

KUTZTOWN UNIVERSITY, DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

CompTIA Certifications and You

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Introduction

It could be said without further citation that the world of computer science is growing. The number of computers per household in the US has grown steadily since 1984 [1] and the number of computers per household *worldwide* has seen steady increases since the early 2000's. [2] The amount of data we produce is growing at an increasing rate - approximately 2.5 quintillion bytes of data a year. [3] The number of students interested in computer science and the number of computer related jobs is growing too. [4] The only thing that hasn't seemed to grow proportionally is academic infrastructure needed to support the growing number of students interested in computer science[5].

Like many, when I chose to pursue an academic career in computer science I did so in large part based on the guarantee of a promising career. And indeed, from the moment I started sending my resume out and it didn't take long before I was receiving phone calls and e-mails from recruiters who thought I was a "really good fit" for their opening based upon my academic credentials. My initial confidence faltered after realizing that many of these jobs were at best marginally related to my degree. Starting salaries were less than ideal and far lower than what popular career sites projected. Some recruiters were downright predatory - perhaps hoping to lure in a well-rounded graduate blissfully unaware of her own worth. Some recruiters had clearly not even read my resume, wasting my time and theirs only to determine that I was not as good a fit as they once thought.

With the realization that these "guaranteed" careers weren't quite what I'd imagined, I wondered what I could do to improve my standing amongst other applicants. What could I do to *truly* stand out and land an interview? While research seemed to be a hot commodity amongst academic types, I found that many job listings had the same confusing phrase somewhere in the applicant requirements, "experience required". Some entry-level positions even required 3-5 years of professional experience. So I wondered what I could do to free myself from the vicious cycle of needing experience, yet having none. What could I do to nudge my resume to the top of the stack? What could I do to stand a chance?

Horrified, I began picking the brains of every IT professional I knew from help desk clerks to penetration testers for the US Department of Defense there was one common piece of advice. Invest in yourself above and beyond your degree. Take courses in soft skills. *Get certified*, but not by just any run of the mill certification factory. Get *CompTIA* certified. And so I did. This paper chronicles my experience with becoming CompTIA Security+ certified and offers words of wisdom for prospective test takers.

Rationale

As a student not lacking in academic knowledge or soft skills, I decided to really dig into *why* a computer science career seeker would devote not only their time, but also a considerable amount of money into certification. This section explains the rationale behind becoming CompTIA certified.

Overall

First, it is important for students to understand why they should seek certification and how it could boost their career potential straight out of college. The computerscience.org page on certifications provides an excellent first resource for future cert seekers. It gives a brief rationale for becoming certified, an overview of the types of certifications available, tips on identifying accredited and legitimate certification programs, funding methods, and finally a comprehensive list of certification programs. In their rationale, they state two important statistics that prove the value of certifications from employers' perspectives. These statistics come from Microsoft and CompTIA respectively. A whopping 91% of recruiters look for relevant certifications, and 93% of hiring managers find certs to be beneficial. [6] These statements alone provide a strong argument for certification, but can be expanded upon as follows.

Recruiters looking for *relevant* certifications are trying to find candidates knowledgeable in certain field. So it is particularly for computer science students who can choose to focus in any of a number of different areas, yet earn the exact same degree as a peer in a different focus. For example, one "IT" student may be interested in networking while another is interested in security. Although the two fields are closely related, an expert in one is not necessarily an expert in the other. With relevant certifications an employer can make that distinction early in the hiring process. With a large enough candidate pool, the certification could even boost a candidate closer to the top of the "stack". In short, a certification from an accredited institution is a quick way for an employer to know where a candidates strengths and interests lie.

Hiring managers find certifications to be beneficial for a number of reasons. For one, maintaining certifications requires upkeep and shows that a candidate is staying current their field. In the ever changing landscape of computer science¹, it is obvious why staying current in the field is particularly important for a candidate's career. Since the growth of technology has accelerated with each generation, companies cannot afford a stagnant employee knowledge base. Neither can job seekers afford to fall behind. Earning and maintaining certifications also shows that a candidate is willing to continue learning and to invest in themselves to further their career. This is a quality that is equally as

¹An interesting article by Berman and Dorrier illustrates this point nicely. [7]

valuable to employers as it is difficult to translate on a resume.

Statistical interpretations aside, interested readers should visit their favorite career site and search for “computer science certifications” or something of the like. The number of jobs that prefer or even *require* certification may come as a surprise to many students. Many jobs requiring certification also come in at a higher pay scale than jobs without the requirement². See Figure 2.1 on the following page for a few tables of results from Tittel’s “Best Information Security Certifications For 2017”. CompTIA’s Network+, Security+, A+, and Server+ all make the list.

Informal interviews with IT professionals and hiring managers also yielded some valuable information about the value of certification. Every interviewee saw at least some value in attaining certifications³. Only one interviewee had anything negative to say, and his (valid) point was that being certified does not necessarily translate to practical skill and that a “good hiring manager” should be able to identify a skilled worker with or without a cert. He did agree however, that given a big enough candidate pool he would likely consider those with certs before those without.

CompTIA

Attaining certification is a relatively low-risk investment for a student preparing to enter the workforce. There are a seemingly endless number of “certifications” out there in all price ranges, but it is crucial that the certification is well-recognized and sought-after by the student’s desired employers. Luckily there are plenty of well-known and *accredited* certification programs to choose from. CompTIA is a solid choice for entry-level certification because it is widely recognized and offers a wide range of certifications in stable as well as up-and-coming topics in computer science.

CompTIA may not be a “household” name, but amongst professional IT circles it certainly isn’t foreign. Every professional approached for interview was aware of and/or had attained CompTIA certification. The CompTIA brand makes appearance in articles, blogs, and even has a subreddit⁴. The consensus amongst these sources is generally positive confirming that CompTIA certification is not a waste for those ambitious enough to attain it.

²Originally I had sourced a few positions from indeed.com to share here, but at the time of this paper’s completion the link had broken. Most notably, the search returned high-paying yet entry level positions at Booz Allen Hamilton and the US Department of Defense.

³A leader at an IT contracting company for the US DoD even asked me to send my resume when he found out I was interested in becoming certified.

⁴<https://www.reddit.com/r/CompTIA/>

Certification	SimplyHired	Indeed	LinkedIn Jobs	TechCareers	Total
Cisco CCIE	2,070	2,317	1,627	12,496	18,510
Cisco CCNP	4,573	5,065	3,384	21,800	34,822
CompTIA Network+	2,928	3,285	203	2,173	8,589
Juniper JNCIE-ENT	199	224	128	30	581
Wireshark WCNA*	40	42	29	13	124

(a) Best Computer Networking Certifications For 2017

Certification	SimplyHired	Indeed	LinkedIn Jobs	TechCareers	Total
CEH	1,977	2,184	1,427	257	5,845
CISM	3,286	3,585	2,337	10,629	19,837
CISSP	10,526	11,617	7,632	15,212	44,987
GSEC	1,317	1,477	954	128	3,876
Security+	3,038	3,396	1,275	1,431	9,140

(b) Best Information Security Certifications For 2017

Cert	SimplyHired	Indeed	LinkedIn Jobs	TechCareers	Total
ACMT	240	274	67	466	1,020
BICSI Technician	429	23	184	0	636
Cisco CCT*	216	237	208	40	701
CompTIA A+	1,484	1,448	687	1,021	4,640
CompTIA Server+	1,998	100	63	1,021	3,182

(c) Best Computer Hardware Certifications For 2017

Certification	SimplyHired	Indeed	LinkedIn Jobs	TechCareers	Total
Apple ACSP	108	120	67	17	312
CompTIA A+	1,512	1,668	665	1,429	5,274
HDI-SCA	214	239	11	101	565
ITIL Foundation	133	154	50	87	424
MCSA: Windows 10	343	373	171	71	958

(d) Best Help Desk Certifications For 2017

Figure 2.1: Each of these figures shows the number of job postings for each field across four popular career development websites.

Anecdotal information aside, the CompTIA brand also shows up in many “best of” listicles and even the Global Knowledge “2017 IT Skills and Salary Report”[13]. It states that in the US, the average salary for a CompTIA certified professional was \$82,045. CompTIA made the list 3 times in the Top 20 Highest Paying Certifications list with Project+, Security+, and Network+ coming at \$92,593, \$87,666, and \$79,435 respectively. CompTIA came up several other times in the report being listed as an incredibly useful entry-level certification as well as providing certifications for new and emerging fields (Cybersecurity Analyst CSA+).

The skeptical reader confirming these sources will notice that a large number of other certification programs are recognized at least once, if not many, times. A few popular certifications/programs are: (ISC)², GIAC, CISSP, SANS, Microsoft, Motorola, Avaya, etc. Amongst these giants, CompTIA stands out however for being the best *entry-level* certification program. This is likely due in large part to the broad range of topics offered which makes CompTIA a good choice for job seekers who want to prove they are invested in their career, but don’t want to be limited to one field. Many of the other programs mentioned are more specialized, more expensive, or have additional requirements. These programs are better for IT professionals seeking to elevate already established careers.

All things considered, students should be encouraged to get CompTIA certified. CompTIA is a leader in providing entry-level certifications in the industry and doesn’t appear to be going anywhere anytime soon. With the question of *why* to become CompTIA certified now answered, the next question a student may have regarding CompTIA certification is *how* to accomplish it.

Logistics

As is the case with many things, it is easier to *decide* to seek certification than it is to follow through with obtaining it. While most students have survived logistical nightmares worse than signing up for a certification exam (class schedules, multiple part-time jobs, FASFA applications, etc.), making the commitment to take a wholly optional exam is probably quite low on most students' list of priorities. Surely, some students will give up on the idea of certification when faced with the responsibility of actually signing up. This section aims to prepare prospective cert seekers for the parts of the exam you can not “study” for.

Note that from this section forward the tone of this paper shifts from research toward reflection on my personal experiences with becoming certified.

Scheduling

Scheduling extra-curricular exams can be a daunting and frustrating task. Some exams are held infrequently and without flexibility like the SATs and GRE[®] Subject Tests which are only offered three or four times throughout the year. To make matters worse, some exams have stringent test taking environment requirements, so test-takers must travel some distance to be able to take their exam in an “approved facility”.

With this in mind, I made scheduling my CompTIA exam a top priority near the beginning of the semester to ensure that I could complete the certification prior to graduation. I was pleasantly surprised however to find that the scheduling was more flexible than any other test like this I had taken. First, I found that there was no shortage of testing centers since CompTIA certification exams are administered by Pearson. Next, test times were not relegated to any specific day and time so I could decide exactly which day of the week I'd like to take the exam and to a lesser extent what time of day. Finally, there was no registration deadline, so tests could be scheduled as early as the following day or as far out as posted by the test center.

When scheduling I was quite pleased to discover that Kutztown University offered the exam as well as Berks Technical Institute, and Reading Area Community College. At the very least I knew I wouldn't be required to travel far. Then, I found that each test center offered different test times. Kutztown offered sporadic test times including a few evenings, RACC offered the exam Tuesday through Thursday mornings, and Berks offered test times Monday through Saturday mornings and afternoons.

Since the scheduling was so flexible, I eventually decided to hold off on it until I got further through my preparation. The entire process left me feeling at ease and confident that I could take the exam near home, at an agreeable hour, when I was ready.

Cost

Cost is another major consideration when deciding to take a certification exam. Before digging too deeply into the costs associated with the CompTIA exams, let me preface this by saying that as a student the CompTIA exams can be prohibitively expensive. As mentioned in the previous section, becoming CompTIA certified is an investment in one's career, so I encourage all potential cert seekers to seriously consider all options before walking away due to sticker shock. It may be possible to get financial support from your employer or learning institution. I for one was unable to find financial assistance so I paid for my exam out-of-pocket¹.

The following pricing information was pulled directly from www.comptiastore.com at the time this paper was written, and no special pricing could be found anywhere else online. The table below provides a summary of the observed pricing for several of the most popular certifications. The last two columns represent the differences in cost between the packages for each test.

(\$\$)	Basic	Deluxe	Premium	B → D	D → P
A+*	205	299	384	+94	+85
Network+	294	380	465	+86	+85
Security+	320	397	482	+77	+85
Server+	294	380	465	+86	+85
Linux+*	200	298	383	+98	+85

Table 3.1: CompTIA Exam and Package Cost Comparison

The A+ and Linux+ exams require passing two exams (of equal cost shown in the table) to achieve certification. The table below shows the benefits of each package.

¹However, upon finding a job out of college I was pleasantly surprised to find that CompTIA exams would be covered under my benefits package.

	Basic	Deluxe	Premier
Exam Voucher	x	x	x
CompTIA Certmaster		x	x
Exam Voucher Retake		x	x
\$100 E-gift Card			x

Table 3.2: CompTIA Exam Package Features Comparison

The Basic package includes only the test. A student may opt for this “package” if they feel **very confident** in their ability to pass the exam. The Deluxe package offers two additional benefits: the CertMaster study program (more on this later) and a retake voucher. This package is good for cert seekers who may feel under confident or have been out of school for some time. When upgrading to the Deluxe package, Security+ offers the greatest value with Network+ and Server+ coming second. Finally, the Premium package offers a \$100 gift card for an added \$85. This amounts to \$15 off the next exam, so students should only purchase this if they plan on taking another exam.

I opted for the Deluxe package since I wanted to write a review the CertMaster program by taking a “dry run” of the exam after completing *only* the CertMaster program. For this reason, the retake voucher was crucial.

Procedure

This subsection describes my experience of all the actions taken before and after taking the CompTIA exam. Details about the exam itself are in the “Execution” section.

The first steps needed to prepare for my CompTIA exam were purely administrative. Since you’ll need to keep track of a few accounts, dates, vouchers, and confirmation numbers, I recommend these first administrative steps be completed in one sitting. Give yourself about an hour to get thru these steps and have your credit card ready, a notepad for writing down the user names and passwords you’ll be required to create, a calender, and a rough idea of when you’d like to take your exam.

As the first administrative step, the exam had to be purchased via the Comptia Store². Setting up a CompTIA store account and purchasing the exam was simple and similar to purchasing any other good or service online. I received a voucher almost immediately with explicit instructions for the next step. I was not required to log in to this account again throughout the process, but if another exam is taken it will be required.

²<https://www.comptiastore.com/>

For the second administrative step, the exam had to be scheduled. As a Pearson administered exam, you are required to create a another account with Pearson and schedule through their website using the voucher sent from CompTIA. While I do not recall the finer details I distinctly remember becoming frustrated when trying to compare scheduling times across various locations. After completing the scheduling process it was not immediately clear what the next step was before my exam date. I was sent a reminder e-mail a few weeks before the exam, but even that was somewhat vague and I was uneasy with the whole ordeal at this point.

As the third and final administrative step, I was required to make a third account in order to use for the Cert-Master program. This was painless, and getting into the software for the first time was simple.

The initial phase for taking the CompTIA Security+ exam was certainly more involved than I expected, and did not provide for a high morale going in. I **strongly** recommend keeping a detailed list of logins and passwords somewhere safe. It is also prudent to set up an e-mail filter early so you don't miss important information regarding your exam.

The day of the exam was simple and (relatively) stress free. The flexible scheduling options allowed me to take the exam at KU's testing center in Stratton near the end of the day (after classes and work). The exam instructions explained for me to be there at least 15 minutes early, parking was free and finding the location was simple since I was familiar with the building already. From previous experience with other exams, students taking the exam in an unfamiliar location should leave with ample amount of time to account for traffic or other difficulty.

Once in the testing center, the proctor collected my credentials (two forms of identification), had me sign a waiver and complete a few other administrative tasks before taking my photo. I was also given a keyed locker to hold my belongings. Going into the exam I was given a small dry-erase notepad and a marker for any scratch work.

Leaving the testing center after completion was also a nonevent. I simply returned the whiteboard, emptied my locker, made small talk with the proctor and left.

A few days after the exam I received an e-mail prompting me to confirm my name and address so that I could receive both the digital and printed copies of my certification. Responding to the confirmation e-mail was a bit of a hassle as the website was confusing and it wasn't clear that I needed to make a fourth "candidates" account using information found on the original voucher I received. I ended up needing to contact customer support for assistance. Luckily, customer support was easy to reach by phone and there was little to no wait time. The woman was courteous and polite and able to quickly rectify my problem. I received my official paper copy in the mail a few weeks later.

Overall, the CompTIA experience was not unpleasant. The most difficult part was managing the accounts needed to sign into the CompTIA store, the Pearson website, CertMaster, and the CompTIA candidates page. Any student should be able to complete the process (barring that they don't fail the exam), without incident.

Preparation

This section describes my personal experience when preparing specifically for the CompTIA Security+ exam. First, I will give a brief description of the resources used for preparation. Then, I will compare and contrast the methods based on cost, availability, ease of use, and accuracy. Finally, I will offer my personal conclusion on which method of preparation I found the most effective, and some recommendations for cert seekers wishing to study as a group.

Resources

This section briefly describes the resources available to Kutztown University students studying for any CompTIA exam. Although I studied solely for the Security+ exam, many if not all of the resources described here are available for the other CompTIA exams.

Courses at KU

As a student at KU, your first resource for learning is usually the courses you take. Likewise, many who take the CompTIA exams nationwide do so as part of a larger program. For example, certain information security positions in the military require one or more of these certifications. So a candidate for this type of position may also take courses (college or otherwise accelerated) that prepares them for the exam.

It was happy coincidence that I took Dr. Zhang's Advanced Information Security (CSC 441) course this semester. Prior to the semester's start I was unsure which CompTIA exam to attempt. The course materials chosen by Dr. Zhang were specifically (and coincidentally) designed as a study guide for the Security+ exam. At this point I realized that I'd be missing a valuable opportunity to save myself both time and effort studying if I did not go with the Security+ exam.

While I cannot say how well other courses line up to corresponding CompTIA exams, I can say that in the case of the Security+ exam the curricula lined up almost perfectly, and gaps in either were easily filled with supplemental materials. The table below shows all the professional CompTIA exams and which courses offered at KU may be useful when taken in tandem when studying for the exam.¹

¹Students interested in the exams which do not have coursework counterparts at KU can talk to their fellow students and professors about independent instruction or having new courses designed in these topics.

CompTIA Exam	Corresponding Course	CompTIA Exam	Corresponding Course
A+	None	Network+	CSC 311/411/512
Cloud+	None	Project+	CSC 554
CSA+	None	Security+	CSC 341/441
Linux+	CSC 352/552	Server+	None
Mobility+	None		

Table 4.1: Table of CompTIA Exams and Corresponding KU Course Offerings

TestOut

TestOut’s Security Pro software is a well-rounded full-package software training tool developed with the CompTIA Security+ certification in mind. It offers true mixed-media and learning paradigms and as such appeals to a wide range of learners.

Theoretical or concrete areas of the package read like an abridged textbook, offering pertinent information and minimum working examples for understanding. These text sections are often paired with instructional videos that are surprisingly engaging and easy to follow. These videos also have an “interactive” component which played like a script alongside them. There are curriculum appropriate quizzes that can be completed with immediate feedback after each question or the feedback can be held until the end like a traditional quiz.

Finally, the TestOut software included a large number of labs that emulated setting up secure networks, answering questions interactively, and generally providing a more “hands on” feel for learning.

CertMaster

The CertMaster study program is SaaS offered by CompTIA. The program is stated to take approximately 14 hours, but can take more or less time depending on the student’s experience level and drive. The program is broken down into a curriculum which roughly follows a watered down version the curricula offered in KU’s equivalent course and the TestOut program.

Each section contains anywhere from 9 to 55 multiple choice questions. Each question can be answered in one of three ways. The student can answer confidently with a single answer, divide their answer between two responses, or

can decline to answer altogether. Answering correctly on the first attempt marks the question as complete and it will not be shown again, answering “I’m not sure” (marking two answers), and getting one correct marks the question in progress, and it will be shown at least once more to be marked complete upon a correct answer, answering a question incorrectly also marks it in progress, but it must be answered correctly at least twice in a row to be marked complete.

Each question is also paired with an image the first and sometimes second time the question is attempted. For the final response to questions answered incorrectly the first time, the image is removed. It is difficult to say the motivation behind this feature, but there is likely some basis to its addition.

Upon completing a section, the progress meter and estimated time to completion is updated.

The CertMaster program is offered across platforms via web and mobile browsers as well as an app in both the Android and iTunes app stores.

Other Resources

Other resources include primarily textbooks or other software packages not mentioned here. While these resources will not be listed or elaborated on, the interested reader should investigate any options they feel may be more useful to them.

Comparison of Resources

This subsection compares the resources listed in the previous section based on the following features: cost, availability, ease of use, and accuracy/usefulness. Cost refers to financial contributions required for the resource. Availability refers to the ease of access of the resource. Ease of use refers to how user-friendly the resource is. Finally, accuracy/usefulness refers to how well the resource reflects the exam itself.

Note that these comparisons are based on the resources used for the Security+ exam and that resources geared toward other exams may not be the same. All potential test takers should do their due diligence before purchasing additional resources.

Cost

The lowest cost option for study resource for students currently enrolled in Advanced Information Security (CSC 441) would be to simply take the course and study diligently, perhaps reading additional chapters not assigned if

a book (vs TestOut) is used. The next most cost effective resource would be the CertMaster program offered with the Deluxe CompTIA package. Finally, the TestOut program is the most expensive option when offered outside of a college course. The table below shows pricing options for TestOut’s programs.

Student Promo	Full Access	Single Course	3 Course Bundle	4 Course Bundle	Library Suite
\$102	\$79/mo	\$349	\$495	\$595	\$895/yr

Table 4.2: TestOut Pricing Options

The “Student Promo” is offered only when taken as part of a participating college course. “Full Access” allows the user to study using any of their products for a monthly charge. The “Library Suite” offers full access to all TestOut products.²

Availability

The CertMaster tool was by far the most available study resource of all. CertMaster could be easily accessed anywhere I had Internet access and from any of the devices I typically carry. I used the CertMaster Android app, and also used it on Chrome for both my PC and Android phone. It ran as expected on all platforms without diminished performance. I was not able to test the functionality from an Apple device. It is noteworthy to add that the PC version on Chrome worked very well with my Surface Book’s touch screen. I was able to easily use my laptop in tablet mode when studying, making the CertMaster tool the most lightweight and comfortable to use.

The TestOut software was far less portable, as it is only accessible on PC. It is mostly touch-compatible, but less so than the CertMaster tool. Slow Internet speeds or underpowered machines crippled the software unacceptably.

While books would certainly be the most “available” resource, they fall short in this comparison due to their physical size. The previously discussed resources could be accessed via devices that many students or IT professionals carry daily.

Attending a college course in person is the least available resource for obvious reasons.

²Full Access and Library Suite have the potential of being the most cost effecting training methods *by far*, but the high buy-in is certainly prohibitive for students and this programs requires that the exam is purchased separately. These options may be useful for established professionals looking to further their careers or self-taught IT hopefuls.

Ease of Use

This comparison is only relevant to the CertMaster and TestOut tools. Clearly, books are easy to use (for most), but whether or not a book *will* be studied effectively is entirely up to the reader. College courses are typically not “used” so they will also be left out of this comparison.

In addition to being more cost-effective and available, CertMaster was significantly easier to use than the TestOut software. It’s simple concept and interface had a nearly non-existent learning curve. The tool was also well-developed and bug free.

The TestOut software was relatively straightforward for studying purposes, and the quizzes/exams were easy to complete, but the lab sections were poorly documented, confusing, and difficult to master. Some labs contained vague instructions that were not obvious or well-covered in previous sections. The simulations also ran on dated Windows operating systems with severely limited functionality. The software was also buggy and slow at times.

Accuracy and Usefulness

After taking the exam TestOut came ahead a clear winner where accuracy and usefulness are concerned, despite its shortcomings. The TestOut software is a complete course in and of itself and could be used by someone wishing to become CompTIA certified with no prior formal training. It also contained both types of questions that could be found on the exam (multiple choice and lab). The multiple choice questions were spot on with respect to emulating the actual exam. The lab sections, although different on the actual exam, provided enough exposure to that type of problem to lessen the shock value upon seeing one on the exam.

The questions on CertMaster were *similar* to the exam, but not nearly as accurate as the ones on the TestOut program. CertMaster also provided little background knowledge, so it would not be suitable for those with little/no formal training. It would be entirely sufficient however for a test taker with a solid prior understanding of the topic who wishes to brush up on the material before the exam. I for one used the CertMaster program to guide my study, and searched Google for additional information when needed.

I cannot adequately rate the accuracy or usefulness of any text resources, since I abandoned them early in the process. College courses not specifically geared towards CompTIA certifications will likely depend on the professor and curriculum.

Verdict

When deciding which study material is right for you, it is important to prioritize your needs. For test takers with limited prior knowledge, ample study time, and drive, TestOut is a wonderful whole-package tool. It is however the most costly when purchased outside of student or package pricing. Cert seekers with some prior knowledge will benefit greatly from the CertMaster tool as a refresher. It is not however unreasonable to expect that some students could pass the exam with only knowledge gained from a typical college course.

Any of the aforementioned resources can/should be used in tandem with the multitude of free practice tests that can be found on-line³. Test takers should do their due diligence by reading up on any practice exam provider to ensure that it is an accurate (and legal) representation of the chosen exam.

Group Study

As is the case with most group programs, a study group for CompTIA cert seekers should be tailored to the group. Here are a few recommendations for groups to consider.

Set a goal date for the exam and purchase and schedule your exam *first*. This piece of advice comes from an interviewee with a number of certifications under his belt. He found that whether studying alone or in groups, paying for and scheduling the exam early provided some level of accountability that you would not otherwise have.

Research study tools early and take into consideration the needs of the group. While TestOut offered an awesome complete package, it may be cost prohibitive for some members. Textbooks may be dry or difficult to read and discourage active participation. For this reason it will be important for each group forming to discuss their options and agree on their study plan/resources.

Preparation for one exam should be completed in a semester or less. Due to the rote nature of a majority of the exam, it is important to keep a brisk pace so that come exam day the early material is still fresh in your mind.

Groups should meet at least weekly and keep a line of communication open for impromptu discussion.

Topics in IT can cover a lot of ground in a single chapter, so open and frequent communication will be very helpful in making sure each topic gets the coverage it requires.

³It is difficult to provide specific link to these specific practice exams due to the sheer volume of them on the internet. I, personally, did not use many free practice exams since I paid for other study materials.

If possible, CompTIA exams should be taken in tandem with parallel courses offered. Students attending a course that closely aligns with a CompTIA exam have an advantage of having all the resources available in the course. This can save the student time and money.

CompTIA exams can be studied for simultaneously. In particular, the Security+ and Network+ exams are very closely related and could be reasonably completed within the same semester.

Execution

This section describes the process of taking the exam itself. Note that it is unethical to go into detail about the questions themselves. The information shared here is a general overview of the exam.

My first impression of the exam was marked by the dated feeling of the software. It may have been the aging machine the exam was being distributed on, but the graphics and aspect ratio were a bit uncomfortable to look at.

The exam was composed of “lab” and multiple choice questions. The multiple choice questions offered no surprises except a nice feature for flagging questions for review. My preparation for the exam up to this point was pretty on par with the exam itself. The lab questions however were buggy at best and the instructions were unclear¹. I was able to work out *what* the answers were quickly, but spent the majority of my time on these questions figuring *how* to complete the lab. I strongly recommend reading the lab questions, writing down any answers you may know, and then moving on to complete the rest of the exam prior to attempting the labs.

Upon finishing you are given the option to review the questions you flagged during the exam (a very nice feature!). After finishing your review and submitting your results, a screen appears immediately giving you your score as well as a small lackluster message about passing or failing the exam. You are then taken to a short demographic survey before given the prompt to exit the exam.

My final impression of the exam itself was a mixture of confusion and happiness. I finished the exam with ample time remaining but with only one point keeping me from failing the exam on my “dry run”. I walked away with temporary proof of my success and a smile.

¹As is standard with most exams, I am not at liberty to discuss specific questions from the exam, but one of the questions expressly **did not** work as described. I considered contacting CompTIA about the particular question, but after passing the exam my frustration with the question quickly dissolved.

Conclusion

At the end of this process one major takeaway was that much of the stress surrounding the CompTIA exam was undue. The education I earned at Kutztown University provided a solid base for the exam, and with minimal self-study I was able to earn the exam¹. However, one valid and major stressor surrounding the exam was the associated cost.

Despite the stress and cost surrounding the exam itself, I do feel it was worth it and will pursue additional CompTIA certifications. While I didn't exactly *feel* my net worth increase immediately upon passing the Security+ exam, I can confirm that the rumors about CompTIA certification and hireability are true. For one, I noticed a marked improvement in the quality of recruiting correspondence I received. Had I chosen to follow information security as my career path, I'm certain the certification would have given me a leg up. Even less important, but noteworthy to add was the "cool factor" of becoming certified. My employer at the time of becoming certified thought it was "cool" and joked that he hoped I wouldn't be jumping ship so soon. Other IT professionals in my network were also impressed and asked for my resume. I bumped elbows and shared some bar talk with federal information security agents interested in *my* interest in information security. Overall, I was pleasantly surprised with the responses I received.

I do plan on taking more of the CompTIA exams and maintaining the certifications going into the future. Even as a developer, the knowledge I have proven via the Sec+ exam has been useful. My colleagues knows that when it comes to security, I can hold my own and in fact contribute to the conversation. Additional certifications will only add to my knowledge pool and put me in a better position if I should decide to leave my career as a developer. Even if I never choose to pursue a career for which these certifications are specialized, I know that maintaining them marks me a well-rounded and ambitious candidate.

As a final thought, I strongly encourage fellow Kutztown University students to earn one or more CompTIA certifications before the conclusion of their degree regardless of their focus.

¹I earned CSC-IT minor as well as a Master's in Software development. Diligent IT students should be able to pass the certifications exam may be able to pass the exam with zero self-study.

Bibliography

- [1] United States Census Bureau, *Measuring America*
<https://www.census.gov/library/visualizations/2014/demo/computer-use-infographic.html>
- [2] TekCarta, *Personal Computers per Household (68 countries)*
<https://www.nakono.com/tekcarta/databank/personal-computers-per-household/>
- [3] Storage Servers, *How much data is created daily?*
<https://storageservers.wordpress.com/2016/02/06/how-much-data-is-created-daily/>
- [4] Bureau of Labor Statistics, *Occupations with the most job growth*
https://www.bls.gov/emp/ep_table_104.htm
- [5] Taylor Soper - GeekWire, *Analysis: The exploding demand for computer science education, and why America needs to keep up*
<https://www.geekwire.com/2014/analysis-examining-computer-science-education-explosion/>
- [6] ComputerScience.org, *Certifications in CS*
<http://www.computerscience.org/degrees/certifications/>
- [7] Alison E. Berman and Jason Dorrier, *Technology Feels Like Its Accelerating Because It Actually Is* <https://singularityhub.com/2016/03/22/technology-feels-like-its-accelerating-because-it-actually-is/#.WUh6u2jyuTE>
- [8] Author Unknown, *How much can I expect to earn with a Security+ certification?* <https://www.concise-courses.com/security/comptia-salary-expectations/>
- [9] Ed Tittel and Kim Lindros *Best Computer Networking Certifications* <http://www.tomsitpro.com/articles/networking-certifications,2-208.html>
- [10] Ed Tittel *Best Information Security Certifications For 2017* <http://www.tomsitpro.com/articles/information-security-certifications,2-205.html>
- [11] Ed Tittel and Mary Kyle *Best Computer Hardware Certifications* <http://www.tomsitpro.com/articles/hardware-certifications,2-678.html>
- [12] Ed Tittel and Mary Kyle *Best Help Desk Certifications* <http://www.tomsitpro.com/articles/help-desk-certifications,2-675.html>
- [13] Global Knowledge *2017 IT Skills and Salary Report* <https://www.globalknowledge.com/us-en/content/salary-report/it-skills-and-salary-report/>