Creating multiple Pathways to Prosperity (Symonds, Schwartz, & Ferguson, 2011) is increasingly recognized as a more feasible and functional strategy for preparing high school students to lead successful lives than our long-standing national emphasis on the four-year college pathway for all students. While earning a bachelor’s degree opens the door to many rewarding careers, the majority of high school students never earn a four-year degree. Furthermore, a significant number of students graduate from high school without the necessary skills to pursue college level work or employment. This means that if we want to prepare all students for success, we must develop viable alternative pathways alongside the pathway through four years of college. The Pathways to Prosperity Project has argued that such pathways are not rigid, like tracks. They allow for deviation and for changes from one to another. Pathways are self-selected, not imposed. Young people may follow different pathways to the same destination.

Career and technical education (CTE) is the major alternative pathway to the academic, pre-collegiate pathway currently pursued by most high school students in New York and around the country. Some of the world’s most prosperous countries – including Switzerland, Germany, Denmark and Australia – have long recognized the critical importance of career education, which they call vocational education and training (VET). In the most comprehensive study ever done of VET, the Organisation for Economic Co-operation and Development (OECD) documented that students in high-quality VET programs often learn more, are more likely to graduate, and are far better prepared for employment than students on a strictly academic pathway (2010). In NYS 90 percent of CTE program completers graduate with a Regents diploma, some with Advanced Designation. Despite this record, CTE has been overshadowed in NYS and the US by the immense effort devoted to improving the academic pathway, including the standards movement. Unfortunately, raising standards has too often been seen as antithetical to CTE, with the result that support for CTE has waned.

However, there is compelling evidence that high-quality CTE does a better job of preparing students for college and career. Graduates of the best CTE programs go on to pursue post-secondary education at institutions ranging from technical and community colleges to major universities. Yet unlike their peers on the academic pathway, CTE concentrators also receive valuable career preparation. Indeed, at a time when the percentage of employed young adults has fallen to a record low, CTE graduates are often able to secure employment right out of high school – employment that can in turn help them finance the ever-increasing cost of higher education.

Recognizing these points, The Board of Regents (June 12, 2012) commissioned Cornell Professor Stephen Hamilton to work with William Symonds, Director of the Pathways to Prosperity Project at the Harvard Graduate School of Education, to identify CTE
examinations of sufficient quality that they may be considered comparable to Regents examinations (Slentz, 2012a & 2012b). The key conclusion of this report is that CTE examinations that meet the criteria set out below could in fact raise the current bar for a Regent’s diploma, and that recognizing the recommended examinations, and others to be identified in the future, would be a major step towards meeting the need to prepare New York high school students for both college and career. This report describes the rationale for that project, its procedures and results.

**Purposes of High-stakes Examinations**

Like other high-stakes examinations, Regents examinations have multiple purposes. By identifying certain knowledge and skills as most important, they guide the efforts of teachers and students, who have an incentive to invest more time in examination subjects than in other subjects. They provide a benchmark of achievement for teachers and students, for schools and school districts. And examination grades signal graduates’ levels of achievement to external stakeholders, notably college admissions officers and employers.

The NY State Board of Regents first conducted high school examinations in 1878. The original five subjects quickly proliferated to include many very narrow topics (e.g., Cicero *pro LegeManilia*) and by the early twentieth century some vocational subjects such as commercial arithmetic and commercial law. The proliferation of examinations was reversed by the 1970s, as the Regents embraced a protocol of fewer examinations covering more comprehensive topics. During the same period, examinations in vocational subjects were eliminated. (See [http://www.p12.nysed.gov/assessment/hsgen/archive/rehistory.htm](http://www.p12.nysed.gov/assessment/hsgen/archive/rehistory.htm))

Currently nearly all high school students are required to pass five Regents examinations with a score of 65 or above:

- Comprehensive English (9-11th grade ELA courses)
- U.S. History and Government (11th grade course)
- Global History and Geography (two courses)
- One math examination
- One science examination

It should be noted that passing five Regents examinations with a score of 65 or above does not guarantee readiness to begin college level work (Everson, 2010). In fact, only about half the students who earn a Regent’s diploma are actually “college ready,” meaning they are prepared to pass a college-level credit-bearing course. The CTE examinations that we are recommending have been chosen because they would actually raise the bar for what a Regents diploma signifies.

**College and Career Readiness**

The rationale for incorporating CTE examinations alongside Regents examinations rests on the goal of assuring that high school graduates are both “college and career
As the Council recognized, the term, “college and career readiness,” is defined in various ways. However, nearly all definitions assert consistency, if not identity, between what were formerly seen as two distinct goals: college and career. (The fact that virtually all college graduates go on to careers has often been overlooked by proponents of college readiness.) Because nearly all jobs that pay enough to support a family and offer prospects for continued learning and advancement require some form of post-secondary education, the argument goes, graduates must be college ready to be career ready. New York State recognized this trend by eliminating the local diploma for most students, requiring passing scores on five Regents examinations as a condition for graduation. There is no doubt that the assumption underlying this formulation is valid. Employers need far fewer unskilled workers than they did in the past, reducing the number of low-skill jobs and the compensation for those that remain. In this 21st century labor market, New York has an obligation to prepare high school students to successfully pursue higher education. But just because a student is college ready does not mean that he or she is also career ready.

The operational definition of college readiness is that graduates are able to pass credit-bearing college courses without having to enroll first in non-credit developmental or remedial courses. Using this definition, the current passing score for Regents examinations (65) has been shown to be too low (Everson, 2010). Math and ELA scores have to reach 75-80 to bring the likelihood of earning a grade of C or better in college courses to an acceptable level. What this means is that roughly half of the students who earn a Regents diploma are not actually “college ready.” While alarming, this situation is hardly unique to New York. Nationally, ACT (2011) found that only 25 percent of high school graduates were prepared to take college-level courses in all four core disciplines: English, reading, math and science; and just 45 percent were prepared to take college-level courses in math. ACT called on states to define performance standards so that students, parents and teachers know what is required to succeed in college. The unfortunate situation today is that, despite all the emphasis on college readiness, many high school graduates who enroll in college never complete college or earn a recognized credential (Symonds et al., p. 7, & Figure 1, p. 3).

While addressing the shortfall in college readiness goes beyond the scope of our charge, it should be taken into account in considering CTE examinations for Regents recognition. CTE examinations that tangibly demonstrate college readiness – in the sense that post-secondary institutions grant course credit, advanced standing or admission to students who pass the examination – should be recognized as holding students to a higher
standard than Regents examinations using 65% as a passing score. Students who pass one of the recommended CTE examinations have demonstrated that they are leaving high school ready for both college and career, something that cannot be claimed for all graduates who earn Regents diplomas.

Moreover, passing college courses or even earning a degree do not equate to career readiness. In its definition of “What It Means to be College and Career Ready,” the Career Readiness Partner Council wrote that in addition to academic proficiency, a career-ready person must achieve a “level of technical-skill proficiency aligned to (their) chosen career field and pathway.” They must also master what are sometimes called “21st century skills,” such as clear and effective communications; critical thinking; effective use of technology; and the ability to work productively in teams. Similarly, a report from ChildTrends (Lippman, Atienza, Rivers, & Keith, 2008) compared research findings on college readiness and workforce readiness. While the report’s authors found considerable overlap, they also found that workforce readiness includes characteristics not addressed in research on college readiness, such as listening skills, group work, the ability to understand technical material, and prior work experience. A California organization, ConnectEd (2012), has provided another synthesis of college and career readiness, in the form of a framework with four inter-related domains of learning: knowledge; skills; productive dispositions and behaviors; and educational, career, and civic engagement. The latter domain refers to “engaging in and navigating” the three worlds of higher education, work, and civic life. Readiness for productive employment requires more than being able to pass college-level courses. Stone and Lewis (2012) provide another critique of the identification of college readiness with career readiness, pointing out that, in addition to employability or “soft” skills, career readiness entails technical knowledge and skill and the “technical expression” or application of academic knowledge (p. 15).

Non-cognitive Skills

Defining college and career readiness in terms of test scores treats knowledge of academic material as the most important, even the sole element of readiness, ignoring a large domain that some have called “soft skills.” Murnane and Levy (1996) found that line workers in manufacturing firms needed to have achieved a minimum level of cognitive competency – being able to read and do math at a ninth-grade level – but that once workers reached that level, their performance and prospects for higher earnings depended on their soft skills, especially teamwork and communication (p. 37). The Secretary’s Commission on Achieving Necessary Skills (1991) identified what came to be called the SCANS skills, which include a range of non-cognitive skills. By these definitions, career readiness is a more rigorous standard than college readiness alone because it requires a wider range of skills, including but not limited to the cognitive domain.

A new report from the National Research Council (NRC, 2012) provides the most authoritative treatment of career readiness. After reviewing many different versions of college and career readiness and a wider range of research on the topic than is cited in
other reports, the authors identified three categories of competencies needed for productive employment in the 21st century, which they labeled cognitive, intra-personal, and inter-personal. Cognitive competencies include: cognitive processes and strategies (e.g., critical thinking, problem solving); knowledge, and creativity. Intra-personal competencies include: intellectual openness (e.g., flexibility, continuous learning); work ethic/conscientiousness (e.g., initiative, grit, productivity); and positive core self-evaluation (e.g., physical and psychological health). Inter-personal competencies include teamwork and collaboration (e.g., communication, cooperation, and empathy); and leadership. They noted that these are not really new competencies; they have been valuable for centuries. However, as relatively low-skill farm and factory jobs have receded, these competencies are now needed in a wider range of occupations.

Tough (2011), a journalist who skillfully integrated profiles of individuals and institutions with capsule summaries of recent research, used the term, “character,” for the latter two sets of competencies. He cited the collaborative effort of some prominent researchers and practitioners who boiled down the meaning of character to seven key strengths, which they called grit, self-control, zest, social intelligence, gratitude, optimism, and curiosity. Tough noted that these elements define character in terms of striving and achievement more than being considerate to others, which is stressed in many character education programs. This emphasis fit his purpose of trying to understand how it is that some children manage to overcome formidable odds and succeed in school and in life despite growing up poor (a phenomenon also known as resilience; see, e.g., Masten, 2001). In this context he also noted that the children of college-educated parents often absorb some of these character traits without explicit instruction from their families, communities, religious institutions, and schools. The institutions he described that succeed at getting low-income youth into college intentionally and explicitly set out rules and expectations and provide instruction and support so that students who do not gain these character strengths at home have a chance to acquire them. KIPP Academies are an example, where students are directly taught how to be good students and receive character report cards. Character defined this way is at least as strong a predictor of academic success as scores on tests of knowledge.

Tough makes another point that the NRC report confirms with copious citations of research: conventional schools are better at teaching cognitive knowledge than at teaching character. Much more research has been done on both promoting and measuring cognitive knowledge. But research confirms that character can be taught. The research on this topic converges on the value of experiential and project-based learning, especially for intra-personal and inter-personal competencies, but for cognitive competencies as well (Bransford, Brown, Cocking, Donovan, & Pellegrino, 2000; Hoffman, 2011; NRC, 2004 & 2012).

Conveniently, the broader range of competencies employers seek are identical or parallel to civic competencies. Public schools in the United States were created not just to prepare workers but as an even higher priority to prepare citizens for active participation in a democracy. This goal must remain prominent as we strive to improve college and career readiness. Embracing, teaching, and assessing the broader set of competencies
moves us toward the goal of promoting informed and active citizenship as well. Learning to analyze written information and numerical data to solve real-world problems, learning to work in groups, and developing character are as important for civic engagement as for employment.

**High-Quality Career and Technical Education**

In addition to preparing students for careers more effectively than conventional academic courses, high-quality CTE is more effective in preparing some students for college, especially when it includes work-based learning opportunities. It enables students whose interests and learning styles are not attuned to academics to acquire the competencies they need for college and careers, including cognitive competencies (Stone & Lewis, 2012). Some students who struggle with math when it is taught in the abstract, learn it very well when it is related to something they understand and care about, such as repairing automobiles or accounting. CTE is also a very effective strategy for increasing student engagement, which is critical to learning. CTE students rarely need to ask, “Why am I learning this?” because the answer is so readily apparent. This is one reason why CTE reduces the likelihood of dropping out, especially when students obtain sufficient academic credits and concentrate their CTE credits in a specific occupational area (Stone & Lewis, 2012, p. 60). Moreover, because struggling students are disproportionately from disadvantaged backgrounds, CTE is an important strategy for equalizing opportunity. In addition, it can introduce students from low-income families to a range of realistic pathways to the middle class, something that purely academic instruction cannot do. Various forms of work-based learning enrich CTE – field trips, job shadowing, service-learning, internships, cooperative education, apprenticeships, even part-time and summer jobs (NRC, 2012). Work-based learning is central in the advanced stages of education for some of the most prestigious careers, notably medicine (internships and residencies), law (associates), and engineering (cooperative education). It is ironic that such opportunities are seldom available to students who most need alternative learning environments to conventional classrooms.

CTE makes students more career ready than strictly academic courses. CTE students learn far more about the current labor market than students in academic courses. In addition to the valuable intra-personal and inter-personal competencies students acquire and demonstrate through work-based learning, they are more likely in their classes to engage in hands-on projects that require teamwork, problem solving, and the application of cognitive competencies. CTE students acquire technical competencies that employers reward. As a result, they can earn more after graduating from high school whether working full-time or employed part-time while enrolled in college.

**Implications**

College readiness is necessary but not sufficient for career readiness. Career readiness requires academic knowledge, but also intra-personal and inter-personal competencies related to being a good worker in any workplace, and technical competencies related to specific jobs. Graduates who are career ready can apply academic knowledge, use what
they have learned to solve problems that are not neatly set out in textbook fashion. Examinations of purely academic proficiency, such as the Regents examinations, do not measure many of the competencies that are widely agreed to be critical to success in the 21st century, nor do strictly academic courses teach those competencies.

The Regents should recognize the contribution of CTE to both college and career readiness. Although vocational education gained prominence in the U.S. as an alternative to the academic high school curriculum, even at its birth in the early twentieth century, John Dewey (1913/1974) advocated “education through occupations” rather than education for occupations (emphasis added). He contended that occupations are a natural and powerful focus for learning that is much broader than training for a particular job. High-quality CTE is high-quality education. It prepares students for employment in an occupational field while also preparing students for the post-secondary education they will need both to advance in that field and to move into another one in response to changes in the labor market or in their interests. Standards in CTE can be even higher than those in some academic areas. For example, the reading levels of many technical manuals are much higher than those required in high school courses (Daggett, 2003). Several of the CTE examinations we recommend (e.g., ASE, ProStart, NIMS, A+, Network+) are part of a more comprehensive certification process that incorporates performance measures and supervised work experience along with examination scores, constituting a far more rigorous demonstration of competence than earning a score of 65 or better on a Regents examination.

The central point of the Pathways report (Symonds, et al., 2011) is that our country needs to provide a wider range of pathways to productive employment, nurturing family life, and engaged citizenship than the college prep pathway. Nearly two decades of effort to improve academic achievement have been based on the correct premise that all young people should be prepared to succeed in post-secondary education (college for all) but the incorrect corollaries that all young people need to know all the same things and to learn them the same way. CTE is a well-established alternative pathway that will be enhanced if students are allowed to use their performance on a CTE examination as part of their qualification for high school graduation. Passing a high-quality CTE examination in addition to the current five required Regents examinations will provide stronger evidence than is now available that a graduate is both college and career ready. For these reasons, we believe the Regents should formally incorporate high-quality CTE examinations into the Regents examination process. We believe such a step would send an important signal to students, parents, employers and the broader community that career readiness is critical and is not demonstrated solely by passing academic courses and examinations. In addition, the prospect of obtaining Regents’ recognition would serve as a spur to encourage CTE providers to improve the quality and rigor of their programs so that their students are able to pass these examinations.

**Criteria for High-Quality CTE Examinations**

At its first meeting (January 10, 2013), the Expert Advisory Board (Appendix A) discussed criteria to help identify and evaluate CTE examinations that signify both
college and career readiness. Project staff subsequently refined the criteria with additional Board input. We obtained information on how each examination met most but not all the criteria. Even so, we are confident that these criteria are appropriately stringent and that they helped us identify CTE assessments that are truly worth of Regents recognition.

Criterion 2 refers to academic learning, but we must caution that a CTE examination will not assess the same content as a Regents examination any more than an ELA examination assesses biology content. However, because students who elect to use a CTE examination to meet graduation requirements must still achieve passing scores on currently-required Regents examinations, our recommendation will preserve the academic integrity of the Regents diploma. At the same time, these students will also have demonstrated career readiness — something that is not currently measured at all by Regents examinations.

Four key criteria were generated and applied.

1. **The assessment provides credible evidence that the student is college and career ready.** Following are some sources of credibility:
   (a) The assessment is recognized by employers in an industry sector. Ideally, a passing score provides a credential that will qualify the student for at least entry-level employment in the industry. Priority will be given to nationally-recognized credentials.
   (b) If the assessment is normally completed at the post-secondary level, a cut score has been established for high school students that signifies the student is ready to take credit-bearing courses at the post-secondary level.
   (c) The assessment is widely recognized by post-secondary institutions within New York, for admissions and/or credit.

2. **The assessment includes academic as well as technical learning.** The following factors are considered.
   (a) The examination covers a broad range of learning. Narrow technical examinations are not by themselves sufficient. Breadth may be achieved by “bundling” multiple examinations.
   (b) The examination measures some of the knowledge and skills that comprise the Common Core State Standards, such as reading of technical materials or application of mathematical principles.
   (c) The rigor of the assessment is comparable to that of Regents examinations.

3. **The assessment is for an occupation in a career cluster that is recognized by the State Education Department and is of clear economic value to the state of New York.** The following factors are considered.
   (a) The occupation is in high demand, meaning that a significant number of people are already employed in the occupation and/or that employment is increasing.
   (b) The occupation generally pays experienced workers “a living wage.” At the very least, entry-level workers are paid above the minimum wage.
(c) The number of students eligible to take this assessment is large enough to warrant the Regents’ recognition.

4. The assessment meets the following technical requirements.
   (a) The examination is aligned with existing knowledge and practice and updated regularly (every four years in most cases).
   (b) The examination has acceptable psychometric properties. It is properly validated and free from ethnic or gender bias. A technical manual meeting testing industry standards is available for public inspection.
   (c) The examination questions are secure and administration oversight comparable to a Regents examination.
   (d) The organization responsible for the examination is considered credible by the State Education Department; e.g., makes standards publicly available, trains proctors, is affiliated with trade groups, provides data for instructional improvement, responds quickly to technical concerns and user questions.

Procedures for Reviewing Examinations

The National Research Center for Career and Technical Education (NRCCTE) at the University of Louisville was sub-contracted by Cornell University to conduct technical reviews of CTE examinations based on the criteria and recommendations from the Expert Advisory Board. The NRCCTE also identified additional examinations for review, developed a framework for reviewing nominated examinations and a concise format for presenting results. During its second meeting (April 11, 2013), the Expert Advisory Board discussed specific examinations that Board members and the NRCCTE had identified and raised several additional questions about them. The NRCCTE then solicited additional information from organizations that produce those examinations and added the relevant information for each examination. The 13 examinations recommended in this report resulted from that process.

The NRCCTE began by gathering information from key stakeholders, including higher education institutions, employers and employer organizations, state and federal agencies, and organizations producing CTE examinations that are not represented on the Expert Advisory Board. The NRCCTE consulted with the NYSED about the selection framework, asked for input into the initial criteria from the Expert Advisory Board, and discussed procedures NYSED uses for creating its list of recommended technical skills assessments (TSAs), as required by the Carl D. Perkins CTE legislation (Perkins IV). The NYSED list has over 900 assessments. A TSA inventory project previously conducted by NRCCTE has more than 200 examinations and the Southern Regional Education Board listed more than 100 examinations from a single-state study. The criteria developed with the Expert Advisory Board were critical to sorting through such a large number of examinations. We sought the best examinations from a range of occupational clusters as a test of the criteria and review procedures; we did not attempt a detailed review of all examinations that might meet the criteria.
Selection Framework
The NRCCTE developed a template to link the criteria with information about each examination under consideration. Most information came from examination producers, but labor market information and data about student enrollment in career clusters related to the examinations came from the NYS Department of Labor and the NYSED. Extensive information was collected and analyzed for 35 examinations. After eliminating examinations that are inappropriate for high school students, 23 examinations remained for further review by the Expert Advisory Board. Information about each of the 23 examinations was summarized in a one-page document. These “one-pagers” were sent to project staff for review and revision and crosschecked by key informants and by members of the Expert Advisory Board. The list of 23 examinations was sent to NYSED CTE staff for review and comment. The one-page summaries reviewed during the April meeting of the Expert Advisory Board incorporated this input. Upon review, the Board reduced the number of recommended examinations to 13 and posed the following questions for NRCCTE and the project staff to answer by contacting the organizations that are responsible for the examinations.

1. Do you have evidence that employers use the assessment when making hiring decisions? Do applicants who have achieved the cut scores get preferential treatment, all else equal, in the application process (e.g., more likely to get an interview) and in hiring? Numbers would carry weight.

2. How are Subject Matter Experts selected? What is the proportion from industry, from education? A range and maybe some examples would help.

3. Can you give detail on alignment with standards? Which specific standards? What is your definition of alignment?

4. Can you provide sample test items to demonstrate depth and complexity for comparison with Regents examination questions? Some of the same items could illustrate alignment with standards.1

Project staff sent individual emails to each organization requesting answers to these questions. They also conducted telephone and face-to-face conversations with representatives of several organizations. The new information was then added to the original one-pagers. The final summaries, now longer than one page, are available upon request, as are those for examinations considered but not recommended.

Blue Ribbon Commission
A draft of this report was sent to members of a Blue Ribbon Commission (Appendix B). Meeting on July 2, 2013, the Commission approved the recommended examinations and suggested revisions that are incorporated into this version.

Recommended Examinations

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1Rather than include sample test items in the text we have provided a few in Appendix C.
The 13 CTE examinations that are recommended for recognition by the Regents are listed below with brief descriptions and accounts of the rationale for their selection.

**The ProStart National Certificate of Achievement**
ProStart is a national program that is administered by the National Restaurant Association’s Education Foundation. Since it began in 1997 it has grown to serve students in 47 states. To earn the COA, students must complete a comprehensive, two-year program of study that includes everything from food and workplace safety to food preparation to financial management. They must achieve a score of at least 70 on the national written examinations administered at the end of each year. In New York, students must also pass a technical assessment that measures such hands-on skills as use of knives, cooking and baking, and knowledge of safety and sanitation practices. In addition, students must complete at least 400 hours of “mentored work” in the industry. Because of these rigorous requirements, only about 10 to 15 percent of ProStart students actually earn the COA. In effect, they are the “elite” of the nation’s culinary students, and they are clearly both college and career ready. The Culinary Institute of America – the nation’s leading post-secondary culinary college – accepts the COA as proof that an applicant has completed the admissions requirement of at least 6 months of work experience in the industry. The COA is also recognized by Paul Smith’s College, and many community colleges have articulation agreements with high schools that offer ProStart. The COA is widely respected by employers in the restaurant/hospitality industry. “The COA is absolute gold,” says Rick Sampson, President of the NY State Restaurant Assn., who adds that a high school student who has earned this will be “grabbed immediately by employers.” The restaurant/hospitality industry is extraordinarily important to the state of New York. It ranks as the second largest employer in the state, with about 750,000 total employees, and is expected to grow even larger in coming years. Yet “one of the biggest problems we are facing right now is finding qualified help,” says Sampson.

**ASE Student Certification**
The National Institute for Automotive Service Excellence (ASE) administers a set of examinations to qualify automotive technicians. “Student Certification” is the first level and most appropriate for high school students. Certification standards were created by business and education partnerships at the national, regional, and state levels in partnership with SkillsUSA, Automotive Youth Educational Systems (AYES) and the National Automotive Technicians Educational Foundation (NATEF). Examination questions are derived from task lists or competencies essential to the maintenance, service and repair of vehicles (automobiles, light trucks and medium/heavy vehicles) as well as the diagnosis and repair of collision damage and painting and refinishing.

The examination is linked to automotive CTE programs that are accredited by NATEF. Recognizing that contemporary automotive technicians must demonstrate academic as well as technical competencies, those programs must incorporate academic skills in the disciplines of English, mathematics, and science. These academic skills have been correlated with national standards for English, mathematics, and science.
Examinations and certifications are organized around: Maintenance & Light Repair (540 hours combined classroom and lab/shop instructional activities); Automobile Service Technology (840 hours combined classroom and lab/shop instructional activities); and Master Automobile Service Technology (1080 hours combined classroom and lab/shop instructional activities). Passing standards are set for each test based on actual student performance.

ASE certification relates to the Motor Vehicles sub-cluster, which is ranked 15th by employment and 8th by average wage. More than 350,000 automotive service professionals currently hold ASE certifications.

A+ Certification
CompTIA, the source of this examination, was created by a consortium of IT corporations including Microsoft, HP, Cisco, Dell, and Intel to certify technicians who work with multiple platforms. Representative job titles include technical support specialists, field service technicians, IT support technicians, IT support administrators and IT support specialists. A+ Certification is, therefore, more universal than certification in one provider’s equipment or software. It attests to a technician’s ability to perform essential IT tasks such as installation, configuration, diagnosing, preventive maintenance, basic networking and security. It also confirms a technician’s understanding of customer service and communication skills needed to work with clients.

The A+ certification is awarded after the completion of two tests, an “essentials” examination, and any one of three “electives.” The eight basic proficiency domains are: Personal computer components; Laptop and portable devices; Operating systems; Printers and scanners; Networking components; Security; Safety and environmental issues; Communication and work place ethics and professionalism. Examinees who achieve cut scores may proceed to prepare for and take other CompTIA certificate examinations, which include Network+, Server+, and Linux+.

IT is ranked 8th in employment and 2nd by average wage. Nearly one million IT specialists currently hold A+ certification.

Network+ Certification
Passing A+ is a pre-requisite for taking Network+, also from CompTIA. Students who pass are qualified for IT employment in positions such as network administrator, network technician, network installer, help desk technician, and IT cable installer. The five basic domains for proficiency covered by the certification are: Network Concepts; Network Installation and Configuration; Network Media and Technology; Network Management; and Network Security. Each of these domains is covered by about a fifth of the examination. Students who earn certification are able to configure, maintain, and troubleshoot network devices, analyze network traffic, use common protocols and media types, and understand the features and purpose of network technologies.

Companies such as Dell, HP, Ricoh, Sharp and Xerox recommend or require Network+ for their networking technicians. It is a technical prerequisite option for IT technicians.
seeking to join the Apple Consultants Network, and is recognized by the U.S. Department of Defense.

National Institute of Metal Working (NIMS) Skills Certification
All NIMS standards are industry-written and industry-validated, and are subject to regular, periodic reviews under the procedures accredited and audited by the American National Standards Institute (ANSI). Skill Standards describe the common duties and the knowledge, skills, abilities and related attributes workers need to perform their duties well. They are developed by workers, managers, and trainers from the metalworking industry and are subject to two different forms of national validation. The resulting skill standards define what industry wants workers to know and be able to do, and defines a skills and training framework for the metalworking industry nationwide.

NIMS certification attests to an individual’s skills as measured against the NIMS standard. Earning NIMS certification requires passing a performance test and theory test. The performance requirements and the theory tests are drawn directly from the NIMS standards, and are written and piloted by industry. Level I certification, which is appropriate for high school students, is based on a series of modular tests, which when completed, demonstrate the graduate’s knowledge, skills, and abilities (KSAs) in 11 distinct subject areas including: Measurement, Materials & Safety; Job Planning, Benchwork & Layout; Manual Milling Skills; Turning Operations, Grinding Skills; Drill Press Skills, CNC Turning and Milling Programming Setup and Operations. NIMS requires 100 percent conformance to all specifications. If all of the specifications have not been met, then the examinee must make appropriate corrections or retake the test.

Industrial Machinery and Services is ranked 7th by employment and 9th by average wage. NIMS has a stakeholder base of more than 6000 metalworking firms and is supported by the industry’s major trade organizations.

PrintED
Based on industry standards for graphic communications courses of study at the secondary and post-secondary levels, PrintED is a national accreditation program created by the Graphic Arts Education and Research Foundation. Students may take 2 out of 3 examinations at program exit: Digital File Preparation, Graphics Communication Technology, or Press Operations. Graphics Communication Technology is the introductory examination, which must be bundled with one of the other two. The examinations assess the following topics, among others:

- Understanding the basic principles of publishing design, desktop publishing, graphic design and production;
- Software skills for page layout, desktop publishing, illustration and image editing, sketches, and computer-generated layouts;
- The ability to use color, proofread using basic editing marks and using advanced PDF methods;
- Knowledge of sequential press operations and procedures, degrees of roller pressure, the characteristics of different paper types and grains, the properties and application of different ink types and colors; and
• Solutions to common print production problems and maintenance procedures.

Many CTE programs accredited by PrintED have articulation agreements with institutions of higher education. The communication industry cluster (which includes software and media services) ranks 4th by employment and 5th by average wage.

**Student Electronics Technician**
The SET Certification was developed by the Electronic Technicians Association (ETA) for high school students and entry-level technicians. Committees made up of a demographically diverse group of ETA staff, educators, multiple national association representatives, and subject matter experts provide input for, review and update examinations at least annually to comply with electronic industry standards. Examined competencies cover subject areas of electronics, computer and information technology, and communications. They also incorporate mathematics, writing, safety precautions, and technician work procedures. ETA also encourages and supports hands-on practical examinations, including specific assessment tools that measure hands-on performance.

The National Skills Standards Board’s feasibility study concluded that ETA’s certification programs are among the best available in any industry. The Certified Electronics Technician (CET) program, for which the SET is a first step, is one of the most widely recognized certification programs in the industry.

The electronics and imaging industry cluster ranks 13th by employment and 4th by average wage.

**Carpentry Level-1 Certification**
This is one of many certifications sponsored by the National Center for Construction Education and Research (NCCER). It is appropriate to high school students and can be augmented with higher-level certifications in carpentry and other construction trades. Level-1 includes: orientation to the trade; building materials, fasteners and adhesives; hand and power tools; reading plans and elevations; floor systems; wall and ceiling framing; roof framing; introduction to concrete and reinforcing materials; windows and exterior doors; and basic stair layout.

Building construction accounted for 82,800 jobs in NY State in 2009.

**Assessment of Skills and Knowledge for Business (A*S*K)**
This set of examinations was developed by the Assessment of Skills and Knowledge for Business Institute with technical assistance from NOCTI. It comprises four examinations: Fundamental Business Concepts; Fundamental Marketing Concepts; Concepts of Finance; Concepts of Entrepreneurship and Management. The examinations were designed to accompany a curriculum representing a continuum of instruction ranging from simple to complex and is divided into six planning levels: Prerequisite; Career-Sustaining; Specialist; Supervisor; Manager; and Owner. The planning levels can serve as building blocks for curriculum development in that students should know and be able to demonstrate the successful performance at one level before tackling more complex skills...
and knowledge at the next level. The levels can also be used as the basis for developing an articulated sequence of instruction between high school and postsecondary business courses. Certificates are issued for those students meeting or exceeding two cut score thresholds: (a) Certified High Achiever; and (b) Certified High Achiever, Exemplary Performance. The objectives that the examination addresses use words such as “identify,” “apply,” “describe,” “demonstrate,” “choose,” “prepare,” “diagnose,” “prove,” “complete,” and, “calculate.” Certification requires students to score a minimum of 70%. Although certification rates vary by exam type, an average of 30% of all high school students earn certification. Statistical data for each A*S*K certification exam is reviewed at least once annually to determine how effectively the overall exam and individual items within the exam are performing. On average, 10% - 20% of the weakest items are replaced. Additional reviews by subject matter experts focus on item validity relative to the research base (standards and performance indicators).

**NOCTI Examinations**

The following four examinations are all from NOCTI, a very well established organization that develops and administers assessments of technical competence for secondary and post-secondary students. NYSED has approved a large number of NOCTI examinations and they are widely used in CTE programs around the country. Test development procedures are rigorous. Administration and security are carefully controlled. Many NYS post-secondary institutions attend to NOCTI examination scores in making admission decisions. Some grant college credit for scores meeting their standards.²

NOCTI assessments are aligned to the National Council of Teachers of Mathematics standards, the National Science Education Standards, and National Council of Teachers of English and the International Reading Association standards. Alignments are currently in progress to the Common Core State Standards as well as the Common Career Technical Core Standards. These assessments have been selected as part of New York’s program approval process and can be used to obtain a CTE endorsement on the Regents diploma for approved programs. This assessment has also been approved as part of the Annual Professional Performance Review (APPR) initiative.

NOCTI assessments are recommended for college credit through the National College Credit Recommendation Service (NCCRS). Experienced industry experts and professors evaluated the rigor of this assessment to translate the content into college credit equivalencies. Criterion-referenced cut scores are established for both the written and performance components. Cut scores set the point at which a test taker is considered minimally competent for beginning a position or post-secondary courses in the occupational area. Each cut score is established through a research-based process utilizing 10 to 15 subject matter experts representing both industry and education.

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²We consulted with NOCTI President and CEO John Foster in this project but did not invite him to serve on the Expert Advisory Board to avoid any appearance that his advocacy of NOCTI examinations might serve his organization’s private interests.
The only concern we encountered about NOCTI examinations is that the organization is oriented strongly toward schools. In contrast, the sponsors of the examinations described above are primarily employer and/or employee groups. As a result, we were unable to determine whether employers consider NOCTI examination scores in making hiring decisions or whether a high school student with high scores might be granted advanced standing in a related apprenticeship program. Despite this limitation, we believe the following examinations merit recognition by the Regents. The summaries rely heavily on information supplied by NOCTI.

**Advertising and Design**

This test is designed for program completers and entry-level employees in the advertising and design field, measuring knowledge and skills in such topics as design theory and application, color theory and application, drawing and digital illustration, photography, typography, multimedia, digital image manipulation, production and printing, computer literacy, and communication skills. This career area fits in the Communications, Software & Media Services industry cluster, which ranks 4th by employment and 5th by average wage.

**Accounting – Basic**

This test is designed for program completers and entry-level employees in the accounting/bookkeeping field, measuring knowledge and skills in such topics as general accounting knowledge, journalizing, posting, payroll preparation, cash and banking procedures, merchandise inventory, completion of accounting cycle, identification and application of source data, use of mechanical and electronic accounting devices, and data security. The Financial Services industry cluster ranks 2nd by employment and 1st by average wage. It is critically important to the NYS economy. Accounting is a support function within that cluster, well below the top in status and earnings but an essential component.

**Agricultural Mechanics**

This test is designed for program completers and entry-level employees in the agricultural mechanics field, measuring knowledge and skills in such topics as general safety, welding and mechanics, power and machinery, electrical power and process, agricultural structures, agribusiness, and environmental and natural resource systems. While not ranked as one of the top industries in the state of New York, agriculture is an important industry with significant employment Upstate. Almost 4,000 students are enrolled in the agricultural, food and natural resources cluster. (We also considered two other agriculture examinations but were unable to obtain adequate information about them: NOCTI’s Production Agriculture; and the Agricultural Assessment System developed in NYS.)

**Hospitality Management – Food and Beverage**
This test is designed for program completers and entry-level employees in the hotel management field, measuring knowledge and skills in such topics as understanding of the hospitality industry, guest relations and concierge duties, opening and settling financial transactions, safety and security, legal and ethical responsibilities, marketing and sales, travel and tourism, hotel restaurant management, and food and beverage service. Travel and Tourism is an important industry in the New York, ranking third by employment and 16th by average wage.

Conclusions

CTE courses can and should be a pathway into college and career for more students in NY State. High-quality end-of-course and end-of-program examinations can assure employers and admissions officers that graduates have acquired academic and technical competence related to an occupation. Passing these examinations – especially as one part of a more elaborate certification process – strongly signals to employers that the graduate is career-ready, they are fully qualified for at least an entry-level job. For example: CompTIA’s A+ Certification is recognized by IT employers around the world. Similarly, the ProStart National Certificate of Achievement signifies that the graduate has mastered all of the basics needed for employment in the restaurant/hospitality industry. And because students who elect to take one of these CTE examinations will still have to pass currently-required Regents examinations, they will still have met expectations regarding academic proficiency. They will have demonstrated that they are college and career ready far more convincingly than those students who simply pass five academic Regents examinations.

The examinations recommended here can also help to improve and maintain quality in CTE programs. Teachers, administrators, parents, school boards, and NYSED can identify especially strong programs by reviewing students’ performance on these examinations. Both as signals of students’ competence and indicators of programs’ quality, CTE examinations function in the same manner as Regents examinations. Thus we are convinced that Regents’ recognition of the recommended CTE examinations will simultaneously open new pathways to college and careers for students and raise standards for high school graduation.

In addition to providing a set of recommended CTE examinations along with a rationale for their adoption and information on each, we hope we have provided a template that can be used in the future to add more CTE examinations to the approved list. We fully expect that the Regents’ acceptance of our recommendations will stimulate CTE educators and examination providers to propose additional examinations for adoption and that some of these examinations will meet our criteria.

We note the potential value of adding examinations related to health care, one of the largest and fastest-growing occupational areas. We found the Emergency Medical Technician (EMS) Certification from the National Highway Transportation Services Administration a very strong example. The major reason for their absence from this list is that many health-related occupations restrict practice to people who are age 18 or older. This makes work-based learning very challenging at the high school level. For
high school students in health-related CTE programs, the best option is likely to be dual enrollment and 2+2 or other articulation arrangements linking their secondary studies to post-secondary education.

Finally, we recommend that these CTE examinations be recognized only when students are enrolled in approved CTE programs. The criteria for approval are as follows.

Approved programs lead to an industry-recognized credential or certificate at the postsecondary level, or an associate or baccalaureate degree and offer:

- an opportunity to apply academic concepts to real-world situations;
- preparation for industry-based assessments or certifications; and the opportunity to earn college credit or advanced standing while still in high school; and
- work-based learning opportunities where students demonstrate mastery of skills essential in the workplace.


This limitation would assure that students who choose the CTE pathway are all enrolled in rigorous and systematic CTE programs that include demonstrations of workplace skills that written examinations do not assess directly.
References


Appendix A

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Appendix C

Sample Test Items

A*S*K Sample Questions

**Synthesis and Evaluation**, including development of conclusions, ideas and recommendations for action based on hypothetical situations and data.

Examples:

1. Dan and Sarah are planning to open a business. Sarah is unable to devote full time to daily business operations but plans to provide financial support. Which form of business partnership would you suggest to Sarah?

   a. Open  
   b. Close  
   c. General  
   d. Limited

2. While at work, employees see that a customer has been in an accident. The customer appears to be unconscious. What should they do?

   a. Take careful notes  
   b. Start CPR  
   c. Call 911  
   d. Move victim to a more comfortable position

NIMS Sample Question

You are milling a 1.0000 Diameter counterbore using G3 with tool radius compensation. When you finish and you measure the hole is .996. What is the correct tool wear adjustment for the tool?

A. -.002  
B. -.004  
C. .002  
D. .004
The drawing below is a finished contour around a casting. You will climb cut the finished pass using cutter compensation that will offset from the work surface. You will fill in the necessary answers a-e to complete the missing portions of the program.

**.250 Dia End Mill 4 Flute**

T #6 150 SFPM .003 FPT

O54321 (Contour)

G0 G20 G54 G90

G91 G28 Z0 T6(.25 E.M.)

G90 M6

N01 X-.3 Y0 S2400 Mxx (Pos 1)

N02 G43 H6 Z.05 Mxx

N03 G__ Z-.550 F28.

N04 G__ Y-.300(2)

N05 X0 (3)

N06 Y1.75 (4)

N07 X_____Y_____ (Pos 5)

N08 X____ (Pos 6)

N09 Y1.625 (7)

N10 G__X___Y___I___J__(Pos 7-8)

Line N10 (Arc)(8)
Using the partial drawing provided, what is the minimum diameter allowable for datum "B"?

A. G3 X1.25 Y1.625 I1.375 J0
B. G2 X1.625 Y1.25 I1.5 J0
C. G2 X1.625 Y1.25 I1.5 J0
D. G3 X1.25 Y1.625 I0 J1.375
A. 20.13 mm  
B. 31.6 mm  
C. 42 mm  
D. 20.00 mm

PrintED® Introduction to Graphic Communications  
Sample Exam Questions

1. The printing process that uses an inked, raised image that is pressed against paper is:  
   a. Letterpress  
   b. Gravure  
   c. Offset  
   d. Digital printing

2. Jobs requiring numbering, like tickets or forms, are most often done using the process of:  
   a. Gravure  
   b. Digital printing  
   c. Offset  
   d. Letterpress  
   e. Both b and d

3. To succeed in the graphic arts, a skilled technical employee must be able to:  
   a. Write and design  
   b. Supervise the work of others  
   c. Operate sophisticated machinery  
   d. Start a new business

4. The part of the offset press that holds and supplies ink to the inking rollers is the:  
   a. Doctor blade  
   b. Ink fountain  
   c. Plate cylinder  
   d. Water fountain

5. A thin sheet of paper, metal or polyester which carries the image is called the:  
   a. Blanket  
   b. Offset  
   c. Plate  
   d. Impression cylinder

NOCTI Audio-Visual Communications  
Sample Questions:
Grouping objects into categories according to similarities is
A. seriation
B. conservation
C. classification
D. temporal relations

Fine motor skills are developed through activities such as
A. throwing and catching
B. grasping and pinching
C. running and jumping
D. listening to directions

Competition among preschoolers should be
A. encouraged
B. discouraged
C. planned
D. taught

Props and beads can be used to promote
A. creative play
B. fine motor skills
C. gross motor skills
D. fashion appreciation

**NOCTI Advertising and Design**

**Sample Questions**

When designing a billboard, readability is maximized by choosing
A. red on black
B. yellow on white
C. red on white
D. blue on gray

Adjusting space between letters is
A. reading
B. kerning
C. editing
D. scaling

A vector image can be
A. scaled
B. pixelated
C. tiled
D. merged
The standard bleed allowance should be
A. 1/32 inch
B. 1/8 inch
C. 1/2 inch
D. 1 inch

After scanning a photograph, the image is broken up into a
A. dot pattern
B. highlighted image
C. line pattern
D. shaded image

ASE Sample Questions
In the diagram, 50 Newton meters (37 ft-lbs) of force is being applied to a 25mm (1 in.) diameter hydraulic cylinder. The force is transferred to a 75 mm (3 in.) diameter cylinder. What is the resultant force at the 75mm (3 in.) cylinder?

(A) 250 Nm (185 ft-lbs)
(B) 150 Nm (111 ft-lbs)
(C) 25 Nm (18 ft-lbs)
(D) 10.6 Nm (12.3 ft-lbs)

The reading on the illustrated metric micrometer is:

(A) 7.28 mm.
(B) 7.28 mm.
(C) 7.28 mm.
(D) 7.28 mm.