


ACTUARIAL *Exam Tactics*

Learn More, Study Less

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FSA/FCAS
PASS
PRACTICE
STUDY
PLAN

Proven tactics for achieving exam success
from the youngest FSA ever.

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Foreword

Actuarial exam candidates have an abundance of choices in test-prep manuals that summarize what to study for a particular exam, while providing ample sources for extra practice problems. However, there remains scant literature on the specifics of how to study for actuarial exams in general. This new book by two recently credentialed actuaries of the Society of Actuaries (SOA) (one an FSA, and the other an ASA) provides a detailed overview on both how to maximize one's probability of passing an actuarial exam and how to significantly reduce the prep time required to achieve success.

Roy Ju and Mike Jennings are two of the best students I have had the privilege of teaching during my 8+ years at Drake University. You may have heard of Roy before, as he was recently recognized by the SOA as the youngest Fellow in their history, achieving the FSA designation at the tender age of 20. Michael's perspective, though, is equally valuable, since he mastered Roy's study methods during their time together at Drake, and made quick adjustments to become ASA (& CERA) within a year of receiving his undergraduate degree.

Roy and Mike believe that the optimal pathway to passing actuarial exams is to learn successful study methods and to faithfully implement them over time. This text is meant to teach the aspiring actuarial exam candidate about these methods so that the reader will not have to struggle for several exams (or years) before achieving their goals. In the authors' words: "As students begin the actuarial exam process, they are cast into uncharted territory with no tools to help them navigate...one

can go through the entire exam process fumbling to reinvent the wheel regarding which study methods work best.” The primary benefit of this text is to teach students the right way to process the large amount of both quantitative and conceptual information that ultimately appears on actuarial exams.

Actuarial Exam Tactics: Learn More, Study Less is organized into three compact sections. Part I focuses on effectiveness, or how to learn the material well enough to pass, while keying in on fundamental concepts and mandatory review sessions. Part II emphasizes efficiency, or how to learn the material at an acceptable level albeit with fewer study hours. Finally, Part III discusses the essential step of how to adhere to the principles learned in Parts I and II in an organized and disciplined manner, while staying current with one’s original study schedule. A very helpful benefit to the reader at the end each chapter is a “Cheat Sheet” summary of chapter highlights, along with a terse summary of the take-home message.

Roy and Mike’s goal in writing this text is to “produce significant growth in the ability to master the exam process (both understanding the material and doing it in a shorter time).” After reading through this exciting perspective on how to foster exam success, I am confident that other readers, especially those at a more junior stage in their actuarial careers, will attain the “significant growth” that Roy and Mike intend. Furthermore, if these readers adhere over time to the same principles that worked for Roy and Mike, they have an excellent opportunity, in the not-too-distant future, to enjoy lucrative professional careers in actuarial science.

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— Chapter 1 —

Introduction

*“Give me six hours to chop down a tree
and I will spend the first four sharpening the axe.”*

— *Abraham Lincoln*

Mike’s Story

What most intrigued me about Roy becoming the youngest FSA was not his age—I figured this was achievable for anyone that started the exams early and wasted away their high school and college careers studying. What really caught my attention was *how* he studied for these exams.

My assumption that Roy spent all his time studying was quickly dismantled when I learned that he was one of the top-ranked tennis players in the state, played trombone at an all-state level, and volunteered 200 hours of his time all while passing his first three exams in high school. How could someone accomplish so much with the same 24 hours per day as me? Was Roy a natural prodigy, a workaholic or was there a method to his madness?

As I was entering my junior year at Drake University, Roy was entering as a freshman, and I was determined to learn about his study approach. We became friends throughout the year, and when I started

asking about studying, I quickly realized his approach was far from traditional. When I asked him how many practice tests he did before taking MLC that fall, the answer was zero. I was beyond skeptical that his study methods had any use to the average, run-of-the-mill student like myself. I was doing fine with my own study method, and having just passed my third preliminary exam that summer, I decided to ignore his study approach and continue along my way.

Shortly thereafter, I entered an exam drought. I failed MLC the next year and felt incredibly discouraged while contemplating the thousands of study hours still ahead on the path to Fellowship. I was still skeptical of Roy's studying, but I was determined to do my own research into effective study techniques to get back onto a successful exam path. As I researched, I was shocked at the similarities between Roy's seemingly absurd methods and psychological learning principles. Around this same period, I learned of Roy's most impressive exam feat to-date. He passed two FSA exams in one sitting while taking seven university courses, working 25-30 hours per week at an actuarial internship, and serving as the President and Vice President of two campus organizations. I knew it was time for a second conversation with Roy to uncover the details of his approach.

The result of that conversation (and many follow-ups) transformed the way I studied. After almost two years without passing an exam, I entered the most fruitful period of my exam career. In 15 months, I passed Exam C, Exam MLC, the FAP modules, the FSA modules, and Exam ERM. I've been thrilled with the results of this new strategy, but one question still bothered me—**where were these study methods when I started taking the exams?**

As students begin the actuarial exam process, they are cast into uncharted territory with no tools to help them navigate. Sure, there are published study materials outlining *what* to study, but there is no guide on *how* to study. One can go through the entire exam process fumbling to reinvent the wheel on which study methods work best. Far too often, this leads to students settling for a mediocre study approach that worked for them in the past without any deliberate attempts to further improve that approach.

The goal of this book is not to serve as *the* definitive study approach for actuarial exams, but to serve as a compass to point your study efforts in the right direction. You don't have to settle for the conventional rule of 100 hours of study time per exam hour; you will be surprised at how much study time you can eliminate with a deliberate practice of improving your study skills. Ideally, future students will master this approach and push the entire field forward by creating even more effective methods. Before you dive into studying for your next exam, sharpen the axe and make an effort to improve your approach—you will not be disappointed with the results.

Roy's Story

I began my exam journey in high school, though I did not initially intend to become an actuary. My parents wanted me to become a doctor, and I had strong interest in the high-pressure and challenging nature of surgery. However, every career inventory survey I did suggested “actuary” as my top recommended career, so I started to do some research. I was excited by the prospect of applying mathematical principles in a practical setting, so I started taking the exams and the rest was history.

When I began my first exam, I consulted Google to better understand how people were preparing for these exams. I was amazed when I learned how massive a time commitment these exams seemed to be! The study manuals were much thicker than expected when they arrived. I assumed that manuals of this size contained plenty of redundant information that wouldn't be necessary to pass a 30-question exam. As most of you can imagine, every conversation I had to understand which parts of the manual were most important ended in the realization that standard practice was to read through the entire manual from start to finish; most sources did not hint at prioritizing certain sections or concepts. Instead, most individuals tried their best to power through each manual, page by page. Through all of these searches, I also noted the numerous efforts of those who were in the same boat as me, asking themselves how to go about tackling these exams.

As I went through these exams, I came to learn that the ideal approach is not just following the crowd and trudging through the exam manuals from front to back. While the manuals were very useful resources for these exams, it dawned upon me that the goal should shift from *finishing* the manual to *understanding* the material. As you will find in this book, this seldom requires a linear approach of plowing through the appropriate study manual.

As I reflect upon my exam journey, I can recount numerous circumstances of studying while waiting for my friends to pick me up, studying while watching football, and studying while cooking. As a matter of fact, Sundays were always free days from dedicated study because I am an enthusiastic fantasy football competitor. There is no way that I could stay competitive in my league if I wasn't watching NFL football all Sunday, every Sunday! You will be hard pressed to find

anyone that would advise multitasking while studying, but stick with us, and you will learn about how to incorporate short and effective study sessions into your daily life.

People often ask about what drove me to obtain my FSA at such a young age. My motivation came as a result of enjoying the journey and approaching the exams in a way that worked well with my class/work/life balance. This naturally flows from integrating the actuarial exams into my life in a sustainable and unforced fashion. In the chapters ahead, you will learn more about how I approached the exams from a conceptual basis to put more intuition into actuarial calculations.

On a final note to my friends at Drake and at high school who “never” saw me study—those who wondered how I got anything productive done, given the amount of time I spent hanging out, watching sports, working out, and EATING. And to my parents, who never observed me hiding in the books, I hope that the contents of this book can help you better understand how I balanced exam study with all of my other life commitments.

— Chapter 2 —

Overview

By Mike Jennings

How do you define being “good” at passing actuarial exams? The obvious answer is that your exam score indicates your ability, but there is another missing dimension: time spent studying. If you score an eight on your exam with 150 hours of studying, it’s fair to say that you’re a better exam taker than someone who took 500 hours to obtain the same score. Thus, our two main areas of focus to improve exam performance will be effectiveness (learning the material well enough to pass) and efficiency (equal learning with fewer study hours). **Effectiveness is doing the right things; efficiency is doing things right.**

The sequencing of these two objectives is important; there is no sense in becoming more efficient at ineffective learning techniques. If you are trying to learn by hand-copying the textbook, you shouldn’t work on more efficient handwriting abilities; you should instead start with a more effective learning method. Although you may be tempted to jump right to the Efficiency section to cut down on study time, the best way to save time is by starting with the most effective strategies to learn the material. The basic principles introduced in this book can also be applied to improve your learning of almost *any* subject.

After learning about effective study methods, the Efficiency section will teach you how to implement those techniques in less time. This is how you go from passing with 100 study hours per exam hour to passing with 25-50 study hours per exam hour. These are the techniques that allowed Roy to take two FSA exams in one sitting while balancing a full work and school schedule with a rich personal life.

By working diligently to improve the effectiveness and efficiency of your study approach, you will find it much more manageable to maintain work/life balance throughout the exam process and enjoy yourself along the way.

At the end of each chapter in the Effectiveness and Efficiency sections, we included a “Cheat Sheet” to summarize the key information from the chapter. You may choose only a few strategies from this book to implement at a time, so these Cheat Sheets can serve as a quick reference guide when you are looking back for additional techniques to try in the future.

— Part I —
Effectiveness: How to Pass the Exams

By Mike Jennings

“It is important to view knowledge as sort of a semantic tree – make sure you understand the fundamental principles, i.e. the trunk and big branches, before you get into the leaves/details or there is nothing for them to hang on to.” — Elon Musk

In order to find effective study techniques, we have to understand the goal of the study process: to develop a holistic understanding of the exam topic. To illustrate this holistic understanding more concretely, think of a knowledge tree, borrowing from Elon Musk’s analogy. For exam FM, the knowledge tree may look like the following diagram.



The trunk is the main topic of the exam—Financial Mathematics. The branches consist of the fundamental concepts and learning objectives from the syllabus, and the leaves consist of the details, definitions, and formulas related to each learning objective.

Many students ignore this hierarchy; they simply work through the details of the syllabus material without trying to connect them back to the overarching topic—I was guilty of this myself for my first several

preliminary exams. You can still manage to pass by memorizing formulas and facts, but there are two main drawbacks: you forget the material soon after the exam since there is no foundation holding it together, and it takes significantly longer to study by trying to memorize isolated formulas instead of forming an intuitive understanding. If you've already taken an exam, you can perform a quick test to see if you formed a holistic understanding: how would you explain Financial Mathematics (or any other exam topic) to a new actuarial student? If you don't know where to start with this answer, it's likely that you did not fully understand the relationships between the concepts that you studied. If you have a holistic understanding, you can explain by stepping through the knowledge tree starting with the trunk and slowly moving through the branches—explain the two segments of interest theory and financial economics and give an overview of the main learning objectives in each, using details as necessary to illustrate these concepts.

The study approach outlined in this section shows you how to intentionally build this holistic understanding throughout your study process. We will offer tools to build your initial foundation during your first read-through of the material, but you should not expect to fully grasp the concepts on the first attempt. You may miss a few leaves (details) here and there, or they may fall off over the time it takes to work through the high volume of study material. Thus, the second part of this section will focus on the most effective methods to review and reinforce the concepts from your initial read-through. Through this process of understanding and reviewing fundamental concepts, you will build a holistic understanding and set the foundation for your future exam success.

— Chapter 4 —

Productive Review Sessions

“There is no waste in the world that equals the waste from needless, ill-directed, and ineffective motions”. — Frank Bunker Gilbreth, Sr.

“It is not enough to be industrious; so are the ants. What are you industrious about?” — Henry David Thoreau

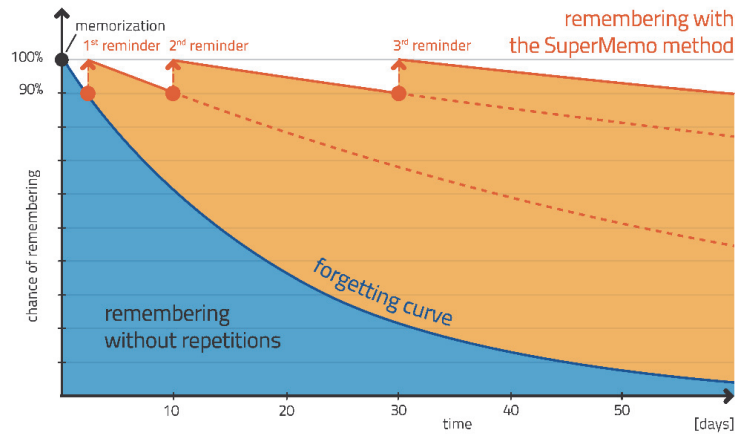
The most common advice on studying for actuarial exams is to do as many practice problems as possible. While this advice is generally sound for reinforcing the fundamental concepts, there is a more deliberate way to go about this review. To elaborate on the best practices of reviewing material, we will answer the following two questions: *when* to review and *how* to review.

When to Review? (Spacing Effect)

Out of all the literature on effective learning methods, the spacing effect appears to be the most studied and proven method to increase retention of material.^{2, 3, 4} The spacing effect describes a phenomenon that we all intuitively assume: studying a subject multiple times over a longer period is superior to a single, massed study session for long term

memory.* This outcome is a natural result of the related concept of the forgetting curve, the idea that our retention of a given concept declines at an exponential rate over time when there is no reinforcement of the initial concept.⁵ Naturally, the easiest way to fight the forgetting curve is to schedule spaced reviews at strategic intervals over the course of your study time.

How frequently should these reviews be scheduled? The optimal intervals are dependent on the time between initial learning and the exam date, but a good rule of thumb is to schedule weekly review sessions to review the prior week's material plus a longer review session at the end of the month to review older concepts. If you want to get very detailed about maximizing the effectiveness of your review sessions, you can use software such as SuperMemo or Anki that calculate your ideal review intervals. The following graph from SuperMemo illustrates the effectiveness of using spaced practice.



* Note that this effect does not hold for short-term memory tests. That is, cramming is still effective if the only goal is short-term retention of the material. This doesn't work well for actuarial exams because of the high volume of material to be learned. Further, the exam material is cumulative and a cramming approach to the exams is highly ineffective in the long-run, lending even more credibility to the spacing effect approach for the actuarial exam process.

The key takeaway here is to not leave all your review until the end of your exam prep process. The common approach of working through each section of the exam manual and then reviewing everything in the last few weeks is not as effective as scheduling review sessions at regular intervals.

Traditional Approach:



Improved Approach:



Not only is this spaced review approach more effective for learning, but it also has the psychological benefit of assessing your progress as you go; you don't have to panic when you do your first real set of practice problems with only 3 weeks before the exam and realize how much review you still need. Now that you know to plan these frequent reviews into your study schedule, the next big question is what to do during these reviews.

How to review? (Retrieval Practice/Testing Effect)

To ensure your spaced review sessions are productive, you should have a plan of what to do during these sessions. One of the least productive ways to spend your review time is to reread your study manual or notes (especially rewriting notes). Learning depends not just on

storing the material (e.g. reading and rereading), but more importantly on retrieving that material. The biggest problem with rereading material is that you create a fluency illusion; you build a familiarity with the topic and convince yourself it will be easy to remember later because it is easy to understand now. The best way to break through this illusion is to test your recall of the information. After all, retrieving information is the skill we need to use on exam day, so why not practice it throughout your preparation?

Retrieval practice, or self-testing, is critical to effective review. The main goal of this testing process is to point out gaps in your fundamental understanding and to spend time reinforcing those weak points. The key is to focus your effort on your pain points, not on the concepts you already know well. If you get a practice question wrong, revisit that concept to fix your understanding and then attempt the problem again shortly after to ensure you learned the material. To perform this iterative cycle of test-fix-test, there are two important features to include: immediate feedback and appropriate difficulty. Immediate feedback is crucial to help you quickly identify the specific holes in your understanding after being tested on a problem, and it usually comes in the form of a model solution. An appropriate level of difficulty is important to make sure you are being challenged with effortful recall, but not so difficult that you have no idea where to begin with solving the problem. The problems should stretch you beyond your current abilities to identify failure points, but not so far beyond that there are dozens of potential points of failure that become overwhelming.

What tools can you use for self-testing? The most obvious is practice problems, especially for the preliminary exams. These are extremely effective, but we will not touch on them too much as everyone is already

very familiar with this strategy (we will discuss more unique uses of them in the Efficiency section).

For testing your conceptual understanding, you can use a method called the Feynman technique:

1. Pick a fundamental concept to test (e.g. immunization, bonds, option payoffs, put-call parity, gross premium reserves).
2. Explain the topic as if you are teaching it to a new student.
3. When you get stuck, go back to your source materials to fill in the gap in your understanding (this is when rereading is effective—when used for feedback on a problem).
4. Simplify the concept and use analogies—get rid of overly technical language and substitute it with simpler wording or an analogy. This prevents you from confusing knowledge of words for knowledge of the idea.

This simple process tests your fundamental understanding of a concept by your ability to explain it in your own words. The technique is a useful supplement to practice problems, and it is especially useful when you get to the essay exams where practice problems are scarce. You don't have to write down your explanations, but that can be a useful step to keep yourself honest on where you lack understanding. Philosopher and educator Mortimer Adler wrote “The person who says he knows what he thinks but cannot express it usually does not know what he thinks.”

Reviewing conceptual knowledge is often overlooked for the calculation-based preliminary exams. However, a strong conceptual understanding allows you to perform reasonability checks for your calculations to catch simple errors and save time on the exam. For example, an intuitive understanding of call and put options (Exam

MFE*) allows you to estimate an option price based on the stock price relative to the strike price, or moneyness of the option (a stock price much lower than the strike price will result in a cheap call option). Similarly, an intuitive understanding of reserves allows you to perform checks such as making sure your reserve is no greater than the arithmetic sum of future payments. While these checks help during the exam process, they become even more useful in the workplace, the ultimate goal of this whole journey.

In addition to practice problems and the Feynman technique, another common testing tool is flashcards. Flashcards can be effective, but make sure you are not just using them to memorize a formula and settle for surface-level understanding. Flashcards are more effective when geared toward understanding fundamental principles, including plenty of How and Why questions. For example, instead of making a flashcard for “What is the formula for Bayes’ Theorem?” (Exam P), you can add the follow up question “How is Bayes’ Theorem applied in a risk management context?”

Review Tip:

Interleaved practice. As you approach the end of your study prep, you will learn more effectively if you mix (or interleave) practice problems on different subjects rather than focusing on one subject at a time. Focusing on individual subjects is effective for gaining an initial understanding, but interleaved practice more accurately represents what you will experience on exam day. Additionally, interleaved practice reduces your dependence on the context in which a problem is presented; you don’t want to become dependent on answering a straddle option question only when you are in the mindset of answering other call/put option questions.

* Exam MFE will be on the syllabus through June 30, 2018, and will be replaced by Exam IFM on July 1, 2018.

The last study tool we will mention is what we'll call a "one-pager". Toward the end of your study prep, you will have already spent a lot of time understanding and reviewing fundamental concepts. However, students often don't finish the final step of solidifying the relationships between these concepts to create a holistic understanding of the subject. Creating a "one-pager" is essentially creating a condensed study guide, and the process will help you compress and simplify the material down to its most essential concepts and understand how they fit together. I recently took Exam ERM and I created a "one-pager" summary for each of the syllabus objectives, where I listed each reading and its fundamental concepts on a single page. To take it a step further, I then created a new draft that eliminated the list of readings and simply integrated the common concepts among the readings.

If you think there is too much material to ever compress to a single page, you probably need to spend more time simplifying to get to the fundamental concepts. Just remember the quote from Blaise Pascal, "I would have written a shorter letter, but I did not have the time." Simplification is an effortful process that takes time. The benefit of this study tool is not the summary itself—it's the process of compressing the information into a constrained space, pushing you to truly understand the fundamentals. The holistic understanding that you build will also help you distinguish which types of problems are likely to be tested. Often, the most challenging topics can be the most obscure and can deviate from the fundamental concepts. When an obscure type of practice problem or topic doesn't fit the holistic picture, you can choose to skip the problem, knowing it is not likely to show up on the test. Often, these types of problems take the longest to understand and can even confuse your understanding of the fundamental concept if you spin the wheels too long trying to understand them.

If you get nothing else out of this book, please remember: spaced reviews and self-testing are the two of the most important principles to improve learning. Using these methods to reinforce concepts will help you learn the material deeply enough to pass your exams. Now that you have learned effective study techniques, you may ask yourself “how can I implement these in less time?”

Cheat Sheet: Productive Review Sessions

When to review?

Spacing Effect



- Don't leave all review for the end of prep
- Schedule weekly & monthly reviews

How to review?

Self-Testing

- Don't reread material and notes
- Use practice problems, the Feynman technique, "one-pager" summaries, flashcards
- Immediate feedback & appropriate difficulty
- Interleaved practice toward the end of prep

