

EXAM  
CODE **437**

CATALOG  
NUMBER **BUSx437**



# Quantitative Analysis

CREDIT  
HOURS

**3**

LEVEL

**UPPER**

PUBLISHED NOVEMBER 2017

The most current content guides are available at:  
[www.excelsior.edu/contentguides](http://www.excelsior.edu/contentguides)

**U** **EXCEL**<sup>®</sup>  
STUDY.LEARN.SUCCEED.

# CONTENTS

<b>Preparing for the Exam</b> .....	<b>1</b>
<b>Before You Choose This UExcel Exam</b> .....	<b>1</b>
Uses for the Examination .....	1
Examination Length and Scoring .....	1
<b>UExcel Exam Resources</b> .....	<b>1</b>
Excelsior College Bookstore .....	1
UExcel Practice Exams .....	1
Excelsior College Library .....	2
Online Tutoring .....	2
MyExcelsior Community .....	2
<b>Preparing for UExcel Exams</b> .....	<b>2</b>
How Long Will It Take Me to Study? .....	2
Study Tips .....	2
Using UExcel Practice Exams .....	3
About Test Preparation Services .....	3
<b>Preparing for This Exam</b> .....	<b>3</b>
Prior Knowledge .....	3
Using the Content Outline .....	3
Using the Sample Questions and Rationales .....	3
<b>Recommended Resources for the UExcel Exam in Quantitative Analysis</b> .....	<b>4</b>
Textbooks .....	4
Reducing Textbook Costs .....	4
<b>Content Outline</b> .....	<b>5</b>
General Description of the Examination .....	5
Learning Outcomes .....	5
Content Outline .....	6
<b>Sample Questions</b> .....	<b>9</b>
<b>Rationales</b> .....	<b>10</b>
<b>Taking the Exam</b> .....	<b>12</b>
<b>Registering for Your Exam</b> .....	<b>12</b>
Register Online .....	12
Examination Administration .....	12
Computer-Delivered Testing .....	12
<b>On the Day of Your Exam</b> .....	<b>12</b>
Important Reminders .....	12
Academic Honesty Nondisclosure Statement .....	12
Information About UExcel Exams for Colleges and Universities .....	13



## SECTION ONE

# Preparing for the Exam

## Before You Choose This UExcel Exam

---

### Uses for the Examination

- Excelsior College, the test developer, recommends granting three (3) semester hours of upper-level undergraduate credit to students who receive a letter grade of C or higher on this examination. The examination may be used to help fulfill the course requirement for the BS in General Business or as a free elective for all Excelsior College degree programs that allow for free electives.
- 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.

### Examination Length and Scoring

The examination consists of approximately 90 questions, most of which are multiple choice; for samples of all the item types on this exam, see the sample items in the back of this guide. Some items are unscored, pretest items. The pretest items are embedded throughout the exam and are indistinguishable from the scored items. You will have two (2) hours to complete the examination. Your score will be reported as a letter grade.

## 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:

**[www.excelsior.edu/bookstore](http://www.excelsior.edu/bookstore)**

### UExcel Practice Exams

The official UExcel practice exams are highly recommended as part of your study plan. Once you register for your UExcel exam, you are eligible to purchase the corresponding practice exam, which can be taken using any computer with a supported Web browser. Each practice exam includes two forms that you may take within a 180-day period.

## 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](http://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 SMARTHINKING™ to connect with tutors who have been trained in a variety of academic subjects. To access SMARTHINKING, go to [www.excelsior.edu/smarthinking](http://www.excelsior.edu/smarthinking). Once there, you may download a copy of the SMARTHINKING Student Handbook as a PDF.

## MyExcelsior Community

MyExcelsior Community enables Excelsior College students and alumni to interact with their peers online. As members, students can participate in real-time chat groups, join online study groups, buy and sell used textbooks, and share Internet resources. **Enrolled students have automatic access from their MyExcelsior page.** Visit [www.excelsior.edu/myexcelsiorcommunity](http://www.excelsior.edu/myexcelsiorcommunity).

# Preparing for UExcel Exams

---

## How Long Will It Take Me to Study?

A UExcel exam enables you to show that you've learned material comparable to one or more 15-week college-level courses. As an independent learner, you should study and review as much as you would for a college course. For a 3-credit course in a subject they don't know, most students would be expected to study nine hours per week for 15 weeks, for a total of 135 hours.

## 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.

## Using UExcel Practice Exams

We recommend taking the first form of the practice exam when you begin studying, to see how much you already know. After taking the first practice exam, check your performance on each question and find out why your answer was right or wrong. This feedback will help you improve your knowledge of the subject and identify areas of weakness that you should address before taking the exam. Take the second form of the practice exam after you have finished studying. Analyze your results to identify the areas that you still need to review.

Although there is no guarantee, our research suggests that students who do well on the practice exams are more likely to pass the actual exam than those who do not do well (or do not take advantage of this opportunity).

## 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](http://www.excelsior.edu/testprep).

## Preparing for This Exam

---

### Prior Knowledge

A solid grounding in statistics is assumed.

### Using the Content Outline

Each content area in the outline includes (1) the recommended minimum hours of study to devote to that content area and (2) 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 in other 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 Quantitative Analysis

---

The study materials listed below are recommended by Excelsior College as the most appropriate resources to help you study for the examination. For information on ordering from the Excelsior College Bookstore, see page 1 of this guide. You may also find resource materials in college libraries. Public libraries may have some of the textbooks or may be able to obtain them through an interlibrary loan program.

You should allow sufficient time to obtain resources and to study before taking the exam.

## Textbooks

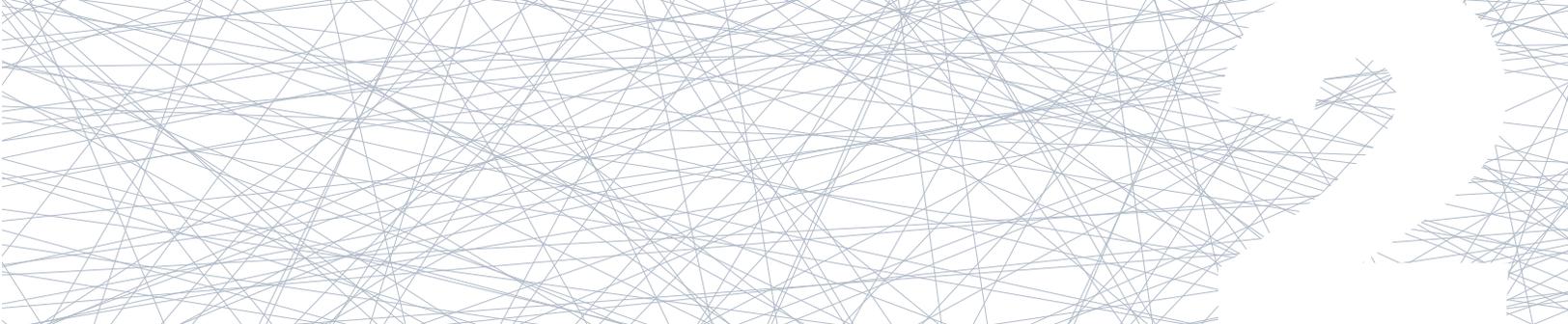
**The following textbook was used by the examination development committee to verify all questions on the exam. These study materials may be purchased from the Excelsior College Bookstore.**

**[www.excelsior.edu/bookstore](http://www.excelsior.edu/bookstore)**

Anderson, D.R., Sweeney, D.J., Williams, T.A., Camm, J.D., & Martin, K. (2016) *An introduction to management science: Quantitative approaches to decision making* (14th ed.). Mason, OH: South-Western CENGAGE.

## 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.



## SECTION TWO

# Content Outline

### **General Description of the Examination**

The UExcel Quantitative Analysis examination is based on material typically taught in an upper-level undergraduate course in quantitative analysis.

The examination measures knowledge and understanding of the major quantitative techniques and their application to the analysis of business problems. Topics include estimation, hypothesis testing, linear and multivariate regression and correlation, decision theory, linear programming, time series and supply chain management, transportation and assignment models, and inventory management and queuing theory models.

Those beginning to study for this exam should have a strong understanding of statistics.

### **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. Describe the role of quantitative methods in business decision making.
2. Compare and contrast different business modeling techniques, their benefits and weaknesses, and situations in which each model is appropriate to use.
3. Develop solutions for business problems using the following quantitative techniques: decision analysis; queuing; simulation; linear programming.

## 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 Quantitative Analysis examination, the percent of the examination, and the hours to devote to each content area are listed below.

Content Area	Percent of the Examination	Hours of Study
I. Decision Making Overview and Risk Analysis	10%	14
II. Decision Analysis	15%	20
III. Queuing Theory	10%	14
IV. Integer Programming and Project Scheduling	10%	14
V. Linear Programming	15%	20
VI. Sensitivity Analysis	15%	20
VII. Linear Programming Applications	15%	20
VIII. Distribution and Network Models	10%	14
<b>Total</b>	<b>100%</b>	

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. Decision Making Overview and Risk Analysis

**10** PERCENT OF EXAM | **14** HOURS OF STUDY

Ch. 1, Introduction

Ch. 10, Inventory Models

Ch. 11, Waiting Line Models

Ch. 12, Simulation

#### A. Decision-making process

#### B. Model development

1. Model types
2. Mathematical modeling
  - a. Uncontrollable inputs
  - b. Controllable inputs
  - c. Decision variables

#### C. Risk analysis

1. Applications of Monte Carlo simulation
  - a. Risk analysis
  - b. Inventory models
  - c. Waiting line models

## II. Decision Analysis

---

**15** PERCENT OF EXAM | **20** HOURS OF STUDY

---

### Ch. 13, Decision Analysis

---

#### A. Decision making without probabilities

1. Optimistic approach
2. Conservative approach
3. Minimax regret approach

#### B. Decision making with probabilities

1. Decision trees
2. Expected values
3. Expected value of perfect information
4. Risk analysis

#### C. Decision making with sample information

1. Decision strategy
2. Bayes' theorem
3. Expected value of sample information

## III. Queuing Theory

---

**10** PERCENT OF EXAM | **14** HOURS OF STUDY

---

### Ch. 11, Waiting Line Models

---

#### A. Waiting line structure

1. Single channel
2. Arrival processes (Poisson distribution)
3. Services processes (exponential distribution)
4. Queue discipline

#### B. Single Channel with Poisson arrival and exponential service (M/M/1)

#### C. Multiple channel with Poisson arrival and exponential service (M/M/2)

#### D. Economic analysis of waiting lines

## IV. Integer Programming & Project Scheduling

---

**10** PERCENT OF EXAM | **14** HOURS OF STUDY

---

### Ch. 7, Integer Linear Programming

### Ch. 9, Project Scheduling: PERT/CPM

---

#### A. Integer programming

1. Graphical solution
2. Computer solution
3. Applications
  - a. Capital budgeting
  - b. Fixed costs
  - c. Distribution systems

#### B. Project scheduling

1. Projects with known activity times
  - a. Critical path concepts
  - b. Determining critical path
2. Projects with uncertain activity times

## V. Linear Programming

---

**15** PERCENT OF EXAM | **20** HOURS OF STUDY

---

### Ch. 4, Linear Programming Applications in Marketing, Finance, and Operations Management

---

#### A. Simple LP formulation

1. Problem formulation (maximization/minimization)
2. Graphical solution
3. Extreme points
4. Interpretation of computer output
5. Special cases
  - a. Alternative solutions
  - b. Infeasible
  - c. Unbounded

## VI. Sensitivity Analysis

---

**15** PERCENT OF EXAM | **20** HOURS OF STUDY

---

**Ch. 3, Linear Programming: Sensitivity Analysis and Interpretation of Solution**

---

### A. Graphical

1. Objective function
2. Right hand sides

### B. Computer output

1. Dual price
2. Reduced cost
3. Range feasibility
4. Simultaneous changes

## VII. Linear Programming Applications

---

**15** PERCENT OF EXAM | **20** HOURS OF STUDY

---

**Ch. 4, Linear Programming Applications in Marketing, Finance, and Operations Management**

---

### A. Marketing applications

1. Media selection
2. Marketing research

### B. Financial applications

1. Portfolio selection
2. Financial planning

### C. Operations management applications

1. Make vs. buy
2. Production scheduling
3. Workforce assignment

## VIII. Distribution and Network Models

---

**10** PERCENT OF EXAM | **14** HOURS OF STUDY

---

**Ch. 6, Distribution and Network Models**

---

### A. Transportation problem

### B. Assignment problem

### C. Transshipment problem

## SECTION THREE

# 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 10–11 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, a basic 8-function calculator will also be available on your computer. A typical calculator is printed at the back of this content guide.

1. What is the volume that results in revenue being equal to total cost?
  - 1) profit-volume model
  - 2) break-even point
  - 3) marginal volume
  - 4) marginal cost
2. In a waiting line situation, arrivals occur at a rate of 2 customers per minute, and the service times average 20 seconds per customer. Assume the Poisson and exponential distributions. What is the average time (in minutes) a customer spends in the waiting line?
  - 1) 0.25
  - 2) 0.50
  - 3) 2.00
  - 4) 4.00
3. Which term describes the process of determining if the computer procedure that performs simulation calculations is logically correct?
  - 1) implementation
  - 2) repetition
  - 3) validation
  - 4) verification
4. If the acceptance of project A is conditional on the acceptance of project B, and vice versa, what is the appropriate constraint to use?
  - 1) multiple-choice
  - 2) corequisite constraint
  - 3)  $k$ -out-of- $n$  alternatives
  - 4) mutually exclusive constraint
5. Activities K, M, and S immediately follow activity H, and their latest start times are 14, 18, and 11. What is the latest finish time for activity H?
  - 1) 11
  - 2) 14
  - 3) 18
  - 4) It cannot be determined.

## SECTION FOUR

# Rationales

### 1. (IB1)

- 1) The profit-volume model determines the total profit associated with a specified production-sales volume.
- \*2) **Break-even analysis determines the sales level needed to break even or when cost or expenses and revenue are equal. There is no net loss or gain.**
- 3) There is no such thing as marginal volume. Marginal cost varies directly with production volume. In general, if the volume of output increases, the cost per unit decreases.
- 4) Marginal cost is the total cost that results from producing one additional unit.

### 2. (IIIB)

- \*1) **In a single-channel waiting line model with Poisson arrivals and exponential service times, the average time a customer spends in the waiting line is  $W_q$ , the average number of customers in the waiting line is  $L_q$ , the mean number of arrivals per time period is  $\lambda$ , and the mean number of services per time period is  $\mu$ .**

$$W_q = \frac{L_q}{\lambda}$$

$$L_q = \frac{\lambda^2}{\mu(\mu - \lambda)}$$

$$\lambda = 2 \frac{\text{customer}}{\text{min}}, \mu = \frac{1 \text{ customer}}{15 \text{ sec}} \times \frac{60 \text{ sec}}{\text{min}} = 4 \frac{\text{customer}}{\text{min}}$$

$$L_q = \frac{4}{4(4-2)} = 0.5$$

$$W_q = \frac{L_q}{\lambda} = \frac{0.5}{2} = 0.25 \text{ min}$$

\*correct answer

- 2) This is the value for the average number of customers in the waiting line,  $L_q$ .
- 3) This is the value of the mean number of customer arrivals per time period,  $\lambda$ .
- 4) This is the value of the mean number of customer services per time period,  $\mu$ .

### 3. (IVA)

- 1) Implementing the simulation alone cannot determine if it is logically correct. See 4).
- 2) Repeating the simulation alone cannot determine if it is logically correct. See 4).
- 3) Validation ensures that the simulation model is an accurate representation of the real system.
- \*4) **Verification is mainly a debugging task to make sure that no errors are in the computer procedure that implements the simulation.**

### 4. (IXB)

- 1) Multiple-choice constraint is used when only one of the multiple projects must be selected. (that is,  $w_1 + w_2 + w_3 = 1$ )
- \*2) **Because the acceptance of project A is necessary for the acceptance of project B and vice versa, the appropriate constraint is corequisite where both projects must be selected. (that is,  $w_1 + w_2 = 2$ )**
- 3) The  $k$ -out-of- $n$  alternatives constraint is an extension of the multiple-choice constraint. It is used when more than one out of multiple projects must be selected. This is an example of a 2-out-of-5 alternatives constraint. (that is,  $w_1 + w_2 + w_3 + w_4 + w_5 = 2$ )
- 4) Mutually exclusive constraint is used if a “no” selection or zero is also a possible choice. (that is,  $w_1 + w_2 + w_3 \leq 1$ )

5. (XA2)

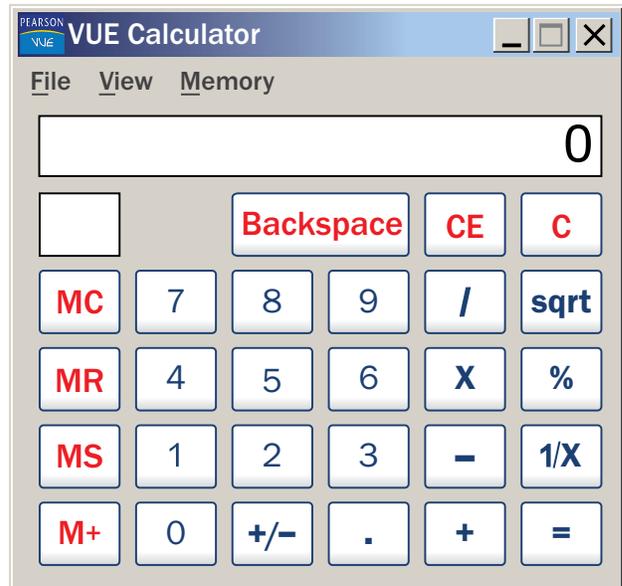
1) See 3).

2) See 3).

\*3) Since the latest start (**LS**) for S is week 11, it needs to be started prior to K (**LS** = 14) and M (**LS** = 18), and the latest finish (**LF**) for H has to be completed in week 11. H - S is the critical path and not H - K or H - M.

Based on the critical path, **LF** (H) = **LS** (S) = 11

4) See 3).



\*correct answer

## SECTION FIVE

# Taking the Exam

## Registering for Your Exam

### Register Online

[www.excelsior.edu/examregistration](http://www.excelsior.edu/examregistration)

Follow the instructions and pay by Visa, MasterCard, American Express, or Discover Card.

### Examination Administration

Pearson Testing Centers serve as the administrator for all Excelsior College computer-delivered exams. The Disability Services office at Excelsior College is responsible for considering requests for reasonable accommodations (exceptions for individual students with documented disabilities). If you are requesting an accommodation due to a disability, download and complete a Request for Accommodation form that can be accessed by visiting the Excelsior College website at [www.excelsior.edu/disability-services](http://www.excelsior.edu/disability-services).

### Computer-Delivered Testing

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.

We strongly encourage you to use the online tutorial before taking your exam at a Pearson Testing Center. To access the tutorial, go to [www.pearsonvue.com/uexcel](http://www.pearsonvue.com/uexcel) and click on the Pearson VUE Tutorial link on the right hand side of the page.

## On the Day of Your Exam

### Important Reminders

On the day of your exam, remember to:

- dress comfortably: the computer will not mind that you're wearing your favorite relaxation outfit
- 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.

### Academic Honesty Nondisclosure Statement

- All test takers must agree to the terms of the Excelsior College Academic Honesty Policy before taking an examination. The agreement will be presented on screen at the Pearson VUE Testing Center before the start of your exam.
- Once the test taker agrees to the terms of the Academic Honesty Nondisclosure Statement, the exam will begin.

### If you choose not to accept the terms of the agreement

- your exam will be terminated
- you will be required to leave the testing center

- you will not be eligible for a refund. For more information, review the Student Policy Handbook at [www.excelsior.edu/studentpolicyhandbook](http://www.excelsior.edu/studentpolicyhandbook).

Student behavior is monitored during and after the exam. Electronic measures are used to monitor the security of test items and scan for illegal use of intellectual property. This monitoring includes surveillance of Internet chat rooms, websites, and other public forums.

## **Information About UExcel Exams for Colleges and Universities**

A committee of teaching faculty and practicing professionals determines the learning outcomes to be tested on each exam. Excelsior College Center for Educational Measurement staff oversee the technical aspects of test construction in accordance with current professional standards. To promote fairness in testing, we take special care to ensure that the language used in the exams and related materials is consistent, professional, and user friendly. Editorial staff perform systematic quantitative and qualitative reviews to ensure accuracy, clarity, and compliance with conventions of bias-free language usage.

Excelsior College, the test developer, recommends granting three (3) semester hours of upper-level undergraduate credit to students who receive a letter grade of C or higher on this examination. The examination may be used to help fulfill the course requirement for the BS in General Business or as a free elective for all Excelsior College degree programs that allow for free electives. 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.



7 Columbia Circle, Albany, New York 12203-5159

Phone: | toll free 888-647-2388 or 518-464-8500

TDD: | 518-464-8501

Fax: | 518-464-8777

[excelsior.edu/exams](http://excelsior.edu/exams)