

### Question #1 of 117

Twenty Level I CFA candidates in a study group took a practice exam and want to determine the distribution of their scores. When they grade their exams they discover that one of them skipped an ethics question and subsequently filled in the rest of his answers in the wrong places, leaving him with a much lower score than the rest of the group. If they include this candidate's score, their distribution will *most likely*:

- A) be positively skewed.
- B) have a mean that is less than its median.
- C) have a mode that is less than its median.



#### Explanation

With the low outlier included, the distribution will be negatively skewed. For a negatively skewed distribution, the mean is less than the median, which is less than the mode.

(Study Session 2, Module 8.3, LOS 8.k)

### Question #2 of 117

Annual Returns on ABC Mutual Fund									
Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
11.0%	12.5%	8.0%	9.0%	13.0%	7.0%	15.0%	2.0%	-16.5%	11.0%

Assuming a mean of 7.2%, what is the sample standard deviation of the returns for ABC Mutual Fund for the period from Year 1 to Year 10?

- A) 9.8%.
- B) 7.8%.
- C) 9.1%.



#### Explanation

Standard deviation =  $[\sum_i (x_i - \bar{X})^2 / (n - 1)]^{1/2} = (744.10 / 9)^{1/2} = 9.1\%$ .

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

### Question #3 of 117

Consider the following statements about the geometric and arithmetic means as measures of central tendency. Which statement is *least* accurate?

- A) The geometric mean calculates the rate of return that would have to be earned each year to match the actual, cumulative investment performance.
- B) The difference between the geometric mean and the arithmetic mean increases with an increase in variability between period-to-period observations.



C) The geometric mean may be used to estimate the average return over a one-period time horizon because it is the average of one-period returns.



**Explanation**

The *arithmetic* mean may be used to estimate the average return over a one-period time horizon because it is the average of one-period returns. Both remaining statements are true.

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

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**Question #4 of 117**

In a skewed distribution, what is the minimum proportion of observations between +/- two standard deviations from the mean?

A) 95%.



B) 84%.



C) 75%.



**Explanation**

For any distribution we can use Chebyshev's Inequality, which states that the proportion of observations within  $k$  standard deviations of the mean is at least  $1 - (1/k^2)$ .

$$1 - (1/2^2) = 0.75, \text{ or } 75\%.$$

Note that for a normal distribution, 95% of observations will fall between +/- 2 standard deviations of the mean.

(Study Session 2, Module 8.3, LOS 8.h)

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**Question #5 of 117**

A distribution with a mode of 10 and a range of 2 to 25 would *most likely* be:

A) negatively skewed.



B) normally distributed.



C) positively skewed.



**Explanation**

The distance to the left from the mode to the beginning of the range is 8. The distance to the right from the mode to the end of the range is 15. Therefore, the distribution is skewed to the right, which means that it is positively skewed.

(Study Session 2, Module 8.3, LOS 8.j)

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**Question #6 of 117**

Use the results from the following survey of 500 firms to answer the question.

Number of Employees	Frequency
300 up to 400	40
400 up to 500	62
500 up to 600	78
600 up to 700	101
700 up to 800	131
800 up to 900	88

The lower boundary of the fifth interval (class) is:

**A)** 700



**B)** 701



**C)** 800



**Explanation**

700 - 800, lower boundary = 700

(Study Session 2, Module 8.1, LOS 8.b)

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**Question #7 of 117**

A summary measure of a characteristic of an entire population is called a:

**A)** statistic.



**B)** parameter.



**C)** census.



**Explanation**

A parameter measures a characteristic of the underlying population.

(Study Session 2, Module 8.1, LOS 8.b)

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**Question #8 of 117**

A sample of returns for four randomly selected assets in a portfolio is shown below:

Asset	Return (%)
A	1.3
B	1.4
C	2.2
D	3.4

What is the sample standard deviation of asset returns?

A) 0.88%.



B) 0.97%.



C) 1.13%.



#### Explanation

The sample standard deviation equals the square root of the sum of the squares of the position returns less the mean return, divided by the number of observations in the sample *minus one*.

Position	Return (%)	(Return - Mean) <sup>2</sup>
A	1.3	0.60
B	1.4	0.46
C	2.2	0.02
D	3.4	1.76
Mean	8.3/4 = 2.075	Sum = 2.83
Std. Dev. = $[2.83 / (4 - 1)]^{0.5} = 0.97$		

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

#### Question #9 of 117

Given the following annual returns, what are the population variance and standard deviation, respectively?

2000	2001	2002	2003	2004
15%	2%	5%	-7%	0%

A) 32.4; 5.7.



B) 51.6; 7.2.



C) 64.5; 8.0.



#### Explanation

The population variance is found by taking the mean of all squared deviations from the mean.

$$[(15 - 3)^2 + (2 - 3)^2 + (5 - 3)^2 + (-7 - 3)^2 + (0 - 3)^2] / 5 = 51.6$$

The population standard deviation is found by taking the square root of the population variance.

$$51.6^{1/2} = 7.2$$

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

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### Question #10 of 117

A portfolio has a return of 14.2% and a Sharpe's measure of 3.52. If the risk-free rate is 4.7%, what is the standard deviation of returns?

A) 2.6%.



B) 3.9%.



C) 2.7%.



#### Explanation

Standard Deviation of Returns =  $(14.2\% - 4.7\%) / 3.52 = 2.6988$ .

(Study Session 2, Module 8.3, LOS 8.i)

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### Question #11 of 117

Portfolio A earned an annual return of 15% with a standard deviation of 28%. If the mean return on Treasury bills (T-bills) is 4%, the Sharpe ratio for the portfolio is:

A) 1.87.



B) 0.39.



C) 0.54.



#### Explanation

$(15 - 4) / 28 = 0.39$

(Study Session 2, Module 8.3, LOS 8.i)

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### Question #12 of 117

Given the following annual returns, what are the median and mode returns, respectively?

1995	1996	1997	1998	1999
15%	2%	5%	-7%	0%

A) 2.00%; 3.00%.



B) no median exists; no mode exists.



C) 2.00%; no mode exists.



#### Explanation

Median: Arrange the return values from largest to smallest and take the middle value: (7%), 0%, 2%, 5%, 15%. The middle value is 2.00%. Mode: The mode is defined as the value that most often shows up in a distribution. Because no return value shows up more than once, this distribution has no mode.

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

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### Question #13 of 117

Cameron Ryan wants to make an offer on the condominium he is renting. He takes a sample of prices of condominiums in his development that closed in the last five months. Sample prices are as follows (amounts are in thousands of dollars): \$125, \$175, \$150, \$155 and \$135. The sample standard deviation is *closest* to:

A) 38.47.



B) 370.00.



C) 19.24.



#### Explanation

Calculations are as follows:

1. Sample mean =  $(125 + 175 + 150 + 155 + 135) / 5 = 148$
2. Sample Variance =  $[(125 - 148)^2 + (175 - 148)^2 + (150 - 148)^2 + (155 - 148)^2 + (135 - 148)^2] / (5 - 1) = 1,480 / 4 = 370$
3. Sample Standard Deviation =  $370^{1/2} = 19.24\%$ .

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

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### Question #14 of 117

Which of the following statements regarding the Sharpe ratio is *most* accurate? The Sharpe ratio measures:

A) peakedness of a return distribution.



B) excess return per unit of risk.



C) total return per unit of risk.



#### Explanation

The Sharpe ratio measures excess return per unit of risk. Remember that the numerator of the Sharpe ratio is (portfolio return – risk free rate), hence the importance of *excess* return. Note that peakedness of a return distribution is measured by *kurtosis*.

(Study Session 2, Module 8.3, LOS 8.i)

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### Question #15 of 117

Claude Bellow, CFA, is an analyst with a real estate focused investment firm. He asks his assistant to gather annual return information on a large office building and on a (REIT) real estate investment trust with diverse holdings. The following tables summarize the information.

Table 1: Annual returns (in %)					
Asset	Year 1	Year 2	Year 3	Year 4	Year 5
REIT	25.0	20.0	5.0	-5.0	13.0
Office Building	15.0	5.0	-5.0	-2.0	13.0

Table 2: Mean and Dispersion Information		
Asset	Mean Return*	Variance
REIT	11.6%	114.24
Office Building	5.2%	62.56

\* Calculated using the arithmetic mean.

A partner in the firm asks Bellow to calculate the Sharpe ratio for the REIT. If the risk-free rate is 5.0%, the Sharpe ratio is *closest* to:

- A) 0.06.
- B) 1.62.
- C) 0.62.



#### Explanation

The Sharpe ratio measures the excess return per unit of risk. The formula is:

$$\text{Sharpe Ratio} = (\bar{r}_p - \bar{r}_f) / \sigma_p$$

where:  $\bar{r}_p$  = portfolio return;  $\bar{r}_f$  = risk free return;  $\sigma$  = standard deviation

$$\text{Sharpe Ratio}_{\text{REIT}} = (11.6\% - 5.00\%) / 114.24^{1/2} = 0.62.$$

(Study Session 2, Module 8.3, LOS 8.i)

### Question #16 of 117

An investor has a \$12,000 portfolio consisting of \$7,000 in stock A with an expected return of 20% and \$5,000 in stock B with an expected return of 10%. What is the investor's expected return on the portfolio?

- A) 15.0%.
- B) 15.8%.
- C) 12.2%.



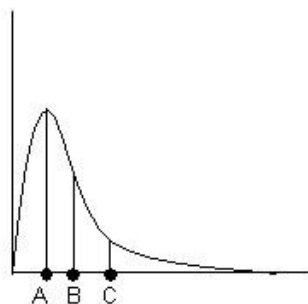
#### Explanation

Find the weighted mean where the weights equal the proportion of \$12,000.  $(7,000 / 12,000)(0.20) + (5,000 / 12,000)(0.10) = 15.8\%$ .

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

## Question #17 of 117

Consider the following graph of a distribution for the prices for various bottles of California-produced wine.



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

- A) Approximately 68% of observations fall within one standard deviation of the mean. ✓
- B) The graph could be of the sample \$16, \$12, \$15, \$12, \$17, \$30 (*ignore graph scale*). ✗
- C) The distribution is positively skewed. ✗

### Explanation

This statement is true for the *normal* distribution. The above distribution is positively skewed. *Note:* for those tempted to use Chebyshev's inequality to determine the percentage of observations falling within one standard deviation of the mean, the formula is valid only for  $k > 1$ .

The other statements are true. When we order the six prices from least to greatest: \$12, \$12, \$15, \$16, \$17, \$30, we observe that the mode (most frequently occurring price) is \$12, the median (middle observation) is \$15.50  $[(15 + 16)/2]$ , and the mean is \$17 (sum of all prices divided by number in the sample). *Time-Saving Note:* Just by ordering the distribution, we can see that it is positively skewed (there are large, positive outliers). By definition,  $\text{mode} < \text{median} < \text{mean}$  describes a positively skewed distribution.

(Study Session 2, Module 8.3, LOS 8.j)

## Question #18 of 117

Annual Returns on ABC Mutual Fund									
Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10
11.0%	12.5%	8.0%	9.0%	13.0%	7.0%	15.0%	2.0%	-16.5%	11.0%

What are the arithmetic mean return and the geometric mean return, respectively, for ABC Mutual Fund for the period Year 1 to Year 10?

- A) 8.2%; 6.8%. ✗
- B) 7.2%; 5.6%. ✗
- C) 7.2%; 6.8%. ✓

### Explanation

Arithmetic mean =  $(11 + 12.5 + 8 + 9 + 13 + 7 + 15 + 2 - 16.5 + 11) / 10 = 7.20$

Geometric mean =  $(1.11 \times 1.125 \times 1.08 \times 1.09 \times 1.13 \times 1.07 \times 1.15 \times 1.02 \times 0.835 \times 1.11)^{1/10} - 1 = (1.932)^{0.10} - 1 = 1.068 - 1 = 0.068$  or 6.8%

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



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### Question #19 of 117

An investor has a \$15,000 portfolio consisting of \$10,000 in stock A with an expected return of 20% and \$5,000 in stock B with an expected return of 10%. What is the investor's expected return on the portfolio?

A) 7.9%.



B) 16.7%.



C) 12.2%.



#### Explanation

Find the weighted mean where the weights equal the proportion of \$15,000.  $[(10,000 / 15,000) \times 0.20] + [(5,000 / 15,000 \times 0.10] = 16.7\%$ .

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

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### Question #20 of 117

A portfolio is equally invested in Stock A, with an expected return of 6%, and Stock B, with an expected return of 10%, and a risk-free asset with a return of 5%. The expected return on the portfolio is:

A) 7.0%.



B) 7.4%.



C) 8.0%.



#### Explanation

$(0.333)(0.06) + (0.333)(0.10) + 0.333(0.05) = 0.07$

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

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### Question #21 of 117

For the last four years, the returns for XYZ Corporation's stock have been 10.4%, 8.1%, 3.2%, and 15.0%. The equivalent compound annual rate is:

A) 9.2%.



B) 9.1%.



C) 8.9%.



#### Explanation

$(1.104 \times 1.081 \times 1.032 \times 1.15)^{0.25} - 1 = 9.1\%$

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

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### Question #22 of 117

The following table provides average return and variance of returns for portfolio managers Bob, Mark, and Rick:

	<u>Bob</u>	<u>Mark</u>	<u>Rick</u>
Average Return (%)	15	13	9
Variance	81	49	36

Which of these managers has the best risk-adjusted return, as measured by the Sharpe Ratio, if the risk-free rate is 4%?

A) Bob.



B) Rick.



C) Mark.



#### Explanation

This question is solved by calculating the Sharpe Ratio for each of the managers. Then select the manager with the highest ratio. Because the standard deviations are not given, they must be found as the square root of the given variances:

Bob:  $81^{1/2} = 9$

Mark:  $49^{1/2} = 7$

Rick:  $36^{1/2} = 6$

Sharpe Ratio for each manager, with risk-free rate = 4%:

Bob:  $(15 - 4) / 9 = 1.222$

Mark:  $(13 - 4) / 7 = 1.286$

Rick:  $(9 - 4) / 6 = 0.833$

Mark has the highest risk-adjusted return.

(Study Session 2, Module 8.3, LOS 8.i)

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### Question #23 of 117

Which of the following statements about the median is *least* accurate? It is:

A) more affected by extreme values than the mean.



B) equal to the 50<sup>th</sup> percentile.



C) equal to the mode in a normal distribution.



#### Explanation

Median is less influenced by outliers since the median is computed as the "middle" observation. On the other hand, all of the data including outliers are used in computing the mean. Both remaining statements are true regarding the median.

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

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### Question #24 of 117

Michael Philizaire is studying for the Level I CFA examination. During his review of measures of central tendency, he decides to calculate the geometric average of the appreciation/depreciation of his home over the last five years. Using comparable sales and market data he obtains from a local real estate appraiser, Philizaire calculates the year-to-year percentage change in the value of his home as follows: 20, 15, 0, -5, -5. The geometric return is *closest* to:

A) 0.00%.



B) 4.49%.



C) 11.60%.



#### Explanation

The geometric return is calculated as follows:

$$[(1 + 0.20) \times (1 + 0.15) \times (1 + 0.0) (1 - 0.05) (1 - 0.05)]^{1/5} - 1,$$

$$\text{or } [1.20 \times 1.15 \times 1.0 \times 0.95 \times 0.95]^{0.2} - 1 = 0.449, \text{ or } \mathbf{4.49\%}.$$

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

### Question #25 of 117

Use the results from the following survey of 500 firms to answer the question.

Number of Employees	Frequency
300 up to 400	40
400 up to 500	62
500 up to 600	78
600 up to 700	101
700 up to 800	131
800 up to 900	88

The cumulative relative frequency of the second interval (400 to 500) is:

A) 10.2%.



B) 20.4%.



C) 12.4%.



#### Explanation

$$62 + 40 = 102, 102 / 500 = 0.204 \text{ or } 20.4\%$$

(Study Session 2, Module 8.1, LOS 8.c)

### Question #26 of 117

The owner of a company has recently decided to raise the salary of one employee, who was already making the highest salary in the company, by 40%. Which of the following value(s) is (are) expected to be affected by this raise?

A) mean only.



B) median only.



C) mean and median only.



#### Explanation

Mean is affected because it is the sum of all values / number of observations. Median is not affected as it is the midpoint between the top half of values and the bottom half of values.

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

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### Question #27 of 117

Which of the following statements regarding the terms population and sample is *least* accurate?

A) A descriptive measure of a sample is called a statistic.



B) A sample's characteristics are attributed to the population as a whole.



C) A sample includes all members of a specified group.



#### Explanation

A population includes all members of a specified group. A sample is a portion, or subset of the population of interest.

(Study Session 2, Module 8.1, LOS 8.a)

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### Question #28 of 117

How is the relative frequency of an interval computed?

A) Dividing the frequency of that interval by the sum of all frequencies.



B) Subtracting the lower limit of the interval by the upper limit.



C) Dividing the sum of the two interval limits by 2.



#### Explanation

The relative frequency is the percentage of total observations falling within each interval. It is found by taking the frequency of the interval and dividing that number by the sum of all frequencies.

(Study Session 2, Module 8.1, LOS 8.c)

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### Question #29 of 117

What does it mean to say that an observation is at the sixty-fifth percentile?

A) 65% of all the observations are above that observation.



B) 65% of all the observations are below that observation.



C) The observation falls within the 65th of 100 intervals.



#### Explanation

If the observation falls at the sixty-fifth percentile, 65% of all the observations fall below that observation.

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

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### Question #30 of 117

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

A) In a skewed distribution, 95% of all values will lie within plus or minus two standard deviations of the mean.



B) A distribution that is not symmetrical has skew not equal to zero.



C) A positively skewed distribution is characterized by many small losses and a few extreme gains.



#### Explanation

For a normal distribution, the mean will be equal to its median and 95% of all observations will fall within plus or minus two standard deviations of the mean. For a skewed distribution, because it is not symmetrical, this may not be the case. Chebyshev's inequality tells us that at least 75% of observations will lie within plus or minus two standard deviations from the mean.

(Study Session 2, Module 8.3, LOS 8.j)

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### Question #31 of 117

If the historical mean return on an investment is 2.0% and the standard deviation is 8.8%, what is the coefficient of variation (CV)?

A) 1.76.



B) 4.40.



C) 6.80.



#### Explanation

The CV = the standard deviation of returns / mean return or  $8.8\% / 2.0\% = 4.4$ .

(Study Session 2, Module 8.3, LOS 8.i)

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### Question #32 of 117

Annual Returns on ABC Mutual Fund									
20X0	20X1	20X2	20X3	20X4	20X5	20X6	20X7	20X8	20X9
11.0%	12.5%	8.0%	9.0%	13.0%	7.0%	15.0%	2.0%	-16.5%	11.0%

If the risk-free rate was 4.0% during the period, what is the Sharpe ratio for ABC Mutual Fund?

A) 0.35.



B) 0.52.



C) 0.68.



**Explanation**

	20X0	20X1	20X2	20X3	20X4	20X5	20X6	20X7	20X8	20X9	
Annual return	11.0%	12.5%	8.0%	9.0%	13.0%	7.0%	15.0%	2.0%	-16.5%	11.0%	Mean = 7.2
X – mean	3.8	5.3	0.8	1.8	5.8	-0.2	7.8	-5.2	-23.7	3.8	
(X – mean) <sup>2</sup>	14.44	28.09	0.64	3.24	33.64	0.04	60.84	27.04	561.69	14.44	Sum = 744.10

Variance =  $(X - \text{mean})^2 / (n - 1) = 744.10 / 9 = 82.68$

Standard deviation =  $(82.68)^{1/2} = 9.1$

Sharpe Ratio =  $(\text{mean return} - \text{risk-free rate}) / \text{standard deviation} = (7.2 - 4) / 9.1 = 0.35$

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

### Question #33 of 117

Use the results from the following survey of 500 firms to answer the question.

Number of Employees	Frequency
300 up to 400	40
400 up to 500	62
500 up to 600	78
600 up to 700	101
700 up to 800	131
800 up to 900	88

The width of each interval (class) for this frequency table is:

A) 100



B) 50



C) 101



**Explanation**

Max of interval – Min of interval = 100

(Study Session 2, Module 8.1, LOS 8.b)

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### Question #34 of 117

Which measure of central tendency can be used for both numerical and categorical variables?

A) Mean.



B) Mode.



C) Median.



#### Explanation

The mode is the only choice that makes sense since you cannot take an average or median of categorical data such as bond ratings (AAA, AA, A, etc.) but the mode is simply the most frequently occurring number or category.

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

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### Question #35 of 117

Given the following frequency distribution:

Return	Frequency
-10% up to 0%	5
0% up to 10%	7
10% up to 20%	9
20% up to 30%	6
30% up to 40%	3

What is the relative frequency of the 0% to 10% interval?

A) 23.3%.



B) 40.0%.



C) 33.3%.



#### Explanation

Total number of frequencies = 30.

$7/30 = 23.3\%$ .

(Study Session 2, Module 8.1, LOS 8.c)

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### Question #36 of 117

In a positively skewed distribution, the:

A) median equals the mean.



B) mean is greater than the median.



C) mean is less than the median.



#### Explanation

In a right-skewed distribution, there are large positive outliers. These outliers increase the mean of the distribution but have little effect on the median. Therefore, the mean is greater than the median.

(Study Session 2, Module 8.3, LOS 8.k)

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### Question #37 of 117

Assume that the following returns are a sample of annual returns for firms in the clothing industry. Given the following sample of returns, what are the sample variance and standard deviation respectively?

Firm 1	Firm 2	Firm 3	Firm 4	Firm 5
15%	2%	5%	(7%)	0%

A) 51.6; 7.2.



B) 32.4; 5.7.



C) 64.5; 8.0.



#### Explanation

The sample variance is found by taking the sum of all squared deviations from the mean and dividing by (n - 1).

$$[(15 - 3)^2 + (2 - 3)^2 + (5 - 3)^2 + (-7 - 3)^2 + (0 - 3)^2] / (5 - 1) = 64.5$$

The sample standard deviation is found by taking the square root of the sample variance.  $\sqrt{64.5} = 8.03$

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

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### Question #38 of 117

Which of the following statements concerning a distribution with positive skewness and positive excess kurtosis is *least* accurate?

A) It has fatter tails than a normal distribution.



B) The mean will be greater than the mode.



C) It has a lower percentage of small deviations from the mean than a normal distribution.



#### Explanation

A distribution with positive excess kurtosis has a higher percentage of small deviations from the mean than normal. So it is more "peaked" than a normal distribution. A distribution with positive skew has a mean > mode.

(Study Session 2, Module 8.3, LOS 8.l)

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### Question #39 of 117

The following data points are observed returns.

4.2%, 6.8%, 7.0%, 10.9%, 11.6%, 14.4%, 17.0%, 19.0%, 22.5%

What return lies at the 70th percentile (70% of returns lie below this return)?

A) 19.0%.



B) 14.4%.



C) 17.0%.



#### Explanation

With 9 observations, the location of the 70th percentile is  $(9 + 1)(70 / 100) = 7$ . The seventh observation in ascending order is 17.0%.

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

### Question #40 of 117

Given the following annual returns, what are the geometric and arithmetic mean returns, respectively?

2002	2003	2004	2005	2006
15%	2%	5%	-7%	0%

A) 2.75%; 3.00%.



B) 1.45%; 3.00%.



C) 2.75%; 5.80%.



#### Explanation

Geometric Mean:  $(1.15 \times 1.02 \times 1.05 \times 0.93 \times 1.0)^{1/5} - 1 = 1.1454^{1/5} - 1 = 2.75\%$

Arithmetic Mean:  $(15\% + 2\% + 5\% - 7\% + 0\%) / 5 = 3.00\%$

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

### Question #41 of 117

In a frequency distribution histogram, the frequency of an interval is given by the:

A) width of the corresponding bar.



B) height of the corresponding bar.



C) height multiplied by the width of the corresponding bar.



#### Explanation

In a histogram, intervals are placed on the horizontal axis, and frequencies are placed on the vertical axis. The frequency of a particular interval is given by the value on the vertical axis, or the height of the corresponding bar.

(Study Session 2, Module 8.1, LOS 8.d)

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### Question #42 of 117

Regardless of the shape of a distribution, according to Chebyshev's Inequality, what is the minimum percentage of observations that will lie within  $\pm$  two standard deviations of the mean?

A) 75%.



B) 89%.



C) 68%.



#### Explanation

According to Chebyshev's Inequality, for any distribution, the minimum percentage of observations that lie within  $k$  standard deviations of the distribution mean is equal to:

$1 - (1 / k^2)$ , with  $k$  equal to the number of standard deviations. If  $k = 2$ , then the percentage of distributions is equal to  $1 - (1 / 4) = 75\%$ .

(Study Session 2, Module 8.3, LOS 8.h)

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### Question #43 of 117

An investor has a portfolio with 10% cash, 30% bonds, and 60% stock. If last year's return on cash was 2.0%, the return on bonds was 9.5%, and the return on stock was 25%, what was the return on the investor's portfolio?

A) 36.50%.



B) 18.05%.



C) 22.30%.



#### Explanation

Find the weighted mean of the returns.  $(0.10 \times 0.02) + (0.30 \times 0.095) + (0.60 \times 0.25) = 18.05\%$

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

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### Question #44 of 117

An investor has a portfolio with 10% cash, 30% bonds, and 60% stock. Last year, the cash returns was 2.0%, the bonds' return was 9.5%, and the stocks' return was -32.5%. What was the return on the investor's portfolio?

A) -7.00%.



B) -33.33%.



C) -16.45%.



#### Explanation

Find the weighted mean.  $(0.10)(0.02) + (0.30)(0.095) + (0.60)(-0.325) = -16.45\%$ .

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

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### Question #45 of 117

The mean monthly return on a sample of small stocks is 4.56% with a standard deviation of 3.56%. What is the coefficient of variation?

A) 84%.



B) 78%.



C) 128%.



#### Explanation

The coefficient of variation expresses how much dispersion exists relative to the mean of a distribution and is found by  $CV = s / \text{mean}$ .  $3.56 / 4.56 = 0.781$ , or 78%.

(Study Session 2, Module 8.3, LOS 8.i)

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### Question #46 of 117

A distribution that has positive excess kurtosis is:

A) more peaked than a normal distribution.



B) less peaked than a normal distribution.



C) more skewed than a normal distribution.



#### Explanation

A distribution with positive excess kurtosis is one that is more peaked than a normal distribution.

(Study Session 2, Module 8.3, LOS 8.I)

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### Question #47 of 117

The returns for individual assets in a portfolio are shown below:

Assets	Return (%)
A	1.3
B	1.4
C	2.2
D	3.4
E	1.7

What is the population standard deviation of the returns?

A) 0.56%.



B) 1.71%.



C) 0.77%.



### Explanation

The population standard deviation equals the square root of the sum of the squares of the position returns less the mean return, divided by the number of entities in the population.

Position	Return (%)	(Return - Mean) <sup>2</sup>
A	1.3	0.49
B	1.4	0.36
C	2.2	0.04
D	3.4	1.96
E	1.7	0.09
Mean	10.0/5 = 2.0	Sum = 2.94
Std. Dev. = $(2.94/5)^{0.5} = 0.77\%$		

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

### Question #48 of 117

Returns for a portfolio over the last four years are shown below. Treating these returns as a sample, what is their coefficient of variation (CV)?

Year	Return
1	17.0%
2	12.2%
3	3.9%
4	-8.4%

A) 0.55.

B) 1.80.

C) 1.56.



### Explanation

The coefficient of variation is equal to the standard deviation of returns divided by the mean return.

Mean return =  $(17.0\% + 12.2\% + 3.9\% - 8.4\%) / 4 = 6.175\%$

Year	Return	$(R - 6.175\%)^2$
1	17.0%	117.18
2	12.2%	36.30
3	3.9%	5.18
4	-8.4%	212.43
		Sum = 371.09

Sample standard deviation =  $[371.09 / (4 - 1)]^{0.5} = 11.12\%$




Coefficient of variation =  $11.12\% / 6.175\% = 1.80$

(Study Session 2, Module 8.3, LOS 8.i)

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### Question #49 of 117

Which one of the following alternatives *best* describes the primary use of descriptive statistics? Descriptive statistics are used to:

- A) arrive at estimates regarding a large set of data regarding the statistical characteristics of a smaller sample. 
- B) obtain data about the characteristics of any data set that can be used to assess the likelihood of the occurrence of future events. 
- C) summarize important characteristics of large data sets. 

#### Explanation

Descriptive statistics are used mainly to summarize important characteristics of large data sets.

(Study Session 2, Module 8.1, LOS 8.a)

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### Question #50 of 117

The weights and returns for individual positions in a portfolio are shown below:

Position	Mkt. Value at 1/1/05 (\$MM)	Return for 2005 (%)
A	1.3	-2.0
B	1.4	-4.2
C	2.2	+6.4
D	3.9	+2.1
E	1.7	-0.8

What is the return on the portfolio?

A) +1.18%.



B) -1.20%.



C) +1.50%.



#### Explanation

The return is equal to sum of the products of each position's value and return divided by the beginning portfolio value.

Position	Mkt. Value at 1/1/05 (\$MM)	Return for 2005 (%)	Position Value × Return (\$MM)
A	1.30	-2.0	-0.0260
B	1.40	-4.2	-0.0588
C	2.20	+6.4	0.1408
D	3.90	+2.1	0.0819
E	1.70	-0.8	-0.0136
Total	<b>10.50</b>		<b>0.1243</b>
0.1243 / 10.5(\$MM) =		<b>+1.1838%</b>	

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

#### Question #51 of 117

In a negatively skewed distribution, what is the order (from lowest value to highest) for the distribution's mode, mean, and median values?

A) Mode, mean, median.



B) Mean, median, mode.



C) Median, mode, mean.



#### Explanation

In a negatively skewed distribution, the mean is less than the median, which is less than the mode.

(Study Session 2, Module 8.3, LOS 8.k)

#### Question #52 of 117

Distribution X has a mean of 10 and a standard deviation of 20. Distribution Y is identical to Distribution X in all respects except that each observation in Distribution Y is three times the value of a corresponding observation in Distribution X. The mean and standard deviation of Distribution Y are *closest* to:

Mean

Standard  
deviation

A) 30

20



B) 10                      60



C) 30                      60



**Explanation**

If the observations in Distribution Y are three times the observations in Distribution X, the mean and standard deviation of Distribution Y are three times the mean and standard deviation of Distribution X. The standard deviation of a data set measured in feet, for example, will be 3 times the standard deviation of the data set measured in yards (since 1 yard = 3 feet).

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

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**Question #53 of 117**

Which of the following statements about histograms and frequency polygons is *least* accurate?

A) A frequency polygon is constructed by plotting the midpoint of each interval on the horizontal axis.



B) A histogram and a frequency polygon both plot the absolute frequency on the vertical axis.



C) A histogram connects points with a straight line.



**Explanation**

In constructing a frequency polygon, the midpoint of each interval is plotted on the horizontal axis and the frequency of each interval is plotted on the vertical axis. Points are then connected with straight lines. A histogram is a bar chart of data that has been grouped into a frequency distribution – because it is a bar chart, there are no individual points to connect.

(Study Session 2, Module 8.1, LOS 8.d)

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**Question #54 of 117**

What is the compound annual growth rate for stock A which has annual returns of 5.60%, 22.67%, and -5.23%?

A) 8.72%.



B) 6.00%.



C) 7.08%.



**Explanation**




Compound annual growth rate is the geometric mean.  $(1.056 \times 1.2267 \times 0.9477)^{1/3} - 1 = 7.08\%$

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

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**Question #55 of 117**

Which one of the following alternatives *best* describes the primary use of inferential statistics? Inferential statistics are used to:

- A) summarize the important characteristics of a large data set based on statistical characteristics of a smaller sample. 
- B) make forecasts based on large data sets. 
- C) make forecasts, estimates or judgments about a large set of data based on statistical characteristics of a smaller sample. 

**Explanation**

Inferential statistics are used mainly to make forecasts, estimates or judgements about a large set of data based on statistical characteristics of a smaller set of data.

(Study Session 2, Module 8.1, LOS 8.a)

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**Question #56 of 117**

A portfolio of options had a return of 22% with a standard deviation of 20%. If the risk-free rate is 7.5%, what is the Sharpe ratio for the portfolio?

- A) 0.568. 
- B) 0.725. 
- C) 0.147. 

**Explanation**

Sharpe ratio =  $(22\% - 7.50\%) / 20\% = 0.725$ .

(Study Session 2, Module 8.3, LOS 8.i)

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**Question #57 of 117**

A distribution with a mean that is less than its median *most likely*:

- A) is positively skewed. 
- B) is negatively skewed. 
- C) has negative excess kurtosis. 

**Explanation**

A distribution with a mean that is less than its median is a negatively skewed distribution. A negatively skewed distribution is characterized by many small gains and a few extreme losses. Note that kurtosis is a measure of the peakedness of a return distribution.

(Study Session 2, Module 8.3, LOS 8.k)

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**Question #58 of 117**



Claude Bellow, CFA, is an analyst with a real estate focused investment firm. He asks his assistant to gather annual return information on a large office building and on a (REIT) real estate investment trust with diverse holdings. The following tables summarize the information.

Table 1: Annual returns (in %)					
Asset	Year 1	Year 2	Year 3	Year 4	Year 5
REIT	25.0	20.0	5.0	-5.0	13.0
Office Building	15.0	5.0	-5.0	-2.0	13.0

Table 2: Mean and Dispersion Information		
Asset	Mean Return*	Variance
REIT	11.6%	114.24
Office Building	5.2%	62.56

\* Calculated using the arithmetic mean.

Which of the following statements about the coefficient of variation of the two assets is *least* accurate?

- A) The coefficient of variation of the office building returns is approximately 1.52. ✗
- B) The mean of the squared deviations from the arithmetic mean of the office building is less than that of the REIT. ✗
- C) There is more dispersion relative to the mean in the distribution of the REIT returns when compared to the distribution of the returns for the office building. ✓

#### Explanation

There is *less* dispersion relative to the mean in the distribution of the REIT returns ( $CV = s / \text{mean} = 114.24^{1/2} / 11.6 = 0.92$ ) when compared to the distribution of the monthly returns for the Office building ( $CV = 62.56^{1/2} / 5.2 = 1.52$ ). The coefficient of variation measures how much dispersion exists relative to the mean of a distribution and allows for direct comparison of dispersion across different data sets. *Note:* Ignore Table 1! All the information you need is in Table 2.

Both remaining statements are true. The mean of the squared deviations from the arithmetic mean is the definition of the variance, and the variance of the Office Building returns is less than for those of the REIT. Thus, the same relationship holds for the standard deviation.

(Study Session 2, Module 8.3, LOS 8.i)

## Question #59 of 117

Trina Romel, mutual fund manager, is taking over a poor-performing fund from a colleague. Romel wants to calculate the return on the portfolio. Over the last five years, the fund's annual percentage returns were: 25, 15, 12, -8, and -14.

Determine if the geometric return of the fund will be less than or greater than the arithmetic return and calculate the fund's geometric return:

Geometric  
Return

Geometric compared to  
Arithmetic

- A) 12.86% greater than
- B) 4.96% less than
- C) 4.96% greater than



#### Explanation

The geometric return is calculated as follows:

$$[(1 + 0.25)(1 + 0.15)(1 + 0.12)(1 - 0.08)(1 - 0.14)]^{1/5} - 1,$$

$$\text{or } [1.25 \times 1.15 \times 1.12 \times 0.92 \times 0.86]^{0.2} - 1 = 0.4960, \text{ or } \mathbf{4.96\%}.$$

The geometric return will always be less than or equal to the arithmetic return. In this case the arithmetic return was 6%.

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

### Question #60 of 117

According to Chebyshev's Inequality, for any distribution, what is the minimum percentage of observations that lie within three standard deviations of the mean?

- A) 75%.
- B) 89%.
- C) 94%.



#### Explanation

According to Chebyshev's Inequality, for any distribution, the minimum percentage of observations that lie within k standard deviations of the distribution mean is equal to:  $1 - (1 / k^2)$ . If  $k = 3$ , then the percentage of distributions is equal to  $1 - (1 / 9) = 89\%$ .

(Study Session 2, Module 8.3, LOS 8.h)

### Question #61 of 117

Given the following frequency distribution:

Return	Frequency
-10% up to 0%	5
0% up to 10%	7
10% up to 20%	9
20% up to 30%	6
30% up to 40%	3

What is the cumulative relative frequency of the 20% up to 30% return interval?

- A) 10%.
- B) 70%



C) 90%.



#### Explanation

Total number of observations = 30.

Cumulative relative frequency =  $(5 + 7 + 9 + 6) / 30 = 90\%$

(Study Session 2, Module 8.1, LOS 8.c)

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### Question #62 of 117

What is the coefficient of variation for a distribution with a mean of 10 and a variance of 4?

A) 40%.



B) 25%.



C) 20%.



#### Explanation

Coefficient of variation, CV = standard deviation / mean. The standard deviation is the square root of the variance, or  $4^{1/2} = 2$ . So, CV =  $2 / 10 = 20\%$ .

(Study Session 2, Module 8.3, LOS 8.i)

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### Question #63 of 117

An investor is considering two investments. Stock A has a mean annual return of 16% and a standard deviation of 14%. Stock B has a mean annual return of 20% and a standard deviation of 30%. Calculate the coefficient of variation (CV) of each stock and determine if Stock A has less dispersion or more dispersion relative to B. Stock A's CV is:

A) 1.14, and thus has more dispersion relative to the mean than Stock B.



B) 0.875, and thus has less dispersion relative to the mean than Stock B.



C) 1.14, and thus has less dispersion relative to the mean than Stock B.



#### Explanation

CV stock A =  $0.14 / 0.16 = 0.875$

CV stock B =  $0.30 / 0.20 = 1.5$

Stock A has less dispersion relative to the mean than Stock B.

(Study Session 2, Module 8.3, LOS 8.i)

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### Question #64 of 117

In a positively skewed distribution, what is the order (from lowest value to highest) for the distribution's mode, mean, and median values?

A) Mode, median, mean.



B) Mode, mean, median.



C) Mean, median, mode.



**Explanation**

In a positively skewed distribution, the mode is less than the median, which is less than the mean.

(Study Session 2, Module 8.3, LOS 8.k)

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**Question #65 of 117**

Given the following set of data:

17, 3, 13, 3, 5, 9, 8

The value 8 is *most accurately* described as the:

A) mean.



B) mode.



C) median.



**Explanation**

Median = middle of distribution = 8 (middle number);

Mean =  $(3 + 3 + 5 + 8 + 9 + 13 + 17) / 7 = 8.28$ ;

Mode = most frequent observation = 3.

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

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**Question #66 of 117**

Consider the following set of stock returns: 12%, 23%, 27%, 10%, 7%, 20%, 15%. The third quartile is:

A) 23%.



B) 21.5%.



C) 20.0%.



**Explanation**

The third quartile is calculated as:  $L_y = (7 + 1) (75/100) = 6$ . When we order the observations in ascending order: 7%, 10%, 12%, 15%, 20%, 23%, 27%, "23%" is the sixth observation from the left.

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

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**Question #67 of 117**

Use the results from the following survey of 500 firms to answer the question.

Number of Employees	Frequency
300 up to 400	40
400 up to 500	62
500 up to 600	78
600 up to 700	101
700 up to 800	131
800 up to 900	88

The frequency of the third class is:

A) 180.



B) 78.



C) 156.



**Explanation**

The third class is 500 - 600 with a frequency of 78.

(Study Session 2, Module 8.1, LOS 8.b)

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**Question #68 of 117**

Given the following annual returns, what is the mean absolute deviation?

2000	2001	2002	2003	2004
15%	2%	5%	-7%	0%

A) 22.0%.



B) 3.0%.



C) 5.6%.



**Explanation**

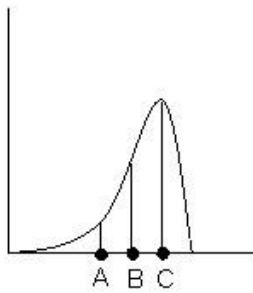
The mean absolute deviation is found by taking the mean of the absolute values of deviations from the mean.  $(|15 - 3| + |2 - 3| + |5 - 3| + |-7 - 3| + |0 - 3|) / 5 = 5.60\%$

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

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**Question #69 of 117**

Consider the following graph of a distribution for the prices of various bottles of champagne.



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

- A) The distribution is negatively skewed.
- B) Point A represents the mode.
- C) The mean value will be less than the mode.



#### Explanation

The graph represents a negatively skewed distribution, and thus Point A represents the mean. By definition,  $\text{mean} < \text{median} < \text{mode}$  describes a negatively skewed distribution.

(Study Session 2, Module 8.3, LOS 8.k)

### Question #70 of 117

If a distribution is skewed:

- A) each side of a return distribution is the mirror image of the other.
- B) it will be more or less peaked reflecting a greater or lesser concentration of returns around the mean.
- C) the magnitude of positive deviations from the mean is different from the magnitude of negative deviations from the mean.



#### Explanation

Skewness is caused by the magnitude of positive deviations from the mean being either larger or smaller than the magnitude of negative deviations from the mean. Each side of a skewed distribution is not a mirror image of the other. Peakedness of a distribution is measured by kurtosis.

(Study Session 2, Module 8.3, LOS 8.j)

### Question #71 of 117

Which of the following statements about interpreting skewness and kurtosis is *least* accurate?

- A) A distribution that is skewed left has more frequent occurrences of large negative outcomes compared to a normal distribution.
- B) Positive values of kurtosis indicate a distribution that has fatter tails than a normal distribution.



C) Values of relative skewness in excess of 0.5 in absolute value are interpreted as indicating that a distribution is significantly skewed.



#### Explanation

Positive values of excess kurtosis (kurtosis > 3) indicate that a distribution has fatter tails (i.e., greater probability of extreme outcomes) than a normal distribution. Positive values of kurtosis (kurtosis > 0) do not necessarily indicate that a distribution has fat tails.

Left skewness indicates that large negative outliers occur more frequently compared to a normal distribution. A distribution with skewness greater than 0.5 in absolute value is considered to be significantly skewed.

(Study Session 2, Module 8.3, LOS 8.I)

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### Question #72 of 117

Which of the following indicates the frequency of an interval in a frequency distribution histogram?

A) Horizontal logarithmic scale.



B) Width of the corresponding bar.



C) Height of the corresponding bar.



#### Explanation

In a histogram, intervals are placed on horizontal axis, and frequencies are placed on the vertical axis. The frequency of the particular interval is given by the value on the vertical axis, or the height of the corresponding bar.

(Study Session 2, Module 8.1, LOS 8.d)

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### Question #73 of 117

Find the respective mean and the mean absolute deviation (MAD) of a series of stock market returns.

Year 1	14%
Year 2	20%
Year 3	24%
Year 4	22%

A) 20%; 3%.



B) 22%; 3%.



C) 20%; 12%.



#### Explanation

$$(14 + 20 + 24 + 22) / 4 = 20 \text{ (mean)}$$

Take the absolute value of the differences and divide by n:

$$\text{MAD} = [ |14 - 20| + |20 - 20| + |24 - 20| + |22 - 20| ] / 4 = 3\%.$$

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

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### Question #74 of 117

A distribution of returns that has a greater percentage of small deviations from the mean and a greater percentage of large deviations from the mean compared to a normal distribution:

A) has positive excess kurtosis.



B) has negative excess kurtosis.



C) is positively skewed.



#### Explanation

A distribution that has a greater percentage of small deviations from the mean and a greater percentage of large deviations from the mean will be leptokurtic and will exhibit positive excess kurtosis. The distribution will be taller (more peaked) with fatter tails than a normal distribution.

(Study Session 2, Module 8.3, LOS 8.I)

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### Question #75 of 117

An investor has the following assets:

- \$5,000 in bonds with an expected return of 8%.
- \$10,000 in equities with an expected return of 12%.
- \$5,000 in real estate with an expected return of 10%.

What is the portfolio's expected return?

A) 10.00%.



B) 11.00%.



C) 10.50%.



#### Explanation

Expected return is the weighted average of the individual expected values. The expected return is:  $[(5,000) \times (10.00) + (5,000) \times (8.00) + (10,000) \times (12.00)] / 20,000 = 10.50\%$ .

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

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### Question #76 of 117

A stock had the following quarterly holding period returns over the last six quarters: 1.5%, 2.0%, -0.9%, 4.4%, 2.3%, and -1.7%. The effective annual rate of return over this period is *closest* to:

A) 5.08%.



B) 5.06%.



C) 5.14%.



#### Explanation



Six-quarter holding period return =  $(1.015)(1.020)(0.991)(1.044)(1.023)(0.983) - 1 = 7.71\%$ .

Effective annual rate of return =  $(1.0771)^{4/6} - 1 = 5.08\%$ .

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

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### Question #77 of 117

For the past three years, Acme Corp. has generated the following sample returns on equity (ROE): 4%, 10%, and 1%. What is the sample variance of the ROE over the last three years?

A) 21.0(%<sup>2</sup>).



B) 21.0%.



C) 4.6%.



#### Explanation

$$[(4 - 5)^2 + (10 - 5)^2 + (1 - 5)^2] / (3 - 1) = 21(\%^2).$$

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

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### Question #78 of 117

Which of the following statements concerning kurtosis is *least* accurate?

A) A leptokurtic distribution has fatter tails than a normal distribution.



B) A distribution that is more peaked than a normal distribution is leptokurtic.



C) A leptokurtic distribution has excess kurtosis less than zero.



#### Explanation

A leptokurtic distribution is more peaked than normal and has fatter tails. However, the excess kurtosis is greater than zero.

(Study Session 2, Module 8.3, LOS 8.l)

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### Question #79 of 117

Monthly returns for a set of small cap stocks are 1.3%, 0.8%, 0.5%, 3.4%, -3.5%, -1.2%, 1.8%, 2.1%, and 1.5%. An analyst constructs a frequency distribution and a frequency polygon using the following intervals: -4.0% to -2.0%, -2.0% to 0.0%, 0.0% to 2.0%, and 2.0% to 4.0%. Which of the following statements about these data presentations is *least* accurate?

A) The relative frequency of the interval -2.0% to 0.0% equals the relative frequency of the interval 2.0% to 4.0%.



B) A frequency polygon plots the midpoint of each interval on the horizontal axis and the absolute frequency of that interval on the vertical axis.



C) The absolute frequency of the interval 0.0% to 2.0% is 5.



#### Explanation

When completed, the frequency distribution table should look as follows:

Frequency Distribution of Monthly Small Cap Stock Returns		
Interval	Absolute Frequency	Relative Frequency
-4.0% to -2.0%	1	11.1%
-2.0% to 0.0%	1	11.1%
0.0% to 2.0%	5	55.6%
2.0% to 4.0%	2	22.2%
Total	9	100.0%

The relative frequency of the interval -2.0% to 0.0% *does not* equal the relative frequency of the interval 2.0% to 4.0%.

(Study Session 2, Module 8.1, LOS 8.c)

#### Question #80 of 117

A higher Sharpe ratio indicates:

A) lower volatility of returns.



B) a higher excess return per unit of risk.



C) a lower risk per unit of return.



#### Explanation

The Sharpe ratio is excess return (return –  $R_f$ ) per unit of risk (defined as the standard deviation of returns).

(Study Session 2, Module 8.3, LOS 8.i)

#### Question #81 of 117

The mean monthly return on U.S. Treasury bills (T-bills) is 0.42%. The mean monthly return for an index of small stocks is 4.56%, with a standard deviation of 3.56%. What is the Sharpe measure for the index of small stocks?

A) 1.16%.



B) 16.56%.



C) 10.60%.



#### Explanation

The Sharpe ratio measures excess return per unit of risk.  $(4.56 - 0.42) / 3.56 = 1.16\%$ .

(Study Session 2, Module 8.3, LOS 8.i)

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### Question #82 of 117

If a distribution is positively skewed, then generally:

- A) mean > median > mode.
- B) mean < median < mode.
- C) mean > median < mode.



#### Explanation

When a distribution is positively skewed the right side tail is longer than normal due to outliers. The mean will exceed the median, and the median will generally exceed the mode because large outliers falling to the far right side of the distribution can dramatically influence the mean.

(Study Session 2, Module 8.3, LOS 8.k)

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### Question #83 of 117

Twenty students take an exam. The percentages of questions they answer correctly are ranked from lowest to highest as follows:

32 49 57 58 61

62 64 66 67 67

68 69 71 72 72

74 76 80 82 83

In a frequency distribution from 30% to 90% that is divided into six equal-sized intervals, the absolute frequency of the sixth interval is:

- A) 2
- B) 4
- C) 3



#### Explanation

The intervals are  $30\% \leq x < 40\%$ ,  $40\% \leq x < 50\%$ ,  $50\% \leq x < 60\%$ ,  $60\% \leq x < 70\%$ ,  $70\% \leq x < 80\%$ , and  $80\% \leq x \leq 90\%$ . There are 3 scores in the range  $80\% \leq x \leq 90\%$ .

(Study Session 2, Module 8.1, LOS 8.b)

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### Question #84 of 117

Which of the following is *least likely* a measure of dispersion?

- A) Percentile.
- B) Variance.
- C) Range.



### Explanation

Percentiles and other quantiles are measures of location. Range and variance are measures of dispersion.

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

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### Question #85 of 117

Portfolio A earned a return of 10.23% and had a standard deviation of returns of 6.22%. If the return over the same period on Treasury bills (T-bills) was 0.52% and the return to Treasury bonds (T-bonds) was 4.56%, what is the Sharpe ratio of the portfolio?

A) 0.91.



B) 1.56.



C) 0.56.



### Explanation

Sharpe ratio =  $(R_p - R_f) / \sigma_p$ , where  $(R_p - R_f)$  is the difference between the portfolio return and the risk free rate, and  $\sigma_p$  is the standard deviation of portfolio returns. Thus, the Sharpe ratio is:  $(10.23 - 0.52) / 6.22 = 1.56$ . Note, the T-bill rate is used for the risk free rate.

(Study Session 2, Module 8.3, LOS 8.i)

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### Question #86 of 117

Which of the following statements about statistical concepts is *least* accurate?

A) The coefficient of variation is useful when comparing dispersion of data measured in different units or having large differences in their means.



B) For a normal distribution, only 95% of the observations lie within  $\pm 3$  standard deviations from the mean.



C) For any distribution, based on Chebyshev's Inequality, 75% of the observations lie within  $\pm 2$  standard deviations from the mean.



### Explanation

For a normal distribution, 95% of the observations lie within  $\pm 2$  standard deviations of the mean while 99% of the observations lie within plus or minus three standard deviations of the mean. Both remaining statements are true. Note that 75% of observations for any distribution lie within  $\pm 2$  standard deviations of the mean using Chebyshev's inequality.

(Study Session 2, Module 8.3, LOS 8.h)

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### Question #87 of 117

Which of the following statements regarding frequency distributions is *least* accurate? Frequency distributions:

A) work with all types of measurement scales.



B) organize data into overlapping groups.



C) summarize data into a relatively small number of intervals.



#### Explanation

Data in a frequency distribution must belong to only one group or interval. Intervals are mutually exclusive and non-overlapping.

(Study Session 2, Module 8.1, LOS 8.b)

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### Question #88 of 117

Which of the following sets of data is *most accurately* described as a sample?

A) Years of higher education of the portfolio managers at a mutual fund.



B) Annual returns on a an index of common stocks over a recent 10-year period.



C) Year-end assets under management for each mutual fund registered with a securities regulator.



#### Explanation

Historical returns on an index may be viewed as a sample from the population of all possible return outcomes. For this reason, when we calculate descriptive statistics of historical returns such as their standard deviation, we treat the data as a sample rather than a population. The other two choices each include all the outcomes for the variable described.

(Study Session 2, Module 8.1, LOS 8.a)

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### Question #89 of 117

A distribution that is more peaked than normal is:

A) platykurtic.



B) leptokurtic.



C) skewed.



#### Explanation

A distribution that is more peaked than normal is leptokurtic. A distribution that is flatter than normal is platykurtic.

(Study Session 2, Module 8.3, LOS 8.I)


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### Question #90 of 117

Which of the following statements about kurtosis is *least* accurate? Kurtosis:

A) is used to reflect the probability of extreme outcomes for a return distribution.



**B)** measures the peakedness of a distribution reflecting a greater or lesser concentration of returns around the mean. 

**C)** describes the degree to which a distribution is not symmetric about its mean. 

#### Explanation

The degree to which a distribution is not symmetric about its mean is measured by skewness. Excess kurtosis which is measured relative to a normal distribution, indicates the peakedness of a distribution, and also reflects the probability of extreme outcomes.

(Study Session 2, Module 8.3, LOS 8.I)

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### Question #91 of 117

When creating intervals around the mean to indicate the dispersion of outcomes, which of the following measures is the *most* useful? The:

**A)** variance. 

**B)** standard deviation. 

**C)** median. 

#### Explanation

The standard deviation is more useful than the variance because the standard deviation is in the same units as the mean. The median does not help in creating intervals around the mean.


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


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### Question #92 of 117

What are the median and the third quintile of the following data points, respectively?

9.2%, 10.1%, 11.5%, 11.9%, 12.2%, 12.8%, 13.1%, 13.6%, 13.9%, 14.2%, 14.8%, 14.9%, 15.4%

**A)** 13.1%; 13.6%. 

**B)** 12.8%; 13.6%. 

**C)** 13.1%; 13.7%. 

#### Explanation

The median is the midpoint of the data points. In this case there are 13 data points and the midpoint is the 7<sup>th</sup> term.

The formula for determining quantiles is:  $L_y = (n + 1)(y) / (100)$ . Here, we are looking for the third quintile (60% of the observations lie below) and the formula is:  $(14)(60) / (100) = 8.4$ . The third quintile falls between 13.6% and 13.9%, the 8<sup>th</sup> and 9<sup>th</sup> numbers from the left. Since L is not a whole number, we interpolate as:  $0.136 + (0.40)(0.139 - 0.136) = 0.1372$ , or 13.7%.

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

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### Question #93 of 117

The respective arithmetic mean and geometric mean returns of the following series of stock market returns are:

Year 1	14%
Year 2	6%
Year 3	-5%
Year 4	20%

A) 8.90%; 8.62%.



B) 8.75%; 8.34%.



C) 8.75%; 8.62%.



#### Explanation

$(14 + 6 + (-5) + 20) / 4 = 8.75$ .

$((1.14 \times 1.06 \times 0.95 \times 1.20)^{0.25} - 1 = 8.34\%$ .

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

### Question #94 of 117

In a skewed distribution, what is the minimum amount of observations that will fall between +/- 1.5 standard deviations from the mean?

A) 95%.



B) 56%.



C) 44%.



#### Explanation

Because the distribution is skewed, we must use Chebyshev's Inequality, which states that the proportion of observations within  $k$  standard deviations of the mean is at least  $1 - (1 / k^2)$ .

$$1 - (1 / 1.5^2) = 0.5555, \text{ or } 56\%.$$

(Study Session 2, Module 8.3, LOS 8.h)

### Question #95 of 117

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

A) A normal distribution has excess kurtosis of three.



B) Approximately 68% of the observations lie within +/- 1 standard deviation of the mean.



C) The mean and variance completely define a normal distribution.



#### Explanation




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

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

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### Question #96 of 117

Which of the following *best* describes a frequency distribution? A frequency distribution is a grouping of:

- A) data into groups, the numerical order of which does not matter 
- B) data into non-overlapping intervals 
- C) measures used to describe a population 

#### Explanation




A frequency distribution is a presentation of data grouped into non-overlapping intervals to aid the analysis of large data sets.

(Study Session 2, Module 8.1, LOS 8.b)

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### Question #97 of 117

Johnson Inc. manages a growth portfolio of equity securities that has had a mean monthly return of 1.4% and a standard deviation of returns of 10.8%. Smith Inc. manages a blended equity and fixed income portfolio that has had a mean monthly return of 1.2% and a standard deviation of returns of 6.8%. The mean monthly return on Treasury bills has been 0.3%. Based on the Sharpe ratio, the:

- A) performance of the Smith portfolio is preferable to the performance of the Johnson portfolio. 
- B) performance of the Johnson portfolio is preferable to the performance of the Smith portfolio. 
- C) Johnson and Smith portfolios have exhibited the same risk-adjusted performance. 

#### Explanation

The Sharpe ratio for the Johnson portfolio is  $(1.4 - 0.3)/10.8 = 0.1019$ .

The Sharpe ratio for the Smith portfolio is  $(1.2 - 0.3)/6.8 = 0.1324$ .

The Smith portfolio has the higher Sharpe ratio, or greater excess return per unit of risk.

(Study Session 2, Module 8.3, LOS 8.i)

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### Question #98 of 117

Which of the following is an example of a parameter?

- A) Sample standard deviation. 
- B) Population variance. 
- C) Sample mean. 



### Explanation

A parameter is any descriptive measure of a population characteristic. The population variance describes a population while the sample standard deviation and sample mean are each descriptive measures of samples.

(Study Session 2, Module 8.1, LOS 8.b)

### Question #99 of 117

What is the seventh decile of the following data points?

81	84	91	97	102	108	110	112	115	121
128	135	138	141	142	147	153	155	159	162

A) 141.7.



B) 141.0.



C) 142.0.



### Explanation

The formula for determining quantiles is:  $L_y = (n + 1)(y) / (100)$ . Here, we are looking for the seventh decile (70% of the observations lie below) and the formula is:  $(21)(70) / (100) = 14.7$ . The seventh decile falls between 141.0 and 142.0, the fourteenth and fifteenth numbers from the left. Since L is not a whole number, we interpolate as:  $141.0 + (0.70)(142.0 - 141.0) = 141.7$ .

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

### Question #100 of 117

Use the results from the following survey of 500 firms to answer the question.

Number of Employees	Frequency
300 up to 400	40
400 up to 500	62
500 up to 600	78
600 up to 700	101
700 up to 800	131
800 up to 900	88

The number of classes in this frequency table is:

A) 6.



B) 600.



C) 5.



### Explanation

300 - 400 = 1, 400 - 500 = 2, 500 - 600 = 3, 600 - 700 = 4, 700 - 800 = 5, 800 - 900 = 6, Total = 6

(Study Session 2, Module 8.1, LOS 8.b)

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### Question #101 of 117

If a distribution is positively skewed:

A) the mode is greater than the median.



B) the mean is greater than the median.



C) the mode is greater than the mean.



#### Explanation

For a positively skewed distribution, the mode is less than the median, which is less than the mean (the mean is greatest). Remember that investors are attracted to positive skewness because the mean return is greater than the median return.

(Study Session 2, Module 8.3, LOS 8.k)

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### Question #102 of 117

Which measure of scale has a true zero point as the origin?

A) Ordinal scale.



B) Nominal scale.



C) Ratio scale.



#### Explanation

Ratio scales are the strongest level of measurement; they quantify differences in the size of data and have a true zero point as the origin.

(Study Session 2, Module 8.1, LOS 8.a)

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### Question #103 of 117

Given the following frequency distribution:

Interval	Frequency
10 up to 30	5
30 up to 50	10
50 up to 70	15
70 up to 90	5

Which of the following statements is *least* accurate?

A) The absolute frequency of the third interval is 15.



B) The number of observations is greater than 30.



C) The relative frequency of the second interval is less than 15%.



#### Explanation

The relative interval frequency is (interval frequency) / (total number) = 28.57%. The number of observations is  $5 + 10 + 15 + 5 = 35$ .

(Study Session 2, Module 8.1, LOS 8.b)

### Question #104 of 117

Given the following sample data, find the sample standard deviation of returns for Stock A and for Stock B.

	Stock A	Stock B
Year 1	16%	20%
Year 2	20%	24%
Year 3	12%	10%

Std. Dev. A    Std. Dev. B

A) 4.0%                      5.9%



B) 4.0%                      7.2%



C) 3.3%                      5.9%



#### Explanation

First find the mean of the returns, then take differences from the mean and square them. Add the squared differences and divide by  $n-1$  to find the variance, and take the square root of the variance to find the standard deviation.

For Stock A:  $(16 + 20 + 12)/3 = 48/3 = 16\%$  average return.

$$(16 - 16)^2 = 0^2 = 0$$

$$(20 - 16)^2 = 4^2 = 16$$

$$(12 - 16)^2 = -4^2 = 16$$

$$0 + 16 + 16 = 32; 32/(3-1) = 16; 16^{1/2} = 4.0\%$$

For Stock B:  $(20 + 24 + 10) = 54/3 = 18\%$  average return.

$$(20 - 18)^2 = 2^2 = 4$$

$$(24 - 18)^2 = 6^2 = 36$$

$$(10 - 18)^2 = -8^2 = 64$$

$$4 + 36 + 64 = 104; 104 / (3 - 1) = 52; 52^{1/2} = 7.2\%$$

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

### Question #105 of 117

A summary measure that is computed to describe a population characteristic from a sample is called a:

- A) census.
- B) parameter.
- C) statistic.



#### Explanation

When sampling from a portion of the population, you compute a statistic to make inferences about the population.

(Study Session 2, Module 8.1, LOS 8.a)

### Question #106 of 117

For the investments shown in the table below:

Investment	Return (%)
A	12
B	14
C	9
D	13
E	7
F	8
G	12

Which of the following statements is *most accurate*?

- A) The median is equal to the mode.
- B) The mean is equal to the mode.
- C) The mean is equal to the median.



#### Explanation

The median is the mid-point or central number of returns arranged from highest to lowest or lowest to highest. In this case: 7, 8, 9, **12**, 12, 13, 14. The median return is 12%. The mode is the return that occurs most frequently. In this case, 12% is also the mode. The mean is  $75 / 7 = 10.71\%$ .


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


### Question #107 of 117

Which of the following statements about the arithmetic mean is *least* accurate?

- A) The arithmetic mean is the only measure of central tendency where the sum of the deviations of each observation from the mean is always zero.



**B)** If the distribution is skewed to the left then the mean will be greater than the median. 

**C)** The arithmetic mean of a frequency distribution is equal to the sum of the class frequency times the midpoint of the frequency class all divided by the number of observations. 

**Explanation**

If the distribution is skewed to the left, then the mean will be less than the median.

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

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**Question #108 of 117**

The mean monthly return on (U.S. Treasury bills) T-bills is 0.42% with a standard deviation of 0.25%. What is the coefficient of variation?

**A)** 168%. 

**B)** 84%. 

**C)** 60%. 

**Explanation**

The coefficient of variation expresses how much dispersion exists relative to the mean of a distribution and is found by  $CV = s / \text{mean}$ , or  $0.25 / 0.42 = 0.595$ , or 60%.

(Study Session 2, Module 8.3, LOS 8.i)

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**Question #109 of 117**

Fifty mutual funds are ranked according to performance. The five best performing funds are assigned the number 1, while the five worst performing funds are assigned the number 10. This is an example of a(n):

**A)** interval scale. 

**B)** ordinal scale. 

**C)** nominal scale. 

**Explanation**


The ordinal scale of measurement categorizes and orders data with respect to some characteristic. In this example, the ordinal scale tells us that a fund ranked "1" performed better than a fund ranked "10," but it does not tell us anything about the difference in performance.

(Study Session 2, Module 8.1, LOS 8.a)

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**Question #110 of 117**

What is the main difference between descriptive statistics and inferential statistics? Descriptive statistics are:

**A)** used to summarize a large data set while inferential statistics involves procedures used to make forecasts or judgments about a large data set by examining a smaller sample. 

**B)** used to make forecasts about the likelihood of upcoming events while inferential statistics are used to summarize any data set.



**C)** used to summarize data while inferential statistics are used to obtain precise information about a large data set.



**Explanation**

Descriptive statistics are used to summarize a large data set while inferential statistics are based on procedures used to make forecasts or judgments about a large data set by examining a smaller set of data.

(Study Session 2, Module 8.1, LOS 8.a)

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**Question #111 of 117**

Which of the following statements concerning skewness is *least* accurate? A distribution with:

**A)** a distribution with skew equal to 1 is not symmetrical.



**B)** positive skewness has a long left tail.



**C)** negative skewness has a large number of outliers on its left side.



**Explanation**

A distribution with positive skewness has long *right* tails.

(Study Session 2, Module 8.3, LOS 8.I)

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**Question #112 of 117**

The mean and standard deviation of returns for Stock A is represented below.

	Arithmetic Mean	Standard Deviation
Stock A	20%	8%

The coefficient of variation of Stock A is:

**A)** 0.4



**B)** 3



**C)** 2.5



**Explanation**

CV = Standard Deviation / Mean = (8 / 20) = 0.4

(Study Session 2, Module 8.3, LOS 8.i)

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**Question #113 of 117**

Assume a sample of beer prices is negatively skewed. Approximately what percentage of the distribution lies within plus or minus 2.40 standard deviations of the mean?

A) 58.3%.



B) 82.6%.



C) 95.5%.



#### Explanation

Use Chebyshev's Inequality to calculate this answer. Chebyshev's Inequality states that for any set of observations, the proportion of observations that lie within  $k$  standard deviations of the mean is *at least*  $1 - 1/k^2$ . We can use Chebyshev's Inequality to measure the minimum amount of dispersion whether the distribution is normal or skewed. Here,  $1 - (1 / 2.4^2) = 1 - 0.17361 = 0.82639$ , or **82.6%**.

(Study Session 2, Module 8.3, LOS 8.h)

### Question #114 of 117

One year ago, an investor made five separate investments with the invested amounts and returns shown below. What is the arithmetic and geometric mean return on all of the investor's investments respectively?

Investment	Invested Amount	Return (%)
A	10,000	12
B	10,000	14
C	10,000	9
D	20,000	13
E	20,000	7

A) 11.00; 10.97.



B) 11.64; 10.97.



C) 11.00; 10.78.



#### Explanation

Arithmetic Mean:  $12 + 14 + 9 + 13 + 7 = 55$ ;  $55 / 5 = 11$

Geometric Mean:  $[(1.12 \times 1.14 \times 1.09 \times 1.13 \times 1.07)^{1/5}] - 1 = 10.97\%$

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

### Question #115 of 117

Given a population of 200, 100, and 300, the coefficient of variation is *closest to*:

A) 100%.



B) 30%.



C) 40%.



### Explanation

$$CV = (\sigma/\text{mean})$$

$$\text{mean} = (200 + 100 + 300)/3 = 200$$

$$\sigma = \sqrt{[(200 - 200)^2 + (100 - 200)^2 + (300 - 200)^2] / 3} = \sqrt{6666.67} = 81.65$$

$$(81.65/200) = 40.82\%$$

(Study Session 2, Module 8.3, LOS 8.i)




### Question #116 of 117

Following is the population of temperatures (in degrees Celsius) observed during a ten-day period of January taken in San Francisco at the Ferry Building.

Day/°C	1	2	3	4	5	6	7	8	9	10
High	9	11	13	14	13	13	11	14	15	17
Low	3	6	6	7	10	10	9	6	8	4

- The population of high temperatures is normally distributed with a mode of 13°C and a coefficient of variation (CV) of 0.165.
- The population of low temperatures is positively skewed with a mean of 6.9°C and a CV of 0.328.
- A sample of high temperatures taken on odd days (5 data points) has a mean of 12.2°C and a variance of 5.20.
- A sample of low temperatures taken on odd days (5 data points) has a mean of 7.2°C.

Which of the following statements about the temperatures in San Francisco is *least* accurate?

- A)** For the low temperatures, the mode is less than 6.9°C. 
- B)** For the low temperatures, the population standard deviation is less than the sample standard deviation. 
- C)** For the high temperatures, the population variance is greater than the sample variance. 

### Explanation



The high temperature population variance is *less* than the sample variance. Calculating the *high temperature population variance* would take quite a bit of time – so look for a shortcut! For the population of high temperatures, we are given the mode and the CV. Here, there are two tricks: remember that the CV = standard deviation / mean and that for a normal distribution, the mean = median = mode. We can manipulate the CV equation as standard deviation = mean × CV, or  $13 \times 0.165 = 2.145$ . Squaring this result gives a variance of  $2.145^2 = 4.60$ . Thus, the high temperature population variance is *less* than the sample variance.

Both remaining statements are true. The strategy here is to work from the "easiest" to the most difficult calculations. (Note: all units are °C unless stated otherwise.)

- The question tells us that the *low temperatures* are positively skewed with a mean of 6.9. For a positively skewed distribution, we know that the mean > median > mode. Thus, the mode is less than the mean, or 6.9.
- The population with the *lowest* CV has the least dispersion. Thus, the population of high temperatures (CV of 0.165) is less dispersed than in the population of low temperatures (CV of 0.328).
- Again, calculating the *low temperature population standard deviation* would take quite a bit of time – so look for a shortcut! For the population of high temperatures, we are given the mean and the CV. Here, there is only one trick (we are given the mean): manipulate the CV equation as standard deviation = mean × CV, or  $6.9 \times 0.328 = 2.26$ . Unfortunately, there is no real shortcut for the low temperature sample standard deviation, which is calculated as follows:
  - Sample mean is given at 7.2.
  - Variance =  $[(3 - 7.2)^2 + (6 - 7.2)^2 + (10 - 7.2)^2 + (9 - 7.2)^2 + (8 - 7.2)^2] / (5 - 1) = 7.7$
  - Standard Deviation =  $7.7^{1/2} = 2.78$ .

Thus, the population standard deviation of 2.26 is less than the sample standard deviation of 2.78.

(Study Session 2, Module 8.3, LOS 8.i)

## Question #117 of 117

If stock X's expected return is 30% and its expected standard deviation is 5%, Stock X's expected coefficient of variation is:

- A) 0.167.
- B) 1.20.
- C) 6.0.



### Explanation

The coefficient of variation is the standard deviation divided by the mean:  $5 / 30 = 0.167$ .

(Study Session 2, Module 8.3, LOS 8.i)