2023-24 EDITION

SkillsUSA CHAMPIONSHIPS

RESIDENTIAL AND COMMERCIAL APPLIANCE TECHNOLOGY

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 residential and commercial appliance technology.

ELIGIBILITY

Open to active SkillsUSA members enrolled in programs that may include, but not limited to, commercial or residential cooking, laundry, refrigeration, or clean-up products. May also include facilities management/maintenance, residential appliance technology, commercial appliance technology, and programs with HVAC/R as a segment within its curriculum and part of the occupational objective.

CLOTHING REQUIREMENTS

Class C: Competition Specific — Manufacturing/Construction Khaki Attire

- Official SkillsUSA khaki short-sleeve work shirt
- Khaki pants
- Black, brown, or tan work shoes

Note: Safety glasses must have side shields or goggles. (Prescription glasses may be used only if they are equipped with side shields. If not, they must be covered with goggles.)

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 all competition functions and activities.

EQUIPMENT AND MATERIALS

1. Supplied by the technical committee:
   a. Competition appliances
   b. Competition specialized tools
   c. Overview of the product and disassembly
   d. Schematics to assist with diagnoses
2. Supplied by the competitor: (***Note:*** The tools listed below are a minimal suggestion. The competitor may bring additional tools at their discretion. No electric or battery-powered tools are allowed.)
   a. Toolbox, tool bag, or tool case
   b. Assortment or sets of hand screwdrivers (e.g., flat, Phillips, Roberts, Safety Torx)
   c. Nut drivers, standard SAE and metric
   d. Assortment or sets of pliers (e.g., common, needle nose, channel lock, diagonal, arc joint)
   e. ¼" drive socket set, standard SAE and metric sockets,
   f. 10-12 oz. hammer
   g. Adjustable wrenches, assorted sizes (e.g., 4", 6", 8")
   h. Allen wrenches, standard SAE and metric, assorted sizes
   i. Assortment or sets of open-end and box-end wrenches, standard SAE and metric
   j. Flashlight
   k. Pocket thermometer or heat meter
   l. Volt-Ohm meter with standard probes and mini electronic probes
   m. Amperage meter, probe, or clamp-on style. Can be integrated with a Volt-Ohm meter
   n. Gloves (optional)
   o. All competitors must create a one-page resume. See "Resume Requirement" below for guidelines. Additionally, and as part of the competition, competitors will submit a hard copy of their resume at orientation.

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

Technicians use mechanical and customer service skills to troubleshoot, repair, and provide preventive maintenance on equipment that can include service to consumers' homes, restaurants, hotels, hospitals, cafeterias, schools, and universities. The competition is defined by industry standards and is subject to the manufacturers involved. Make sure to check the SkillsUSA website for updates.

KNOWLEDGE PERFORMANCE

The competition may include a written test (or tests) that assesses knowledge.

- Technical assessment: Installing, servicing and repairing household and commercial appliances
- Customer Relations/Oral assessment
- Employability assessment/resume
- Competitors are required to take the SkillsUSA professional development test

SKILL PERFORMANCE

The competition includes a series of stations where competitors will demonstrate the ability to perform jobs and skills such as customer service, electrical, and mechanical diagnostic skills selected from commercial cooking equipment, dishwasher products, laundry products, and refrigeration products. Competitors will also need to accurately diagnose and repair residential appliances: washers, dryers, refrigerators, ovens, cooktops, microwaves, dishwashers and brazing/Lokring for sealed system repairs.

COMPETITION GUIDELINES

1. The competition will assess a participant's skill while practicing accuracy, good workmanship, speed, and the safe use of tools and test equipment.
2. All industry standards and safety practices will be followed and assessed as a part of this competition.

STANDARDS AND COMPETENCIES

These are required prerequisites, knowledge, and competencies that you may need to demonstrate for each appliance product station.

* Indicates demonstration is applicable to residential products
** Indicates demonstration is applicable to commercial products
*** Indicates demonstration is applicable to residential and commercial products

RCAT 1.0 — ***Demonstrate knowledge and use of diagnostic tools, equipment, technical literature, electrical, gas, water, steam and hydraulic systems

1.1. Demonstrate correct use of basic hand tools
1.2. Demonstrate correct use of specialty tools
1.3. Display knowledge of meters for the task at hand
1.4. Read wiring schematic/diagrams and tech sheets
1.5. Demonstrate knowledge of electrical supply sources for the required task at hand
1.6. Demonstrate knowledge of all electrical circuits
1.7. Demonstrate correct use of gas specialty tools, e.g., fluid and pressure manometers
1.8. Demonstrate knowledge of gas tubing, surface burner types, oven burner types, orifices, orifice sizes
1.9. Demonstrate knowledge of steam/water systems, e.g., steam supply sources, Steam cooking, Steam cleaning, Water quality and supply, Water filters
1.10. Demonstrate knowledge of electronic controls, e.g., Customer user interfaces, electronic control boards, Relay boards, Power boards

Laundry

RCAT 2.0 — *Washer: Diagnose and service common failures on various types of residential top-load and front-load washing machines according to the manufacturer's specifications

2.1. Demonstrate the ability to operate and service components related to residential washers
2.2. Demonstrate knowledge to service washing systems: hoses, diverters, check valves, pumps, valves, and seals
2.3. Demonstrate knowledge of drive systems: belts, transmissions, agitators, wash impellers, clutches, brakes, pulleys, and multi-phase drive motors
2.4. Demonstrate knowledge of mechanical systems: leveling legs, suspension systems, cabinet/base structure, door lock systems

RCAT 3.0 — *Dryer: Diagnose and service common failures on various types of residential electric and gas dryers per manufacturer's specifications

3.1. Demonstrate the ability to operate and service components related to residential electrical and gas dryers
3.2. Demonstrate knowledge to service drive systems: belts, idler pulleys of all types
3.3. Demonstrate knowledge to service and repair drying systems: time dry, auto dry, sensor control dry and electronic control dry
3.4. Demonstrate knowledge to service and repair mechanical systems: leveling legs, drum rollers, drum support bearings, drum glides, door springs, door latches and cabinet/base structure

3.5. Demonstrate knowledge to service and repair air flow systems: cabinet duct system, blower wheels, drum/door seals, lint filter and air flow sensors
3.6. Demonstrate knowledge of dryer steam systems

Cooling

RCAT 4.0 — *** Diagnose and service common failures on various types of refrigerators per manufacturer's specifications

4.1. Demonstrate knowledge of icemaker system; module, thermostat, thermistor, cube flex/tray and heater
4.2. Demonstrate knowledge of ice and water dispenser systems; auger motor, crusher mechanism, ice bucket components, dispenser door mechanism, condensation heaters and ice- level sensing devices, water filters and water pressure.
4.3. Demonstrate knowledge of mechanical systems: leveling legs/rollers, door operation/alignment, door gasket replacement, freezer/fresh food compartment controls
4.4. Demonstrate knowledge of air- circulation systems: air ducts, diverters, baffles, and fan motors
4.5. Demonstrate knowledge of sealed system: basic refrigeration theory, identify/diagnose leaks and restrictions in condenser/post loop tubing/evaporator/heat exchanger/drier filter, compressor operation and diagnostics
4.6. Demonstrate knowledge and understanding of various refrigerant gasses currently used in refrigeration products within a sealed system

Cooking

RCAT 5.0 — *** Diagnose and service common failures on various types of electric, induction, gas ranges & microwave ovens per manufacturer's specifications

5.1. Possess a knowledge of cooking systems: surface cooking, standard/convection bake, broil, induction, steam, microwave
5.2. Demonstrate knowledge of LP and natural gas fundamentals and theory
5.3. Demonstrate knowledge of conventional electric and induction cooking systems
5.4. Demonstrate knowledge of gas cooking systems, gas conversion and gas pressures.
5.5. Demonstrate knowledge of self- clean system
5.6. Demonstrate knowledge of motors: fan, servo/actuator
5.7. Demonstrate knowledge of mechanical systems: leveling legs, door locks, door structure and seals, door springs/hinges, cabinet/base structure
5.8. Demonstrate knowledge of microwave operations: conventional, convection and inverter technologies
5.9. Demonstrate knowledge of microwave cooking theory
5.10. Demonstrate knowledge of door lock mechanisms
5.11. Demonstrate knowledge of high-voltage heating systems: magnetron, transformer, capacitor, and diode
5.12. Demonstrate knowledge of convection components
5.13. Demonstrate knowledge of mechanical systems: door structure and seals, door springs/hinges, wave guide and cabinet/base structure

Cleaning

RCAT 6.0 — *** Diagnose and service common failures on various types of dishwashers per manufacturer's specifications

6.1. Possess a knowledge of dishwasher operations
6.2. Demonstrate knowledge of water circulation systems: hoses, diverters, check valves, pumps, valves, and seals
6.3. Demonstrate knowledge of water heating and drying systems: thermistors, heaters, and relays
6.4. Demonstrate knowledge of mechanical systems: leveling legs, cabinet/base structure, door lock mechanism, door structure and door/tub gasket
6.5. Demonstrate theoretical knowledge of thermal, chemical and mechanical energy of temperature, detergent, water quality and circulation

Refrigerant Tubing Connections

RCAT 7.0 — *** Assemble a closed loop tubing project that exhibits all techniques of brazing copper and steel tubing, compression, and flaring techniques, to complete a refrigeration closed loop sealed system repair per manufacturers' specifications

7.1. Demonstrate correct usage of the acetylene/oxygen or turbo torch brazing equipment and connection(s) joint using refrigeration compression tools and fittings such as LOKRING, brass, steel and copper tubing and fittings
7.2. Braze materials using heat trap paste, flux, 45-percent high silver alloy brazing material, 15-percent silver alloy brazing rod and saddle/access valves
7.3. Use of basic/specialty hand tools: wedging tool, tubing bender, triangular file, burr remover, sanding cloth, valve core removal tool, triangular file or cap tube cutter, process tube adaptor, pinch off tools and fitting/cleaning brush
7.4. Practice leak detection methods
7.5. Follow proper safety practices: fire extinguisher at hand, gloves, safety glasses and flame-retardant mat

RCAT 8.0 — ***Knowledge Performance and Interpersonal Skills

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.
- Solve practical problems involving percentages.

Science Skills

- Describe and recognize elements, compounds, mixtures, acids, bases and salts
- Describe and recognize solids, liquids and gasses
- Describe characteristics of types of matter based on physical and chemical properties
- Use knowledge of physical properties (shape, density, solubility, odor, melting point, boiling point, color)
- Use knowledge of chemical properties (acidity, basicity, combustibility, reactivity)
- Understand the modern model of atomic structure
- Use knowledge of classification of elements as metals, metalloids and nonmetals
- Understand the Law of Conservation of Matter and Energy
- Describe phases of matter
- Describe and identify physical changes to matter
- Predict chemical changes to matter (types of reactions, reactants, products and balanced equations)
- Use knowledge of mechanical, chemical and electrical energy
- Use knowledge of heat, light and sound energy
- Use knowledge of temperature scales, heat and heat transfer
- Use knowledge of speed, velocity and acceleration
- Use knowledge of work, force, mechanical advantage, efficiency and power
- Use knowledge of principles of electricity and magnetism
- Use knowledge of static electricity, current electricity and circuits
- Use knowledge of magnetic fields and electromagnets
- Use knowledge of motors and generators

Language Arts Skills

- Provide information in conversations and in group discussions
- Provide information in oral presentations
- Demonstrate use of such verbal communication skills as word choice, pitch, feeling, tone and voice
- Demonstrate use of such nonverbal communication skills as eye contact, posture and gestures using interviewing techniques to gain information
- Analyze mass media messages
- Identify words and phrases that signal an author’s organizational pattern to aid comprehension

- Understand source, viewpoint and purpose of 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
- Demonstrate persuasive writing
- Demonstrate informational writing
- Edit writing for correct grammar, capitalization, punctuation, spelling, sentence structure and paragraphing

CONNECTIONS TO NATIONAL STANDARDS

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

Math Standards

- Numbers and operations
- Algebra
- Measurement
- Data analysis and probability
- Problem solving
- Reasoning and proof
- Communication
- Connections
- Representation

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

Science Standards

- Understands the structure and properties of matter
- Understands the sources and properties of energy
- Understands forces and motion
- Understands the nature of scientific inquiry
- Understands the scientific enterprise

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

Language Arts Standards

- Students read a wide range of print and nonprint texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works.

- 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 should have the necessary skills and understanding of using a computer and cell phones to navigate through various standard industry forms and websites.
- Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, and videos) 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.*