CHAPTER 9

Audit Sampling

Review Questions

9–1 Nonstatistical sampling is an audit sampling technique in which the risk of sampling error is estimated by the auditors using professional judgment rather than by the laws of probability. Statistical sampling involves the quantification of the risk of sampling error through the use of mathematics and laws of probability.

9–2 Sampling risk is the possibility that the auditors will make an erroneous decision based on a sample result. To control sampling risk the auditors increase the size of their samples. Nonsampling risk is the risk of erroneous conclusions by the auditors based on any factor other than sampling. For example, the auditors may perform inappropriate tests, or they may not recognize errors in the sample items examined. Nonsampling risk may be controlled by adequate planning and supervision of engagements, and the establishment of effective quality control policies and procedures.

9–3 The physical representation of the actual population is the recorded value that represents the population. For example, if the auditors use a computer printout of recorded accounts payable from which to sample, they must attempt to determine that it properly includes all accounts payable.

9–4 All three of the methods of selecting items for examination (random number table selection, systematic selection, random number generator selection) will produce a random sample if properly applied. However, when using systematic sampling on a population that is not in random order, it may be necessary to stratify the population into segments or to use a relatively large number of starting points to produce a random sample.

9–5 "Systematic selection" in auditing means drawing every $n$th item from the population of items to be sampled. For example, the auditors might draw every tenth check from a file of paid checks. To help insure a random sample, the auditors should ascertain that the population is in random sequence, and is not, for example, classified by size of check. If the population is not in random order, the auditors may be able to stratify it into segments, each of which is in random order. They may also guard against a nonrandom sample by using several random starting points. Systematic selection is easily applied to unnumbered documents merely by counting off the sampling interval between documents to be selected.

9–6 Sampling without replacement means that once an item is drawn for inclusion in a sample, it is not replaced into the population prior to drawing the remaining items. Therefore, one item cannot be included more than once in a given sample. Sampling with replacement means that selected items are replaced into the population prior to drawing the next item. Under this method, it is possible for one item in the population to be drawn several times, thus representing several sample items in a given sample.
Sampling without replacement results in a smaller sample because the population is treated as finite.

If a particular account is drawn twice when sampling with replacement, the item is included twice in the sample. Note that when sampling without replacement the item is only included once.

The three major factors that determine the sample size for an attributes sampling plan are (1) the risks of assessing control risk too low, (2) the tolerable deviation rate, and (3) the expected population deviation rate. In addition, the size of the population has a small effect on the sample size.

In estimating the expected population deviation rate the auditors often use (1) the sample results from prior years, (2) experience with similar tests for other clients, or (3) results of a small pilot sample.

Combining several types of attributes in a definition of a deviation is acceptable, provided that the attributes are of similar audit significance. Note, however, that if various attributes of differing importance are combined, the significance of a specified deviation rate becomes obscured.

When an auditor believes that the expected rate exceeds the tolerable deviation rate, no test of controls will generally be performed. This is because control risk will normally be assessed at the maximum level since the control is believed to be ineffective since the expected deviation rate exceeds the deviation rate exceeding the tolerable deviation rate.

A dual-purpose test is one which tests and internal control procedure and substantiates the dollar amount of an account balance.

When performing dual-purpose test the sample size is determined by calculating the sample sizes for each of the purposes and then using the larger of the two.

Yes. If the sample was drawn on a random basis, the sample results should represent the true population characteristic within a specified allowance for sampling risk and with a specified level of sampling risk.

Expected deviation rate is a term associated with attributes sampling. In sampling for attributes, the required sample size will vary directly with the expected deviation rate. The higher the expected deviation rate, the larger the sample required to give an estimate of the true deviation rate with a specified sampling risk and allowance for sampling risk. Some students may point out that the higher the "true" deviation rate the smaller the sample size needed in discovery sampling. While this observation is correct, the "expected" deviation rate in a discovery sampling plan is always zero.

Attributes sampling would estimate the percentage of extensions that are in error, and variables sampling would estimate total dollar amount of misstatements in the schedule. In general, attributes sampling estimates the deviation rate (occurrence rate) of a characteristic, and the variables sampling estimates the dollar value of a characteristic.

In using a sequential sampling plan, the auditors select a small initial sample, and based on the results of examining it they decide (1) to assess control risk at the planned level, (2) assess control risk at a level higher than the planned level, or (3) to increase their sample size to get more information about operating effectiveness of the procedure. If they decide to increase their sample size.
size, they make a similar decision after examining the additional items. The process usually continues for no more than four stages.

9–19 In performing substantive tests of the book value of a population, the two aspects of sampling risk are:

\[ a. \text{ The risk of incorrect rejection} \]—that is, the possibility that the sample will indicate the existence of material misstatement when, in fact, material misstatement does not exist.

\[ b. \text{ The risk of incorrect acceptance} \]—that is, the possibility that the sample results will cause the auditor to accept the population as free of material misstatement when, in fact, material misstatement does exist.

The risk of incorrect acceptance is of more significance to auditors than the risk of incorrect rejection. If auditors incorrectly reject a population, they will perform more audit procedures to determine the nature and extent of the assumed material misstatement. These additional procedures will, presumably, lead the auditors to the correct conclusion. Thus, the risk of incorrect rejection causes inefficiency in the audit process, but does not cause the auditors to overlook material misstatements in the financial statements. The risk of incorrect acceptance, on the other hand, can lead directly to material misstatement being present in the audited statements. The condition can result in losses to those relying upon the financial statements, and possible legal liability for the auditors.

9–20 The auditors may obtain an estimate of the dollar amount of the standard deviation by procedures such as by (1) using the results obtained in previous years, (2) calculating the standard deviation of the population's book values, or (3) taking a small pilot sample.

9–21 The planned allowance for sampling risk is first used as an input into the formula for determining the appropriate sample size. It is then used for evaluating sample results when the sample’s standard deviation is equal to the estimated standard deviation. Note: In cases in which the estimated standard deviation differs from that obtained in the sample, an adjusted allowance for sampling risk may be calculated.

9–22 An adjusted allowance for sampling risk will be calculated when the estimated standard deviation differs from that obtained in the sample. This method keeps the risk of incorrect acceptance at its planned level. Students may point out that it can be calculated in all circumstances for evaluation purposes in that it provides the planned allowance for sampling risk in situations in which the estimated and sample's (audited value) standard deviations are equal.

9–23 The mean-per-unit sampling method's estimated total audited value of the population is $20 \times 10,000$ accounts, or $200,000$.

9–24 The use of ratio or difference estimation techniques requires that (1) each population item has a book value, (2) an audited value may be ascertained for each sample item, and (3) differences between audited and book values (misstatements) are relatively frequent.

9–25 When the client's book value falls outside the interval, the auditor may decide to (1) increase the sample size of the test, (2) perform other audit tests of the account, or (3) work with the client's personnel to locate other misstated items in the account.
9–26 When evaluating results using the mean-per-unit method the auditors do not directly use the difference between the audited values and the book values of the individual items in their sample. The estimated total audited value is compared to the book value of the entire population.

9–27 It is not correct to say that when using nonstatistical variables sampling it is impossible to project the misstatements identified to the entire population. In fact, auditors are required to project the misstatements identified in the sample to the population regardless of whether statistical or nonstatistical sampling is used.

9–28 When using nonstatistical sampling, the projected misstatement must be much lower than the tolerable misstatement in order for the auditors to conclude that an account balance is acceptable. Because statistical sampling is not being used, the auditors using nonstatistical sampling will apply judgment in determining whether the projected misstatement and the tolerable misstatement differ by an adequate amount to lead to a conclusion that the account balance is acceptable.

Questions Requiring Analysis

9–29 a. Relative to nonstatistical sampling, statistical techniques may provide the auditors with the following advantages:

(1) Designing efficient samples (that may avoid "overauditing").
(2) Measuring the sufficiency of the evidence obtained (this potentially could be helpful in a court proceeding or to help justify work to a client who was critical of the extent of testing).
(3) Objectively evaluating sample results.

b. Decisions requiring professional judgment in performing statistical tests of controls include:

(1) Identifying the controls to be tested. This involves consideration of the types of misstatements that might occur, identifying the controls that should prevent these misstatements, and deciding whether consideration of those controls to reduce the auditors' assessment of control risk would sufficiently reduce the required amount of substantive procedures to justify the related tests of controls.
(2) Defining a "deviation." If the test results are to be meaningful, all exceptions included in the definition of "deviation" must be similar in their potential audit significance.
(3) Determining the maximum tolerable deviation rate. This involves judgment because deviations do not necessarily correspond directly with misstatements in the financial statements. A single deviation may result in material misstatement, while numerous deviations may result in no misstatement.
(4) Establishing an appropriate risk of assessing control risk too low.
(5) Defining the population to be tested. The auditor may want to consider stratifying the population by time period if, for example, changes in internal control may have occurred or new personnel may have been hired.
(6) Evaluating the results. In addition to drawing statistical conclusions, the CPAs should evaluate the qualitative characteristics of the exceptions found in the sample. Also, if the sample results do not support the planned assessed level of control risk, the CPA must determine the required modification of substantive procedures.

c. When the CPAs have applied attributes sampling techniques and discovered that the deviation rate exceeds their stipulated maximum tolerable deviation rate, the following courses of action are available to them:
(1) An investigation might be made to determine the reasons for the unexpectedly high deviation rate and to ascertain its potential effect upon the financial statements.

(2) The CPAs might extend the size of their original sample to provide a more precise estimate of the population deviation rate.

(3) In light of the higher than anticipated deviation rate, the auditors must increase their assessment of control risk in the related area. This may necessitate expanding the planned substantive test procedures for assertions that are potentially affected by the control weakness.

9–30  

a. Attributes sampling.

b. The appropriate table for determining sample size is illustrated in Figure 9–4. Using the row for a 2 percent expected deviation rate and the column for a tolerable deviation rate of 8 percent, we find a required sample size of 77 items, with 2 allowable deviations.

c. No. Since 4 deviations is in excess of the allowable deviations (2) in Figure 9–4, the CPAs know that the upper limit is in excess of 8 percent. Figure 9.5 may be used to determine that when the sample contains 4 deviations the upper limit is 11.8 percent (using the table values for a sample of 75 items).

d. Population: 100,000, Confidence: 95%, Precision: 8.00%, Error Rate: 2.00

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e. Confidence: 95, Sample Size: 79, Number of Errors: 4

The upper error limit frequency is:

11.59%

No, the auditor can only conclude with a 5 percent risk of assessing control risk too low that the population deviation rate does not exceed 11.59%.

9–31 Discovery sampling can provide a high degree of confidence of locating an example of an exception when the exception has an occurrence rate in the population of as low as one half of 1 percent. If the number of forgeries is very small, however, discovery sampling could give little assurance of locating a forged check. For example, if only one forged check exists, the probability of it being included in a sample is exactly equal to the percentage of the population examined. Discovery sampling cannot rule out the possibility of one or a few forgeries with much assurance.

9–32 There are several major problems with this sampling plan and the method used to evaluate the sample results.

(1) The method of selection is likely to lead to a sample that is not representative of the population. Items on the same page of an inventory listing may be of similar type and cost. The cost of the items may have been determined by the same employee.
(2) The auditor should have considered taking a stratified sample of the inventory items. A stratified sample is more efficient and, in this case, probably more effective because it is unlikely that a $50,000 sample would be adequate to estimate the misstatement in a $5,000,000 inventory account. The variance in inventory account populations is usually very large.

(3) The auditor failed to project the misstatement in the sample to the population. The projected misstatement is equal to $500,000 ($5,000 \times \frac{[5,000,000]}{50,000})$, which is significantly greater than the $100,000 amount that is considered to be a material misstatement in the account.

(4) The auditor failed to consider the sampling risk that the true misstatement in the inventory might be significantly more than the projected misstatement.

(5) The auditor failed to propose an adjustment to the inventory for the $5,000 in known misstatements. Even though the amount is not material, the auditor should suggest that the adjustment be made.

The risk of incorrect acceptance is controlled by tightening or widening the allowance for sampling risk (ASR). The relationship between the planned allowance for sampling risk, sampling risk, and the maximum tolerable misstatement is expressed below:

$$\text{Planned ASR} = \frac{\text{Tolerable misstatement}}{1 + \left(\frac{\text{Incorrect acceptance coefficient}}{\text{Incorrect rejection coefficient}}\right)}$$

The tolerable misstatement was given as $500,000. The risk coefficients are taken from Figure 9.8; the coefficient for incorrect acceptance is 1.28 and the coefficient for incorrect rejection is 1.15. Thus, the required planned allowance for sampling risk may be determined as follows:

$$\text{Planned ASR} = \frac{500,000}{1 + (1.28/1.15)} = 236,630$$

a. Ratio and difference estimation techniques are appropriate when all of the following conditions are met: (1) every item in the population has a known book value, (2) an audited or correct value may be ascertained for every item included in the sample, and (3) differences between audited and book values are relatively frequent.

b. The relationship of the differences in audited and book values to book values determines whether ratio or difference estimation will be more effective. Ratio estimation is more effective when the differences are nearly proportional to book values. Thus, the ratios of audited to book values will be relatively constant. This occurs more frequently than might be apparent because of the tendency for transactions (and errors) to be nearly proportional to account balances. When misstatements are not nearly proportional to account balances, the variability of the ratios of audited to book values increases. This may cause difference estimation to become the more efficient technique.
9–35 The required sample size is calculated as:

\[
\text{Sample size} = \frac{\text{Population value} \times \text{Reliability factor}}{\text{Tolerable misstatement}}
\]

\[
= \frac{\$330,000 \times 3.00}{\$30,000} = 33
\]

9–36 The required sample size is calculated as:

\[
\text{Sample size} = \left(\frac{\text{Population size} \times \text{Incorrect rejection coefficient} \times \text{Estimated standard deviation}}{\text{Planned allowance for sampling risk}}\right)^2
\]

\[
\text{Sample size} = \left(\frac{5,000 \times 2.00 \times \$30}{\$25,000}\right)^2 = \left(\frac{\$300,000}{\$25,000}\right)^2 = 144 \text{ accounts}
\]

The problem states that the population consists of 5,000 invoices. Figure 9.8 shows the incorrect rejection coefficient corresponding to 4.6 percent as 2.00. The planned standard deviation and allowance for sampling risk are provided as $30, and $25,000, respectively.

**Objective Questions**

9–37 Multiple Choice Questions

a. (2) Sampling risk is the risk of making a wrong decision based on a sample result. The other choices are elements of nonsampling risk.

b. (1) The risk of incorrect rejection and assessing control risk too high relate to the efficiency of the audit since the related errors result in additional, unneeded, audit procedures. The risks of incorrect acceptance and assessing control risk too low relate to audit effectiveness.

c. (2) Block sampling is least desirable. It consists of all items during a selected time period, numerical sequence, or alphabetical sequence. Due to the relatively large number of blocks needed to form a reasonable audit conclusion, block sampling cannot generally be relied upon to efficiently produce a representative sample.

d. (3) A sample that is representative of the audit population must be obtained. The sample is "representative" in the sense that it allows the auditor to project sample results to the overall population. The sample may, but need not be random, stratified, or large.
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e. (2) Discovery sampling is a modified case of attributes sampling. Its purpose is to detect at least one deviation, with a predetermined risk of assessing control risk too low, if the deviation rate in the population is greater than the specified tolerable deviation rate. It is effectively used when auditors are looking for critical deviations that are not expected to be frequent in number.

f. (1) A larger variance in the dollar value of accounts (as measured by the standard deviation) results in a larger sample size because the standard deviation is in the numerator of the equation to calculate sample size—increasing the numerator increases sample size. The other factors all result in a smaller sample size.

g. (3) Attribute sampling is used for test of controls since it is a plan that enables auditors to estimate the rate of deviation in a population.

h. (1) Tolerable misstatement is directly related to materiality. That is, as the measure of materiality increases, the tolerable misstatement allocated to the various accounts is increased. Tolerable misstatement is materiality at the account balance level.

i. (1) When the expected deviation rate exceeds the tolerable deviation rate, it is unlikely that tests of controls will be performed. This is because in such a situation testing is only likely to reveal to the auditors that the system is not operating effectively as they expected.

j. (1) Mean-per-unit estimation is best because no "book value" is available for the trucks. The difference, ratio, and probability-proportional-to-size methods all require the comparison of a book value to an audited value.

k. (4) The estimated total audited value of the population using the mean-per-unit method is calculated as $203 (mean audited value in sample) × 1,000 accounts = $203,000.

l. (3) When calculating the estimated audited value of the population using the difference method the average misstatement is first calculated as $203 – $200 = $3. The projected misstatement is then calculated by multiplying the average misstatement times the number of accounts in the population, or $3 × 1000 = $3000. Because the average misstatement is an understatement, the projected misstatement of $3000 is added to the population book value of $198,000 to calculate the estimated audited value of $201,000.

9–38

a. True
b. True
c. True
d. True
e. True
f. True
g. True
h. False (The larger the standard deviation, the larger the required sample size.)
i. True
j. False (Unrestricted random sampling normally results in a larger sample size than stratified sampling.)
Case 1
(1) The required sample size from population 1 is larger than from population 2. An increase in population size, holding other factors constant, requires an increase in sample size.

Case 2
(4) The required sample size from population 1 relative to population 2 cannot be determined from this information. The greater variability of population 1 indicates the need for a larger sample, but the larger tolerable misstatement permits a smaller sample. Since the magnitude of these opposing factors is not known, the overall effect upon sample size cannot be determined.

Case 3
(1) A larger sample size is required for population 1 than for population 2. The larger size of population 1 and the smaller tolerable misstatement both indicate the need for a larger sample.

Case 4
(4) The required sample size from population 1 relative to population 2 cannot be determined from this information. The smaller size and variability of population 1 indicates the need for a smaller sample, but the lower planned risk of incorrect acceptance requires a larger sample. Since the magnitude of the factors is unknown, the overall effect cannot be determined.

Case 5
(3) A smaller sample size is required from population 1 relative to population 2. The smaller population size, larger tolerable misstatement and higher risk of incorrect acceptance all indicate the need for a smaller sample.

Definitions
a. 6
b. 2
c. 4
d. 7
e. 8
f. 10
g. 13
h. 14
i. 9

Problems
9–41 SOLUTION: Judgment in sampling  (Estimated time: 30 minutes)

a. Areas requiring the auditors to make judgment decisions when statistical sampling techniques are employed (only four required):

   (1) Defining the population, characteristics to be tested, and deviations. Unless a relationship is defined between the occurrence rate of deviations in the population and
either the propriety of the client's financial statements or the strength of internal
control, little useful information is gained by estimating the occurrence rate.

(2) Determining the appropriate statistical selection techniques for drawing a random
sample. The auditors must recognize the advantages and disadvantages of stratified
selection, unstratified selection, and systematic selection, and determine which
technique is appropriate for selecting an economical random sample.

(3) Establishing the required maximum tolerable deviation rate and the risk of assessing
control risk too low for the procedure. This requires judgment decisions regarding
materiality, time, cost, and the planned assessed level of control risk.

(4) Interpreting sample results. This requires a decision as to whether the results support
the auditors' planned assessed level of control risk, or whether additional sampling is
necessary to reach a conclusion.

(5) Following up on the discovery of critical errors or unacceptable deviation rates.

(6) Determining the circumstances under which statistical sampling is appropriate, and
those in which other techniques should be used in lieu of, or to supplement, the
statistical sampling techniques.

This is an open-ended question. The student may identify numerous other areas in which the
auditors must make judgment decisions.

b. If the CPAs' sample shows an unacceptable deviation rate, they may take the following
actions:

(1) They may enlarge their sample to increase the precision of their estimate.

(2) They may isolate the type of deviation and expand their examination as it relates to the
transactions that give rise to that type of deviation.

(3) The auditors' usual response to an unacceptably high deviation rate is to increase their
assessed level of control risk. Accordingly, the auditors would increase the intensity
of their substantive procedures.

c. Techniques for selecting an unstratified random sample of accounts payable vouchers include
the following:

Random Sample. A random sample is a sample of a given size drawn from a population in a
manner such that every possible sample of that size is equally likely to be drawn. Items may
be selected randomly by:

(1) Table of Random Numbers. Use one of a number of published tables. Using four
columns in the table, select the first 80 numbers, which fall within the range of 1 to
3,200. The starting point in the table should be selected randomly and the path to be
followed through the table should be set in advance and followed consistently.

(2) Random Number Generator. Using generalized audit software, generate a list of 80
random numbers.

Systematic Sample. A systematic sample is drawn by selecting every $nth$ item beginning
with one or more random starts.

(1) One Random Starting Point. Select every 40th voucher after selecting the initial
voucher (from 1 to 40) randomly.

(2) Several Random Starting Points. For example, use two random starting points and
select 40 of the 80 vouchers from each of the two sequences. Select every 80th
voucher (3,200/40) after each of the two random starting points between 1 and 80 for each of the two sequences.

9–42 SOLUTION: Abba Company (Estimated time: 20 minutes)

   a. The additional factors affecting the size of the sample include the risk of assessing control risk too low, the tolerable deviation rate, and, to a lesser extent, the population size.

   b. Sources of the estimate of the population deviation rate include (1) pilot sample results, (2) a review of prior working papers, and (3) professional judgment based on discussions with management, etc.

   c. Figure 9.5 indicates that when 4 deviations are identified (4 percent of 100) for a sample of 100 with a 5 percent risk of assessing control risk too low an achieved upper deviation rate of 9 percent is obtained.

   d. Among the actions possible when computed sample results exceed the established tolerable maximums include increasing the assessed level of control risk or expanding the sample size.

   e. **Confidence: 95, Sample Size: 100, Number of Errors: 4**

      The upper error limit frequency is: 9.16%

9–43 SOLUTION: Ingo Corporation (Estimated time: 20 minutes)

   a. As indicated in the table, a tolerable deviation rate of 4 percent would indicate an assessment of control risk at the low level.

   b. From Figure 9.4 we get a sample size of 117 with one allowable deviation.

   c. Using a sample size of 100 (the largest table sample size that does not exceed the actual size) and no deviations, Figure 9.5 indicates that the achieved upper deviation rate is 3 percent. The assessed level of control risk would be low.

   d. Using a sample size of 100 (the largest table sample size that does not exceed the actual size) and 2 deviations, Figure 9.5 indicates that the achieved upper deviation rate is 6.2 percent. The assessed level of control risk would still be low as it is less than 7 percent.

   e. Using a sample size of 100 (the largest table sample size that does not exceed the actual size) and 8 deviations, Figure 9.5 indicates that the achieved upper deviation rate is 14.0 percent. The assessed level of control risk would be slightly below the maximum because the upper deviation rate falls between 11 and 20 percent.
f. **Population:** 3,000, **Confidence:** 95 percent, **Precision:** 4.00 percent, **Error Rate:** 0.25

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 **g. Confidence:** 95, **Sample Size:** 119, **Number of Errors:** 0

The upper error limit frequency is: 2.52%

The assessed level of control risk is low.

 **h. Confidence:** 95, **Sample Size:** 119, **Number of Errors:** 2

The upper error limit frequency is: 5.29%

The assessed level of control risk is low.

 **i. Confidence:** 95, **Sample Size:** 119, **Number of Errors:** 8

The upper error limit frequency is: 12.13%

The assessed level of control risk is slightly below the maximum.

9–44 **SOLUTION:** Scott Duffney, CPA (Estimated time: 20 minutes)

(1) The mean-per-unit method estimates the total value of the population by (1) using the sample audited mean as an estimate of the true population mean, and (2) extending this estimated population mean by the number of items in the population as follows:

\[ \$990 \times 3,000 \text{ accounts} = \$2,970,000 \text{ estimated audited value} \]

The projected misstatement is equal to the client's book value minus the estimated audited value:

\[ \$3,000,000 - \$2,970,000 = \$30,000 \text{ projected misstatement (overstatement)} \]

(2) The projected misstatement using the ratio method is calculated as follows:
Sample net misstatement = \frac{\text{Sample net misstatement}}{\text{Sample items}} \times \text{Population book value}

Sample net misstatement = 100 \times ($990 - 998)
= -$800

Book value of the sample = 100 \times $998 = $99,800

Projected misstatement = \frac{-$800}{$99,800} \times $3,000,000
= $24,048 overstatement

The estimated audited value would be calculated as follows:

Estimated audited value = \text{Book value} - \text{projected overstatement}
= $3,000,000 - 24,048
= $2,975,952

(3) The projected misstatement using difference estimation would be calculated as follows:

Projected misstatement = \frac{\text{Sample net misstatement}}{\text{Sample items}} \times \text{Population items}

= \frac{-$800}{100} \times 3,000
= $24,000 overstatement

The estimated audited value would be calculated as follows:

Estimated misstatement = \text{Book value} - \text{projected misstatement}
= $3,000,000 - 24,000
= $2,976,000

9–45 SOLUTION: Mean-per-Unit Estimation (Estimated time: 25 minutes)

a. To calculate the required sample size the auditors must first calculate the planned allowance for sampling risk (ASR):
The tolerable misstatement is given, and the incorrect acceptance and rejection coefficients are from Figure 9.8.)

The sample size may next be determined as:

\[
\text{Planned ASR} = \left( \frac{\text{Tolerable misstatement}}{1 + \frac{\text{Incorrect acceptance coefficient}}{\text{Incorrect rejection coefficient}}} \right)
\]

\[
\text{Planned ASR} = \left( \frac{\$60,000}{1 + \frac{1.28}{1.96}} \right) = \$36,296
\]

b. (1) Using mean-per-unit sampling, the point estimate of the accounts receivable audited balance is calculated by multiplying the average audited value in the sample ($146) times the number of accounts in the population (10,000), or:

\[
\$146 \times 10,000 \text{ accounts} = \$1,460,000.
\]

(2) Since the client's book value is given as $1,500,000, the projected misstatement is $40,000 ($1,500,000 – $1,460,000).

(3) The formula for the adjusted allowance (ASR) for sampling risk is:

\[
\text{Tol. mis. - } \left( \frac{\text{Pop. value} \times \text{Inc. accept. coef.} \times \text{Est. std. dev.}}{\sqrt{\text{Sample size}}} \right)
\]

\[
\$60,000 - \left( \frac{10,000 \times 1.28 \times \$28}{\sqrt{183}} \right) = \$33,506
\]

(4) Because the interval calculated by using the point estimate of the account's audited value and adjusted ASR ($1,460,000 ± $33,506) does not include the client’s book value ($1,500,000), the auditor is unable to accept the population as not including misstatement in excess of the tolerable amount.
9–46 SOLUTION: Jexel (Estimated time: 20 minutes)

a. To calculate the required sample size the auditors must first calculate the planned allowance for sampling risk (ASR):

\[
\text{Planned ASR} = \frac{\text{Tolerable misstatement}}{1 + \left(\frac{\text{Incorrect accept. coef.}}{\text{Incorrect rej. coef.}}\right)}
\]

\[
= \frac{182,000}{1 + (1.64 / 2.00)}
\]

\[
= 100,000
\]

(The tolerable misstatement is given, and the incorrect acceptance and rejection coefficients are from Figure 9.8.)

The sample size may next be determined as:

\[
\text{Sample size} = \left(\frac{\text{Population size} \times \text{Incorrect rejection coefficient} \times \text{Estimated std. dev.}}{\text{Planned allowance for sampling risk}}\right)^2
\]

\[
= \left(\frac{10,000 \times 2.00 \times 25}{100,000}\right)^2 = 25
\]

b. To calculate the acceptance interval, the point estimate and the adjusted allowance for sampling risk (ASR) must be calculated as illustrated below:

Point estimate = 122 \times 10,000

= 1,220,000

Adjusted ASR = \text{Tolerable misstatement} - \left(\frac{N \times \text{Incorrect accept. coef.} \times \text{Est. std. dev.}}{\sqrt{\text{Sample size}}}\right)

\[
= 182,000 - \left(\frac{10,000 \times 1.64 \times 25}{\sqrt{25}}\right)
\]

\[
= 100,000
\]
Because the book value ($1,250,000) falls within the acceptance interval of the point estimate $1,220,000 ± the adjusted allowance for sampling risk ($100,000), the balance may be accepted as not being materially misstated.

The projected misstatement is calculated as follows:

Projected misstatement = Book value – Point estimate

= $1,250,000 – $1,220,000

= $30,000 overstatement

c. To calculate the acceptance interval, the adjusted allowance for sampling risk (ASR) and the point estimate must first be calculated:

\[
\text{Adjusted ASR} = \text{Tolerable misstatement} - \left( \frac{N \times \text{Incorrect accept. coef} \times \text{Est. std. dev.}}{\sqrt{\text{Sample size}}} \right)
\]

\[
= $182,000 - \left( \frac{10,000 \times 1.64 \times $20}{\sqrt{25}} \right)
\]

\[= $116,400\]

The point estimate is still $1,220,000.

Because the book value ($1,250,000) falls within the acceptance interval of the point estimate $1,220,000 ± the adjusted allowance for sampling risk ($116,400), the balance may be accepted as not being materially misstated.

The projected misstatement is still $30,000.

9–47 SOLUTION: Potomac Mills (Estimated time: 30 minutes)

a. (1) Mean-per-unit estimates the total value of a population by (1) using the sample mean as an estimate of the true population mean, and (2) extending this estimated population mean by the number of items in the population. The computations are as follows:

(1) Estimated population mean =

\[
$582,000/200 \text{ (lots)} = $2,910 \text{ (per lot)}
\]
(2) Estimated total audited value =

\[ 2,910 \text{ (per lot)} \times 2,000 \text{ (lots)} = 5,820,000 \]

(2) Ratio estimation estimates the total population value by (1) using the ratio of the sample audited values to book values as an estimate of the ratio of population audited value to book value, and (2) applying this estimated ratio to the population book value. The computations are as follow:

(1) Estimated ratio of audited to book values =

\[ 582,000 / 600,000 = 97\% \]

(2) Estimated total audited value =

\[ 97\% \times 5,900,000 = 5,723,000 \]

(3) Difference estimation estimates the total population value by (1) using the average difference between the audited and book values of sample items as an estimate of the average difference for all population items, (2) extending the estimated average difference by the number of items in the population, and (3) using the resulting estimate of the total difference between audited and book values to compute the estimated total value. The computations are as follow:

(1) Estimated average difference in audit and book values =

\[ (582,000 - 600,000) / 200 \text{ (lots)} = -90 \text{ (per lot)} \]

(2) Estimated total difference =

\[ -90 \text{ (per lot)} \times 2,000 \text{ (lots)} = -180,000 \]

(3) Estimated total audited value =

\[ 5,900,000 - 180,000 = 5,720,000 \]

b. The sample contains an element of sampling error with respect to the average dollar value of production lots. The mean book value of the population is $2,950 ($5,900,000/2,000 lots), while the mean book value in the sample is $3,000 ($600,000/200 lots). Mean-per-unit estimation uses the mean value of the sample as the basis for estimating total value. Thus, if the sample contains a disproportionate number of higher (or lower) priced items, this sampling error will affect the estimate of the total population value.

The estimate of total value developed in ratio estimation is based upon the ratio of audited values to book values, rather than upon mean dollar value. If this ratio has no tendency to vary with the dollar value of the lot, the estimate of total value is not affected by the mean value of items in the sample. However, sampling error may still be present if the sample lots are not representative of the population with respect to the ratio of audited values to book values.
SOLUTION: Evaluating Sample Results (Estimated time: 30 minutes)

a. The auditors would project the misstatement found in the sample to the population using either the ratio or difference approach. The ratio approach would result in a projected misstatement of $65,500. This may be computed by first calculating the ratio of the audited to book value as 1.0132 ($23,100/$22,800 [since there is a net understatement of $300, the audited value is $23,180]) and estimating the audited value of the population as:

$$1.0132 \times 5,000,000 = 5,066,000 \text{ (rounded)}$$

The projected misstatement is thus $66,000 under the ratio method. (Note: The student who rounded to 1.0, will have a book value of $5,050,000 and a projected misstatement of $50,000.)

The difference approach results in an average difference of $1.50 ($300 net difference divided by 200 items). Multiplying by the 100,000 invoices indicates a projected misstatement of $62,400 ($1.50 \times 41,600).

The auditors would then compare the projected misstatement to the tolerable misstatement (which is not provided) to determine whether to accept or reject the population.

b. As indicated in part (a) the average difference of $1.50 is projected to a total misstatement of $62,400. However, without information on the standard deviation of the differences we are unable to determine sampling risk.

c. If the sample of 200 invoices was selected as part of a valid sampling attributes plan, the auditors could use the 5 deviations observed in the sample to estimate the deviation rate in the population. Figure 9.5 reveals that for a sample of 200 items containing 5 deviations the achieved upper deviation rate is 5.2 percent, at a 5 percent risk of assessing control risk too low. Since the achieved upper deviation rate exceeds the stipulated maximum deviation rate of 5 percent, the sample results have not fulfilled the auditors' original requirements. Absent other circumstances, the auditors will increase the assessed level of control risk based on the results of the sample.

Landi Corporation (Estimated Time: 20 minutes)

a. The required sample size is calculated as:

$$\text{Sample size} = \left( \frac{\text{Pop. value} \times \text{Reliability factor}}{\text{Tolerable misstatement}} \right)$$

$$= \left( \frac{$2,500,000 \times 2.30}{57,500} \right) = 100$$
Chapter 09 - Audit Sampling

b.  (1) **Ratio Estimation Method:**

Projected misstatement = \( \left( \frac{\text{Sample net misstatement}}{\text{Book value of sample}} \right) \times \text{Book value of population} \)

Projected misstatement = \( \left( \frac{\$800}{\$17,000} \right) \times \$2,500,000 = \$117,647.06 \)

(2) **Difference Estimation Method:**

The average difference is $8 ($800/100 items); The projected misstatement is equal to $8 \times 15,000 accounts, or $120,000.

c. Because the projected misstatement far exceeds the tolerable misstatement of $57,500, the auditors would reject the population. This would normally result in additional procedures aimed at identifying the other misstated accounts.

9–50 SOLUTION: Kaplan Corporation (Estimated time: 25 minutes)

a. The required sample size is calculated as:

\[
\text{Sample Size} = \left( \frac{\text{Population book value} \times \text{Reliability factor}}{\text{Tolerable misstatement}} \right)
\]

\[
\text{Sample Size} = \left( \frac{\$1,000,000 \times 1.6}{\$50,000} \right) = 32
\]

b. The book value of the three accounts with misstatements is $1,512 ($100 + 512 + 900) while the audited value is $1,210 ($90 + 600 + 520). Since the remainder of the sample, 29 items, has an average book and audited value of $501, the total is $14,529 ($510 \times 29). Accordingly, the sample total audited and book value is as follows:
Accordingly, the misstatement in the sample is equal to $302 ($16,041 − $15,739)

The projected misstatement may be calculated as:

\[
\text{Projected misstatement} = \left( \frac{\text{Sample net misstatement}}{\text{Book value of sample}} \right) \times \text{Book value of population}
\]

\[
= \left( \frac{\$302}{\$16,041} \right) \times \$1,000,000 = \$18,826
\]

The population would be accepted because $18,826 does not approach $50,000.

**In-Class Team Cases**

9–51 SOLUTION: Mill Company (Estimated time: 25 minutes)

The incorrect assumptions, statements, and applications of attribute sampling include the following:

1. Statistical sampling does not eliminate the need for professional judgment.
2. The tolerable rate is too high (20 percent) if Baker plans to assess control risk at a low level.
3. Discovery sampling is not an appropriate sampling technique in this situation (it is appropriate when the deviation rate is expected to be near zero).
4. The sampling technique employed is not discovery sampling.
5. The increase in the population size has little or no effect on determining sample size.
6. Baker failed to consider the allowable risk of assessing control risk too low (risk of overreliance) in determining the sample size.
7. The population from which the sample was chosen (invoices) was an incorrect population since the objective was to ascertain whether shipments had been properly billed (the prenumbered shipping documents would have been a more appropriate population).
8. The sample selected was not randomly selected.
(9) Baker failed to consider the difference of an immaterial amount to be a deviation.

(10) The allowance for sampling risk was incorrectly calculated.

(11) Baker's reasoning concerning the decision that the sample supported a low assessed level of control risk was erroneous.

9–52. SOLUTION: Daulton & Weed, CPAs (Estimated time: 35 minutes)

a. (1) Sample size \( = \left( \frac{1.96 \times 6}{1} \right)^2 = 139 \) (rounded up).

(2) Sample size \( = \left( \frac{1.96 \times 6}{2} \right)^2 = 35 \) (rounded up).

(3) Sample size \( = \left( \frac{1.96 \times 16}{1} \right)^2 = 984 \) (rounded up).

(4) Sample size \( = \left( \frac{1.96 \times 16}{2} \right)^2 = 246 \) (rounded up).

b. (1) The standard deviation has a significant effect on the sample size because the standard deviation measures the information content obtained from the sample items about the mean of the population. There is a direct relationship between the standard deviation and the required sample size. As the standard deviation increases, the required sample size increases.

(2) The level of precision also has a significant effect on the sample size because it requires more sample items to get a more precise estimate of a population. Therefore, there is an inverse relationship between desired precision and the required sample size. As the desired precision decreases, the required sample size increases.

Note: Students may wonder why the population size is not considered in these formulas. Since we are estimating the precision around the mean value the population as opposed to the total value of a population, the population size is not considered. The formula assumes an infinite population.
Chapter 9 Appendices

9A–1 The factors that affect sample size in a PPS sample are (1) the recorded dollar amount of the population, (2) the reliability factor, (3) the tolerable misstatement, and (4) the expansion factor.

9A–2 The statement is correct since when using a systematic selection technique with PPS sampling every \( \text{nth} \) dollar (the size of the sampling interval) is selected. Accordingly, any account larger than that amount will be included in the sample. For example, assume a sampling interval of $1,000 and an account of $1,200. Since every 1000th dollar is selected, the $1,200 account, an accumulation of dollars \( n \) through \( n + 1,200 \) cannot be missed.

9A–3 When using the PPS approach auditors select items for inclusion in the sample using individual dollars. When evaluating results, however, auditors typically consider either the entire account, or invoice, as determining the status of one specific dollar of the account is often not possible.

9A–4 In probability-proportional-to-size sampling, each dollar included in the total book value of the population is considered to be a separate "item" for possible inclusion in the sample. Thus, the population would include 4,583,231 items. Of course, to audit a selected "dollar," the auditors must audit the value of the part or product to which that dollar is assigned.

9A–5 The statement is incorrect because one component of the upper limit on misstatement, the basic precision, will be greater than zero (basic precision = reliability factor \times sampling interval). However, note that the projected misstatement and the incremental allowance components of the upper limit on misstatement will equal zero when no misstatements are detected.

9A–6 To calculate the tainting percentage we must divide the misstatement $30 by the book value, here $120 ($90 audited value + $30 error). Accordingly, the tainting percentage is 25 percent. Students should be certain that they understand that the tainting percentage is the misstatement divided by the book value, not by the audited value.

9A–7 The reliability factor table is first consulted to identify a "reliability factor" for the sample size formula. Second, in evaluation, that factor is again used to calculate the sample's basic precision. Third, the reliability factor table is used in the computation of the incremental allowance.

9A–8 The projected misstatement is $16,000. This is calculated by multiplying the tainting percentage times the sampling interval. The tainting percentage is the amount of misstatement divided by the account's book value—here, 80 percent ($8000 / $10,000). The 80 percent tainting percentage multiplied times the sampling interval of $20,000 provides the $16,000 projected misstatement.

9A–9
a. In PPS sampling, the "items" in the population are the individual dollars comprising the population's book value. Thus, an accounts receivable population consisting of, say, 2,000 accounts with a total book value of $1,421,000 is regarded as a population of 1,421,000 items. In a mean-per-unit sampling plan, however, the "items" would be the 2,000 individual customer accounts.

b. PPS sampling results in automatic stratification of the population by dollar amount. Each account receivable has a probability of selection proportionate to its size. That is, a $1,000 account is twice as likely to be selected in the sample as a $500 account.
Audit risk (Estimated time: 25 minutes)

a. The audit risk of material misstatement in the financial statements (AR) is the product of:

(1) **Inherent Risk (IR)**, the risk of material misstatement in an assertion, assuming there were no related internal controls.
(2) **Control Risks (CR)**, the risk of material misstatement occurring in an assertion, and not being prevented or detected on a timely basis by internal control.
(3) **Analytical Procedures (AP)**, the risk that analytical procedures and other relevant substantive procedures would fail to detect material misstatements in the assertion being tested.
(4) **Test of Details (TD)**, the allowable risk of incorrect acceptance for the substantive tests of details.

In equation form, this relationship is expressed as follows:

\[ AR = IR \times CR \times AP \times TD \]

This equation may be restated to solve for the allowable detection risk as follows:

\[ TD = \frac{AR}{IR \times CR \times AP} \]

**NOTE:** This model may also be formulated with detection risk replacing AP and TD.

b. Using the risk levels set forth in the problem, and the above formula the allowable risk of incorrect acceptance for the substantive test of details is computed as illustrated below:

\[ TD = \frac{.02}{(.8 \times .5 \times .4)} = .125 \]

Thus the risk of incorrect acceptance should be limited to 16 percent if the auditors are to achieve their objective of holding audit risk to 2 percent.

c. Detection risk (DR) is the combination of AP × TD. Accordingly, the detection risk implicit in this problem is:

\[ DR = AP \times TD = .40 \times .125 = .05 \]
9A–11 SOLUTION: Desert Enterprises (Estimated time: 30 minutes)

a. (1) Required sample size is calculated as follows:

\[
\text{Sample size} = \frac{\text{Population book value} \times \text{Reliability factor}}{\text{Tolerable misstatement} - (\text{Expected misstatement} \times \text{Expansion factor})}
\]

\[
\text{Sample size} = \frac{500,000 \times 3}{25,000 - (2,000 \times 1.6)} = 69
\]

Note: The reliability factor is from the zero misstatements row of Figure 9.14.

(2) The sampling interval is calculated simply by dividing the book value of receivables by the sample size, as follows:

\[
\text{Sampling interval} = \frac{\text{Recorded receivables}}{\text{Sample size}} = \frac{500,000}{69} = 7,246
\]

b. The results may be evaluated as follows:

(1) Projected misstatement =

<table>
<thead>
<tr>
<th>Book Value</th>
<th>Audited Value</th>
<th>Misstatement</th>
<th>Tainting %</th>
<th>Sampling Interval</th>
<th>Projected Misstatement</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ 50</td>
<td>$ 47</td>
<td>$ 3</td>
<td>6%</td>
<td>$7,246</td>
<td>$ 435</td>
</tr>
<tr>
<td>800</td>
<td>760</td>
<td>40</td>
<td>5%</td>
<td>7,246</td>
<td>362</td>
</tr>
<tr>
<td>8,500</td>
<td>8,100</td>
<td>400</td>
<td>NA</td>
<td>NA</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>1,197</strong></td>
</tr>
</tbody>
</table>

(2) Basic precision = Reliability factor × Sampling interval

\[
= 3.0 \times 7,246 = \$21,738
\]

(3) Incremental allowance =

<table>
<thead>
<tr>
<th>Reliability Factor</th>
<th>Increment</th>
<th>(Increment-1)</th>
<th>Projected Misstatement</th>
<th>Incremental Allowance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.00</td>
<td>1.75</td>
<td>.75</td>
<td>$435</td>
<td>$ 326</td>
</tr>
<tr>
<td>4.75</td>
<td>1.55</td>
<td>.55</td>
<td>362</td>
<td>199</td>
</tr>
<tr>
<td>6.30</td>
<td>1.55</td>
<td>.55</td>
<td>362</td>
<td>199</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>525</strong></td>
</tr>
</tbody>
</table>

(4) Upper limit on misstatement = $ 1,197 + $21,738 + $525 = $23,460
NOTES:

Projected misstatement

a. Tainting percentages are calculated as the difference between book and audited value divided by book value (e.g., $(50 – 47)/50 = 6\%$).

b. No tainting percentage is calculated for items in excess of the sample interval and the actual misstatement is extended to projected misstatement (as for the third error).

Basic precision is always the reliability factor for zero misstatements multiplied times the sampling interval.

Incremental allowance

a. Reliability factors are read from Figure 9.14, starting at zero misstatements.

b. "Increment – 1" is the difference in the two adjacent reliability factors minus 1 (e.g., 4.75 – 3.00 – 1.00 = .75).

c. Misstatements in excess of the sampling interval are not considered in the incremental allowance. This is because the nature of the process requires that all items in excess of the sampling interval be included in the sample—therefore no allowance for items not in the sample is necessary.

c. The results obtained in part b would indicate that the auditors might accept the population as not containing a tolerable misstatement at the 5 percent level of risk of incorrect acceptance. The auditors would also consider the results obtained in conjunction with other audit tests.

d. **Population:** 500,000.00, **Confidence:** 95 percent, **Materiality:** 25,000.00, **Errors:** 2,000.00

<table>
<thead>
<tr>
<th>Sample size</th>
<th>69</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interval size</td>
<td>7,166.66</td>
</tr>
<tr>
<td>Maximum tolerable taintings</td>
<td>27.90%</td>
</tr>
</tbody>
</table>

*Note:* The interval size here varies from that obtained in part (a) above due to small differences in underlying assumptions incorporated into the ACL software.
e. **Confidence:** 95, **Interval:** 7,167

<table>
<thead>
<tr>
<th>Item</th>
<th>Error</th>
<th>Most Likely Error</th>
<th>Upper Error Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>21,500.00</td>
</tr>
<tr>
<td>Basic Precision</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.00</td>
<td>3.00</td>
<td>430.00</td>
<td>752.50</td>
</tr>
<tr>
<td>800.00</td>
<td>40.00</td>
<td>358.33</td>
<td>555.41</td>
</tr>
<tr>
<td>912.00</td>
<td>45.00</td>
<td>353.62</td>
<td>516.29</td>
</tr>
<tr>
<td>8,500.00</td>
<td>400.00</td>
<td>400.00</td>
<td>400.00</td>
</tr>
<tr>
<td>300.00</td>
<td>–25.00</td>
<td>–597.22</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td>944.73</td>
<td>23,724.20</td>
</tr>
</tbody>
</table>

**Note:** Part e includes an understated account (the account with a book value $300 has an audited value of $325). Although the text discussion does not consider understatements, note above how it is handled by ACL in the calculation of most likely error (projected misstatement)—in essence directly the opposite of an overstatement. The calculation is:

\[
\text{\(-$25 \text{ misstatement} / $300 \text{ book value}\) } \times 7,166.66 \text{ sampling interval } = –$597.22
\]

However, the misstatement is not considered by ACL in determining the upper error limit.

**Objective Questions**

9A–12

a. C
b. C
c. C
d. I
e. C
f. I
g. I
h. I
i. I. (It is the recorded amount divided by sample size: $300,000 / 100 = $3,000)
j. C

9A–13 Simulation

a. (1) 30 items. Calculated by dividing the population book value ($2,400,000) by the sampling interval size ($80,000).

Accordingly $2,400,000/80,000 = 30 items.
b. (7) $25,162.50. Calculated by summing the misstatements ($12.50 + $150 + $25,000 = $25,162.50).

c. (8) $42,000. Projected misstatement represents the most likely total misstatement in the population ($42,000).

d. (13) $294,550. The upper limit on misstatement is the sum of projected misstatement, basic precision, and the incremental allowance ($42,000 + $240,000 + $12,550 = $294,550).

e. (11) $252,550. The allowance for sampling risk is the sum of basic precision and the incremental allowance ($240,000 + $12,550 = $252,550).

f. (16) Reject because the upper limit on misstatement ($294,550) exceeds the tolerable misstatement ($280,000).

g. (17) Because basic precision uses a 3.0 factor, the test is being performed at 5 percent.

In-Class Team Case

9A–14 SOLUTION: Probability-Proportional-to-Size Sampling (Estimated time: 25 minutes)

a. The advantages of probability-proportional-to-size (PPS) sampling over classical variables sampling are as follows:

   • The technique is generally easier to use than classical variables sampling.

   • No estimate of the standard deviation of the population is needed.

   • The technique automatically stratifies the population because items are selected based on their dollar amount.

   • When there are few misstatements, the technique will generally result in a smaller sample size.

   • Sample selection can begin before the entire population is available.

b. Sampling interval = Recorded receivables/Sample size

   = $300,000/60 = $5,000

c. Projected misstatement

<table>
<thead>
<tr>
<th>Book Value</th>
<th>Audited Value</th>
<th>Misstatement</th>
<th>Tainting %</th>
<th>Sampling Interval</th>
<th>Projected Misstatement</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>320</td>
<td>80</td>
<td>20%</td>
<td>$5,000</td>
<td>1,000</td>
</tr>
<tr>
<td>500</td>
<td>0</td>
<td>500</td>
<td>100%</td>
<td>5,000</td>
<td>5,000</td>
</tr>
<tr>
<td>6,000</td>
<td>2,500</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>3,500</td>
</tr>
</tbody>
</table>

$9,500
d. \[ \text{Basic precision} = \text{Sampling interval} \times \text{Reliability factor} \]
\[ = 5,000 \times 3.00 = 15,000 \]

Incremental allowance =

<table>
<thead>
<tr>
<th>Reliability Factor</th>
<th>Increment</th>
<th>(Increment-1)</th>
<th>Projected Misstatement</th>
<th>Incremental Allowance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.00</td>
<td>1.75</td>
<td>.75</td>
<td>$5,000</td>
<td>$3,750</td>
</tr>
<tr>
<td>4.75</td>
<td>1.55</td>
<td>.55</td>
<td>1,000</td>
<td>550</td>
</tr>
<tr>
<td>6.30</td>
<td></td>
<td></td>
<td></td>
<td>$4,300</td>
</tr>
</tbody>
</table>

Note: Reliability factors are obtained from Figure 9.14.

e. \[ \text{The upper limit on misstatements} = \text{Projected misstatement} + \text{Basic precision} + \text{Incremental allowance} \]
\[ = 9,500 + 15,000 + 4,300 = 28,800 \]

f. You must reject the account as being possibly materially misstated because the upper limit on misstatements exceeds tolerable misstatement.

g. \[ \text{Population:} 300,000.00, \text{Confidence:} 95 \text{ percent}, \text{Materiality:} 15,000.00, \text{Errors:} 0.00 \]

<table>
<thead>
<tr>
<th>Sample size</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interval size</td>
<td>5,000.00</td>
</tr>
</tbody>
</table>

h. \[ \text{Confidence:} 95, \text{Interval:} 5,000 \]

<table>
<thead>
<tr>
<th>Item</th>
<th>Error</th>
<th>Most Likely Error</th>
<th>Upper Error Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Precision</td>
<td>500.00</td>
<td>500.00</td>
<td>5,000.00</td>
</tr>
<tr>
<td></td>
<td>400.00</td>
<td>80.00</td>
<td>1,000.00</td>
</tr>
<tr>
<td></td>
<td>6,000.00</td>
<td>3,500.00</td>
<td>3,500.00</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
<td>9,500.00</td>
</tr>
</tbody>
</table>
Integrating Problem

9A–15 SOLUtion: Integrating Problem (Estimated time: 40 minutes)

(1) The tolerable misstatement was given as $390,000. The risk coefficients are taken from Figure 9.8; the coefficient for incorrect acceptance is 1.64, and the coefficient for incorrect rejection is 1.64. Thus, the required planned allowance for sampling risk (ASR) may be determined as follows:

\[
\text{Planned ASR} = \frac{\text{Tolerable misstatement}}{1 + (\text{Incorrect acceptance coefficient} / \text{Incorrect rejection coefficient})}
\]

\[
\text{Planned ASR} = \frac{\$390,000}{1 + (1.64 / 1.64)} = \frac{\$390,000}{2} = \$195,000
\]

The required sample size may be determined as follows:

\[
\text{Sample size} = \left( \frac{\text{Population book value} \times \text{Incorrect rejection coefficient} \times \text{Est. std. dev.}}{\text{Planned allowance for sampling risk}} \right)^2
\]

\[
\text{Sample size} = \left( \frac{40,000 \times 1.64 \times 45}{\$195,000} \right)^2 = \left( \frac{\$2,952,000}{\$195,000} \right)^2 = 229 \text{ accounts}
\]

b. 93 items (from Figure 9.4).

c. To calculate projected misstatement, an estimate of the total audited value of the account must be calculated, and subtracted from the client's book value.

To calculate the audited value of the account, we must first calculate the audited value of the sample, and then project this to the population. The total misstatement in the account is an overstatement of $20,300 ($27,500 – 7,200). Therefore, the audited value of the sample is the book value of $40,800, less the $20,300 misstatement, or $20,500, and the projected misstatement is calculated as follows:

\[
\$20,500 / 208 \text{ accounts} = \$98.56 \text{ (approximately)}
\]

\[
\$98.56 \times 40,000 \text{ accounts in population} = \$3,942,400 \text{ estimate of audited value}
\]

\[
\$5,000,000 - \$3,942,400 = \$1,057,600 \text{ projected misstatement.}
\]

d. The adjusted allowance for sampling risk (ASR) may be calculated as follows:
Chapter 09 - Audit Sampling

Adjusted ASR = Tolerable Misstatement – \left( \frac{N \times \text{Incorrect accept. coef} \times \text{Est. std. dev.}}{\sqrt{\text{Sample size}}} \right)

Adjusted ASR = $390,000 – \left( \frac{40,000 \times 1.64 \times $55}{\sqrt{208}} \right)

Adjusted ASR = $139,445

Acceptance Interval = Audited value ± Adjusted ASR

Acceptance Interval = $3,942,400 ± $139,445

Because $5,000,000 is outside of this range, the population would be rejected.
e. Average audited value in sample = $98.56 (see part c)

Average book value in sample = $196.15 ($40,800/208)

Average difference = $196.15 – $98.56 = $97.59

$97.59 × 40,000 accounts = $3,903,600 projected misstatement.

*Note to Instructor:* Notice how the one large error resulted in an extremely large projected misstatement. While the problem is not completely realistic due to the various assumptions made (especially the small standard deviation), you might wish to point out that the small number of misstatements may lead to results such as this.

f. We are to ignore our answer to part b in responding to this question. Accordingly, we are to assume a sample of 208 accounts, with five deviations. Figure 9.5 includes a sample size of 200 (the closest to 208). Using that sample size and five deviations, we determine that the achieved upper deviation rate is 5.2 percent.

g. (1) Projected misstatement

<table>
<thead>
<tr>
<th>Book Value</th>
<th>Audited Value</th>
<th>Misstatement</th>
<th>Tainting %</th>
<th>Sampling Interval</th>
<th>Projected Misstatement</th>
</tr>
</thead>
<tbody>
<tr>
<td>$26,000</td>
<td>$ 5,950</td>
<td>$20,050</td>
<td>NA</td>
<td>NA</td>
<td>$20,050</td>
</tr>
<tr>
<td>1,000</td>
<td>900</td>
<td>100</td>
<td>10%</td>
<td>$24,038</td>
<td>2,404</td>
</tr>
<tr>
<td>220</td>
<td>200</td>
<td>20</td>
<td>9%</td>
<td>24,038</td>
<td>2,163</td>
</tr>
<tr>
<td>180</td>
<td>120</td>
<td>60</td>
<td>33%</td>
<td>24,038</td>
<td>7,933</td>
</tr>
<tr>
<td>100</td>
<td>30</td>
<td>70</td>
<td>70%</td>
<td>24,038</td>
<td>16,827</td>
</tr>
</tbody>
</table>

| $49,377 |

(2) Basic precision = Reliability factor × Sampling interval

3.0 × $24,038 = $72,114

(3) Incremental allowance

<table>
<thead>
<tr>
<th>Reliability Factor</th>
<th>Increment</th>
<th>(Increment-1)</th>
<th>Projected Misstatement</th>
<th>Incremental Allowance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.00</td>
<td>1.75</td>
<td>.75</td>
<td>$16,827</td>
<td>$12,620</td>
</tr>
<tr>
<td>4.75</td>
<td>1.55</td>
<td>.55</td>
<td>7,933</td>
<td>4,363</td>
</tr>
<tr>
<td>6.30</td>
<td>1.46</td>
<td>.46</td>
<td>2,404</td>
<td>1,106</td>
</tr>
<tr>
<td>7.76</td>
<td>1.40</td>
<td>.40</td>
<td>2,163</td>
<td>865</td>
</tr>
</tbody>
</table>

$18,954

(4) Upper limit on misstatement = $49,377 + $72,114 + $18,954

= $140,445