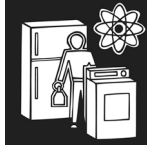


MAJOR APPLIANCE AND REFRIGERATION TECHNOLOGY



PURPOSE

To evaluate each contestant's preparation for employment and to recognize outstanding students for excellence and professionalism in the field of major appliance and refrigeration technology and commercial food equipment.

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

ELIGIBILITY

Open to active SkillsUSA members enrolled in programs with major appliance repair technology within its career objective.

CLOTHING REQUIREMENTS

Class C: Contest Specific — Manufacturing/Construction Khaki Attire

- Official SkillsUSA khaki short-sleeve work shirt and pants
- Black, brown or tan leather 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 800-401-1560 or 703-956-3723.

Note: Contestants must wear their official contest clothing to the contest orientation meeting and all MART contest functions and activities.

EQUIPMENT AND MATERIALS

1. Supplied by the technical committee:
 - a. Contest appliances
 - b. Contest specialized tools
2. Supplied by the contestant:
 - a. Tool box, tool bag or tool case

- b. Assortment or sets of hand screwdrivers (e.g., flat, Phillips, Roberts, torx head screwdrivers)
- 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
- 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)
- q. 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: The tools listed above are a minimal suggestion. The contestant may bring additional tools at their discretion. No electric or battery-powered tools are allowed.

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 is defined by industry standards and is subject to the manufacturers involved; make sure to check website for updates.

Knowledge Performance

The contest will include four written knowledge assessments that assess knowledge:

1. Technical assessment: Installing, servicing and repairing household appliances
2. Customer Relations assessment

3. Employability assessment/résumé
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.
4. SkillsUSA Professional Development assessment.

Skill Performance

The contest includes a series of stations where contestants will demonstrate the ability to perform jobs and skills selected from the following list of standards and competencies as determined by the SkillsUSA Championships technical committee.

Contest Guidelines

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

Standards and Competencies

MAT 1.0 — Diagnose and repair common failures on various types of domestic top-load and front-load washing machines according to the manufacturer's specifications

- 1.1 Use diagnostic tools, equipment and technical literature
 - 1.1.1 Display knowledge of a volt/ohm meter
 - 1.1.2 Display knowledge of an amperage meter
 - 1.1.3 Demonstrate correct use of basic hand tools
 - 1.1.4 Demonstrate correct use of specialty tools
 - 1.1.5 Read wiring schematic/diagrams and tech sheets
- 1.2 Understand and operate electrical/mechanical components
 - 1.2.1 Repair problems associated with systems: hoses, diverters, check valves, pumps, valves and seals
 - 1.2.2 Demonstrate knowledge associated with motors: single speed, multiple speed, multi-phase and direct current

- 1.2.3 Demonstrate knowledge of switches: all types
- 1.2.4 Demonstrate knowledge of mechanical timer controls
- 1.2.5 Demonstrate knowledge of electronic controls
- 1.2.6 Demonstrate knowledge of customer user interfaces
- 1.2.7 Demonstrate knowledge of drive systems: belts, transmissions, agitators, clutches, brakes, pulleys and multi-phase drive motors
- 1.2.8 Demonstrate knowledge of water heating systems: thermistors, heaters, relays
- 1.2.9 Demonstrate knowledge of mechanical systems: leveling legs, suspension systems, cabinet/base structure, door lock systems
- 1.2.10 Demonstrate knowledge of other electrical components: alternating current line filters, capacitors, relays, solenoids, transformers, fuses, light bulbs of all types
- 1.2.11 Demonstrate knowledge of washer steam systems

MAT 2.0 — Diagnose and repair common failures on various types of domestic electric and gas dryers per manufacturer's specifications

- 2.1 Use diagnostic tools, equipment and technical literature
 - 2.1.1 Display knowledge of a volt/ohm meter
 - 2.1.2 Display knowledge of an amperage meter
 - 2.1.3 Demonstrate correct use of basic hand tools
 - 2.1.4 Demonstrate correct use of specialty tools
 - 2.1.5 Read wiring schematic/diagrams and tech sheets
- 2.2 Possess the ability to service components related to domestic electrical and gas dryers
 - 2.2.1 Demonstrate knowledge to service and repair heating systems: heating elements, operating thermostats, hi-limit thermostats, thermistors, thermal

- fuses and motor centrifugal switches
- 2.2.2 Demonstrate knowledge to service and repair gas heating systems: safety valves, igniters, flame sensors, operating thermostats, hi-limit thermostats, thermistors, thermal fuses and motor centrifugal switch, gas valves, gas tubing and orifices
- 2.2.3 Demonstrate knowledge to service and repair switches: all types
- 2.2.4 Demonstrate knowledge to service and repair mechanical timer controls
- 2.2.5 Demonstrate knowledge to service and repair electronic controls
- 2.2.6 Demonstrate knowledge to service and repair customer user interface
- 2.2.7 Demonstrate knowledge to service and repair drive system: belts, idler pulleys and motors of all types
- 2.2.8 Demonstrate knowledge to service and repair drying systems: time dry, auto dry, sensor control dry and electronic control dry
- 2.2.9 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
- 2.2.10 Demonstrate knowledge to service and repair other electrical components: relays, solenoids, transformers, fuses, light bulbs of all types
- 2.2.11 Demonstrate knowledge to service and repair air flow systems: cabinet duct system, blower wheels, drum/door seals, lint filter and air flow sensors
- 2.2.12 Demonstrate knowledge of dryer steam systems

MAT 3.0 — Diagnose and repair common failures on various types of domestic refrigerators per manufacturer’s specifications

- 3.1 Use diagnostic tools, equipment and technical literature
 - 3.1.1 Display knowledge of a volt/ohm meter
 - 3.1.2 Display knowledge of an amperage meter
 - 3.1.3 Demonstrate correct use of basic hand tools
 - 3.1.4 Demonstrate correct use of basic specialty tools
 - 3.1.5 Read wiring schematic/diagrams and tech sheets
- 3.2 Possess an understanding of the operation of mechanical/electrical components
 - 3.2.1 Demonstrate knowledge of water systems: hoses, water valves, storage tank and filters
 - 3.2.2 Demonstrate knowledge associated with motors and compressors: single speed, multiple speed, multi-phase and direct current
 - 3.2.3 Demonstrate knowledge of switches: all types
 - 3.2.4 Demonstrate knowledge of defrost systems: mechanical defrost timers, electronic controls, heaters, thermostat and thermistors
 - 3.2.5 Demonstrate knowledge of electronic controls
 - 3.2.6 Demonstrate knowledge of customer user interface
 - 3.2.7 Demonstrate knowledge of icemaker system; module, thermostat, thermistor, cube mold/tray and heater
 - 3.2.8 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
 - 3.2.9 Demonstrate knowledge of mechanical systems: leveling legs/rollers, door operation/alignment, door gasket replacement, freezer/fresh food compartment controls

- 3.2.10 Demonstrate knowledge of air-circulation systems: air ducts, diverters, baffles and fan motors
- 3.2.11 Demonstrate knowledge of other electrical components: alternating current line filters, capacitors, relays, solenoids, fuses and light bulbs of all types
- 3.2.12 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
- 3.2.13 Demonstrate knowledge and understanding of various refrigerant gasses currently used in refrigeration products with a sealed system

MAT 4.0 — Diagnose and repair common failures on various types of domestic electric and gas ranges per manufacturer’s specifications

- 4.1 Use diagnostic tools, equipment and technical literature
 - 4.1.1 Display knowledge of a volt/ohm meter
 - 4.1.2 Display knowledge of an amperage meter
 - 4.1.3 Demonstrate correct use of basic hand tools
 - 4.1.4 Demonstrate correct use of basic specialty tools
 - 4.1.5 Read wiring schematic/diagrams and tech sheets
- 4.2 Possess a knowledge of cooking systems: surface cooking, standard/convection bake and broil
 - 4.2.1 Demonstrate knowledge of LP and natural gas fundamentals and theory
 - 4.2.2 Demonstrate knowledge of conventional electric and induction cooking systems: heating elements, thermostats, hi limit thermostats, thermistors, thermal fuses, burner and selector switches
 - 4.2.3 Demonstrate knowledge of gas cooking systems: safety valve,

- spark igniter, direct spark ignition, igniter electrodes, operating thermostats, hi limit thermostats, thermistors, thermal fuses, selector switches, gas valves, gas tubing, orifices, gas conversion
- 4.2.4 Demonstrate knowledge of switches: all types
- 4.2.5 Demonstrate knowledge of mechanical controls
- 4.2.6 Demonstrate knowledge of electronic controls
- 4.2.7 Demonstrate knowledge of customer user interfaces
- 4.2.8 Demonstrate knowledge of self-clean system
- 4.2.9 Demonstrate knowledge of motors: fan, servo/actuator
- 4.2.10 Demonstrate knowledge of mechanical systems: leveling legs, door locks, door structure and seals, door springs/hinges, cabinet/base structure
- 4.2.11 Demonstrate knowledge of other electrical components: relays, solenoids, transformers, fuses and light bulbs of all types

MAT 5.0 — Diagnose and repair common failures on various types of domestic microwaves per manufacturer’s specifications

- 5.1 Use diagnostic tools, equipment and technical literature
 - 5.1.1 Display knowledge of a volt/ohmmeter
 - 5.1.2 Display knowledge of an amperage meter
 - 5.1.3 Demonstrate correct use of basic hand tools
 - 5.1.4 Demonstrate correct use of specialty tools
 - 5.1.5 Read wiring schematic/diagrams and tech sheets
 - 5.1.6 Demonstrate knowledge of microwave operations: conventional, convection and inverter technologies
 - 5.1.7 Demonstrate knowledge of microwave cooking theory
 - 5.1.8 Demonstrate knowledge of motors: fan, servo/actuator
 - 5.1.9 Demonstrate knowledge of switches: all types

- 5.1.10 Demonstrate knowledge of mechanical controls
- 5.1.11 Demonstrate knowledge of electronic controls
- 5.1.12 Demonstrate knowledge of customer user interfaces
- 5.1.13 Demonstrate knowledge of door lock mechanisms
- 5.1.14 Demonstrate knowledge of high-voltage heating system: magnetron, transformer, capacitor and diode
- 5.1.15 Demonstrate knowledge of convection components
- 5.1.16 Demonstrate knowledge of mechanical systems: door structure and seals, door springs/hinges, wave guide and cabinet/base structure
- 5.1.17 Demonstrate knowledge of other electrical components: alternating current line filters, capacitors, relays, solenoids, transformers, fuses, light bulbs of all types

- 6.2.4 Demonstrate knowledge of mechanical timer controls
- 6.2.5 Demonstrate knowledge of electronic controls
- 6.2.6 Demonstrate knowledge of customer user interfaces
- 6.2.7 Demonstrate knowledge of water heating and drying system: thermistors, heaters and relays
- 6.2.8 Demonstrate knowledge of mechanical systems: leveling legs, cabinet/base structure, door lock mechanism, door structure and door/tub gasket
- 6.2.9 Demonstrate knowledge of other electrical components: alternating current line filters, capacitors, relays, solenoids, transformers, fuses, turbidity sensors and all types of light bulbs
- 6.2.10 Demonstrate theoretical knowledge of thermal, chemical and mechanical energy of temperature, detergent, water quality and circulation

MAT 6.0 — Diagnose and repair common failures on various types of domestic dishwashers per manufacturer’s specifications

- 6.1 Use diagnostic tools, equipment and technical literature
 - 6.1.1 Display knowledge of a volt/ohmmeter
 - 6.1.2 Display knowledge of an amperage meter
 - 6.1.3 Demonstrate correct use of basic hand tools
 - 6.1.4 Demonstrate correct use of basic specialty tools
 - 6.1.5 Read wiring schematic/diagrams and tech sheets
- 6.2 Possess a knowledge of dishwasher operations
 - 6.2.1 Demonstrate knowledge of water circulation system: hoses, diverters, check valves, pumps, valves and seals
 - 6.2.2 Demonstrate knowledge of motors: single speed, multiple speed, multi-phase and direct current
 - 6.2.3 Demonstrate knowledge of switches: all types

MAT 7.0 — Assemble a standard brazing project that exhibits all techniques of brazing copper and steel tubing using brazing/connecting equipment, hand tools and specialty tools to precisely complete a domestic refrigeration 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 a refrigeration compression fitting such as LOKRING
- 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: swedging 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
 - 7.4.1 Follow proper safety practices: fire extinguisher at hand, gloves, safety glasses and flame-retardant mat

MAT 8.0 — Demonstrate knowledge of installing, servicing and repairing major household appliances with practical problems and proper use of test equipment in a written assessment.

- 8.1 Complete a written Technical Skills assessment

MAT 9.0 — Demonstrate ability to use spoken, written and visual language to perform competency tasks to display professional and personal interaction with employers

- 9.1 Fill out an employment application
- 9.2 Submit a hard copy one-page résumé to the judge at the mock employer job interview (a 10-point penalty will be assessed if a résumé is not submitted)
- 9.3 Interact in a mock employer job interview scenario
- 9.4 Complete a written employability skills assessment

MAT 10.0 — Demonstrate ability to use spoken, written and visual language to perform competency tasks to display professional and personal interaction with customers

- 10.1 Complete a written customer relations assessment
- 10.2 Interact in a mock customer relations interview scenario

Committee Identified Academic Skills

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

- Provide information in oral presentations

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 gases
- 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 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: <http://www2.mcrel.org/compendium/browse.asp>.

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 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.