COMPUTER PROGRAMMING

SkillsUSA Championships Technical Standards

PURPOSE

To evaluate each competitor's preparation for employment and to recognize outstanding students for excellence and professionalism in the field of computer programming.

ELIGIBILITY

Open to active SkillsUSA members enrolled in programs with computer programming as an occupational objective.

CLOTHING REQUIREMENTS

Class E: Competition Specific — Business Casual

- Official SkillsUSA white polo shirt
- Black dress slacks or black dress skirt (knee-length minimum)
- Black closed-toe dress shoes

Note: Wearing socks or hose is no longer required. If worn, socks must be black dress socks and hose must be either black or skin-tone and seamless/nonpattern.

These regulations refer to clothing items that are pictured and described at www.skillsusastore.org. If you have questions about clothing or other logo items, call 1-888-501-2183.

Note: Competitors must wear their official competition clothing to the competition orientation meeting.

EQUIPMENT AND MATERIALS

1. Supplied by the technical committee:
   a. Printer
   b. Programming instructions
   c. Timing and judges' procedures
2. Supplied by the competitor:
   a. Desktop computer and monitor or laptop
   b. Software to write and run code in a competitor's programming language of choice.
   c. One copy only of the coding reference manual of the language in which competitors will code the program (can be hard copy or digital)
   d. Ballpoint pens or sharpened pencils
   e. Blank notebook paper
   f. One 6' multiple-outlet surge protector
   g. All competitors must create a one-page resume. See "Resume Requirement" below for guidelines.

RESUME REQUIREMENT

Competitors must create a one-page resume to submit online. SkillsUSA South Carolina competitors should submit their resume by the deadline published on the competition updates page of our website. Failure to submit a resume will result in a 10-point penalty.

Your resume must be saved as a PDF file type using file name format of "Last Name_First Name." For example, "Amanda Smith" would save her resume as Smith_Amanda. If you need assistance with saving your file as a PDF, visit the Adobe website for more information.

Note: Check the Competition Guidelines and/or the updates page on the state website.

PROHIBITED DEVICES

Cellphones, electronic watches and/or other electronic devices not approved by a competition's national technical committee are ***NOT*** allowed in the competition area. Please follow the guidelines in each technical standard for approved exceptions. Technical committee members may also approve exceptions onsite during the SkillsUSA Championships if deemed appropriate.

Penalties for Prohibited Devices

If a competitor's electronic device makes noise or if the competitor is seen using it at any time during the competition, an official report will be documented for review by the Director of the SkillsUSA Championships. If confirmed that the competitor used the device in a manner which compromised the integrity of the competition, the competitor's scores may be removed.

SCOPE OF THE COMPETITION

The competition uses competencies identified by the Computing Technology Industry Association. The specific projects chosen for national competition will be determined by the Computer Programming technical committee.

KNOWLEDGE PERFORMANCE

The competition includes a written test assessing, but not limited to, knowledge of Java, C, C++, C#, Python, Ruby, JavaScript, PHP, Objective-C, and SQL.

SKILL PERFORMANCE

The competition includes a computer programming problem consisting of background information and program specifications with accompanying reference materials and description of program output requirements. An appropriate (successfully executable) computer program from design notes and instructions will be developed.

COMPETITION GUIDELINES

1. The competitors will receive a packet that includes three or four projects.
2. Each project's specifications are written for either Java, C, C++, C# Python, Ruby, JavaScript, PHP, Objective-C, or SQL.
3. Projects will be scored on the following six criteria: completeness, correctness of output, validation of input, internal documentation, efficiency of code, and quality of work.
4. The competition will also include an interview to assess competitors' ability to answer questions typical of an entry-level position for a computer programmer.

STANDARDS AND COMPETENCIES

CP 1.0 — Demonstrate knowledge of computer programming
1.1.   Describe how programs and programming languages work
1.2.   Describe the purposes and practices of structured programming

CP 2.0 — Perform competencies related to Java programming
2.1.   Explain the structured programming paradigm
2.2.   Identify the primary components of a Java program
2.3.   Explain the basic syntax of a Java program
2.4.   Demonstrate procedures for compiling and running a Java application
2.5.   Demonstrate use of Java's online hypertext technology documentation
2.6.   Demonstrate use of Java's identifiers to name variables, constants, and methods
2.7.   Demonstrate use of Java's operators to write expressions
2.8.   Explain the rules governing operand evaluation order and operator precedence
2.9.   Summarize Java's variable naming conventions
2.10. Distinguish syntax errors, runtime errors and logic errors
2.11. Understand program flow control in selection and loop statements
2.12. Demonstrate use of methods in Java
2.13. Demonstrate use of declaring, initializing and accessing elements in arrays

2.14. Demonstrate use of the string class to process fixed strings

CP 3.0 — Perform competencies related to C++ programming
3.1. Write C++ programs using input/output statements
3.2. Write C++ programs using selection and iteration
3.3. Create C++ programs using functions
3.4. Write C++ programs using one-dimensional arrays
3.5. Properly document and debug C++ programs
3.6. Create object concepts and terminology
3.7. Implement those algorithms in the C++ programming language using classes
3.8. Debug C++ programs written by others
3.9. Use pointers in C++ programs
3.10. Use sequential files in C++ programs

CP 4.0 — Perform competencies related to Visual Basic programming
4.1. Demonstrate knowledge of the fundamentals of Visual Basic (VB) programming using Visual Basic.NET
4.2. Use sequential and random-access files in VB programs
4.3. Use advanced controls and multiple controls in a business application
4.4. Use a database and database controls in a business application
4.5. Demonstrate knowledge of structured and object-oriented programming techniques through the process of subprograms, selection, and repetition in projects
4.6. Use GUI design principles in all projects

CP 5.0 — SkillsUSA Framework
The SkillsUSA Framework is used to pinpoint the Essential Elements found in Personal Skills, Workplace Skills and Technical Skills Grounded in Academics. Students will be expected to display or explain how they used some of these Essential Elements. Please reference the graphic, as you may be scored on specific elements applied to your project. For more, visit: www.skillsusa.org/who-we-are/skillsusa-framework/.

COMMITTEE IDENTIFIED ACADEMIC SKILLS

The technical committee has identified that the following academic skills are embedded in this competition.

Math Skills
- Use fractions to solve practical problems
- Use proportions and ratios to solve practical problems
- Simplify numerical expressions
- Use scientific notation
- Solve practical problems involving percents
- Solve single variable algebraic expressions
- Solve multiple variable algebraic expressions

- Apply transformations (rotate or turn, reflect or flip, translate or slide, and dilate or scale) to geometric figures
- Construct three-dimensional models
- Apply Pythagorean Theorem
- Make predictions using knowledge of probability
- Make comparisons, predictions, and inferences using graphs and charts
- Organize and describe data using matrices
- Graph linear equations
- Solve problems using proportions, formulas, and functions
- Find slope of a line
- Use laws of exponents to perform operations
- Solve quadratic equations
- Solve problems involving symmetry and transformation

Language Arts Skills
- Provide information in conversations and in group discussions
- Provide information in oral presentations
- Demonstrate comprehension of a variety of informational texts
- Organize and synthesize information for use in written and oral presentations
- Demonstrate knowledge of appropriate reference materials
- Use print, electronic databases and online resources to access information in books and articles

CONNECTIONS TO NATIONAL STANDARDS

State-level academic curriculum specialists identified the following connections to national academic standards.

Math Standards
- Numbers and operations
- Algebra
- Reasoning and proof
- Communication
- Connections
- Representation

Source: NCTM Principles and Standards for School Mathematics. For more information, visit: http://www.nctm.org.

Science Standards
- Understands the sources and properties of energy
- Understands forces and motion
- Understands the nature of scientific inquiry

Source: McREL compendium of national science standards. To view and search the compendium, visit: http://www2.mcrel.org/compendium/.

Language Arts Standards

- Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics).
- Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.
- Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.
- Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
- Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion and the exchange of information).

Source: IRA/NCTE Standards for the English Language Arts. To view the standards, visit: www.ncte.org/standards.