Chapter 15

Audit Sampling for Tests of Controls and Substantive Tests of Transactions

■ Concept Checks

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1. A representative sample is one in which the characteristics of interest for the sample are approximately the same as for the population (that is, the sample accurately represents the total population). If the population contains significant misstatements, but the sample is practically free of misstatements, the sample is nonrepresentative, which is likely to result in an improper audit decision. The auditor can never know for sure whether he or she has a representative sample because the entire population is ordinarily not tested, but certain things, such as the use of random selection, can increase the likelihood of a representative sample.

2. Statistical sampling is the use of mathematical measurement techniques to calculate formal statistical results. The auditor therefore quantifies sampling risk when statistical sampling is used. In nonstatistical sampling, the auditor does not quantify sampling risk. Instead, conclusions are reached about populations on a more judgmental basis. Auditing standards permit auditors to use either statistical or nonstatistical sampling methods.

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1. Analysis of exceptions is the investigation of individual exceptions to determine the cause of the breakdown in internal control. Such analysis is important because by discovering the nature and causes of individual exceptions, the auditor can more effectively evaluate the effectiveness of internal control. The analysis attempts to tell the “why” and “how” of the exceptions after the auditor already knows how many and what types of exceptions have occurred.

2. The steps of the audit sampling process that differ across statistical and nonstatistical sampling are as follows.

   - *Specify acceptable risk of overreliance*: the concepts are the same across the two methods, but quantifying the risk is usually handled differently. In nonstatistical sampling, auditors use categories such as high, medium, or low to quantify acceptable risk, whereas auditors using statistical sampling assign a specific amount (e.g., 10 percent) so that a statistical sample size can be determined and results can be statistically evaluated.

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- *Determine initial sample size*: In statistical sampling, auditors use software or tables to determine sample size based on a statistical formula. In both statistical and nonstatistical sampling approaches, auditors need to consider population size, TER, ARO, and EPER in determining sample sizes and should arrive at a similar sample size as a result.
- *Select the sample*: The only difference in sample selection is the requirement to use a probabilistic method when using statistical sampling.
- *Generalize from the sample to the population*: For statistical sampling, the auditor calculates the computed upper exception rate (CUER) at a specified ARO using audit software or tables based on a statistical formula. In nonstatistical sampling, the auditor compares the sample exception rate (SER) to the estimated population exception rate (EPER) in determining the acceptability of the population.

■ Review Questions

15-1 Sampling risk is the risk that the auditor reaches the wrong conclusion because a sample is not representative of the population. Sampling risk is an inherent part of sampling because the auditor is not testing the entire population. To reduce sampling risk, the auditor could increase sample size or use a sampling method that increases the likelihood of having a representative sample. Nonsampling risk is the risk that an auditor reaches the wrong conclusion for any reason other than sampling risk. For example, the auditor may perform procedures incorrectly or fail to correctly interpret the audit evidence. To reduce nonsampling risk, the auditor can follow auditing standards related to careful design of audit procedures, and proper supervision and review of audit work performed.

15-2 For both statistical and nonstatistical methods, the three main phases of audit sampling are:

1. Plan the sample
2. Select the sample and perform the tests
3. Evaluate the results

15-3 In probabilistic sample selection, the auditor randomly selects items from a population such that each item has a known probability of being included in the sample. Three examples of probabilistic sample methods include simple random sample selection, systematic sample selection, and probability proportional to size sample selection. In nonprobabilistic sample selection methods, such as haphazard sample selection and block sample selection, the auditor uses nonprobabilistic methods that approximate a random sampling approach.

15-4 A block sample is the selection of several items in sequence. Once the first item in the block is selected, the remainder of the block is chosen

automatically. Thus, to select 5 blocks of 20 sales invoices, one would select one invoice and the block would be that invoice plus the next 19 entries. This procedure would be repeated 4 other times.

15-5 In replacement sampling, an element in the population can be included in the sample more than once if the random number corresponding to that element is selected more than once. In nonreplacement sampling, an element can be included only once. If the random number corresponding to an element is selected more than once, it is simply treated as a discard the second time. Although both selection approaches are consistent with sound statistical theory, auditors rarely use replacement sampling; it seems more intuitively satisfying to auditors to include an item only once.

15-6 A simple random sample is one in which every possible combination of elements in the population has an equal chance of selection. Two methods of simple random selection are use of a random number table and use of the computer to generate random numbers. Auditors most often use the computer to generate random numbers because it saves time, reduces the likelihood of error, and provides automatic documentation of the sample selected.

15-7 In systematic sampling, the auditor calculates an interval and then methodically selects the items for the sample based on the size of the interval. The interval is set by dividing the population size by the number of sample items desired.

To select 40 numbers from a population of 2,800, the auditor divides 40 into 2,800 and gets an interval of 70. He or she then selects a random number between 0 and 69. Assume the auditor chooses 17. The first item is the number 17. The next is 87, then 157, 227, and so on.

The advantage of systematic sampling is its ease of use. In most populations a systematic sample can be drawn quickly, the approach automatically puts the numbers in sequential order, and documentation is easy.

A major problem with the use of systematic sampling is the possibility of bias. Because of the way systematic samples are selected, once the first item in the sample is selected, other items are chosen automatically. This causes no problems if the characteristics of interest, such as control deviations, are distributed randomly throughout the population; however, in many cases they are not. If all items of a certain type are processed at certain times of the month or with the use of certain document numbers, a systematically drawn sample has a higher likelihood of failing to obtain a representative sample. This shortcoming is sufficiently serious that some CPA firms prohibit the use of systematic sampling.

15-8 Random (probabilistic) selection is a part of statistical sampling, but it is not, by itself, statistical measurement. To have statistical measurement, it is necessary to mathematically generalize from the sample to the population.

Probabilistic selection must be used if the sample is to be evaluated statistically, although it is also acceptable to use probabilistic selection with a nonstatistical evaluation. If nonprobabilistic selection is used, nonstatistical evaluation must be used.

15-9 The purpose of using nonstatistical sampling for tests of controls and substantive tests of transactions is to estimate the proportion of items in a population containing a characteristic or attribute of interest. The auditor is ordinarily interested in determining internal control deviations or monetary misstatements for tests of controls and substantive tests of transactions.

15-10 An attribute is the definition of the characteristic being tested and the exception conditions whenever audit sampling is used. The attributes of interest are determined directly from the audit program. In a test of control, that attribute is evidence of the operation of the control consistent with the design. In a substantive test, the attribute is the absence of monetary misstatement.

15-11 An attribute is the characteristic being tested for in a population. An exception occurs when the attribute being tested for is absent. The exception for the audit procedure, the duplicate sales invoice has been initialed indicating the performance of internal verification, is the lack of initials on duplicate sales invoices.

15-12 The terms below are defined as follows:

TERM	DEFINITION
a. Acceptable risk of overreliance (ARO)	The risk the auditor is willing to take of accepting a control as effective or a rate of monetary misstatements as tolerable, when the true population exception rate is greater than the tolerable exception rate.
b. Computed upper exception rate (CUER)	The highest estimated exception rate in the population at a given ARO.
c. Estimated population exception rate (EPER)	The exception rate the auditor expects to find in the population before testing begins. It is necessary to plan the appropriate sample size.
d. Sample exception rate (SER)	The actual rate of exception discovered in the sample. It is calculated by dividing the actual number of exceptions in the sample by the sample size.
e. Tolerable exception rate (TER)	The exception rate the auditor will permit in the population and still be willing to use the assessed control risk and/or the amount of monetary misstatements in the transactions established during planning.

15-13 The sampling unit is the population item from which the auditor selects sample items. The major consideration in defining the sampling unit is making it consistent with the objectives of the audit tests. Thus, the definition of the population and the planned audit procedures usually dictate the appropriate sampling unit.

The sampling unit for verifying the occurrence of recorded sales would be the entries in the sales journal since this is the record the auditor wishes to validate. The sampling unit for testing the possibility of omitted sales is the shipping document from which sales are recorded, because the failure to bill a shipment is the exception condition of interest to the auditor.

15-14 The tolerable exception rate (TER) represents the exception rate that the auditor will permit in the population and still be willing to use the assessed control risk and/or the amount of monetary misstatements in the transactions established during planning. TER is determined by choice of the auditor on the basis of his or her professional judgment.

The computed upper exception rate (CUER) is the highest estimated exception rate in the population, at a given ARO. For nonstatistical sampling, CUER is determined by adding an estimate of sampling risk to the SER (sample exception rate). For statistical sampling, CUER is determined by using a statistical sampling table after the auditor has completed the audit testing and therefore knows the number of exceptions in the sample.

15-15 Tolerable exception rate (TER) is the result of an auditor's judgment. The suitable TER is a question of materiality and is therefore affected by both the definition and the importance of the attribute in the audit plan. It represents the exception rate that the auditor will permit in the population and still be willing to conclude that the control is operating effectively and/or the amount of monetary misstatements in the transactions established during planning is acceptable.

The sample size for a TER of 7% would be smaller than that for a TER of 4%, all other factors being equal.

15-16 The appropriate ARO is a decision the auditor must make using professional judgment. The degree to which the auditor wishes to reduce assessed control risk below the maximum is the major factor determining the auditor's ARO.

The auditor will choose a smaller sample size for an ARO of 10% than would be used if the risk were 5%, all other factors being equal.

15-17 The relationship between sample size and the four factors determining sample size are as follows:

a. As the ARO increases, the required sample size decreases.
b. As the population size increases, the required sample size is normally unchanged, or may increase slightly.
c. As the TER increases, the sample size decreases.
d. As the EPER increases, the required sample size increases.

15-18 When the CUER exceeds the TER, the auditor may do one or more of the following:

1. Revise the TER or the ARO. This alternative should be followed only when the auditor has concluded that the original specifications were too conservative, and when he or she is willing to accept the risk associated with the higher specifications.
2. Expand the sample size. This alternative should be followed when the auditor expects the additional benefits to exceed the additional costs. That is, the auditor believes that the sample tested was not representative of the population and that exceptions are not expected in the expanded sample.
3. Revise assessed control risk upward. This is likely to increase substantive procedures. Revising assessed control risk may be done if 1 or 2 is not practical and additional substantive procedures are possible.
4. Write a letter to management. This action should be done in conjunction with each of the three alternatives above. Management should always be informed when its internal controls are not operating effectively. If a deficiency in internal control is considered to be a significant deficiency in the design or operation of internal control, professional standards require the auditor to communicate the significant deficiency to the audit committee or its equivalent in writing. If the client is an accelerated filer publicly traded company, the auditor must evaluate the deficiency to determine the impact on the auditor's report on internal control over financial reporting. If the deficiency is deemed to be a material weakness, the auditor's report on internal control would contain an adverse opinion.

15-19 Attributes sampling is a statistical, probabilistic sampling method that results in an estimate of the proportion of items in a population containing a characteristic or attribute of interest. Attributes sampling is commonly used for tests of controls and substantive tests of transactions.

15-20 In this situation, the sample exception rate (SER) is 4%, the sample size is 100 and the ARO is 10%. From the 10% ARO table (Table 15-9) then, the CUER is 7.9%. This means that the auditor can state with a 10% risk of being wrong that the true population exception rate does not exceed 7.9%.

15-21 The decisions the auditor must make in using attributes sampling are:

- What are the objectives of the audit test?
- Does audit sampling apply?
- What attributes are to be tested and what exception conditions are identified?
- What is the population?
- What is the sampling unit?

15-21 (continued)

- What should the TER be?
- What should the ARO be?
- What is the EPER?
- What generalizations can be made from the sample to the population?
- What are the causes of the individual exceptions?
- Is the population acceptable?

In making the above decisions, the following should be considered:

- The individual situation.
- Time and budget constraints.
- The availability of additional substantive procedures.
- The professional judgment of the auditor.

■ Multiple Choice Questions From CPA Examinations

15-22 a. (3) b. (1) c. (1)

15-23 a. (3) b. (4) c. (4)

15-24 a. (4) b. (3) c. (2)

■ Multiple Choice Questions From Becker CPA Review

15-25 a. (3) b. (3) c. (1)

■ Discussion Questions and Problems

15-26 Note: The PCAOB has reorganized PCAOB auditing standards effective December 31, 2016. The responses below reflect the location of the appropriate guidance in the reorganized standards.

a. AS 2315, Audit Sampling, lists benefits and costs of statistical sampling in section .46. Statistical sampling allows the auditor to design an efficient sample, measure the sufficiency of evidence, and evaluate the sample results. Statistical sampling allows the auditor to quantify sampling risk. However, the costs of using a statistical sampling approach include the costs of training the auditors in appropriate methods, designing samples that satisfy the statistical requirements, and selecting items to be examined. Auditors trade off these benefits and costs in determining whether to use a statistical or nonstatistical approach.

15-26 (continued)

b. According to AS 2315.09-2315.11, audit risk includes both uncertainties from sampling (sampling risk) as well as uncertainties unrelated to sampling (nonsampling risk).

c. According to AS 2315.32, sampling is not always appropriate for tests of controls. For example, procedures performed during the planning process to obtain an understanding of internal controls do not involve sampling. Sampling is not appropriate for tests of controls related to separation of duties or when there is no documented evidence the control has been performed. Sampling also may not apply to procedures performed to obtain an understanding of the control environment (e.g., an inquiry or observation) or the accounting system.

d. These risks are defined in AS 2315.12. The risk of assessing control risk too low represents the risk that the level of control risk assessed by the auditor based on the sample is lower than the true operating effectiveness of the control warrants. This has the potential to impact the effectiveness of the audit if the auditor inappropriately relies on internal controls to reduce substantive testing. The risk of assessing control risk too high represents the risk that the level of control risk assessed by the auditor based on the sample is higher than the true operating effectiveness of the control warrants. This risk relates to the efficiency of the audit in that it could result in the auditor increasing the level of substantive testing unnecessarily.

15-27 (see text Web site for Excel solution for part a.- Filename **P1527.xls**)

a.

SAMPLING UNIT	NUMBERING SYSTEM FOR THE POPULATION	EXCEL SELECTION FORMULA
1. Sales invoice	All invoices numbered 0001 to 8274	=RANDBETWEEN(1,8274)
2. Bill of lading	All bills of lading numbered 18221 through 29427	=RANDBETWEEN(18221, 29427)
3. Customer	A pair of random numbers, where the first random number is the page number (1–20), and the second random number is the line number on the page (1–50)	=RANDBETWEEN(1,20) and =RANDBETWEEN(1,50)

15-27 (continued)

An example random sampling plan prepared in Excel (P1527.xls) is available on the text Web site. The command for selecting the random number can be entered directly onto the spreadsheet, or can be selected from the formulas tab (math & trig). It may be necessary to add the analysis tool pack to access the RANDBETWEEN function. Once the formula is entered, it can be copied down to select additional random numbers. When a pair of random numbers is required, the formula for the first random number can be entered in the first column, and the formula for the second random number can be entered in the second column.

b. First five numbers using systematic selection:

SAMPLING UNIT	INTERVAL	RANDOM STARTING POINT	FIRST 5 SAMPLE ITEMS
1. Sales invoice	110 (8274/75)	39	39 149 259 369 479
2. Bill of lading	149 [(29427-18221) = 11206/75]	18259	18259 18408 18557 18706 18855
3. Customer	13 (979 lines/75)	Page 1, line #11	**Page** **Line** 1 11 1 24 1 37 1 50 2 13

Using systematic selection, the definition of the sampling unit for determining the selection interval for population 3 is the total number of lines in the population. The length of the interval is rounded down to ensure that all line numbers selected are within the defined population.

15-28 (see text Web site for Excel solution for part c.- Filename **P1528.xls**)

a. To test whether shipments have been billed, a sample of warehouse removal slips should be selected and examined to see if they have the proper sales invoice attached. The sampling unit will therefore be the warehouse removal slip.

b. *Attributes sampling method*: Assuming the auditor is willing to accept a TER of 4% at a 5% ARO, expecting no exceptions in the sample, the appropriate sample size would be 74, determined from Table 15-8.

Nonstatistical sampling method: There is no one right answer to this question because the sample size is determined using professional judgment. Due to the relatively small TER (4%), the sample size should not be small. It will most likely be similar in size to the sample chosen by the statistical method.

c. Systematic sample selection:

- 22946 = Population size of warehouse removal slips (34687-11741).
- 74 = Sample size using statistical sampling (students' answers will vary if nonstatistical sampling was used in part b.)
- 310 = Interval (22946/74) if statistical sampling is used (students' answers will vary if nonstatistical sampling was used in part b.).
- 11878 = Random starting point.

Select warehouse removal slip 11878 and every 310th warehouse removal slip after (12188, 12498, etc.)

Computer generation of random numbers using Excel (P1528.xls):

=RANDBETWEEN(11741,34687)

The command for selecting the random number can be entered directly onto the spreadsheet, or can be selected from the formula (math & trig) tab. It may be necessary to add the analysis tool pack to access the RANDBETWEEN function. Once the formula is entered, it can be copied down to select additional random numbers.

d. Other audit procedures that could be performed are:

1. Test extensions on attached sales invoices for clerical accuracy. (Accuracy)

15-28 (continued)

2. Test time delay between warehouse removal slip date and billing date for timeliness of billing. (Timing)
3. Trace entries into perpetual inventory records to determine that inventory is properly relieved for shipments. (Posting and summarization)

e. The test performed in part c. cannot be used to test for occurrence of sales because the auditor already knows that inventory was shipped for these sales. To test for occurrence of sales, the sales invoice entry in the sales journal is the sampling unit. Since the sales invoice numbers are not identical to the warehouse removal slips it would be improper to use the same sample.

15-29 a. It would be appropriate to use attributes sampling for all audit procedures except audit procedures 1 and 2. Procedure 1 involves recalculation of just one month's sales journal's mathematical accuracy. The auditor would judgmentally select the month to test. Procedure 2 involves the performance of an analytical procedure for which the auditor is doing a 100% review of the entire sales journal.

b. The appropriate sampling unit for audit procedures 3-7 is a sales invoice number, date, or line item in the sales journal. The primary emphasis in the test is the occurrence and accuracy objectives.

c. The attributes for testing are as follows:

AUDIT PROCEDURE	ATTRIBUTE
3	The date that credit approval is documented on the sales order and precedes the date on the shipping document.
4	Entries in the sales journal have been shipped as evidenced by the existence of a related shipping document.
5	Evidence that prices used to calculate the sales amount on the invoice were matched to the approved price list.
6	The calculation of the sales amount on the sales invoice is mathematically accurate.
7	Entry in the sales journal matches entry in accounts receivable master file.

15-29 (continued)

d. The sample sizes for each attribute are as follows:

AUDIT PROCEDURE	TEST OF CONTROL OR SUBSTANTIVE TEST OF TRANSACTIONS	SAMPLE SIZE			SAMPLE SIZE
		ARO	TER	EPER	
3	T of C	5%	6%	1.0%	78
4	ST of T	5%	5%	0.5%	93
5	T of C	5%	6%	1.0%	78
6	ST of T	5%	5%	0.5%	93
7	ST of T	5%	5%	0.5%	93

15-30 a. Because the sample sizes under nonstatistical sampling are determined using auditor judgment, students' answers to this question will vary. They will most likely be similar to the sample sizes chosen using attributes sampling in part b. The important point to remember is that the sample sizes chosen should reflect the changes in the four factors (ARO, TER, EPER, and population size). The sample sizes should have fairly predictable relationships, given the changes in the four factors. The following reflects some of the relationships that should exist in student's sample size decisions:

	SAMPLE SIZE	EXPLANATION
1.	90	Given
2.	> Column 1	Decrease in ARO
3.	> Column 2	Decrease in TER
4.	> Column 1	Decrease in ARO (column 4 is the same as column 2, with a smaller population size)
5.	< Column 1	Increase in TER-EPER
6.	< Column 5	Decrease in EPER
7.	> Columns 3 & 4	Decrease in TER-EPER

b. Using the attributes sampling table in **Table 15-8**, the sample sizes for columns 1-7 are:

1. 88
2. 127
3. 181
4. 127
5. 25

15-30 (continued)

6. 18
7. 149

c.

CHANGE IN FACTORS	EFFECT ON SAMPLE SIZE	ILLUSTRATION IN PART a. or b.
1. Increase in ARO.	Decrease	Compare columns 4 and 1
2. Increase in TER.	Decrease	Compare columns 3 and 2 (population sizes are not consistent, but this has little effect on sample size)
3. Increase in EPER.	Increase	Compare columns 6 and 5
4. Increase in population size.	No effect or slight increase	Compare columns 4 and 2

d. The difference in the sample size for columns 3 and 6 result from the larger ARO and larger TER in column 6. The extremely large TER is the major factor causing the difference.

e. *The greatest effect on the sample size is the difference between TER and EPER*. For columns 3 and 7, the differences between the TER and EPER were 3% and 2% respectively. Those two also had the highest sample size. Where the difference between TER and EPER was great, such as columns 5 and 6, the required sample size was extremely small.

Population size has the least effect on sample size. The difference in population size in columns 2 and 4 was 99,000 items, but the sample sizes were the same using the attributes sampling table. Population size only effects sample size when the sample size is a large percentage of the population.

f. The sample size is referred to as the initial sample size because it is based on an estimate of the SER. The actual sample must be evaluated before it is possible to know whether the sample is sufficiently large to achieve the objectives of the test.

15-31 a.

	SER	TER-SER	ALLOWANCE FOR SAMPLING RISK SUFFICIENT?
1.	2%	3%	Probably*
2.	2%	3%	No (due to smaller sample size)*
3.	2%	3%	Yes
4.	2%	3%	Probably*
5.	2%	3%	No (due to small sample size)
6.	10%	NA	No (SER exceeds TER)
7.	0%	5%	Yes
8.	0%	5%	No due to small sample size

* Students' answers as to whether the calculated allowance for sampling risk is sufficient will vary, depending on their judgment. However, they should recognize the effect that lower sample sizes have on the allowance for sampling risk in situations 2, 5, and 8.

b. Using the attributes sampling table in Table 15-9, the CUERs for columns 1-8 are:

1. 4.6%
2. 6.2%
3. 4.0%
4. 4.6%
5. 9.2%
6. 16.4%
7. 3.0%
8. 11.3%

c.

	CHANGE IN FACTORS	EFFECT ON CUER	ILLUSTRATIONS IN PART a. or b.
1	Decrease in ARO	Increase	Compare columns 3 and 4
2	Decrease in population size	No effect or minor decrease	Compare columns 1 and 4

15-31 (continued)

	CHANGE IN FACTORS	EFFECT ON CUER	ILLUSTRATIONS IN PART a. or b.
3	Decrease in sample size	Increase	Compare columns 4 and 5 (both sample exception rates are 2%)
4	Decrease in the number of exceptions in the sample	Decrease	Compare columns 6 and 7

d. The factor that appears to have the greatest effect on CUER is the number of exceptions found in the sample compared to sample size. For example, in columns 2 and 6, the increase from 2% to 10% SER dramatically increased the CUER. Population size appears to have the least effect. For example, in columns 1 and 4, the CUER was the same using the attributes sampling table even though the population in column 1 was 10 times larger.

e. The CUER represents the results of the actual sample whereas the TER represents what the auditor will allow. They must be compared to determine whether or not the population is acceptable.

15-32 a. and b. The sample sizes and CUERs are shown in the following table:

	ACTUAL SAMPLE SIZE	INITIAL SAMPLE SIZE FROM TABLE 15-8	SER	CUER FROM TABLE 15-9	TER
1	100	127	2.0%	6.2%	6.0%
2	100	93	4.0	9.0	5.0
3	20	18	5.0	18.1	20.0
4	100	99	0.0	3.0	3.0
5	60	65	1.7	6.4	8.0
6	60	60	13.3	20.8	15.0

a. The auditor selected a sample size smaller than that determined from the tables in populations 1 and 5. The effect of selecting a smaller sample size than the initial sample size required from the

15-32 (continued)

table is the increased likelihood of having the CUER exceed the TER. If a larger sample size is selected, the result may be a sample size larger than needed to satisfy TER. That results in excess audit cost. Ultimately, however, the comparison of CUER to TER determines whether the sample size was too large or too small.

b. The SER and CUER are shown in columns 4 and 5 in the table on the preceding page.

c. The population results are unacceptable for populations 1, 2, and 6. In each of those cases, the CUER exceeds TER.

The auditor's options are to change TER or ARO, increase sample size, or perform other substantive tests to determine whether there are actually material misstatements in the population. An increase in sample size may be worthwhile in population 1 because the CUER exceeds TER by only a small amount. Increasing sample size would not likely result in improved results for either population 2 or 6 because the CUER exceeds TER by a large amount.

d. Analysis of exceptions is necessary even when the population is acceptable because the auditor wants to determine the nature and cause of all exceptions. If, for example, the auditor determines that a misstatement was intentional, additional action would be required even if the CUER were less than TER.

e.

TERM	NATURE OF TERM
1. Estimated population exception rate	Nonstatistical estimate made by auditor
2. Tolerable exception rate	Audit decision
3. Acceptable risk of overreliance	Audit decision
4. Actual sample size	Audit decision (determined by other audit decisions)
5. Actual number of exceptions in the sample	Sample result
6. Sample exception rate	Sample result
7. Computed upper exception rate	Statistical conclusion about the population

15-33 a. Based on the given ARO of 5% (confidence level of 95%), a CUER of 7.92% indicates the auditor can conclude that the exception rate in the population is no greater than 7.92% with a

5% risk of the exception rate exceeding 7.92%. Stated differently, the auditor is 95% confident that the population exception rate does not exceed 7.92%.

b. Given that Annie established a tolerable exception rate (TER) of 5%, she cannot conclude that the control is effective because the CUER of 7.92% (based on one identified deviation) exceeds the TER of 5%.

c. Annie has the following options given that CUER exceeds TER:
   1. Revise the TER or the ARO. She would choose this alternative only if she concludes that the original specifications were too conservative, or if she is willing to accept the risk associated with the higher specifications.
   2. Expand the sample size. She would choose this alternative if she believes that the sample tested was not representative of the population and that exceptions are not expected in the expanded sample.
   3. Revise assessed control risk upward. This is likely to increase substantive procedures. Revising assessed control risk may be done if 1 or 2 is not practical and additional substantive procedures are possible.
   4. Disclose the information to management. This action should be done in conjunction with each of the three alternatives above to inform management that internal controls are not operating effectively.

d. The controller's explanation that the deviation occurred while a temporary employee was covering for the regular clerk could impact which of the alternatives listed in part c. would be most appropriate. If the exception is isolated to a brief time period, then Annie may choose to expand the sample. She would expect zero deviations for any observations drawn outside the time period covered by the temporary employee. In expanding the sample, she could test additional transactions occurring outside the time period, and assuming zero exceptions are identified in the expanded sample and the CUER is less than TER, she could conclude controls are effective. Deciding between the options discussed in part c. would still be a matter of weighing the costs and benefits of each.

15-34 a. The following shows which are exceptions and why:

INVOICE NUMBER	EXCEPTION?	TYPE OF EXCEPTION
5028	No	Error was detected and corrected by client.
6791	No	Sales invoice was voided.
6810	Yes	Proof of shipment not presented.
7364	No	Credit collection problem; should be noted for review of allowance for doubtful accounts.
7625	Yes	Duplicate sales invoice not properly filed.
8431	Yes	Invoices not recorded by proper date; represents potential cutoff problem.
8528	Yes	Customer orders not included in invoice package to verify compliance with the order.
8566	Yes	Error in pricing. No internal verification.
8780	Yes	Duplicate sales invoice not properly filed.
9169	Yes	Credit not authorized.
9974	Yes	Internal verification of price extensions and postings of sales invoices was not included.

b. It is inappropriate to set a single acceptable tolerable exception rate and estimated population exception rate for the combined exceptions because each attribute has a different significance to the auditor and should be considered separately in analyzing the results of the test.

c. The SER assuming a 5% ARO for each attribute and a sample size of 150 is as shown in the table on the following page:

15-34 (continued)

INVOICE NUMBER	DESCRIPTION OF ATTRIBUTE	NUMBER OF EXCEPTIONS	SER
6810	Shipping document not located	1	.67%
7625 8528 8780	Duplicate sales invoice/ customer order not located	3	2.00%
8431	Invoice date improper	1	.67%
8566	Price extensions and postings incorrect	1	.67%
8566 9974	Price extensions and postings not internally verified	2	1.33%
9169	Credit not authorized	1	.67%

d.

INVOICE NUMBER	TER-SER	ALLOWANCE FOR SAMPLING RISK SUFFICIENT?
6810	5.33%	Yes
7625 8780 8528	4.0%	Probably*
8431	5.33%	Yes
8566	5.33%	Yes
8566 9974	4.67%	Probably*
9169	5.33%	Yes

* Students' answers will most likely vary for this attribute.

e. For each exception, the auditor should check with the controller to determine an explanation for the cause. In addition, the appropriate analysis for each type of exception is as follows:

15-34 (continued)

INVOICE NUMBER	EXCEPTION ANALYSIS
6810	Confirm the account balances to the customers; examine the reduction in the perpetual inventory records.
7625	Trace the amount to the sales journal and accounts receivable master file; examine the shipping document and recompute the sale amount.
8431	Determine who recorded the invoice and check several others prepared by him or her to determine if the problem consistently occurs.
8528	Examine the accounts receivable master file for subsequent cash receipt; examine sales invoices for other invoices to the same customer to determine if customer orders were attached.
8566	Check the price on other invoices to the same customer. Check the price on other invoices that have the same product.
8780	See 7625
9169	Check credit history of customer and evaluate collectibility of the customer's account.
9974	Recheck actual price, extensions, and postings; determine who the clerk was and check several other invoices for proper indication of performance.

15-35 a.

ATTRIBUTE	MISSING ELEMENT
1	CUER is 9.2%
2	Initial sample size is 77
3	Tolerable exception rate is 7%
4	The actual number of exceptions in the sample was 1
5	ARO is 5%
6	Sample size is 70

b. The sample results are unacceptable for Attributes 1 and 6 because CUER exceeds TER for those attributes.

c. Attribute 1 has a lower ARO, which normally would lead to a large sample size. TER-EPER is 6% for both attribute 1 and attribute 3. The sample size for attribute 1 is smaller than the sample size for attribute 3 because the estimated population exception rate is 0%

15-35 (continued)

for attribute 1 but 1% for attribute 3. Because there is no expectation of errors in the population, the sample size is smaller for attribute 1.

d. The CUER is smaller for attribute 2 relative to attribute 5 because ARO is higher in attribute 2 relative to attribute 5, which means the auditor has a greater willingness to accept the risk that the assessment of control risk is too low for attribute 2.

■ Case

15-36 a. Audit sampling could be conveniently used for procedures 3 and 4 since each is to be performed on a sample of the population.

b. The most appropriate sampling unit for conducting *most* of the audit sampling tests is the shipping document because most of the tests are related to procedure 4. Following the instructions of the audit program, however, the auditor would use sales journal entries as the sampling unit for step 3 and shipping document *numbers* for step 4. Using shipping document numbers, rather than the documents themselves, allows the auditor to test the numerical control over shipping documents, as well as to test for unrecorded sales. The selection of numbers will lead to a sample of actual shipping documents upon which tests will be performed.

c. *Note: The sampling data sheet that follows assumes an attributes sampling approach*. The only difference between the sampling data sheet for attributes sampling and for nonstatistical sampling is the actual determination of sample size. For nonstatistical sampling, students' answers will vary, but will most likely be comparable to the sample sizes determined under attributes sampling.

DESCRIPTION OF ATTRIBUTES	EPER	TER	ARO	INITIAL SAMPLE SIZE*
A duplicate sales invoice exists for the shipping document selected.	1.0	5.0	10	77
Shipping document agrees with related duplicate sales invoice.	0.0	4.0	10	57

15-36 (continued)

DESCRIPTION OF ATTRIBUTES	EPER	TER	ARO	INITIAL SAMPLE SIZE*
The duplicate sales invoice has attached a copy of the shipping document, shipping order, and customer order.	1.0	5.0	10	77
The shipping order has proper credit approval.	1.0	5.0	10	77
The duplicate sales invoice has internal verification of computations.	1.0	5.0	10	77
The duplicate sales invoice has the same price and quantity as approved price list and shipping document.	0.0	4.0	10	57
Customer name, amount and date agrees between duplicate sales invoice and sales journal and subsidiary ledger.	0.0	4.0	10	57

* assumes the shipping document is the sampling unit.

■ Integrated Case Application

15-37 (see text Web site for Excel formatted sampling data sheet for part a.-d. Filename **P1537.xls**)

a. and d.

PINNACLE MANUFACTURING—PART VI

Client: Pinnacle Manufacturing

Audit Area: Tests of Controls and Substantive Test of Transactions — Acquisitions.

Define the Objective(s): Examine vendors' invoices, receiving reports, purchase orders, and other related documents to determine whether the system has functioned as intended and as described in the audit program.

15-37 (continued)

Define the population precisely (including stratification, if any): Vouchers from 1/1/2016 to 10/31/2016. First voucher number – 6734. Last voucher number – 33722.

Define the sampling unit, organization of population items, and random selection procedures: Voucher number, recorded sequentially in the acquisitions journal; random number function in electronic spreadsheet.

	Planned Audit				Actual Results			
Description of Attributes	**EPER**	**TER**	**ARO**	**Initial Sample Size**	**Sample Size**	**Number of Exceptions**	**SER**	**Calculated Sampling Error (TER-SER)**
1. Evidence of internal verification of voucher package including propriety of purchase, dates, unit costs, prices, extensions, footings, account classification, recording in journal, and posting and summarization. (6a, b)	0	6%	10%	30	30	2	6.7%	-.7% (note SER exceeds TER)
2. Prices on vendors' invoices conform to approved price limits established by management. (6c)	0	5%	10%	40	40	0	0	5%
3. Price times quantity and other calculations on the vendor's invoice are correct. (6d)	1%	5%	10%	50	50	0	0	5%
4. Evidence of proper account classification on vendors' invoices. (6e)	2%	5%	10%	70	70	0	0	5%
5. Dates on entries in purchases journal agree with dates on receiving reports. (6f)	1%	5%	10%	50	50	2	4%	1%
6. Evidence of internal verification of each purchase voucher. (6g)	0	6%	10%	30	30	0	0%	6%

Results: Based on the results of the tests, all controls appear effective except for evidence of internal verification. Since there were also two errors on timing and an error in comparing the vendor's invoice amount to the acquisitions journal that is not included as an attribute, a larger than normal sample in year-end testing of accounts payable is appropriate.

Notes:
1. The planned audit variables are judgmental. The results of the prior year from part III were used to decide EPER. Initial sample size and CUER are judgments.
2. There was an error discovered where there was no attribute. This happens in practice, too. The auditor should not ignore the exception even though it is an unplanned discovery.

15-37 (continued)

b. **Client:** Pinnacle Manufacturing

Audit Area: Tests of Controls and Substantive Test of Transactions — Cash Disbursements

Define the Objective(s): Examine cancelled checks and other related documents to determine whether the system has functioned as intended and as described in the audit program.

Define the population precisely (including stratification, if any): Cancelled checks from 1/1/2016 to 10/31/2016. First check number – 12376. Last check number – 37318.

Define the sampling unit, organization of population items, and random selection procedures: Check number, recorded sequentially in the cash disbursements journal; random number function in electronic spreadsheet.

	Planned Audit				Actual Results			
Description of Attributes	**EPER**	**TER**	**ARO**	**Initial Sample Size**	**Sample Size**	**Number of Exceptions**	**SER**	**Calculated Sampling Error (TER-SER)**
1. Payee, name, amount, and date on cancelled check agrees with related purchases journal and cash disbursements entry. (9a)	0	5%	10%	40				
2. Evidence of signature, proper endorsement and cancellation of each check. (9b)	0	5%	10%	40				
3. Date on cancelled check agrees with bank cancellation date. (9c)	2	5%	10%	70				
4. Cash discounts are correct. (9d)	0	5%	10%	40				

15-37 (continued)

c. Population = voucher numbers 6734 to 33722

Sample size = 50

Random Selection:

If random selection is performed using Excel, the command to select numbers randomly from the population is:

=RANDBETWEEN(6734, 33722)

The command for selecting the random number can be entered directly onto the spreadsheet, or can be selected from the function menu (math & trig) functions under the "insert" menu. It may be necessary to add the analysis tool pack to access the RANDBETWEEN function. Once the formula is entered, it can be copied down to select additional random numbers. The random numbers will vary for each student, so they are not listed in this solution.

■ **15-38 ACL Problem**

a. There are 4,082 records included in the Invoices file as noted on the bottom of the screen.

b. The sample size is 39 and the sampling interval is 104 (rounded down from 104.66).

c. If the confidence level is increased to 95% and the other sampling parameters are not changed, the sample size increases to 50. If the upper limit is increased to 8% and the confidence level is 90%, the sample size decreases to 29.

(**Note**: answers to part b. and c. are similar to answers obtained using Table 15-8 on p. 508. Differences in sample size of one or two items likely reflect rounding.)

15-38 (continued)

d. The sample is included below (not all columns shown):

Invoice Number	Sales Order Number	Customer Number	Invoice Date	Invoice Amount
173640036997	000008176082	0252432	2/10/2014	29144.36
173640037166	000008176251	0258424	3/9/2014	11167.69
173640037196	000008176281	0261014	3/12/2014	3723.44
173640037226	000008176311	0260835	3/22/2014	21582.56
173640037472	000008176558	0263402	4/15/2014	5009.58
173640037506	000008176592	0255268	4/16/2014	11707.48
173640037545	000008176631	0255998	4/28/2014	19450.53
173640037782	000008176869	0257490	5/11/2014	23638.49
173640037800	000008176887	0257884	5/11/2014	4639.11
173640037808	000008176895	0235520	5/17/2014	1595.31
173640037891	000008176978	0260600	5/20/2014	945.32
173640037931	000008177018	0245068	5/21/2014	27755.91
173640037940	000008177027	0262176	5/26/2014	19244.99
173640038114	000008177201	0257847	6/1/2014	7401.07
173640038204	000008177291	0240643	6/16/2014	15132.12
173640038292	000008177379	0249233	6/16/2014	15728.09
173640038449	000008177536	0244063	6/29/2014	22261.59
173640038458	000008177545	0241913	6/24/2014	6188.54
173640038611	000008177698	0239939	6/29/2014	4170.89
173640038717	000008177804	0256692	7/13/2014	15043.24
173640038905	000008177992	0240304	7/8/2014	9413.12
173640039091	000008178178	0250396	7/22/2014	3210.42
173640039277	000008178364	0239614	7/30/2014	2745.13
173640039343	000008178430	0244488	8/10/2014	20998.44
173640039430	000008178517	0234834	8/20/2014	15128.39
173640039457	000008178544	0251543	8/20/2014	3238.49
173640039487	000008178574	0252534	8/10/2014	768.13
173640039502	000008178589	0244430	8/16/2014	7268.08
173640039589	000008178677	0253965	8/27/2014	1276.47
173640039617	000008178705	0260685	8/27/2014	17376.00
173640039969	000008179057	0244080	9/23/2014	2010.65
173640040032	000008179121	0242752	9/20/2014	13466.11
173640040150	000008179239	0260166	9/30/2014	15636.04
173640040214	000008179303	0248413	9/30/2014	1137.00
173640040565	000008179655	0256038	10/21/2014	1538.06
173640040583	000008179673	0247128	10/29/2014	16293.16
173640040585	000008179675	0263951	10/29/2014	19807.72
173640040697	000008179787	0237042	11/16/2014	2967.13
173640040739	000008179829	0250143	11/25/2014	5182.95

15-38 (continued)

Students should generate the same solution if they use the assigned seed number. Without the seed number, student's solutions will be unique. The formatting of students' solutions may also appear differently if printed in ACL. The solution above was exported to Excel, and not all columns of the dataset are included above.

e. The largest invoice amount included in the sample above is $29,144.36 (invoice number 173640036997). Since record sampling was used, the invoice amount is not considered.

f. Because the sample size was based on zero planned exceptions, the presence of one exception should make the results unacceptable. Using a confidence of 90%, sample size of 39 and 1 error, ACL calculates an upper error limit of 9.97%, which exceeds the tolerable limit of 6%