of a normal market, and a 20% probability of a bear market. If the economy is bad, there is a 20% probability of a bull market, a 30% probability of a normal market, and a 50% probability of a bear market. What is the probability of a bull market next year?

A) 50%.

B) 20%.

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): $(0.40 \times 0.50) + (0.60 \times 0.20) = 0.32$ or 32%.

(Study Session 2, Module 9.1, LOS 9.f)

Question #3 of 117

Given the following table about employees of a company based on whether they are smokers or nonsmokers and whether or not they suffer from any allergies, what is the probability of both suffering from allergies and not suffering from allergies?

	Suffer from Allergies	Don't Suffer from Allergies	Total
Smoker	35	25	60
Nonsmoker	55	185	240
Total	90	210	300

A) 0.00.

B) 1.00.

C) 0.50.

Explanation

These are mutually exclusive, so the joint probability is zero.

(Study Session 2, Module 9.1, LOS 9.f)

Question #4 of 117

Which of the following sets of numbers does NOT meet the requirements for a set of probabilities?

A) (0.10, 0.20, 0.30, 0.40).

B) (0.10, 0.20, 0.30, 0.40, 0.50).

C) (0.50, 0.50).

Explanation

A set of probabilities must sum to one.

(Study Session 2, Module 9.1, LOS 9.b)

Question #5 of 117

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

A) The probability of an event may be equal to zero or equal to one.

B) The sum of the probabilities of events equals one if the events are mutually exclusive and exhaustive.

C) 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 2, Module 9.1, LOS 9.b)

Question #6 of 117

The multiplication rule of probability is used to calculate the:

A) probability of at least one of two events.

B) joint probability of two events.

C) unconditional probability of an event, given conditional probabilities.

Explanation

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

(Study Session 2, Module 9.1, LOS 9.e)

Question #7 of 117

The following table summarizes the results of a poll taken of CEO's and analysts concerning the economic impact of a pending piece of legislation:

Group	Think it will have a positive impact	Think it will have a negative impact	Total
CEO's	40	30	70
Analysts	70	60	130
	110	90	200

What is the probability that a randomly selected individual from this group will be either an analyst or someone who thinks this legislation will have a positive impact on the economy?

A) 0.85.

B) 0.75.

C) 0.80.

Explanation

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

(Study Session 2, Module 9.1, LOS 9.f)

Question #8 of 117

Which of the following statements regarding various statistical measures is *least* accurate?

A) Variance equals the sum of the squared deviations from the mean times the probability that that each outcome will occur.

B) The correlation coefficient is calculated by dividing the covariance of two random variables by the product of their standard deviations.

C) The coefficient of variation is calculated by dividing the mean by the standard deviation.

Explanation

The coefficient of variation equals the standard deviation divided by the mean.

(Study Session 2, Module 9.2, LOS 9.k)

Question #9 of 117

The following table summarizes the availability of trucks with air bags and bucket seats at a dealership.

	Bucket Seats	No Bucket Seats	Total
Air Bags	75	50	125
No Air Bags	35	60	95
Total	110	110	220

What is the probability of randomly selecting a truck with air bags and bucket seats?

A) 0.28.

B) 0.16.

C) 0.34.

Explanation

75 ÷ 220 = 0.34.

(Study Session 2, Module 9.1, LOS 9.f)

Question #10 of 117

A parking lot has 100 red and blue cars in it.

- 40% of the cars are red.
- 70% of the red cars have radios.
- 80% of the blue cars have radios.

What is the probability that the car is red given that it has a radio?

A) 47%.

B) 28%.

C) 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) × (0.70)) + ((0.60) × (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) × (0.40) = 0.37 or 37%.

(Study Session 2, Module 9.3, LOS 9.n)

Question #11 of 117

Given the following probability distribution, find the covariance of the expected returns for stocks A and B.

Event	$P(R_i)$	R_A	R_B
Recession	0.10	-5%	4%
Below Average	0.30	-2%	8%
Normal	0.50	10%	10%
Boom	0.10	31%	12%

A) 0.00109.

B) 0.00174.

C) 0.00032.

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) × (0.12 – 0.09)](0.1) = 0.0006 + 0.00027 + 0.00015 + 0.00072 = 0.00174.

(Study Session 2, Module 9.2, LOS 9.k)

Question #12 of 117

The returns on assets C and D are strongly correlated with a correlation coefficient of 0.80. The variance of returns on C is 0.0009, and the variance of returns on D is 0.0036. What is the covariance of returns on C and D?

A) 0.00144.

B) 0.40110.

C) 0.03020.

Explanation

$r = \text{Cov}(C,D) / (\sigma_C \times \sigma_D)$

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

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

0.8(0.03)(0.06) = 0.00144

(Study Session 2, Module 9.2, LOS 9.k)

Question #13 of 117

Tully Advisers, Inc., has determined four possible economic scenarios and has projected the portfolio returns for two portfolios for their client under each scenario. Tully's economist has estimated the probability of each scenario as shown in the table below. Given this information, what is the expected return on portfolio A?

Scenario	Probability	Return on Portfolio A	Return on Portfolio B
A	15%	17%	19%
B	20%	14%	18%
C	25%	12%	10%
D	40%	8%	9%

A) 11.55%.

B) 10.75%.

C) 9.25%.

Explanation

The expected return is equal to the sum of the products of the probabilities of the scenarios and their respective returns: = (0.15)(0.17) + (0.20)(0.14) + (0.25)(0.12) + (0.40)(0.08) = 0.1155 or 11.55%.

(Study Session 2, Module 9.1, LOS 9.f)

Question #14 of 117

There is a 90% chance that the economy will be good next year and a 10% chance that it will be bad. If the economy is good, there is a 60% chance that XYZ Incorporated will have EPS of $4.00 and a 40% chance that their earnings will be $3.00. If the economy is bad, there is an 80% chance that XYZ Incorporated will have EPS of $2.00 and a 20% chance that their earnings will be $1.00. What is the firm's expected EPS?

A) $3.42.

B) $5.40.

C) $2.50.

Explanation

The expected EPS is calculated by multiplying the probability of the economic environment by the probability of the particular EPS and the EPS in each case. The expected EPS in all four outcomes are then summed to arrive at the expected EPS:

> (0.90 × 0.60 × $4.00) + (0.90 × 0.40 × $3.00) + (0.10 × 0.80 × $2.00) + (0.10 × 0.20 × $1.00) = $2.16 + $1.08 + $0.16 + $0.02 = $3.42.

(Study Session 2, Module 9.2, LOS 9.j)

Question #15 of 117

A company has two machines that produce widgets. An older machine produces 16% defective widgets, while the new machine produces only 8% defective widgets. In addition, the new machine employs a superior production process such that it produces three times as many widgets as the older machine does. Given that a widget was produced by the new machine, what is the probability it is NOT defective?

A) 0.92.

B) 0.76.

C) 0.06.

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 2, Module 9.1, LOS 9.c)

Question #16 of 117

Given Cov(X,Y) = 1,000,000. What does this indicate about the relationship between X and Y?

A) It is weak and positive.

B) It is strong and positive.

C) Only that it is positive.

Explanation

A positive covariance indicates a positive linear relationship but nothing else. The magnitude of the covariance by itself is not informative with respect to the strength of the relationship.

(Study Session 2, Module 9.2, LOS 9.k)

Question #17 of 117

Helen Pedersen has all her money invested in either of two mutual funds (A and B). She knows that there is a 40% probability that fund A will rise in price and a 60% chance that fund B will rise in price if fund A rises in price. What is the probability that both fund A and fund B will rise in price?

A) 0.24.

B) 0.40.

C) 1.00.

Explanation

$P(A) = 0.40$, $P(B|A) = 0.60$. Therefore, $P(AB) = P(A)P(B|A) = 0.40(0.60) = 0.24$.

(Study Session 2, Module 9.1, LOS 9.f)

Question #18 of 117

After repeated experiments, the average of the outcomes should converge to:

A) the variance.

B) the expected value.

C) one.

Explanation

This is the definition of the expected value. It is the long-run average of all outcomes.

(Study Session 2, Module 9.3, LOS 9.l)

Question #19 of 117

There is a 60% chance that the economy will be good next year and a 40% chance that it will be bad. If the economy is good, there is a 70% chance that XYZ Incorporated will have EPS of $5.00 and a 30% chance that their earnings will be $3.50. If the economy is bad, there is an 80% chance that XYZ Incorporated will have EPS of $1.50 and a 20% chance that their earnings will be $1.00. What is the firm's expected EPS?

A) $5.95.

B) $3.29.

C) $2.75.

Explanation

The expected EPS is calculated by multiplying the probability of the economic environment by the probability of the particular EPS and the EPS in each case. The expected EPS in all four outcomes are then summed to arrive at the expected EPS:

> (0.60 × 0.70 × $5.00) + (0.60 × 0.30 × $3.50) + (0.40 × 0.80 × $1.50) + (0.40 × 0.20 × $1.00) = $2.10 + $0.63 + $0.48 + $0.08 = $3.29.

(Study Session 2, Module 9.2, LOS 9.j)

Question #20 of 117

Firm A can fall short, meet, or exceed its earnings forecast. Each of these events is equally likely. Whether firm A increases its dividend will depend upon these outcomes. Respectively, the probabilities of a dividend increase conditional on the firm falling short, meeting or exceeding the forecast are 20%, 30%, and 50%. The unconditional probability of a dividend increase is:

A) 0.333.

B) 1.000.

C) 0.500.

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 2, Module 9.2, LOS 9.h)

Question #21 of 117

If two events are mutually exclusive, the probability that they both will occur at the same time is:

A) Cannot be determined from the information given.

B) 0.50.

C) 0.00.

Explanation

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

(Study Session 2, Module 9.1, LOS 9.a)

Question #22 of 117

An analyst expects that 20% of all publicly traded companies will experience a decline in earnings next year. The analyst has developed a ratio to help forecast this decline. If the company is headed for a decline, there is a 90% chance that this ratio will be negative. If the company is not headed for a decline, there is only a 10% chance that the ratio will be negative. The analyst randomly selects a company with a negative ratio. Based on Bayes' theorem, the updated probability that the company will experience a decline is:

A) 18%.

B) 69%.

C) 26%.

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) × (0.20)) + ((0.10) × (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) × (0.90) = 0.69 or 69%.

(Study Session 2, Module 9.3, LOS 9.n)

Question #23 of 117

Which probability rule determines the probability that two events will both occur?

A) The multiplication rule.

B) The total probability rule.

C) The addition 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 2, Module 9.1, LOS 9.e)

Question #24 of 117

The probabilities of earning a specified return from a portfolio are shown below:

Probability	Return
0.20	10%
0.20	20%
0.20	22%
0.20	15%
0.20	25%

What are the odds of earning at least 20%?

A) Three to two.

B) Three to five.

C) Two to three.

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 2, Module 9.1, LOS 9.c)

Question #25 of 117

The following table summarizes the availability of trucks with air bags and bucket seats at a dealership.

	Bucket Seats	No Bucket Seats	Total
Air Bags	75	50	125
No Air Bags	35	60	95
Total	110	110	220

What is the probability of selecting a truck at random that has either air bags or bucket seats?

A) 34%.

B) 107%.

C) 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 2, Module 9.1, LOS 9.f)

Question #26 of 117

A firm holds two $50 million bonds with call dates this week.

- The probability that Bond A will be called is 0.80.
- The probability that Bond B will be called is 0.30.

The probability that at least one of the bonds will be called is *closest to*:

A) 0.86.

B) 0.50.

C) 0.24.

Explanation

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

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B), \text{ where } P(A \text{ and } B) = P(A) \times P(B)$$

$$P(A \text{ or } B) = 0.80 + 0.30 - (0.8 \times 0.3) = 0.86$$

(Study Session 2, Module 9.1, LOS 9.f)

Question #27 of 117

There is a 40% probability that the economy will be good next year and a 60% probability that it will be bad. If the economy is good, there is a 50 percent probability of a bull market, a 30% probability of a normal market, and a 20% probability of a bear market. If the economy is bad, there is a 20% probability of a bull market, a 30% probability of a normal market, and a 50% probability of a bear market. What is the joint probability of a good economy and a bull market?

A) 20%.

B) 12%.

C) 50%.

Explanation

Joint probability is the probability that both events, in this case the economy being good *and* the occurrence of a bull market, happen at the same time. Joint probability is computed by multiplying the individual event probabilities together: 0.40 × 0.50 = 0.20 or 20%.

(Study Session 2, Module 9.1, LOS 9.f)

Question #28 of 117

An investor is considering purchasing ACQ. There is a 30% probability that ACQ will be acquired in the next two months. If ACQ is acquired, there is a 40% probability of earning a 30% return on the investment and a 60% probability of earning 25%. If ACQ is not acquired, the expected return is 12%. What is the expected return on this investment?

A) 16.5%.

B) 18.3%.

C) 12.3%.

Explanation

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

(Study Session 2, Module 9.2, LOS 9.h)

Question #29 of 117

A bond portfolio consists of four BB-rated bonds. Each has a probability of default of 24% and these probabilities are independent. What are the probabilities of all the bonds defaulting and the probability of all the bonds not defaulting, respectively?

A) 0.00332; 0.33360.

B) 0.04000; 0.96000.

C) 0.96000; 0.04000.

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 2, Module 9.1, LOS 9.f)

Question #30 of 117

If two fair coins are flipped and two fair six-sided dice are rolled, all at the same time, what is the probability of ending up with two heads (on the coins) and two sixes (on the dice)?

A) 0.4167.

B) 0.0069.

C) 0.8333.

Explanation

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

(Study Session 2, Module 9.1, LOS 9.f)

Question #31 of 117

The probability of each of three independent events is shown in the table below. What is the probability of A and C occurring, but not B?

Event	Probability of Occurrence
A	25%
B	15%
C	42%

A) 3.8%.

B) 8.9%.

C) 10.5%.

Explanation

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

(Study Session 2, Module 9.1, LOS 9.f)

Question #32 of 117

Tully Advisers, Inc., has determined four possible economic scenarios and has projected the portfolio returns for two portfolios for their client under each scenario. Tully's economist has estimated the probability of each scenario, as shown in the table below. Given this information, what is the standard deviation of returns on portfolio A?

Scenario	Probability	Return on Portfolio A	Return on Portfolio B
A	15%	18%	19%
B	20%	17%	18%
C	25%	11%	10%
D	40%	7%	9%

A) 4.53%.

B) 1.140%.

C) 5.992%.

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 2, Module 9.3, LOS 9.l)

Question #33 of 117

Compute the standard deviation of a two-stock portfolio if stock A (40% weight) has a variance of 0.0015, stock B (60% weight) has a variance of 0.0021, and the correlation coefficient for the two stocks is –0.35?

A) 2.64%.

B) 0.07%.

C) 1.39%.

Explanation

The standard deviation of the portfolio is found by:

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

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

$= 0.0264$, or 2.64%.

(Study Session 2, Module 9.3, LOS 9.l)

Question #34 of 117

Bonds rated B have a 25% chance of default in five years. Bonds rated CCC have a 40% chance of default in five years. A portfolio consists of 30% B and 70% CCC-rated bonds. If a randomly selected bond defaults in a five-year period, what is the probability that it was a B-rated bond?

A) 0.211.

B) 0.250.

C) 0.625.

Explanation

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

P(default and B) = P(default | B) × P(B) = 0.250 × 0.300 = 0.075

P(default and CCC) = P(default | CCC) × P(CCC) = 0.400 × 0.700 = 0.280

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

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

(Study Session 2, Module 9.3, LOS 9.n)

Question #35 of 117

Given P(X = 2, Y = 10) = 0.3, P(X = 6, Y = 2.5) = 0.4, and P(X = 10, Y = 0) = 0.3, then COV(XY) is:

A) 24.0.

B) -12.0.

C) 6.0.

Explanation

The expected values are: E(X) = (0.3 × 2) + (0.4 × 6) + (0.3 × 10) = 6 and E(Y) = (0.3 × 10.0) + (0.4 × 2.5) + (0.3 × 0.0) = 4. The covariance is COV(XY) = ((0.3 × ((2 – 6) × (10 – 4))) + ((0.4 × ((6 – 6) × (2.5 – 4))) + (0.3 × ((10 – 6) × (0 – 4))) = –12.

(Study Session 2, Module 9.3, LOS 9.m)

Question #36 of 117

A very large company has equal amounts of male and female employees. If a random sample of four employees is selected, what is the probability that all four employees selected are female?

A) 0.0256

B) 0.1600

C) 0.0625.

Explanation

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

(Study Session 2, Module 9.1, LOS 9.f)

Question #37 of 117

Use the following probability distribution to calculate the standard deviation for the portfolio.

State of the Economy	Probability	Return on Portfolio
Boom	0.30	15%
Bust	0.70	3%

A) 6.0%.

B) 5.5%.

C) 6.5%.

Explanation

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

(Study Session 2, Module 9.3, LOS 9.l)

Question #38 of 117

Which of the following statements about counting methods is *least* accurate?

A) 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.

B) The labeling formula determines the number of different ways to assign a given number of different labels to a set of objects.

C) The multiplication rule of counting is used to determine the number of different ways to choose one object from each of two or more groups.

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 2, Module 9.3, LOS 9.o)

Question #39 of 117

There is a 30% probability of rain this afternoon. There is a 10% probability of having an umbrella if it rains. What is the chance of it raining and having an umbrella?

A) 33%.

B) 3%.

C) 40%.

Explanation

P(A) = 0.30. P(B | A) = 0.10. P(AB) = (0.30)(0.10) = 0.03 or 3%.

(Study Session 2, Module 9.1, LOS 9.f)

Question #40 of 117

Personal Advisers, Inc., has determined four possible economic scenarios and has projected the portfolio returns for two portfolios for their client under each scenario. Personal's economist has estimated the probability of each scenario as shown in the table below. Given this information, what is the covariance of the returns on Portfolio A and Portfolio B?

Scenario	Probability	Return on Portfolio A	Return on Portfolio B
A	15%	18%	19%
B	20%	17%	18%
C	25%	11%	10%
D	40%	7%	9%

A) 0.001898.

B) 0.002019.

C) 0.890223.

Explanation

S	P (S)	Return on Portfolio A	R_A – $E(R_A)$	Return on Portfolio B	R_B – $E(R_B)$	$[R_A - E(R_A)] \times [R_B - E(R_B)] \times P(S)$
A	15%	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 2, Module 9.2, LOS 9.k)

Question #41 of 117

In any given year, the chance of a good year is 40%, an average year is 35%, and the chance of a bad year is 25%. What is the probability of having two good years in a row?

A) 16.00%.

B) 8.75%.

C) 10.00%.

Explanation

The joint probability of independent events is obtained by multiplying the probabilities of the individual events together: (0.40) × (0.40) = 0.16 or 16%.

(Study Session 2, Module 9.1, LOS 9.a)

Question #42 of 117

The covariance:

A) must be positive.

B) can be positive or negative.

C) must be between -1 and +1.

Explanation

Cov(a,b) = $\sigma_a\sigma_b\rho_{a,b}$. Since $\rho_{a,b}$ can be positive or negative, Cov(a,b) can be positive or negative.

(Study Session 2, Module 9.2, LOS 9.k)

Question #43 of 117

The probability of a new office building being built in town is 64%. The probability of a new office building that includes a coffee shop being built in town is 58%. If a new office building is built in town, the probability that it includes a coffee shop is *closest* to:

A) 58%.

B) 91%.

C) 37%.

Explanation

P(A|B) = P(AB) / P(B). The probability of a new coffee shop given a new office building is 58% / 64% = 90.63%.

(Study Session 2, Module 9.1, LOS 9.f)

Question #44 of 117

Jessica Fassler, options trader, recently wrote two put options on two different underlying stocks (AlphaDog Software and OmegaWolf Publishing), both with a strike price of $11.50. The probabilities that the prices of AlphaDog and OmegaWolf stock will decline below the strike price are 65% and 47%, respectively, and these probabilities are independent. The probability that at least one of the put options will fall below the strike price is approximately:

A) 0.81.

B) 0.31.

C) 1.00.

Explanation

We calculate the probability that at least one of the options will fall below the strike price using the addition rule for probabilities (A represents AlphaDog, O represents OmegaWolf):

$$P(A \text{ or } O) = P(A) + P(O) - P(A \text{ and } O), \text{ where } P(A \text{ and } O) = P(A) \times P(O)$$

$$P(A \text{ or } O) = 0.65 + 0.47 - (0.65 \times 0.47) = \text{approximately } 0.81$$

(Study Session 2, Module 9.1, LOS 9.f)

Question #45 of 117

A firm wants to select a team of five from a group of ten employees. How many ways can the firm compose the team of five?

A) 120.

B) 25.

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! × 5!) = 3,628,800 / (120 × 120) = 252.

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

(Study Session 2, Module 9.3, LOS 9.o)

Question #46 of 117

Given P(X = 20, Y = 0) = 0.4, and P(X = 30, Y = 50) = 0.6, then COV(XY) is:

A) 25.00.

B) 125.00.

C) 120.00.

Explanation

The expected values are: E(X) = (0.4 × 20) + (0.6 × 30) = 26, and E(Y) = (0.4 × 0) + (0.6 × 50) = 30.

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

(Study Session 2, Module 9.3, LOS 9.m)

Question #47 of 117

There is an 80% chance that the economy will be good next year and a 20% chance that it will be bad. If the economy is good, there is a 60% chance that XYZ Incorporated will have EPS of $3.00 and a 40% chance that their earnings will be $2.50. If the economy is bad, there is a 70% chance that XYZ Incorporated will have EPS of $1.50 and a 30% chance that their earnings will be $1.00. What is the firm's expected EPS?

A) $4.16.

B) $2.00.

C) $2.51.

Explanation

The expected EPS is calculated by multiplying the probability of the economic environment by the probability of the particular EPS and the EPS in each case. The expected EPS in all four outcomes are then summed to arrive at the expected EPS:

> (0.80 × 0.60 × $3.00) + (0.80 × 0.40 × $2.50) + (0.20 × 0.70 × $1.50) + (0.20 × 0.30 × $1.00) = $1.44 + $0.80 + $0.21 + $0.06 = $2.51.

(Study Session 2, Module 9.2, LOS 9.j)

Question #48 of 117

The following table summarizes the results of a poll taken of CEO's and analysts concerning the economic impact of a pending piece of legislation:

Group	Think it will have a positive impact	Think it will have a negative impact	Total
CEO's	40	30	70
Analysts	70	60	130
	110	90	200

What is the probability that a randomly selected individual from this group will be an analyst that thinks that the legislation will have a positive impact on the economy?

A) 0.30.

B) 0.35.

C) 0.45.

Explanation

70 analysts / 200 individuals = 0.35.

(Study Session 2, Module 9.1, LOS 9.f)

Question #49 of 117

If the odds against an event occurring are twelve to one, what is the probability that it will occur?

A) 0.0769.

B) 0.9231.

C) 0.0833.

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 2, Module 9.1, LOS 9.c)

Question #50 of 117

Which of the following statements is *least* accurate regarding covariance?

A) Covariance can only apply to two variables at a time.

B) Covariance can exceed one.

C) The covariance of a variable with itself is one.

Explanation

The covariance of a variable with itself is its variance. Both remaining statements are true. Covariance represents the linear relationship between two variables and is not limited in value (i.e., it can range from negative infinity to positive infinity).

(Study Session 2, Module 9.2, LOS 9.k)

Question #51 of 117

A very large company has twice as many male employees relative to female employees. If a random sample of four employees is selected, what is the probability that all four employees selected are female?

A) 0.3333.

B) 0.0625.

C) 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 4 "successes" = $(0.333)^4$ = 0.0123.

(Study Session 2, Module 9.1, LOS 9.f)

Question #52 of 117

If the outcome of event A is not affected by event B, then events A and B are said to be:

A) conditionally dependent.

B) mutually exclusive.

C) statistically independent.

Explanation

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

(Study Session 2, Module 9.2, LOS 9.g)

Question #53 of 117

A two-sided but very thick coin is expected to land on its edge twice out of every 100 flips. And the probability of face up (heads) and the probability of face down (tails) are equal. When the coin is flipped, the prize is $1 for heads, $2 for tails, and $50 when the coin lands on its edge. What is the expected value of the prize on a single coin toss?

A) $1.50.

B) $2.47.

C) $17.67.

Explanation

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 × \$50) + (0.49 × \$1) + (0.49 × \$2) = \$2.47.

(Study Session 2, Module 9.3, LOS 9.l)

Question #54 of 117

For a stock, which of the following is *least likely* a random variable? Its:

A) most recent closing price. ✗

B) stock symbol. ✓

C) current ratio. ✗

Explanation

A random variable must be a number. Sometimes there is an obvious method for assigning a number, such as when the random variable is a number itself, like a P/E ratio. A stock symbol of a randomly selected stock could have a number assigned to it like the number of letters in the symbol. The symbol itself cannot be a random variable.

(Study Session 2, Module 9.1, LOS 9.a)

Question #55 of 117

An unconditional probability is *most accurately* described as the probability of an event independent of:

A) the outcomes of other events. ✓

B) an observer's subjective judgment. ✗

C) its own past outcomes. ✗

Explanation

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

(Study Session 2, Module 9.1, LOS 9.d)

Question #56 of 117

Given the following table about employees of a company based on whether they are smokers or nonsmokers and whether or not they suffer from any allergies, what is the probability of suffering from allergies or being a smoker?

	Suffer from Allergies	Don't Suffer from Allergies	Total
Smoker	35	25	60
Nonsmoker	55	185	240
Total	90	210	300

A) 0.38. ✓

B) 0.12.

C) 0.88.

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 2, Module 9.1, LOS 9.f)

Question #57 of 117

If the probability of an event is 0.10, what are the odds for the event occurring?

A) One to ten.

B) Nine to one.

C) 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 2, Module 9.1, LOS 9.c)

Question #58 of 117

What is the standard deviation of a portfolio if you invest 30% in stock one (standard deviation of 4.6%) and 70% in stock two (standard deviation of 7.8%) if the correlation coefficient for the two stocks is 0.45?

A) 6.83%.

B) 0.38%.

C) 6.20%.

Explanation

The standard deviation of the portfolio is found by:

$[W_1^2\ \sigma_1^2 + W_2^2\ \sigma_2^2 + 2W_1W_2\sigma_1\sigma_2 r_{1,2}]^{0.5}$, 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 2, Module 9.3, LOS 9.l)

Question #59 of 117

Which of the following is an *a priori* probability?

A) The probability the Fed will lower interest rates prior to the end of the year.

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

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

Explanation

A *priori* probability is based on formal reasoning and inspection. Given the number of stocks in the airline industry in the S&P500 for example, the *a priori* probability of selecting an airline stock would be that number divided by 500.

(Study Session 2, Module 9.1, LOS 9.b)

Question #60 of 117

The joint probability function for returns on an equity index (RI) and returns on a stock (RS)is given in the following table:

	Returns on Index (R_I)		
Return on stock (R_S)	**$R_I = 0.16$**	**$R_I = 0.02$**	**$R_I = -0.10$**
$R_S = 0.24$	0.25	0.00	0.00
$R_S = 0.03$	0.00	0.45	0.00
$R_S = -0.15$	0.00	0.00	0.30

Covariance between stock returns and index returns is *closest* to:

A) 0.029.

B) 0.014.

C) 0.019.

Explanation

$$E(I) = (0.25 \times 0.16) + (0.45 \times 0.02) + (0.30 \times -0.10) = 0.0190.$$

$$E(S) = (0.25 \times 0.24) + (0.45 \times 0.03) + (0.30 \times -0.15) = 0.0285.$$

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

(Study Session 2, Module 9.3, LOS 9.m)

Question #61 of 117

If event A and event B cannot occur simultaneously, then events A and B are said to be:

A) statistically independent.

B) collectively exhaustive.

C) mutually exclusive.

Explanation

If two events cannot occur together, the events are mutually exclusive. A good example is a coin flip: heads AND tails cannot occur on the same flip.

(Study Session 2, Module 9.1, LOS 9.a)

Question #62 of 117

In a given portfolio, half of the stocks have a beta greater than one. Of those with a beta greater than one, a third are in a computer-related business. What is the probability of a randomly drawn stock from the portfolio having both a beta greater than one and being in a computer-related business?

A) 0.167. ✓

B) 0.333. ✗

C) 0.667. ✗

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) × (0.333) = 0.167.

(Study Session 2, Module 9.1, LOS 9.f)

Question #63 of 117

Data shows that 75 out of 100 tourists who visit New York City visit the Empire State Building. It rains or snows in New York City one day in five. What is the joint probability that a randomly choosen tourist visits the Empire State Building on a day when it neither rains nor snows?

A) 95%. ✗

B) 15%. ✗

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) × (0.80) = 0.60 or 60%.

(Study Session 2, Module 9.1, LOS 9.f)

Question #64 of 117

The "likelihood" of an event occurring is defined as:

A) a unconditional probability. ✗

B) a joint probability. ✗

C) a conditional probability. ✓

Explanation

"Likelihood" is defined in the Level I curriculum as a conditional probability, the probability of an observation, given a particular set of conditions (although, in general, it is often used as a synonym for probability). An unconditional probability refers to the probability of an event occurring regardless of past of future events. A joint probability is the probability that two events will both occur.

(Study Session 2, Module 9.1, LOS 9.d)

Question #65 of 117

Tina O'Fahey, CFA, believes a stock's price in the next quarter depends on two factors: the direction of the overall market and whether the company's next earnings report is good or poor. The possible outcomes and some probabilities are illustrated in the tree diagram shown below:

Based on this tree diagram, the expected value of the stock if the market decreases is *closest* to:

A) $62.50.

B) $26.00.

C) $57.00.

Explanation

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

(Study Session 2, Module 9.2, LOS 9.j)

Question #66 of 117

An analyst has a list of 20 bonds of which 14 are callable, and five have warrants attached to them. Two of the callable bonds have warrants attached to them. If a single bond is chosen at random, what is the probability of choosing a callable bond or a bond with a warrant?

A) 0.70.

B) 0.85.

C) 0.55.

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 2, Module 9.1, LOS 9.f)

Question #67 of 117

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

A) An event is a set of one or more possible values of a random variable.

B) A conditional probability is the probability that two or more events will happen concurrently.

C) An outcome is the calculated probability of an event.

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 2, Module 9.1, LOS 9.a)

Question #68 of 117

Assume two stocks are perfectly negatively correlated. Stock A has a standard deviation of 10.2% and stock B has a standard deviation of 13.9%. What is the standard deviation of the portfolio if 75% is invested in A and 25% in B?

A) 0.00%.

B) 0.17%.

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 2, Module 9.3, LOS 9.l)

Question #69 of 117

The following table shows the individual weightings and expected returns for the three stocks in an investor's portfolio:

Stock	Weight	$E(R_X)$
V	0.40	12%
M	0.35	8%
S	0.25	5%

What is the expected return of this portfolio?

A) 8.33%.

B) 8.85%.

C) 9.05%.

Explanation

To solve this problem, we need to use the formula for the expected return of a portfolio: $E(R_P) = w_1E(R_1) + w_2E(R_2) + ... + w_nE(R_n)$

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%.

(Study Session 2, Module 9.3, LOS 9.l)

Question #70 of 117

Use the following data to calculate the standard deviation of the return:

- 50% chance of a 12% return
- 30% chance of a 10% return
- 20% chance of a 15% return

A) 2.5%.

B) 1.7%.

C) 3.0%.

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: $(0.5) \times (0.12 - 0.12)^2 + (0.3) \times (0.1 - 0.12)^2 + (0.2) \times (0.15 - 0.12)^2 = 0.0003$. The standard deviation is the square root of 0.0003 = 0.017 or 1.7%.

(Study Session 2, Module 9.3, LOS 9.l)

Question #71 of 117

Each lottery ticket discloses the odds of winning. These odds are based on:

A) a priori probability.

B) the best estimate of the Department of Gaming.

C) past lottery history.

Explanation

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

(Study Session 2, Module 9.1, LOS 9.b)

Question #72 of 117

Which of the following is an empirical probability?

A) The probability the Fed will lower interest rates prior to the end of the year.

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

C) On a random draw, the probability of choosing a stock of a particular industry from the S&P 500 based on the number of firms.

Explanation

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

(Study Session 2, Module 9.1, LOS 9.b)

Question #73 of 117

Which of the following is a joint probability? The probability that a:

A) stock pays a dividend and splits next year.

B) company merges with another firm next year.

C) stock increases in value after an increase in interest rates has occurred.

Explanation

A joint probability applies to two events that both must occur.

(Study Session 2, Module 9.1, LOS 9.f)

Question #74 of 117

A parking lot has 100 red and blue cars in it.

- 40% of the cars are red.
- 70% of the red cars have radios.
- 80% of the blue cars have radios.

What is the probability of selecting a car at random and having it be red and have a radio?

A) 25%.

B) 28%.

C) 48%.

Explanation

Joint probability is the probability that both events, in this case a car being red *and* having a radio, happen at the same time. Joint probability is computed by multiplying the individual event probabilities together: P(red and radio) = (P(red)) × (P(radio)) = (0.4) × (0.7) = 0.28 or 28%.

	Radio	**No Radio**	
Red	28	12	40
Blue	48	12	60
	76	24	100

(Study Session 2, Module 9.1, LOS 9.f)

Question #75 of 117

The events Y and Z are mutually exclusive and exhaustive: P(Y) = 0.4 and P(Z) = 0.6. If the probability of X given Y is 0.9, and the probability of X given Z is 0.1, what is the unconditional probability of X?

A) 0.42.

B) 0.33.

C) 0.40.

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 | Y) × P(Y) + P(X | Z) × P(Z) = 0.4 × 0.9 + 0.6 × 0.1 = 0.42.

(Study Session 2, Module 9.2, LOS 9.h)

Question #76 of 117

The correlation coefficient for a series of returns on two investments is equal to 0.80. Their covariance of returns is 0.06974. Which of the following are possible variances for the returns on the two investments?

A) 0.04 and 0.19.

B) 0.02 and 0.44.

C) 0.08 and 0.37.

Explanation

The correlation coefficient is: 0.06974 / [(Std Dev A)(Std Dev B)] = 0.8. (Std Dev A)(Std Dev B) = 0.08718. Since the standard deviation is equal to the square root of the variance, each pair of variances can be converted to standard deviations and multiplied to see if they equal 0.08718. √0.04 = 0.20 and √0.19 = 0.43589. The product of these equals 0.08718.

(Study Session 2, Module 9.2, LOS 9.k)

Question #77 of 117

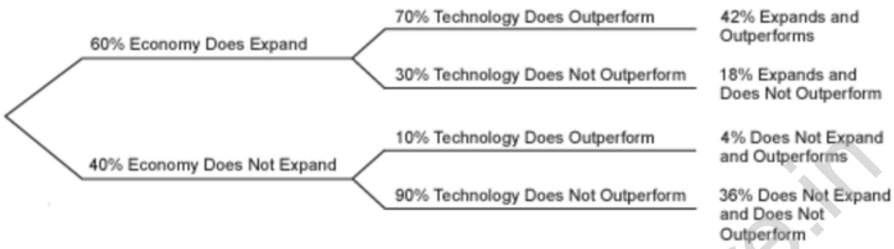
An economist estimates a 60% probability that the economy will expand next year. The technology sector has a 70% probability of outperforming the market if the economy expands and a 10% probability of outperforming the market if the economy does not expand. Given the new information that the technology sector will not outperform the market, the probability that the economy will not expand is *closest* to:

A) 54%.

B) 67%.

C) 33%.

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 – 0.10 = 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 + 0.18 = 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 2, Module 9.3, LOS 9.n)

Question #78 of 117

Given the following table about employees of a company based on whether they are smokers or nonsmokers and whether or not they suffer from any allergies, what is the probability of being either a nonsmoker or not suffering from allergies?

	Suffer from Allergies	Don't Suffer from Allergies	Total
Smoker	35	25	60
Nonsmoker	55	185	240
Total	90	210	300

A) 0.88.

B) 0.50.

C) 0.38.

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 2, Module 9.1, LOS 9.f)

Question #79 of 117

If the probability of both a new Wal-Mart and a new Wendy's being built next month is 68% and the probability of a new Wal-Mart being built is 85%, what is the probability of a new Wendy's being built if a new Wal-Mart is built?

A) 0.60.

B) 0.70.

C) 0.80.

Explanation

P(AB) = P(A|B) × P(B)

0.68 / 0.85 = 0.80

(Study Session 2, Module 9.1, LOS 9.f)

Question #80 of 117

An empirical probability is one that is:

A) determined by mathematical principles.

B) supported by formal reasoning.

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 2, Module 9.1, LOS 9.b)

Question #81 of 117

A company says that whether it increases its dividends depends on whether its earnings increase. From this we know:

A) P(both dividend increase and earnings increase) = P(dividend increase).

B) P(dividend increase | earnings increase) is not equal to P(earnings increase).

C) P(earnings increase | dividend increase) is not equal to P(earnings increase).

Explanation

If two events A and B are dependent, then the conditional probabilities of P(A | B) and P(B | A) will not equal their respective unconditional probabilities (of P(A) and P(B), respectively). Both remaining choices may or may not occur, e.g., P(A | B) = P(B) is possible but not necessary.

(Study Session 2, Module 9.2, LOS 9.g)

Question #82 of 117

Thomas Baynes has applied to both Harvard and Yale. Baynes has determined that the probability of getting into Harvard is 25% and the probability of getting into Yale (his father's alma mater) is 42%. Baynes has also determined that the probability of being accepted at both schools is 2.8%. What is the probability of Baynes being accepted at either Harvard or Yale?

A) 64.2%.

B) 7.7%.

C) 10.5%.

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 2, Module 9.1, LOS 9.f)

Question #83 of 117

John purchased 60% of the stocks in a portfolio, while Andrew purchased the other 40%. Half of John's stock-picks are considered good, while a fourth of Andrew's are considered to be good. If a randomly chosen stock is a good one, what is the probability John selected it?

A) 0.75.

B) 0.40.

C) 0.30.

Explanation

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 Andrew*) = 0.25 × 0.40 = 0.10.

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 2, Module 9.3, LOS 9.n)

Question #84 of 117

If the probability of an event is 0.20, what are the odds against the event occurring?

A) One to four.

B) Four to one.

C) Five 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 2, Module 9.1, LOS 9.c)

Question #85 of 117

Let A and B be two mutually exclusive events with P(A) = 0.40 and P(B) = 0.20. Therefore:

A) P(A and B) = 0.

B) P(B|A) = 0.20.

C) P(A and B) = 0.08.

Explanation

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

(Study Session 2, Module 9.1, LOS 9.d)

Question #86 of 117

If two events are independent, the probability that they both will occur is:

A) 0.00.

B) 0.50.

C) Cannot be determined from the information given.

Explanation

If two events are independent, their probability of their joint occurrence is computed as follows: P(A∩B) = P(A) × P(B). Since we are not given any information on the respective probabilities of A or B, there is not enough information.

(Study Session 2, Module 9.1, LOS 9.f)

Question #87 of 117

A portfolio manager wants to eliminate four stocks from a portfolio that consists of six stocks. How many ways can the four stocks be sold when the order of the sales is important?

A) 180.

B) 360.

C) 24.

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 2, Module 9.3, LOS 9.o)

Question #88 of 117

If X and Y are independent events, which of the following is *most* accurate?

A) P(X or Y) = P(X) + P(Y).

B) P(X or Y) = (P(X)) × (P(Y)).

C) P(X | 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|Y) = P(X).

(Study Session 2, Module 9.2, LOS 9.g)

Question #89 of 117

Avery Scott, financial planner, recently obtained his CFA Charter and is considering multiple job offers. Scott devised the following four criteria to help him decide which offers to pursue most aggressively.

Criterion	% Expected to Meet the Criteria
1. Within 75 miles of San Francisco	0.85
2. Employee size less than 50	0.50
3. Compensation package exceeding $100,000	0.30
4. Three weeks of vacation	0.15

If Scott has 20 job offers and the probabilities of meeting each criterion are independent, how many are expected to meet all of his criteria? (Round to nearest whole number).

A) 3.

B) 1.

C) 0.

Explanation

We will use the multiplication rule to calculate this probability.

$P(1, 2, 3, 4) = P(1) \times P(2) \times P(3) \times P(4)$

$= 0.85 \times 0.50 \times 0.30 \times 0.15 = 0.019125$

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

(Study Session 2, Module 9.1, LOS 9.f)

Question #90 of 117

Given the following probability distribution, find the standard deviation of expected returns.

Event	$P(R_A)$	R_A
Recession	0.10	-5%
Below Average	0.30	-2%
Normal	0.50	10%
Boom	0.10	31%

A) 12.45%.

B) 7.00%.

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 2, Module 9.3, LOS 9.l)

Question #91 of 117

With respect to the units each is measured in, which of the following is the *most easily* directly applicable measure of dispersion? The:

A) variance.

B) standard deviation.

C) covariance.

Explanation

The standard deviation is in the units of the random variable itself and not squared units like the variance. The covariance would be measured in the product of two units of measure.

(Study Session 2, Module 9.2, LOS 9.k)

Question #92 of 117

For a given corporation, which of the following is an example of a conditional probability? The probability the corporation's:

A) dividend increases given its earnings increase.

B) inventory improves.

C) earnings increase and dividend increases.

Explanation

A conditional probability involves two events. One of the events is a given, and the probability of the other event depends upon that given.

(Study Session 2, Module 9.1, LOS 9.d)

Question #93 of 117

There is a 30% chance that the economy will be good and a 70% chance that it will be bad. If the economy is good, your returns will be 20% and if the economy is bad, your returns will be 10%. What is your expected return?

A) 13%.

B) 15%.

C) 17%.

Explanation

Expected value is the probability weighted average of the possible outcomes of the random variable. The expected return is: ((0.3) × (0.2)) + ((0.7) × (0.1)) = (0.06) + (0.07) = 0.13.

(Study Session 2, Module 9.3, LOS 9.l)

Question #94 of 117

The unconditional probability of an event, given conditional probabilities, is determined by using the:

A) total probability rule.

B) addition rule of probability.

C) multiplication rule of probability.

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:

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

(Study Session 2, Module 9.1, LOS 9.e)

Question #95 of 117

The covariance of returns on two investments over a 10-year period is 0.009. If the variance of returns for investment A is 0.020 and the variance of returns for investment B is 0.033, what is the correlation coefficient for the returns?

A) 0.350.

B) 0.687.

C) 0.444.

Explanation

The correlation coefficient is: Cov(A,B) / [(Std Dev A)(Std Dev B)] = 0.009 / [(√0.02)(√0.033)] = 0.350.

(Study Session 2, Module 9.2, LOS 9.k)

Question #96 of 117

Given P(X = 2) = 0.3, P(X = 3) = 0.4, P(X = 4) = 0.3. What is the variance of X?

A) 3.0.

B) 0.6.

C) 0.3.

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 × 2 + 0.4 × 3 + 0.3 × 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 2, Module 9.3, LOS 9.l)

Question #97 of 117

For assets A and B we know the following: $E(R_A) = 0.10$, $E(R_B) = 0.20$, $Var(R_A) = 0.25$, $Var(R_B) = 0.36$ and the correlation of the returns is 0.6. What is the expected return of a portfolio that is equally invested in the two assets?

A) 0.2275.

B) 0.3050.

C) 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: $((w_1) \times (E(R_1)) + ((w_2) \times (E(R_2)) = (0.5 \times 0.1) + (0.5 \times 0.2) = 0.15$.

(Study Session 2, Module 9.3, LOS 9.l)

Question #98 of 117

Tully Advisers, Inc., has determined four possible economic scenarios and has projected the portfolio returns for two portfolios for their client under each scenario. Tully's economist has estimated the probability of each scenario, as shown in the table below. Given this information, what is the standard deviation of expected returns on Portfolio B?

Scenario	Probability	Return on Portfolio A	Return on Portfolio B
A	15%	18%	19%
B	20%	17%	18%
C	25%	11%	10%
D	40%	7%	9%

A) 4.34%.

B) 9.51%.

C) 12.55%.

Explanation

Scenario	Probability	Return on Portfolio B	$P \times [R_B - E(R_B)]^2$
A	15%	19%	0.000624
B	20%	18%	0.000594
C	25%	10%	0.000163
D	40%	9%	0.000504
		$E(R_B) = 12.55\%$	$\sigma^2 = 0.001885$
			$\sigma = 0.0434166$

(Study Session 2, Module 9.3, LOS 9.l)

Question #99 of 117

Last year, the average salary increase for poultry research assistants was 2.5%. Of the 10,000 poultry research assistants, 2,000 received raises in excess of this amount. The odds that a randomly selected poultry research assistant received a salary increase in excess of 2.5% are:

A) 20%.

B) 1 to 5.

C) 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 2, Module 9.1, LOS 9.c)

Question #100 of 117

There is a 40% chance that an investment will earn 10%, a 40% chance that the investment will earn 12.5%, and a 20% chance that the investment will earn 30%. What is the mean expected return and the standard deviation of expected returns, respectively?

A) 15.0%; 5.75%.

B) 15.0%; 7.58%.

C) 17.5%; 5.75%.

Explanation

Mean = (0.4)(10) + (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 = √57.5 = 7.58

(Study Session 2, Module 8.2, LOS 8.g)

Question #101 of 117

Use the following probability distribution to calculate the expected return for the portfolio.

State of the Economy	Probability	Return on Portfolio
Boom	0.30	15%
Bust	0.70	3%

A) 9.0%.

B) 6.6%.

C) 8.1%.

Explanation

$$0.30 \times 0.15 + 0.70 \times 0.03 = 6.6\%$$

(Study Session 2, Module 9.3, LOS 9.l)

Question #102 of 117

If given the standard deviations of the returns of two assets and the correlation between the two assets, which of the following would an analyst *least likely* be able to derive from these?

A) Strength of the linear relationship between the two.

B) Covariance between the returns.

C) Expected returns.

Explanation

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

(Study Session 2, Module 9.2, LOS 9.k)

Question #103 of 117

For assets A and B we know the following: $E(R_A) = 0.10$, $E(R_B) = 0.10$, $Var(R_A) = 0.18$, $Var(R_B) = 0.36$ and the correlation of the returns is 0.6. What is the variance of the return of a portfolio that is equally invested in the two assets?

A) 0.1102.

B) 0.1500.

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 2, Module 9.3, LOS 9.l)

Question #104 of 117

An investor has two stocks, Stock R and Stock S in her portfolio. Given the following information on the two stocks, the portfolio's standard deviation is *closest* to:

- σ_R = 34%
- σ_S = 16%
- $r_{R,S}$ = 0.67
- W_R = 80%
- W_S = 20%

A) 29.4%.

B) 7.8%.

C) 8.7%.

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 2, Module 9.3, LOS 9.l)

Question #105 of 117

Joe Mayer, CFA, projects that XYZ Company's return on equity varies with the state of the economy in the following way:

State of Economy	Probability of Occurrence	Company Returns
Good	.20	20%
Normal	.50	15%
Poor	.30	10%

The standard deviation of XYZ's expected return on equity is *closest to:*

A) 12.3%.

B) 1.5%.

C) 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 2, Module 9.3, LOS 9.l)

Question #106 of 117

There is a 50% chance that the Fed will cut interest rates tomorrow. On any given day, there is a 67% chance the DJIA will increase. On days the Fed cuts interest rates, the probability the DJIA will go up is 90%. What is the probability that tomorrow the Fed will cut interest rates or the DJIA will go up?

A) 0.95.

B) 0.72.

C) 0.33.

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 × 0.90 = 0.45. Thus P (cut interest rates or DJIA increase) = 0.50 + 0.67 – 0.45 = 0.72.

(Study Session 2, Module 9.1, LOS 9.f)

Question #107 of 117

A firm is going to create three teams of four from twelve employees. How many ways can the twelve employees be selected for the three teams?

A) 34,650.

B) 1,320.

C) 495.

Explanation

This problem is a labeling problem where the 12 employees will be assigned one of three labels. It requires the labeling formula. There are [(12!) / (4! × 4! × 4!)] = 34,650 ways to group the employees.

(Study Session 2, Module 9.3, LOS 9.o)

Question #108 of 117

The covariance of the returns on investments X and Y is 18.17. The standard deviation of returns on X is 7%, and the standard deviation of returns on Y is 4%. What is the value of the correlation coefficient for returns on investments X and Y?

A) +0.32.

B) +0.85.

C) +0.65.

Explanation

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

(Study Session 2, Module 9.2, LOS 9.k)

Question #109 of 117

For the task of arranging a given number of items without any sub-groups, this would require:

A) the permutation formula.

B) only the factorial function.

C) the labeling formula.

Explanation

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

(Study Session 2, Module 9.3, LOS 9.o)

Question #110 of 117

A supervisor is evaluating ten subordinates for their annual performance reviews. According to a new corporate policy, for every ten employees, two must be evaluated as "exceeds expectations," seven as "meets expectations," and one as "does not meet expectations." How many different ways is it possible for the supervisor to assign these ratings?

A) 5,040.

B) 360.

C) 10,080.

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 2, Module 9.3, LOS 9.o)

Question #111 of 117

The following information is available concerning expected return and standard deviation of Pluto and Neptune Corporations:

	Expected Return	Standard Deviation
Pluto Corporation	11%	0.22
Neptune Corporation	9%	0.13

If the correlation between Pluto and Neptune is 0.25, determine the expected return and standard deviation of a portfolio that consists of 65% Pluto Corporation stock and 35% Neptune Corporation stock.

A) 10.3% expected return and 2.58% standard deviation.

B) 10.3% expected return and 16.05% standard deviation.

C) 10.0% expected return and 16.05% standard deviation.

Explanation

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

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

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

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

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

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

(Study Session 2, Module 9.3, LOS 9.l)

Question #112 of 117

The probability of A is 0.4. The probability of A^C is 0.6. The probability of (B | A) is 0.5, and the probability of (B | A^C) is 0.2. Using Bayes' formula, what is the probability of (A | B)?

A) 0.125.

B) 0.375.

C) 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 | 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 2, Module 9.3, LOS 9.n)

Question #113 of 117

Pat Binder, CFA, is examining the effect of an inverted yield curve on the stock market. She determines that in the past century, 75% of the times the yield curve has inverted, a bear market in stocks began within the next 12 months. Binder believes the probability of an inverted yield curve in the next year is 20%. Binder's estimate of the probability that there will be an inverted yield curve in the next year followed by a bear market is *closest to:*

A) 50%.

B) 15%.

C) 38%.

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 2, Module 9.1, LOS 9.f)

Question #114 of 117

The probability of rolling a 3 on the fourth roll of a fair 6-sided die:

A) is 1/6 to the fourth power.

B) depends on the results of the three previous rolls.

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 2, Module 9.2, LOS 9.g)

Question #115 of 117

Jay Hamilton, CFA, is analyzing Madison, Inc., a distressed firm. Hamilton believes the firm's survival over the next year depends on the state of the economy. Hamilton assigns probabilities to four economic growth scenarios and estimates the probability of bankruptcy for Madison under each:

Economic growth scenario	Probability of scenario	Probability of bankruptcy
Recession (< 0%)	20%	60%
Slow growth (0% to 2%)	30%	40%
Normal growth (2% to 4%)	40%	20%
Rapid growth (> 4%)	10%	10%

Based on Hamilton's estimates, the probability that Madison, Inc. does not go bankrupt in the next year is *closest* to:

A) 18%.

B) 33%.

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 2, Module 9.2, LOS 9.h)

Question #116 of 117

A bag of marbles contains 3 white and 4 black marbles. A marble will be drawn from the bag randomly three times and put back into the bag. Relative to the outcomes of the first two draws, the probability that the third marble drawn is white is:

A) independent.

B) dependent.

C) conditional.

Explanation

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

(Study Session 2, Module 9.2, LOS 9.g)

Question #117 of 117

A parking lot has 100 red and blue cars in it.

- 40% of the cars are red.
- 70% of the red cars have radios.
- 80% of the blue cars have radios.

What is the probability of selecting a car at random that is either red or has a radio?

A) 88%.

B) 28%.

C) 76%.

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 2, Module 9.1, LOS 9.f)