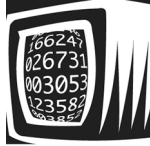


# COMPUTER PROGRAMMING (VIRTUAL)



## PURPOSE

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

First, download and review the General Regulations at: <http://updates.skillsusa.org>.

## ELIGIBILITY

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

## CLOTHING REQUIREMENTS

### Class E: Contest specific — Business Casual

- Official SkillsUSA white polo shirt.
- Black dress slacks (accompanied by black dress socks or black or skin-tone seamless hose) or black dress skirt (knee-length, accompanied by black or skin-tone seamless hose).
- Black leather closed-toe dress shoes.

### Contest Clothing Notes (Apply ONLY to Virtual Competitions):

- Official SkillsUSA Competition Clothing recommended but NOT required.
- Contestant clothing options include the following:
  - Official Competition Clothing.
  - Trade Appropriate Clothing.
  - Professional Dress.
  - Business Casual.
- Clothing must meet industry safety standards.
- No identification of the contestant, school or state is allowed on clothing.
- No offensive, vulgar or inappropriate images or text are allowed on contestants clothing.
- No shorts or sleeveless shirts are allowed.
- Skirts must be at least knee-length.

- Proper Personal Protective Equipment (PPE) must be worn by contestant to meet all state, local and school requirements due to COVID-19.
- Scoring deductions may only be given and/or disqualification of contestant if clothing safety standards are not met.

These regulations refer to clothing items that are pictured and described at:

[www.skillsusastore.org](http://www.skillsusastore.org). If you have questions about clothing or other logo items, call 1-888-501-2183.

## EQUIPMENT AND MATERIALS

Supplied by the contestant:

1. Computer with high-speed internet capability and camera to use applications such as Zoom, Teams, etc. The minimum recommended internet bandwidth speeds for joining Zoom meetings, accessing on-demand curriculum and other online operations is 2.0 Mbps up and down. You can test your current internet speeds by following this link: [www.speedtest.net](http://www.speedtest.net). Allow the page to load and click on GO.
2. A secondary camera(s) may be required to provide judges with the ability to view contestants from different angles. Additional camera requirements will be located on the SkillsUSA website at <http://updates.skillsusa.org>.
3. A contest Proctor will be required to be on site to assist judges. A local industry expert is preferred to serve as the Proctor and shall not be an individual that has been involved with the training of the contestant(s). The Proctor will serve as the onsite "hands and eyes" for the judges. Proctor will follow instructions from the judges for safety and operations related to the competition. Proctor may be asked by judges to perform several tasks such as operating a portable camera to show specific components or steps, measure parts, or any task that will provide judges with information needed to assist in accurate scoring of the contestant's work or presentation. However, the Proctor shall not serve as a judge nor have any influence on contestant scores.
4. The contestant's instructor or advisor shall be on site to observe all competition

activities to ensure a safe and healthy competition experience for all participants. That instructor or advisor will not be allowed to interact or interfere with the competitor unless a safety issue arises that requires interaction. Any other support or interaction between the contestant and the instructor/advisor will result in disqualification.

5. All competitors must create a one-page résumé and submit an electronic copy to the technical committee chair at least seven (7) days in advance of the competition. Failure to do so will result in a 10-point penalty. Instructions for submission of the electronic résumé copy will be provided on the SkillsUSA website at <http://updates.skillsusa.org>.
6. Desktop computer/monitor or laptop
7. Visual Basic, Java, C++ or RPG software
8. One copy only of the coding reference manual of the language in which they will code the program
9. Ballpoint pens or sharpened pencils
10. Blank notebook paper
11. All competitors must create a one-page résumé and submit a hard copy to the technical committee chair at orientation. Failure to do so will result in a 10-point penalty.

**Note:** Your contest may also require a hard copy of your résumé as part of the actual contest. Check the Contest Guidelines and/or the updates page on the SkillsUSA website: <http://updates.skillsusa.org>.

## SCOPE OF THE CONTEST

The contest 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 contest includes a written knowledge test assessing knowledge of Visual Basic, Java, C++ or RPG or “other approved language.” Check the Contest Guidelines and/or the updates page on the SkillsUSA website: <http://updates.skillsusa.org>.

### Skill Performance

The contest 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.

### Contest Guidelines

1. The contestants will receive a packet that includes three or four projects.
2. Each project’s specifications are written for either Visual Basic, Java, C++ or RPG.
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 contest will also include an interview to assess contestants’ ability to answer questions typical of an entry-level position for a computer programmer.

### Standards and Competencies

**Note for Virtual Competitions:** Contestants may not be required to perform all the standards and competencies listed in this section. However, contestants should be prepared to perform components in all areas. Prior to the competition, the technical committee may determine which standards and competencies contestants will be perform for the virtual contests. The technical committee will determine if additional information is needed for contestants prior to the competition. These changes will be posted on the SkillsUSA Championships contest update website at: <http://updates.skillsusa.org>.

#### 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

### **Committee Identified Academic Skills**

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

#### **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 matrixes.
- 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.
- 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).

### 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: [www2.mcrel.org/compendium/browse.asp](http://www2.mcrel.org/compendium/browse.asp).

#### 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).

**Source:** IRA/NCTE Standards for the English Language Arts. To view the standards, visit: [www.ncte.org/standards](http://www.ncte.org/standards).