Statistics

CREDIT HOURS 3
LEVEL LOWER

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Before You Choose This UExcel Exam

Uses for the Examination

- Excelsior College, the test developer, recommends granting three (3) semester hours of lower-level undergraduate credit to students who receive a letter grade of C or higher on this examination.

- Other colleges and universities also recognize this exam as a basis for granting credit or advanced standing.

- Individual institutions set their own policies for the amount of credit awarded and the minimum acceptable grade.

Exam-takers who have applied to Excelsior College should ask their academic advisor where this exam fits within their degree program.

Exam-takers not enrolled in an Excelsior College degree program should check with the institution from which they wish to receive credit to determine whether credit will be granted and/or to find out the minimum grade required for credit. Those who intend to enroll at Excelsior College should ask an admissions counselor where this exam fits within their intended degree program.

For more information on exam availability and actual testing information, see the Exam Registration and Information Guide.

Examination Length and Scoring

The exam consists of approximately 72 single-answer, multiple-choice questions; see the sample questions at the back of this guide. You will have two (2) hours to complete the exam. Your score will be reported as a letter grade. Questions are scored either correct (1) or incorrect (0). There is no partial credit. Each credit-bearing exam contains pretest questions, which are embedded throughout the exam. They are indistinguishable from the scored questions. It is to your advantage to do your best on all the questions. Pretest questions are being tried out for use in future versions of the exam.

The UExcel exams do not have a fixed grading scale such as A = 90–100%, B = 80–90%, and so forth, as you might have seen on some exams in college courses. Each UExcel test has a scale that is set by a faculty committee and is different for each exam. The process, called standard setting, is described in more detail in the Technical Handbook. Excelsior puts each exam through a standard setting because different test questions have different levels of difficulty. To explain further, getting 70% of the questions right on the exam when the questions are easy does not show the same level of proficiency as getting 70% of questions correct when the questions are hard. Every form of a test (a form contains the test questions) has its own specific grading scale tailored to the particular questions on each exam form.

Please also note that on each form, some of the questions count toward the score and some do not; the grading scale applies only to those questions that count toward the score. The area with percentage ratings on the second page of your score report is intended to help identify relative strengths and weaknesses and which content areas to emphasize, should you decide to...
take the examination again. Your grade is based on both scored and pretest questions—pretest questions which are not scored. Therefore, the percentage ratings do not necessarily reflect the total percentage that counted toward your grade.

For the best view of the types of questions on this exam, see the sample questions in the back of this guide. Practice, practice, practice!

Score Reporting

For most of our examinations, based on performance, an examinee is awarded a letter grade of A, B, C, or F along with diagnostic information describing examinee performance in each of the major content areas in any given exam. A letter grade of D can be given, but credit is awarded for A, B, and C letter grades only. The letter grades reported to examinees indicate that their performance was equivalent to the performance of students who received the same letter grade in a comparable, on-campus course.

More specifically, the letter grade indicates the examinee’s proficiency relative to the learning outcomes specified in the exam content guide. Following are general descriptions of examinee performance at each level:

Letter Grade Description

A  Highly Competent: Examinee’s performance demonstrates an advanced level of knowledge and skill, relative to the learning outcomes.

B  Competent: Examinee’s performance demonstrates a good level of knowledge and skill, relative to the learning outcomes.

C  Marginally Competent: Examinee’s performance demonstrates a satisfactory level of knowledge and skill relative to the learning outcomes.

D  Not Competent (no credit recommended): Examinee’s performance demonstrates weak knowledge of the content and minimal skill relative to the learning outcomes.①

F  Fail (no credit recommended): Examinee’s performance demonstrates no knowledge of the content and no skill in the subject relative to the learning outcomes.

Credit is transcripted by Excelsior College for examinees who achieve letter grades of C or higher.

We encourage colleges and universities to use the Excelsior College letter grades of A, B, and C as acceptable standards for awarding credit.

See page 25 for a sample UExcel Grade Report for Examinations, at the back of this content guide.

UExcel Exam Resources

Excelsior College Bookstore

The Excelsior College Bookstore offers recommended textbooks and other resources to help you prepare for UExcel exams.

The bookstore is available online at (login required): www.excelsior.edu/bookstore

Excelsior College Library

Enrolled Excelsior College students can access millions of authoritative resources online through the Excelsior College Library. Created through our partnership with the Sheridan Libraries of The Johns Hopkins University, the library provides access to journal articles, books, websites, databases, reference services, and many other resources. Special library pages relate to the nursing degree exams and other selected exams. To access it, visit www.excelsior.edu/library (login is required).

Our library provides:

• 24/7 availability
• The world’s most current authoritative resources
• Help and support from staff librarians

Online Tutoring

Excelsior College offers online tutoring through SMARTTHINKING™ to connect with tutors who have been trained in a variety of academic subjects. To access SMARTTHINKING, go to www.excelsior.edu/smarthinking. Once there, you may download a copy of the SMARTTHINKING Student Handbook as a PDF.

① In general, two hour exams do not award a D letter grade.
Preparing for UExcel Exams

**Take Charge of Your Own Learning**

At Excelsior College, independent, self-directed study supported by resources we help you find is not a new concept. We have always stressed to exam takers that they are acting as their own teacher, and that they should spend as much time studying for an exam as they would spend in a classroom and on homework for a corresponding college course in the same subject area.

Begin by studying the content outline contained in this content guide, at its most detailed level. You will see exactly which topics are covered, and where chapters on those topics can be found in the Recommended Resources. You will see exactly where you might need to augment your knowledge or change your approach.

The content outline, along with the Learning Outcomes for this exam and recommended textbooks, will serve as your primary resources.

**How Long Will It Take Me to Study?**

Study for a UExcel exam is comparable to an equivalent college-level course. As an independent learner, you should study and review as much as you would for the same subject in a campus-based college course. If you already have a background in the subject, you may be able to pass the exam successfully with fewer hours of study. It depends upon the learner as well as the subject, the number of credits (for example, a 6- or 8-credit exam will require more hours of study than a 3-credit exam), and the length of the exam. We strongly encourage you to create a long-term action, or study plan, so that you have a systematic approach to prepare for the exam. We’ve included guidelines for creating such a plan.

**How Can I Create an Effective Long-Term Study Plan?**

1. **Determine the time you will require to complete your preparation for this exam.** As a rule, you should plan to budget approximately 150 hours of study time for this exam. About 135 of those hours should be spent on studying the content alone. Aside from the content review, you should then factor in time to search for and use other resources, and to complete any projects and assignments in the study materials that will clarify your understanding of the topics in the content outline (that part in the content guide where the specific areas of study are spelled out). Spend more time on concepts and areas in which you feel you are weak. Totaled, this is approximately the amount of time you should expect to devote to a three-credit, campus-based course. The actual amount of time you require depends on many factors, and will be approximate. If your background is weak, you may need to set aside substantially more than 135–150 hours. If your background is strong, you may budget less time.

   Take a few minutes to review the content outline to assess your familiarity with the content. Then, in the space below, write the number of hours you will allocate to complete preparing for the exam.

   Hours Required =

2. **Determine the time you will have available for study.**

   In self-study, you need structure, as well as motivation and persistence, and a methodical approach to preparation. There is no set class to keep you on task. You have to do that yourself. Construct a time-use chart to record your daily activities over a one-week period. The most accurate way to do this is to complete the chart on a daily basis to record the actual amount of time you spend eating, sleeping, commuting, working, watching television, caring for others and yourself, reading, and everything else in an adult’s life. However, if your schedule is regular, you might prefer to complete the chart in one sitting and, perhaps, by consulting your appointment book or planner.

   After you have recorded your activities, you will be ready to schedule study periods around these activities or, perhaps, instead of some of them. In the space below, write the number of hours you will be able to set aside for study each week.

   Hours Required =

3. **Divide the first number by the second number.**

   This will give you the number of weeks you will need to set aside for independent study. For example, if you think you will require 170 hours of study and you have 10 hours available to study each week, divide 170 hours by 10 hours and you will get 17. This means
that you will need about 17 weeks to complete this course of study. However, you will also need to allow about a week for review and self-testing. Moreover, to be on the safe side, you should also add two weeks to allow for unforeseen obstacles and times when you know you will not be able to study (e.g., during family illnesses or holidays). So, in this case, you should allot a total of 18 to 19 weeks to complete your study.

4. Schedule your examination to coincide with the end of your study period.

For example, if you plan to allow 18 weeks for study, identify a suitable examination date and begin study at least 18 weeks before that date. (The date you begin study assumes that you will have received all of your study materials, particularly textbooks, by that time.)

5. Format a long-term study plan.

You will need to use a calendar, planner, or some other tool to format and track your long-term study plan. Choose a method that is convenient and one that keeps you aware of your study habits on a daily basis. Identify the days and exact hours of each day that you will reserve for study throughout your whole independent study period. Check to see that the total number of hours you designate for study on your long-term study plan adds up to the number of hours you have determined you will need to complete this course of study (Step 1).

6. Record in your long-term study plan the content you plan to cover during each study period.

Enter the session numbers, review, and examination preparation activities you will complete during each study period. While it is suggested that approximately 160–170 hours of study is required for this exam, each and every student may require different timelines based on their comfort with, and comprehension of, the material.

You now have a tentative personal long-term study plan. Keep in mind that you will have to adjust your study plan, perhaps several times, as you study. It is only by actually beginning to work systematically through the material, using the content outline, that you will be able to determine accurately how long you should allow for each unit.

What Learning Strategy Should I Use?

The following guidelines are intended to help you acquire the grounding in the knowledge and skills required for successful completion of this examination.

1. Approach learning with a positive attitude.

Most students are capable of learning subject content if they devote enough time and effort to the task. This devotion will give you a positive edge and a feeling of control.

2. Diligently complete the exact work you specified in your study plan.

Your study plan is being designed for the specific purpose of helping you achieve the learning outcomes for this exam.

3. Be an active learner.

You should actively engage in the learning process. Read critically, take notes, and continuously monitor your comprehension. Keep a written record of your progress, highlight content you find difficult to grasp, and seek assistance from someone in your learning community who can help you if you have difficulty understanding a concept.

4. Be patient: you may not understand everything immediately.

When encountering difficulty with new material, be patient with yourself and don't give up. Understanding will come with time and further study. Sometimes you may need to take a break and come back to difficult material. This is especially true for any primary source material (original letters, documents, and so forth) that you may be asked to read. The content outline will guide you through the material and help you focus on key points. You will find that many concepts introduced in earlier sessions will be explained in more detail in later sessions.

5. Apply your learning to your daily life.

Use insights you gain from your study to better understand the world in which you live. Apply the learning whenever you can. Look for instances that support or contradict your reading on the subject.
6. Accommodate your preferred way of learning.

How do you learn best? Common ways to learn are reading, taking notes and making diagrams, and by listening to someone (on video or live). Others learn by doing. Do any of these descriptions apply to you? Or does your learning style vary with the learning situation? Decide what works for you and try to create a learning environment to accommodate your preferences.

Study Tips

Become an active user of the resource materials. Aim for understanding rather than memorization. The more active you are when you study, the more likely you will be to retain, understand, and apply the information.

The following techniques are generally considered to be active learning:

- **preview or survey** each chapter
- **highlight or underline text** you believe is important
- **write questions or comments** in the margins
- **practice re-stating content** in your own words
- **relate what you are reading** to the chapter title, section headings, and other organizing elements of the textbook
- **find ways to engage** your eyes, your ears, and your muscles, as well as your brain, in your studies
- **study with a partner or a small group** (if you are an enrolled student, search for partners on MyExcelsior Community)
- **prepare your review notes** as flashcards or create recordings that you can use while commuting or exercising

When you feel confident that you understand a content area, review what you have learned. Take a second look at the material to evaluate your understanding. If you have a study partner, the two of you can review by explaining the content to each other or writing test questions for each other to answer. Review questions from textbook chapters may be helpful for partner or individual study, as well.

Study smart for your UExcel exam, and succeed with our Student Success Guide.

Using UExcel Practice Exams

The Statistics exam has a corresponding practice exam, which is delivered in the ExamStudio learning platform.

The official UExcel practice exams are highly recommended as part of your study plan. They can be taken using any computer with a supported Web browser such as Google Chrome.

A practice exam package containing two forms is available for this exam, for $75. To register for the practice exam, visit [www.excelsior.edu](http://www.excelsior.edu) and log into your MyExcelsior account. Please note: You must be registered for the corresponding credit-bearing exam first, before you can register for the practice exam.

Practice exams are not graded. Rather, they are intended to help you make sure you understand the subject and give you a sense of what the questions will be like on the exam for credit. Ideally, you would check any questions you got wrong, look at the explanations, and go back to the textbook to reinforce your understanding. After taking both forms of the practice exam, you should feel confident in your answers and confident that you know the material listed in the content outline.

Practice exams are one of the most popular study resources. Practice exams are typically shorter than the credit-bearing exam. Since the questions are drawn from the same pool of questions that appear on the credit-bearing exam, what you will see when you sit for the graded exam will be roughly the same. Used as intended, these practice exams will enable you to:

- Review the types of questions you may encounter on the actual exam.
- Practice testing on a computer in a timed environment.
- Practice whenever and wherever it is convenient for you.
- Take two different forms of a practice exam within a 180-day period. (We highly recommend that you take the first form of the practice exam as a pretest, early in the study period. Use the results to identify areas to further study and carry out a plan. Then take the second form as a post-test and see how much you have improved.)

Although there is no guarantee, our research suggests that exam takers who do well on the practice exams are more likely to pass the actual exam than those
who do not, or who do not take advantage of the opportunity. Note that since the practice exams are not graded (calibrated) the same way as the scores on the credit-bearing exam, it will be hard for you to use the practice exams as a way to predict your score on the credit-bearing exam. The main purpose of the practice exams is for you to check your knowledge and to become comfortable with the types of questions you are likely to see in the actual, credit-bearing exam.

About Test Preparation Services

Preparation for UExcel® exams and Excelsior College® Examinations, though based on independent study, is supported by Excelsior College with a comprehensive set of exam learning resources and services designed to help you succeed. These learning resources are prepared by Excelsior College so you can be assured that they are current and cover the content you are expected to master for the exams. These resources, and your desire to learn, are usually all that you will need to succeed.

There are test-preparation companies that will offer to help you study for our examinations. Some may imply a relationship with Excelsior College and/or make claims that their products and services are all that you need to prepare for our examinations.

Excelsior College is not affiliated with any test preparation firm and does not endorse the products or services of these companies. No test preparation vendor is authorized to provide admissions counseling or academic advising services, or to collect any payments, on behalf of Excelsior College. Excelsior College does not send authorized representatives to a student's home nor does it review the materials provided by test preparation companies for content or compatibility with Excelsior College examinations.

To help you become a well-informed consumer, we suggest that before you make any purchase decision regarding study materials provided by organizations other than Excelsior College, you consider the points outlined on our website at www.excelsior.edu/testprep.

Exam Preparation Strategies

Each learner is different. However, all learners should read the content outline in the exam’s Content Guide and ensure that they have mastered the concepts. For someone with no prior knowledge of the subject, a rule of thumb is 135 hours of study for a three-credit exam—this number is just to give you an idea of the level of effort you will need, more or less.

Content Guides

This content guide is the most important resource. It lists the outcomes, a detailed content outline of what is covered, and textbooks and other study resources. It also has sample questions and suggestions for how to study. Content guides are updated periodically to correspond with changes in particular examinations and in textbook editions. Test-takers can download any of the latest free UExcel content guides by visiting the individual exam page or from the list at www.excelsior.edu/contentguides.

Prior Knowledge

A familiarity with precalculus topics including algebra, trigonometry, and functions is assumed.

Using the Content Outline

Each content area in the content outline includes the most important sections of the recommended resources for that area. These annotations are not intended to be comprehensive. You may need to refer to other chapters in the recommended textbooks. Chapter numbers and titles may differ among textbook editions.

This content outline contains examples of the types of information you should study. Although these examples are numerous, do not assume that everything on the exam will come from these examples. Conversely, do not expect that every detail you study will appear on the exam. Any exam is only a broad sample of all the questions that could be asked about the subject matter.

Using the Sample Questions and Rationales

Each content guide provides sample questions to illustrate those typically found on the exam. These questions are intended to give you an idea of the level of knowledge expected and the way questions are typically phrased. The sample questions do not sample the entire content of the exam and are not intended to serve as an entire practice test.
Recommended Resources for the UExcel Exam in Statistics

The resources listed below are recommended by the examination development committee for use preparing for this exam. Resources listed under “Exam Verification Resources” were used to verify all the questions on the exam. Please refer to the Content Outline to see which parts of the exam are covered by which of the Exam Verification Resources. Resources listed under “Supplemental Resources” provide additional material that may deepen or broaden your understanding of the subject, or that may provide an additional perspective. Textbook resources, both Exam Verification and Supplemental, are available for purchase at the Excelsior College Bookstore.

You should allow ample time to obtain resources and to study sufficiently before taking the exam, so plan appropriately and with care.

A word about textbook editions: Textbook editions listed in the UExcel content guides may not be the same as those listed in the bookstore. Textbook editions may not exactly match up in terms of table of contents and organization, depending upon the edition. However, our team of exam developers checks exam content against every new textbook edition to verify that all subject areas tested in the exam are still adequately available in the study materials. If needed, exam developers will list supplemental resources to ensure that all topics in the exam are still sufficiently covered. Public libraries may have the textbooks you need, or may be able to obtain them for you through interlibrary loan to reduce textbook costs. You may also consider financial aid, if you qualify, to further help defray the steep cost of textbooks. A section on OER has been included in this guide to help you locate additional resources to augment your study.

Exam Verification Resources


NOTE: We recommend that during your study, you perform all calculations using a basic, 8-function calculator, so that you will be well prepared to do similar calculations using the online calculator at the Pearson testing center.

Supplemental Resources

There are no Supplemental Resources for the Statistics exam. For additional information, please refer to available open educational resources (OER).

Reducing Textbook Costs

Many students know it is less expensive to buy a used textbook, and buying a previous edition is also an option. The Excelsior College bookstore includes a buyback feature and a used book marketplace, as well as the ability to rent digital versions of textbooks for as long as students need them. Students are encouraged to explore these and the many other opportunities available online to help defray textbook costs.

A Word About Open Educational Resources

Open educational resources (OER) are educational materials available for study at no cost on the Web. Some OER are available for anyone to access any time. Others, such as Massive Open Online Courses (MOOCs), require sign-up and are only available during certain windows. Please note that some MOOC providers offer certificates of completion or other products or services for a fee. No MOOC or other OER is a complete substitute for the content guide and officially Recommended Resources listed here in this content guide. However, by definition, MOOCs are essentially free of charge and include access to a main body of learning materials that may help you in your learning.

Being an independent learner preparing for credit by exam, you may not need any of the fee-based options that are offered elsewhere online. But if you are looking for a coherent academic course for self-study, lectures on specific topics, or audio or visual materials that fit your learning style better than print materials alone, a MOOC or other type of OER may be your answer. Keep in mind that none of these OER were designed by Excelsior, nor are they guaranteed to match the exam content outlines completely. They are simply another tool available in your study kit.

We highly encourage using the Recommended Resources. In the content outline, you will see that the topics in the exam are referenced to specific portions of recommended textbooks. Using OER alone will not ensure you’ve completely covered the
content in the exam, or it may not cover some topics in sufficient-enough depth without the use of the formal, recommended textbooks.

If the OER course you choose does not include a textbook for reference and you do not have significant practical theory-based experience in the field of study, use a college textbook to ensure adequate preparation for the exam, and use the exam's content outline as a guide.

Combined with comparable college textbooks, OER provides you with a variety of choices in knowledge sources and learning experiences, to enhance your understanding of the subject matter.

**Choosing Open Educational Resources**

Most sites for university-based OER can be searched through www.ocwconsortium.org and/or www.oercommons.org.

Sites that specialize in Web courses designed by college professors under contract with the website sponsor, rather than in Web versions of existing college courses, include:

- www.education-portal.com
- www.opencourselibrary.org (abbreviated as OCL)

We have included specific courses that cover material for one or more UExcel® exams from the sites in the listings above. It’s worth checking these sites frequently to see if new courses have been added that may be more appropriate or may cover an exam topic not currently listed.

In addition, sites like Khan Academy (www.khanacademy.com) and iTunes U feature relatively brief lessons on very specific topics rather than full courses. Full courses are also available on iTunes U (http://www.apple.com/education/ipad/itunes-u/). We have chosen a few courses and collections for this listing.

**Other Online Resources**

This section of the OER Guide is provided to allow learners to independently search for resources.

**Open Online Textbooks**

- BookBoon
  http://bookboon.com/en/textbooks-ebooks
- Flatworld Knowledge
  http://catalog.flatworldknowledge.com/#our-catalog

**College Readiness**

- Khan Academy
  http://www.khanacademy.org/
- Hippocampus
  http://www.hippocampus.org/
- Open Course Library
  http://opencourselibrary.org/colg-110-college-success-course/

**Study Aids**

- Education Portal
  http://education-portal.com/
- Khan Academy
  http://www.khanacademy.org/
- Annenberg Learner
  http://www.learner.org/
- OpenCourseWare
  http://ocwconsortium.org/en/courses/search
- OER Commons
  http://www.oercommons.org/
- Open Course Library
  http://www.opencourselibrary.org/

To achieve academic success, rate yourself at Excelsior College’s Self-Regulated Learning Lab. Visit the Diagnostic Assessment & Achievement of College Skills site at https://srl.daacs.net/

It’s free!
General Description of the Examination

The UExcel Statistics examination is based on material typically taught in a one-semester introductory course in statistics. It measures knowledge and understanding of the fundamental concepts of descriptive and inferential statistics, and the meaning and application of basic statistical ideas.

Those beginning to study for this exam should have a basic knowledge of algebra.

Learning Outcomes

After you have successfully worked your way through the recommended study materials, you should be able to demonstrate the following learning outcomes:

1. Define, organize, and examine data. (Aligns to GECC 2.2)
2. Perform standard statistical calculations. (Aligns to GECC 2.2)
3. Recognize and interpret several types of data. (Aligns to GECC 2.2)
4. Use graphical and numerical summaries. (Aligns to GECC 2.2)
5. Apply standard statistical inference procedures. (Aligns to GECC 2.2)
6. Draw valid conclusions from your analysis of data. (Aligns to GECC 2.2)

General Education Career Competencies Addressed in this Exam

GECC-2: Mathematical and Scientific Problem Solving: Apply mathematical concepts and reasoning to solve problems that involve quantitative information.
Content Outline

The content outline describes the various areas of the test, similar to the way a syllabus outlines a course. To fully prepare requires self-direction and discipline. Study involves careful reading, reflection, and systematic review.

The major content areas on the Statistics examination, the percent of the examination, and the hours to devote to each content area are listed below.

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*Approximate: For those test-takers who know the topic well, less time may be needed to learn the subject matter. For those who are new to the subject matter, more time may be required for study.

**NOTE:** Occasionally, examples will be listed for a content topic to help clarify that topic. However, the content of the examination is not limited to the specific examples given.

I. Overview of Statistics

5 PERCENT OF EXAM

A. Descriptive vs. inferential statistics (populations–samples, parameters–statistics)
B. Uses and misuses of statistics
C. Counting and measuring

II. Summarizing, Organizing, and Describing Data

20 PERCENT OF EXAM

A. Measures of central tendency
   1. Mean (population and sample)
   2. Median
   3. Mode

1. Measurement scales (nominal, ordinal, interval, ratio)
2. Discrete vs. continuous variables
D. Collection of data (random samples, probability samples, samples of convenience)
B. Measures of variation
   1. Range
   2. Variance (population and sample)
   3. Standard deviation (population and sample)
   4. Interquartile range

C. Organizing data
   1. Ordering or ranking
   2. Distributions
      a. Frequency
      b. Relative frequency
      c. Cumulative frequency
   3. Pictorial displays (quantitative, qualitative)
      a. Histogram
      b. Frequency polygon
      c. Box-and-whisker plot
      d. Stem-and-leaf display

D. Measures of relative position
   1. Rank
   2. Quartiles
   3. Percentiles
   4. Standardized scores (z-scores)

E. Interpreting descriptive measures
   1. Symmetry and skewness
   2. Comparative characteristics of measures of central tendency
   3. Unimodal vs. bimodal distributions
   4. Coding data/effects of adding and multiplying by constants
   5. Effects of outliers on descriptive measures

III. Regression and Correlation
   10 PERCENT OF EXAM

A. Scatterplots/diagrams

B. Least squares regression line
   1. Calculation of coefficients
   2. Prediction

C. Correlation coefficient $r$ and coefficient of determination ($R^2$) — calculation and interpretation

IV. Basic Probability Theory
   10 PERCENT OF EXAM

A. Possibilities and probabilities
   1. Counting principles
      a. Basic counting rule — multiplication principle
      b. Permutations
      c. Combinations
   2. Sample spaces
   3. Events
      a. Mutually exclusive
      b. Union, intersection, complement
   4. The concept of a probability
      a. Relative frequency
      b. Theoretical (classical) probability
      c. Conditional probability

B. Rules of probability
   1. Complement rule
   2. Addition rules
      a. Mutually exclusive events
      b. Non-mutually exclusive events
   3. Multiplication rules
      a. Independent events
      b. Dependent events
V. Probability Distributions

10 PERCENT OF EXAM

A. Discrete random variables and their distributions
   1. Basic concepts
      a. Probability distributions and probability functions
      b. Mean (expected value)
      c. Variance and standard deviation
   2. Binomial distributions
      a. Properties of a binomial experiment
      b. Parameters of binomial distributions \((n, p)\)
      c. Calculation of binomial probabilities
         1) Formula
         2) Use of table
      d. Mean and standard deviation
      e. Related word problems

B. Continuous random variables and their distributions
   1. Basic concepts
      a. Probability as area under the curve
      b. Interpretation of mean and standard deviation
   2. Normal distributions
      a. Properties of the normal curve
      b. Parameters of the normal distribution — mean \((\mu)\) and standard deviation \((\sigma)\)
      c. Standard normal distributions
      d. Use of table of areas for standard normal distribution
      e. Standardized units (standardized scores, \(z\)-scores)
      f. Use of area tables to solve general normal distribution problems
      g. Normal approximation of binomial distribution (using continuity correction)

VI. Sampling

10 PERCENT OF EXAM

A. Simple random sampling
   1. Concept of a random sample
   2. Obtaining a simple random sample

B. Sampling distribution of the sample means
   1. Shape of sampling distribution
   2. Expected value (mean) of the sample mean
   3. Standard deviation (standard error) and variance of the sample mean
   4. Probabilities based on sampling distribution
   5. Central limit theorem and applications

C. Other sampling schemes (for example: stratified, cluster, systematic)

VII. Statistical Estimation

15 PERCENT OF EXAM

A. Estimation of a single population mean
   1. Large sample or sample with known variance (using \(z\)-statistic)
      a. Point estimation
      b. Interval estimation (confidence intervals)
   2. Small sample from normal populations (using \(t\)-statistic)
      a. Point estimation
      b. Student’s \(t\) distribution
      c. Interval estimation (confidence intervals)

B. Estimation of population proportions
   using the normal approximation (for large samples, only)
   1. Point estimate (sample proportion)
   2. Mean and standard deviation of sample proportion
   3. Interval estimation (confidence intervals)
C. Estimation of the difference between two population means (for large samples, only)
   1. Matched pairs (dependent samples)
      a. Point estimate
      b. Confidence interval
   2. Large independent samples or samples with known variances
      a. Point estimate
      b. Confidence interval
   3. Small independent samples from normal distributions with equal variances
      a. Point estimate
      b. Confidence interval

D. Estimation of the difference between two population proportions (for large samples, only)
   1. Point estimate of difference
   2. Mean and standard deviation of differences of proportions
   3. Interval estimate of differences of proportions

VIII. Hypothesis Testing

20 PERCENT OF EXAM

A. Testing hypotheses for a single population mean
   1. Formulating hypotheses (null vs. alternative)
      a. Large sample case (using \( z \) test)
      b. Small sample case (using \( t \) test)
   2. Decisions based on \( P \)-values or critical values
   3. Type I and Type II errors

B. Testing hypotheses for population proportions (for large samples, only)
   1. Formulating hypotheses (null vs. alternative)
   2. Decisions based on \( P \)-values or critical values
   3. Type I and Type II errors

C. Testing hypotheses for the difference between two population means
   1. Large independent samples or samples with known population variances (\( z \) test)
   2. Small independent samples from normal distributions with unknown, but assumed equal variance (\( t \) test)
   3. Matched-pairs samples (\( t \) test)

D. Testing hypotheses for the difference between two population proportions (for large samples, only)

E. Chi-square tests
   1. Goodness of fit
   2. Independence in two-way contingency tables
Sample Questions

The sample questions give you an idea of the level of knowledge expected in the exam and how questions are typically phrased. They are not representative of the entire content of the exam and are not intended to serve as a practice test.

Rationales for the questions can be found on pages 18–21 of this guide. In that section, the correct answer is identified and each answer is explained. The number in parentheses at the beginning of each rationale refers to the corresponding section of the content outline. For any questions you answer incorrectly, return to that section of the content outline for further study.

You will be provided with an erasable white board to use during your exam. During your exam, tables of necessary formulas will be available for your reference and you will have access to a basic 8-function calculator on the computer. The calculator button is in the top left hand corner of the page as each question is presented and the tables and formulas are in the Help button located in the lower left hand corner as each question is presented. A list of the formulas is printed at the back of this content guide along with a picture of the calculator that will be available for your use during the exam.

1. What is the mean of the set of data below?
   1, 1, 2, 2, 2, 4, 6, 7, 9, 10, 11
   1) 5
   2) 2
   3) 6
   4) 4

2. A random sample of 5 test scores has a mean of 82 points on a scale of 0 – 100, with a variance of zero. What is the range of these test scores?
   1) 0
   2) 50
   3) 82
   4) 100

3. A stem-and-leaf display of a set of data is shown below:
   2 | 3 4 5
   3 | 0 1 1 2
   4 | 1 2 5 5 5 7 8 9
   5 | 1 1 2 3 5
   6 | 2 3 5
   7 | 0 2
   Leaf Unit = 1.0
   What is the median of the data set?
   1) 45
   2) 45.5
   3) 47
   4) 49

4. A set of scores has a mean of 70 and a standard deviation of 4. Which score has a standardized score of –2.5?
   1) 55
   2) 60
   3) 65
   4) 80

5. If the number \( k \) were added to each value in a set of data, which measure would remain unchanged?
   1) mean
   2) median
   3) mode
   4) range
6. Which of the following scatterplots would have a correlation coefficient closest to zero?

1) 

2) 

3) 

4) 

7. Given the regression equation $y = -3 + 0.5x$, which is true?

1) The value of $y$ increases 1 unit for every 2 units of increase in $x$.
2) The value of $y$ increases 2 units for every 1 unit of increase in $x$.
3) The value of $y$ is 3 units less than $x$.
4) The correlation between $x$ and $y$ is negative.

8. Base your answer to this question on the scatter diagram below:

If the regression line $y = 3 - 0.5x$ fits the points on the scatter diagram perfectly, what is the value of the correlation coefficient $r$?

1) 1
2) -1
3) 0.5
4) -0.5

9. How many different radio station call letter combinations could there be if the first letter must be a W or a K and the whole station name must have three letters?

1) 54
2) 676
3) 1352
4) 17,576

10. Assume that events A and B are mutually exclusive, with $P(A) = 0.4$ and $P(B) = 0.5$. What is $P(A \text{ or } B)$?

1) 0
2) 0.2
3) 0.7
4) 0.9

11. Which of the following is a probability distribution for a discrete random variable?

1) $x$ $P(x)$
   0 0.6
   1 0.6
   2 -0.2

2) $x$ $P(x)$
   0 0.7
   1 -0.2
   2 -0.1

3) $x$ $P(x)$
   0 0.1
   1 0.3
   2 0.6

4) $x$ $P(x)$
   0 0.3
   1 0.3
   2 0.3

12. What are the mean ($\mu$) and standard deviation ($\sigma$) of a binomial distribution where $n = 60$ and $p = 1/6$?

1) $\mu = 10$ and $\sigma = 2.89$
2) $\mu = 10$ and $\sigma = 8.33$
3) $\mu = 30$ and $\sigma = 3.87$
4) $\mu = 30$ and $\sigma = 15$

13. Assume that the grades of individuals taking a proficiency examination are distributed normally with an average score of 75 and a standard deviation of 5. The minimum passing grade on the examination is 70. What is the approximate proportion of individuals who fail the examination?

1) 0.16
2) 0.34
3) 0.68
4) 0.84
14. Which is an accurate statement with regard to a simple random sample?
   1) The population is divided into stratified groups.
   2) The sample consists of every $n$th subject.
   3) The sample uses only subjects that have been screened for common traits.
   4) Samples of the same size have the same probability of being selected.

15. Given a normally distributed population with a mean of 72 and a standard deviation of 12, what is the standard error for the distribution of sample means for samples of size 36?
   1) 12
   2) 2
   3) 36
   4) 72

16. To get a sample of size 20 from the Fortune 500 companies, a statistician began by choosing a random integer (which turned out to be 16) from among the integers 1 to 25. The sample consisted of the companies with the following rankings:

16 41 66 91 116 141 166 191 216 241
266 291 316 341 366 391 416 441 466 491

Which sampling scheme was used?
   1) cluster
   2) simple random
   3) stratified
   4) systematic

17. A change in which value would move the midpoint of the confidence interval for the population mean?
   1) sample size
   2) sample mean
   3) sample standard deviation
   4) confidence level

18. Which of the following pairs of procedures would increase the length of a confidence interval for the population mean? (Assume $\sigma$ remains constant.)
   1) increasing the confidence level and decreasing the sample size
   2) decreasing the confidence level and increasing the sample size
   3) increasing both the confidence level and sample size
   4) decreasing both the confidence level and sample size

19. A random sample of size 5 from a normal distribution, whose mean and variance are unknown, yields a sample mean of 27.75 and a sample variance of 16. Which of the following is closest to a 95% confidence interval for the true mean?
   1) $27.75 \pm 3.51$
   2) $27.75 \pm 4.60$
   3) $27.75 \pm 4.97$
   4) $27.75 \pm 14.02$

20. A college’s past experience is that 46% of students accepted for admission will actually enroll at the college. It is assumed that the students act independently and that the 46% probability of acceptance still holds. If 5490 students are accepted, what is a 99% confidence interval for the number who will enroll?
   1) (2430, 2620)
   2) (2453, 2597)
   3) (2465, 2585)
   4) (0.443, 0.477)

21. In testing the hypotheses $H_0: \mu = \mu_0$ and $H_a: \mu \neq \mu_0$ based on a sample of size $n = 36$, assume that the population standard deviation is known and the value of the test statistic is $z = 1.71$. What is the approximate $P$-value?
   1) .044
   2) .050
   3) .087
   4) .100
22. A group of researchers plan to test the null hypothesis \( H_0: \mu_1 - \mu_2 = 0 \) by drawing independent samples of size \( n = 15 \) and \( n = 12 \), respectively, from two normally distributed populations. The population variances are unknown, but are assumed to be equal. Which statement best describes part of the test procedures?

1) Use test statistic \( t \) and the pooled variance calculated from the sample variances.
2) Use test statistic \( t \) but not the pooled variance calculated from the sample variances.
3) Use test statistic \( z \) and the pooled variance calculated from the sample variances.
4) Use test statistic \( z \) but not the pooled variance calculated from the sample variances.

23. An insurance company that currently sells only automobile insurance is planning to introduce homeowners insurance to its customers. The management has indicated that they will introduce homeowners insurance if more than 40% of their current customers indicate that they will purchase the new insurance. A random sample of 500 customers was used to test \( H_a: p > .40 \). The value of the test statistic was computed to be 2.8. Let \( \alpha \) be the significance level. What is the appropriate conclusion?

At \( \alpha = 0.05 \),

1) there is sufficient evidence to conclude that homeowners insurance should not be introduced.
2) there is insufficient evidence to conclude that homeowners insurance should be introduced.
3) there is sufficient evidence to conclude that homeowners insurance should be introduced.
4) there is insufficient evidence to conclude that more than 80% of current customers will purchase homeowners insurance.

24. A researcher developed a method to treat stomach ulcers. The researcher found that 47% of patients in the treatment group (sample size = 82) were cured, and that 38% of patients in the control group (sample size = 78) were cured. Let \( P_1 \) = the proportion cured in the population of those taking treatment. Let \( P_2 \) = the proportion cured in the population represented by the control group. The \( z \) test for \( H_0: p_1 = p_2 \) is closest to which value?

1) 0.7
2) 1.15
3) 1.6
4) 2.53

25. A researcher wishes to know if there is a relationship between gender and a person’s preference of color in an automobile. Male and female customers at a car dealership are shown a particular model of car in each of four colors and are asked to state their preference. Which would be the most appropriate test to determine whether men and women have different preferences?

1) chi-square test for goodness of fit
2) chi-square test for independence of effects
3) two-sample \( t \) test for comparing means
4) \( z \) test for comparing means
1. **IIA1**

   *1. The mean is the sum of the set of values \(1 + 1 + 2 + \ldots + 11 = 55\) divided by the number of values (11): \(\frac{55}{11} = 5\)

   2. 2 is the mode of the data set.

   3. 6 is not the mean.

   4. 4 is the median of the data set.

2. **IIB1**

   *1. Since the variance is zero, there is no variation. All the values are the same (all the test scores are 82), so the range is zero.

   2. 50 is the midpoint of the test scale.

   3. 82 is the mean of the test scores.

   4. 100 is the range of the test scale.

3. **IIC3d**

   1. 45 is the 12th ranked measure; therefore, it is not the median. 45 is the mode of the set of data.

   2. 45.5 is not the 13th ranked observation; therefore, it is not the median.

   *3. The rank of the median is \(\frac{n+1}{2} = \frac{25+1}{2} = 13\)

      The median is the 13th ranked observation. The 13th ranked observation is 47.

   4. 49 is not the 13th ranked observation; therefore, it is not the median.

4. **IID4**

   1. The standardized score of 55 is \(\frac{55-70}{4} = -3.75\)

   *2. The formula for the standardized score is \(z = \frac{x - \mu}{\sigma}\)

      The standard score of 60 is \(\frac{60-70}{4} = -2.5\)

   3. The standard score of 65 is \(\frac{65-70}{4} = -1.25\)

   4. The standard score of 80 is \(\frac{80-70}{4} = 2.5\)

5. **IIE4** Assuming that \(k \neq 0\),

   1. the mean will be increased by \(kn\) if \(k\) is positive.

   2. the median will change as every number is shifted by \(k\) units.

   3. the mode will change because every value in the data set is changed.

   *4. the range will remain unchanged. The lowest and highest observations will change by the same amount, so the difference will remain the same.

6. **IIIA,C**

   1. This scatterplot shows a weak positive relationship; therefore, the correlation coefficient is a small positive number, but is not closest to zero.

   2. This scatterplot shows a strong positive relationship; therefore, the correlation coefficient is a positive number close to one.

   3. This scatterplot shows a strong negative relationship; therefore, the correlation coefficient is a negative number close to -1.

   *4. This scatterplot shows a random pattern relationship; therefore, the correlation coefficient is a number closest to zero.
7. (IIIIB)
1. Because the slope \( m = 0.5 \), for each two-unit increase in \( x \) there is a one-unit increase in \( y \).
2. Here, \( x \) and \( y \) are incorrectly reversed.
3. The value of \( y \) is actually 3 units less than 0.5\( x \).
4. The correlation between \( x \) and \( y \) is positive because the slope of the regression line is positive.

8. (IIIC)
1. The slope of the regression line is negative, so the correlation must be negative.
2. The slope is negative and all points fit the line perfectly. This is a perfect negative linear relationship; correlation coefficient \( r = -1 \).
3. When the points fit the line perfectly, the correlation can only be 1.00 or -1.00.
4. See 3).

9. (IVA1a)
1. \( 54 = (2)(3)(3)(3) \) which does not represent the number of any three-letter combinations.
2. \( 676 = (1)(26)(26) \) which represents the number of three-letter combinations where the first letter is W only or R only.
3. \( 1352 = (2)(26)(26) \) which represents the number of three-letter combinations where the first letter must be a W or a K.
4. \( 17,576 = (26)(26)(26) \) which represents the number of any three-letter combinations.

10. (IVB2a)
1. \( 0 = P(A \text{ and } B) \).
2. If \( A \) and \( B \) are independent, then \( P(A \text{ and } B) = P(A)P(B) = (.4)(.5) = .2 \).
3. If \( A \) and \( B \) are independent, then \( P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) = .7 \).
4. Since \( A \) and \( B \) are mutually exclusive, then \( P(A \text{ or } B) = P(A) + P(B) = .4 + .5 = .9 \).

11. (VA1a)
1. This is not a probability distribution because it has a negative entry.
2. This is not a probability distribution because it has two negative entries.
3. A probability distribution must satisfy these rules: \( P(x) \) can only be between 0 and 1 inclusive, and the sum of the \( P(x) \) values must be equal to 1. This distribution satisfies both rules.
4. This is not a probability distribution because the sum of \( P(x) \) values is not 1.

12. (VA2d)
1. \( np = 60 \cdot \frac{1}{6} = 10; \sigma = \sqrt{np(1-p)} = \sqrt{60 \cdot \frac{1}{6} \cdot \frac{5}{6}} = \sqrt{8.33} = 2.89 \)
2. \( np = 60 \cdot \frac{1}{6} = 10; \sigma = (2.89)^2 = \text{the variance} \)
3. 30 and 3.87 are the mean and standard deviation of a binomial distribution with \( n = 60 \) and \( p = .60 \) and \( p = .60 \).
4. 30 and 15 are the mean and variance of a binomial distribution with \( n = 60 \), and \( p = .60 \).

13. (VB2f)
1. \( P(fail) = P(x < 70) = P(z < \frac{70 - 75}{5}) = P(z < -1) = .1587 = .16 \)
2. \(.34 = P(70 < x < 75)\)
3. \(.68 = P(70 < x < 80)\)
4. \(.84 = P(x > 70) = P(pass)\)

14. (VIA2)
1. When the population is divided into stratified groups, it is a stratified sample.
2. When the sample consists of every \( n \)th subject, it is a systematic sample.
3. When the sample uses only subjects that have been screened for common traits, it is a judgment or nonprobabilistic sample.
4. When samples of the same size have the same probability of being selected, it is a simple random sample. Each set of \( n \) units has an equal chance of being selected.

*correct answer
15.(VIB3)
1. 12 is the standard deviation of the population.
2. The standard error of the sample means is \( \frac{s}{\sqrt{n}} = \frac{12}{\sqrt{36}} = 2 \)
3. 36 is the sample size.
4. 72 is the mean of the population.

16.(VIC)
1. Cluster sampling is based on the random selection of clusters of elements from a population.
2. In simple random sampling, every possible sample of a given size has the same chance of being selected.
3. In stratified random sampling, first the population is divided into strata, then a random sample is selected from each stratum.
4. This is a classic case of systematic sampling. The first item (#16) is randomly chosen. Then items are chosen at fixed intervals (every 25th).

17.(VIIA)
1. A change of sample size will change the length of the confidence interval for the population mean.
2. A change of sample mean will change the midpoint of the confidence interval for the population mean.
3. A change of sample standard deviation will change the length of the confidence interval for the population mean.
4. A change of confidence level will change the length of the confidence interval for the population mean.

18.(VIIA)
1. Increasing the confidence level and decreasing the sample size will increase the length of the confidence interval.
2. Decreasing the confidence level and increasing the sample size will decrease the length of the confidence interval.
3. Increasing both the confidence level and the sample size may increase or decrease the length of the confidence interval.
4) Decreasing both the confidence level and the sample size may increase or decrease the length of the confidence interval.

19.(VIIA2c) Use \( t \) because sample size is small.
1. \( 27.75 \pm 3.51 = \bar{x} \pm t_{0.025} \frac{s}{\sqrt{n}} \)
2. \( 27.75 \pm 4.60 = \bar{x} \pm t_{0.025} \frac{s}{\sqrt{n}} \)
3. \( n = 5, \bar{x} = 27.75, s^2 = 16 \)
   
   The 95% confidence interval for the true mean is 
   
   \[ \bar{x} \pm t_{0.025} \frac{s}{\sqrt{n}} = 27.75 \pm \frac{4}{\sqrt{5}} \]
   
   \[ = 27.75 \pm 4.97 \]
4. \( 27.75 \pm 14.02 = \bar{x} \pm t_{0.025} \frac{s^2}{\sqrt{n}} \)

20.(VIIB3)
1. \( (2430, 2620) = (2525 - 95, 2525 + 95) \)
   
   The number of students enrolled is a binomial distribution with \( n = 5490, p = .46 \), which is approximately normally distributed with mean \( np = 2525 \) and standard deviation \( \sqrt{np(1 - p)} = 37 \).
   
   Therefore, a 99% confidence interval for the number of students who will enroll is \( 2525 \pm (\frac{z_{0.005}}{37}) = 2525 \pm 2.57(37) = 2525 \pm 95 \).
2. \( (2453, 2597) = (2525 - 72, 2525 + 72) = 2525 \pm (\frac{z_{0.025}}{37}) \)
3. \( (2453, 2585) = (2525 - 60, 2525 + 60) = 2525 \pm (\frac{z_{0.025}}{37}) \)
4. \( (0.443, 0.477) = \frac{2430}{5490} \frac{2620}{5490} \) is the 99% confidence interval for the proportion of students who enroll.

*correct answer
21. (VIIIA2)
1. \(0.044 = P(z > 1.71)\). This is the \(P\)-value of a one-sided test.
2. \(0.05 = P(z < -1.645)\) or \(P(z > 1.645)\). This is the \(P\)-value of a one-sided test when \(z = 1.645\).
3. \(0.087 = 2(1 - 0.9564) = 2P(z > 1.71)\). This is the \(P\)-value of the test.
4. \(0.10 = 2P(z > 1.645)\). This is the \(P\)-value of a two-sided test when \(z = 1.645\).

22. (VIIIC2)
1. Since the population variances are unknown but are assumed to be equal, test statistic \(t\) and pooled variance calculated from the sample variances should be used.
2. This test procedure is only for normal populations with unknown and unequal variances.
3. This test procedure is only for large sample sizes and populations with unknown and equal variances.
4. This test procedure is only for large sample sizes and populations with unknown and unequal variances.

23. (VIIIB2)
1. This conclusion means accept \(H_0\).
2. This conclusion means do not accept \(H_0\).
3. This conclusion means accept \(H_a\). The critical value \(z_a = z_{0.5} = 1.645\). \(z = 2.8 > 1.645\). Therefore, we reject \(H_0\) and accept \(H_a\).
4. This conclusion means do not claim \(p > .80\).

24. (VIIIID)
1) 0.7 is not closest to 1.15.
2) \(\hat{p}_1 = 0.47, \hat{p}_2 = 0.38, \hat{p} = \frac{(0.47)(82) + (0.38)(78)}{82 + 78} = \frac{39 + 30}{160} = \frac{69}{160} = 0.43\)
Therefore, the observed value for the \(z\) test is
\[
\frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1 - \hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} = \frac{0.47 - 0.38}{\sqrt{0.43 \cdot 0.57 \left(\frac{1}{82} + \frac{1}{78}\right)}}
\]
3) 1.6 is not closest to 1.15.
4) 2.53 is not closest to 1.15.

25. (VIIIIE2)
1) The chi-square test for goodness of fit is used to determine whether observed data fit a theoretical distribution.
2) The chi-square test for independence of effects is most appropriate. “Men and women have different preferences” suggests a test of independence.
3) Means are not being compared.
4) See 3).

**correct answer**
Formula Information

Formulas

The formulas and tables listed below will be provided for your use during the examination. You will also have access to a standard calculator, as shown below.

To use the formulas and table during your computer-delivered examination, click the Help button in the lower left corner of any question screen, and select the appropriate tab.

1. Mean
2. Variance
3. Standard deviation
4. Formula for converting to standardized units
5. Number of permutations of \( n \) objects taken \( r \) at a time
6. Number of combinations of \( n \) objects taken \( r \) at a time
7. Complement rule
8. General addition rule
9. Addition rule for mutually exclusive (disjoint) events
10. General multiplication rule
11. Multiplication rule for independent events
12. Mean of a discrete random variable
13. Variance of a discrete random variable
14. Binomial distribution
15. Mean (expected value) and standard deviation of a binomial distribution
16. Standard error of the mean
17. Large-sample level C confidence interval for \( \mu \)
18. Level C confidence interval for \( p \)
19. Level C confidence interval for \( \mu_1 - \mu_2 \) if both populations are normal with equal unknown variances (independent samples)
20. Level C confidence interval for \( p_1 - p_2 \) if both sample sizes are large
21. Level C confidence interval for \( \mu_1 - \mu_2 \) for matched pairs samples
22. Variance of difference of two independent means \( X_1 - X_2 \)
23. Large-sample level C confidence interval for difference of two means
24. Test statistic for test concerning mean with known variance
25. Test statistic for small-sample test concerning mean of normal population with unknown variance
26. Test statistic for large independent sample test concerning \( (\mu_1 - \mu_2) \) difference of two means
27. Test statistic for small independent sample test concerning \( (\mu_1 - \mu_2) \) difference of two means of two normal populations with equal variance
28. Statistic for large-sample test concerning \( (p_1 - p_2) \) difference of two proportions of two populations
29. Chi-square statistic for test of goodness of fit
30. Coefficients of least squares line \( \hat{y} = a + bx \)
31. Computing formula for linear correlation coefficient

Tables

Table I Standard Normal Probabilities
Table II \( t \) Distribution Critical Values
Table III Chi-square Critical Values
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**Register Online**
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Follow the instructions and pay by Visa, MasterCard, American Express, or Discover Card.

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You will take the exam by computer, entering your answers using either the keyboard or the mouse. The system is designed to be as user-friendly as possible, even for those with little or no computer experience. On-screen instructions are similar to those you would see in a paper examination booklet.

Before taking your exam, we strongly encourage you to go on a virtual tour of the testing center. To access this tour, click the What to Expect in a Pearson VUE test center at the following link: home.pearsonvue.com/test-taker/security.aspx

You also will receive a small, erasable whiteboard if you need one. You may not take your own calculator. One will be provided on the testing screen.

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On the day of your exam, remember to:

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- arrive at the test site rested and prepared to concentrate for an extended period
- allow sufficient time to travel, park, and locate the test center
- be prepared for possible variations in temperature at the test center due to weather changes or energy conservation measures
- bring your ID, but otherwise, don’t weigh yourself down with belongings that will have to be kept in a locker during the test.

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Test Date:
1/1/19

Letter Grade:
A

Examination Code and Title: 123-456 UExcel Financial Accounting

Recommended Credit:
3 Lower Level

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DETAILED SCORE REPORT

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<th>Percentage of Exam Covering Content Area</th>
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*Percentage correct is based on both scored and unscored (pretest) items and was not used to calculate your letter grade.