AUTOMOTIVE SERVICE 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 automotive service technology.

First, download and review the General Regulations at updates.skillsusa.org.

ELIGIBILITY

Open to active SkillsUSA members enrolled in career and technical programs with automotive technician or automotive service technology as an occupational objective. Each state may send one high school and one college/postsecondary entry.

CLOTHING REQUIREMENT

Class D: Competition Specific — Blue Attire

- Official SkillsUSA light blue work shirt
- Navy pants
- Black, brown, or tan work safety shoes (with protective toe cap)

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

These regulations refer to SkillsUSA Championships Clothing Classifications that are pictured and described at skillsusastore.org. If you have questions about competition uniforms, call the SkillsUSA Store at 888-501-2183.

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

EQUIPMENT AND MATERIALS

1. Supplied by the technical committee:
   a. All necessary tools and equipment for the competition
   b. All necessary service publications for the competitors
2. Supplied by the competitor:
   a. All competitors must create and submit online a one-page single sided resume. See "Online Submission Requirements" below for guidelines.
   b. National competitors must complete the S/P2 Automotive Safety and Automotive Pollution Prevention certifications. ***Note:*** Access to the S/P2 e-learning program is provided free of charge to national competitors that do not otherwise have access to the S/P2 platform. The deadline and contact to request the S/P2 e-learning program will be published on the SkillsUSA website at updates.skillsusa.org.

***Note*:** All national competitors must also check for competition-specific updates and/or competitor preparation instructions on the SkillsUSA website at updates.skillsusa.org.

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.

ONLINE SUBMISSION REQUIREMENTS

All SkillsUSA national competitors must submit their one-page single sided resume online. The deadline and link for online submissions will be published on updates.skillsusa.org.

1. One-page single sided resume
2. S/P2 Automotive Safety certificate
3. S/P2 Automotive Pollution Prevention certificate

Your submissions must be saved as individual PDF file types using the file name format of "Your Last Name_Your First Name_DocumentType." For example, "Amanda Smith" would save the individual PDF submission files as:

- Smith_Amanda_Resume
- Smith_Amanda_ SP2-Safety
- Smith_Amanda_ SP2-Prevention

SCOPE OF THE COMPETITION

The competition will be consistent with the automobile technician task list outlined in guidelines published by the National Institute for Automotive Service Excellence (ASE) and the ASE Education Foundation at: www.aseeducationfoundation.org.

Competitors will demonstrate their ability to perform jobs or skills selected from the standards mentioned above as determined by the SkillsUSA Championships technical committee. Committee membership includes American Honda Motor Co. Inc., ATech, ConsuLab, Gates Corp., General Motors, Hunter Engineering Co., Megatech Corp., National Institute for Automotive Service Excellence, Pittsburg State University, Snap-on Inc., S/P2, Toyota Motor North America, Inc., CCAR, Stellantis North America, Lucas-Nuelle, Subaru of America and Mercedes-Benz, USA.

KNOWLEDGE PERFORMANCE

The competition will include a general knowledge test provided by ASE covering all eight automobile areas identified in the ASE Education Foundation Automobile Program Standards and the Official ASE Study Guide — Automobile Tests. The test for the high school and college/postsecondary competitions will be comprised of diagnostic and repair content from these skill areas: engine repair, automatic transmission/transaxle, manual drivetrain and axles, suspension and steering, brakes, electrical/electronic steering, heating and air conditioning and engine performance. Competitors are also required to take the SkillsUSA Professional Development Test.

SKILL PERFORMANCE

The competition will include a series of workstations. Workstations consist of a vehicle and/or simulator, components, service publications, and interpersonal skills stations (such as Customer Service and Job Interview).

COMPETITION GUIDELINES

1. A variety of vehicles sold in the United States will be used in the competition. This will include both domestic and imported vehicles.
2. Some or all high school workstations may be different from the college/postsecondary workstations.
3. Safety, quality, ability to follow instructions and procedures, accuracy (in comparison with factory specifications), workmanship, and other skills representative of the trades identified by industry leaders will be judged.
4. Eight (8) to 15 stations will be assigned. Each station will be broken down into specific task criteria and separate steps based on the task. For example:
   Station No. 1 Wire test and repair segments
   Identify faulty circuit = x points
   Repair condition = x points
   Assemble/retest = x points
   Resistor board tests = x points

Compare values to specs = x points
Workmanship = x points
Safety practices = x points

5. The points allowed for each station will be assigned by the national technical committee and will be based on the difficulty of each assigned task.
6. Time limits will be assigned for each task, but no bonus points will be awarded for early completion.

STANDARDS AND COMPETENCIES: HIGH SCHOOL

AST-HS 1.0 — Perform vehicle HVAC system diagnosis and testing to related tasks in the ASE Education Foundation Automobile Program Standards — Automobile Heating and Air Conditioning Task List (ASE Test A7)

1.1. Diagnose and repair an inoperative HVAC system on a current model vehicle.
- 1.1.1. Use a provided factory scan tool for current model vehicle
- 1.1.2. Read DTC with scan tool
- 1.1.3. Read data with scan tool
- 1.1.4. Perform actuator test with scan tool
- 1.1.5. Use factory service information provided
- 1.1.6. Identify correct test procedures
- 1.1.7. Follow the correct test procedure
- 1.1.8. Identify connector pin-outs
- 1.1.9. Identify component locations
- 1.1.10. Read and interpret wiring schematics
- 1.1.11. Identify correct refrigerant/oil/fluid type
- 1.1.12. Use provided test equipment
- 1.1.13. Use a DVOM or DMM
- 1.1.14. Use A/C service gauges
- 1.1.15. Use a repair order
- 1.1.16. Verify complaint
- 1.1.17. Repair vehicle
- 1.1.18. Verify repair was successful
- 1.1.19. Identify components in the system
- 1.1.20. Document diagnostic steps and repair process
- 1.1.21. Demonstrate awareness of the need to recover, recycle, and handle refrigerants using proper equipment and procedures.

AST-HS 2.0 — Perform vehicle engine performance diagnosis and testing to related tasks in the ASE Education Foundation Automobile Program Standards — Automobile Engine Performance Task List (ASE Test A8)

2.1. Diagnose and repair an engine performance issue on a current model vehicle
- 2.1.1. Use a provided factory scan tool for the current model vehicle
- 2.1.2. Read DTC with scan tool
- 2.1.3. Read data with scan tool
- 2.1.4. Perform actuator test with scan tool

2.1.5. Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM), digital storage oscilloscope (DSO), and/or scan tool; determine needed action.
2.1.6. Describe the process for reprogramming or recalibrating the powertrain/engine control module (PCM/ECM).
2.1.7. Identify fuel, air induction, and exhaust system components and configurations.
2.1.8. Verify proper idle speed; determine needed action.
2.1.9. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.
2.1.10. Use factory service information provided
2.1.11. Identify correct test procedures
2.1.12. Follow the correct test procedure
2.1.13. Identify connector pin-outs
2.1.14. Identify component locations
2.1.15. Use wiring schematics
2.1.16. Use provided test equipment
2.1.17. Use a DVOM or DMM
2.1.18. Use a fuel pressure gauge 2.5
2.1.19. Use a repair order
2.1.20. Verify complaint
2.1.21. Repair vehicle
2.1.22. Verify repair was successful
2.1.23. Identify components in the system
2.1.24. Document diagnostic steps and repair process

AST-HS 3.0 — Perform vehicle body electrical diagnosis and testing to related tasks identified in the ASE Education Foundation Automobile Program Standards — Automobile Electrical/Electronic Systems Task List (ASE Test A6)

3.1. Diagnose and repair a body electrical issue on a current model vehicle
3.1.1. Use a provided factory scan tool for the current model vehicle
3.1.2. Read DTC with scan tool
3.1.3. Read data with scan tool
3.1.4. Perform actuator test with scan tool
3.1.5. Use factory service information provided
3.1.6. Identify correct test procedures
3.1.7. Follow the correct test procedure
3.1.8. Identify connector pin-outs
3.1.9. Identify component locations
3.1.10. Use wiring schematics
3.1.11. Use provided test equipment
3.1.12. Use a DVOM or DMM
3.1.13. Use a battery or charging system tester
3.1.14. Use a repair order

3.1.15. Verify complaint
3.1.16. Repair vehicle
3.1.17. Verify repair was successful
3.1.18. Identify components in the system
3.1.19. Document diagnostic steps and repair process

AST-HS 4.0 — Demonstrate application of environment, health and safety knowledge in auto service situations to related OSHA section 1910 standards and EPA standards

4.1. Identify and explain the use of personal protective equipment
4.2. Recall information about automotive-related EPA and OSHA requirements
4.3. Identify and explain the use of blood borne pathogens kits.
4.4. Answer questions from a provided Safety Data Sheet (SDS)
4.5. Describe proper use of a fire extinguisher
4.6. Demonstrate knowledge of automotive lift safety best-practices
4.7. Demonstrate knowledge of automotive battery safety best-practices
4.8. Demonstrate knowledge of automotive high-voltage system safety best-practices

AST-HS 5.0 — Complete a mock job interview for an automotive service technology related position

5.1. Conduct a mock job interview with appropriate professional behavior
5.2. Communicate clearly and effectively
5.3. Clearly and completely fill out a job application

AST-HS 6.0 — Perform electronic circuit diagnosis, testing and wire repair to related tasks identified in the ASE Education Foundation Automobile Program Standards — Automobile Electrical/Electronic Systems Task List (ASE Test A6)

6.1. Construct an electrical circuit from supplied material and a wiring diagram.
6.1.1. Check electrical circuit operation
6.1.2. Take electrical readings on the circuit with a DVOM. Note: A shunt may be used when measuring current
6.1.3. Diagnose and repair the circuit
6.1.4. Confirm the repair of the circuit
6.2. Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits
6.2.1. Check electrical circuits with a test light and determine necessary action
6.3. Repair connectors and terminal ends
6.3.1. Repair wiring harness
6.3.2. Perform solder repair of electrical wiring

AST-HS 7.0 — Perform steering, suspension and wheel alignment to related tasks identified in the ASE Education Foundation Automobile Program Standards — Automobile Suspension and Steering Task List (ASE Test A4)

7.1. Identify wheel alignment tools
7.2. Explain practical application of tools
7.3. Identify OEM alignment products
7.3.1. Explain practical application or use of OEM products

7.3.2. Identify aftermarket alignment products
7.3.3. Explain practical application or use of aftermarket products
7.4. Identify steering suspension components
7.5. Explain alignment theory
7.6. Explain diagnosis of alignment conditions
7.7. Use reference materials provided

AST-HS 8.0 — Perform manual drive train service, testing and diagnosis to related tasks identified in the ASE Education Foundation Automobile Program Standards — Automobile Manual Drive Train and Axles Task List (ASE Test A3)

8.1. Identify components of manual drive trains, axles, drivelines and transfer cases
8.2. Clutch Systems
8.2.1. Check and adjust clutch master cylinder fluid levels, determine the correct fluid for the application
8.2.2. Inspect clutch operating components for wear/damage: determine necessary action
8.2.3. Measure flywheel runout and crankshaft endplay; determine necessary action
8.3. Manual Transmission/Transaxle
8.3.1. Inspect manual transmission/transaxle components for wear/damage; determine necessary action
8.3.2. Measure endplays/preloads on manual transmission/transaxle shafts and determine necessary action
8.3.3. Inspect, measure, reassemble and/or reinstall synchronizer assemblies
8.3.4. Inspect, measure, adjust and/or reassemble transaxle final drives assemblies
8.3.5. Inspect, measure, adjust and/or reassemble 4WD/AWD Transfer Cases
8.4. Driveshafts
8.4.1. Check driveshaft phasing, measure driveshaft runout and/or measure driveshaft operating angles, determine necessary action
8.4.2. Measure transmission and/or drive axles companion flange runout and determine necessary action
8.5. Front and Rear Drive Axles
8.5.1. Inspect differential components for wear and determine necessary action
8.5.2. Measure and adjust drive pinion depth and drive pinion bearing preload
8.5.3. Measure and adjust side bearing preload, ring and pinion gear backlash and determine backlash variation
8.5.4. Check ring and pinion gear contact patterns; determine necessary action
8.5.5. Measure rotating torque on a limited slip differential and determine necessary action
8.5.6. Disassemble, inspect and reassemble limited slip clutch components
8.6. Use factory service information provided to complete tasks
8.7. Use tools provided to complete task
8.8. Determine which components need replaced or repaired in a given situation

AST-HS 9.0 — Perform brake service, testing and diagnosis to related tasks identified in the ASE Education Foundation Automobile Program Standards–Automobile Brakes Task List (ASE Test A5)

9.1. Identify different brake components
9.2. Diagnose pressure concerns in the brake system using hydraulic principles
  9.2.1. Fabricate brake lines (double flare and ISO types)
  9.2.2. Inspect and measure brake drums and determine necessary action
  9.2.3. Remove, inspect and install brake shoes, springs, pins, clips, levers, adjusters and other brake hardware
  9.2.4. Remove, inspect and install wheel cylinders
  9.2.5. Pre-adjust brake shoes and parking brake before installing brake drums
  9.2.6. Remove, inspect and install caliper, pads and related hardware and determine necessary action
  9.2.7. Clean, inspect and measure rotor with a dial indicator and a micrometer and determine necessary action
  9.2.8. Check parking brake components; clean, lubricate, adjust or replace as necessary
  9.2.9. Inspect brake booster and determine necessary action
  9.2.10. Remove, clean, inspect, repack and install wheel bearings; install hub and adjust wheel bearings
9.3. Identify and inspect ABS components and determine necessary action
  9.3.1. Diagnose ABS electronic controls and components
  9.3.2. Test, diagnose and service ABS speed sensors, toothed ring and circuits using an oscilloscope
9.4. Use factory service information provided to complete the above tasks
9.5. Use tools provided to complete the above tasks

AST-HS 10.0 — Perform automatic transmission service, testing and diagnosis to related tasks identified in the ASE Education Foundation Automobile Program Standards — Automobile Automatic Transmission/Transaxle Task List (ASE Test A2)

10.1. Identify components on a transmission
10.2. Diagnose and inspect a transmission
  10.2.1. Check input or output shaft endplay
  10.2.2. Check clutch clearances
  10.2.3. Perform air checks on the clutches
  10.2.4. Measure pump clearances
  10.2.5. Diagnose electrical components on a transmission
10.3. Perform adjustments on a transmission
  10.3.1. Perform valve body adjustments
  10.3.2. Perform input or output shaft adjustments
  10.3.3. Perform clutch pack adjustments
  10.3.4. Perform range sensor adjustments
10.4. Disassemble and assemble components of a transmission
  10.4.1. Disassemble and assemble the planetary gear train
  10.4.2. Disassemble and assemble the front pump

10.4.3. Disassemble and assemble the valve body
10.4.4. Disassemble and assemble clutch packs
10.5. Use factory service information provided to complete tasks
10.6. Use tools provided to complete tasks

AST-HS 11.0 — Perform engine measuring, inspecting, service and diagnosis on the head or block of an engine to related tasks identified in the ASE Education Foundation Automobile Program Standards — Automobile Engine Repair Task List (ASE Test A1)

11.1. Measure and inspect the pistons and connecting rods
11.2. Measure and inspect cylinder diameter
11.3. Measure and inspect cylinder taper and bore with a dial bore gauge
11.4. Measure and inspect the cylinder head
11.5. Measure and inspect valve guides
11.6. Measure and inspect the valves
11.7. Measure and inspect valve stem to guide clearance
11.8. Measure and inspect the camshaft or crankshaft
11.9. Measure and inspect the valve springs
11.10. Measure and inspect valve timing
11.11. Measure and inspect the timing chain or belt
11.12. Identify the clearance specifications for any item requiring measuring and inspecting
11.13. Use the factory service information provided
11.14. Determine which components need to be replaced or repaired on a given engine head or block
11.15. Use the precision engine measurement tools required for measuring or inspecting

AST-HS 12.0 — Use electrical service information resources

12.1. Locate specifications and other service information using electronic service information resources

AST-HS 13.0 — 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. For more, visit: www.skillsusa.org/who-we-are/skillsusa-framework/.

STANDARDS AND COMPETENCIES: COLLEGE/POSTSECONDARY

AST-CPS 1.0 — Perform vehicle HVAC system diagnosis and testing to related tasks in the ASE Education Foundation Automobile Program Standards — Automobile Heating and Air Conditioning Task List (ASE Test A7)

1.1. Diagnose and repair an inoperative HVAC system on a current model vehicle
1.1.1. Use a provided factory scan tool for current model vehicle
1.1.2. Read DTC with scan tool
1.1.3. Read data with scan tool

1.1.4. Perform an actuator test with scan tool
1.1.5. Use factory service information provided
1.1.6. Identify correct test procedures
1.1.7. Follow the correct test procedure
1.1.8. Identify connector pin-outs
1.1.9. Identify component locations
1.1.10. Use wiring schematics
1.1.11. Identify correct refrigerant/oil/fluid type
1.1.12. Use provided test equipment correctly
1.1.13. Use a DVOM or DMM
1.1.14. Use A/C service gauges and interpret readings
1.1.15. Use a repair order
1.1.16. Verify complaint
1.1.17. Repair vehicle
1.1.18. Verify repair was successful
1.1.19. Document diagnostic steps and repair process
1.1.20. Identify hybrid vehicle A/C system electrical circuits and service/safety precautions
1.1.21. Demonstrate awareness of the need to recover, recycle, and handle refrigerants using proper equipment and procedures.

AST-CPS 2.0 — Perform vehicle engine performance diagnosis and testing on a current model vehicle to related tasks in the ASE Education Foundation Automobile Program Standards — Automobile Engine Performance Task List (ASE Test A8)

2.1. Diagnose and repair an engine performance issue on a current model vehicle.
2.1.1. Read data with scan tool
2.1.2. Perform an actuator test with scan tool
2.1.3. Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM), digital storage oscilloscope (DSO), and/or scan tool; determine needed action.
2.1.4. Describe the process for reprogramming or recalibrating the powertrain/engine control module (PCM/ECM).
2.1.5. Diagnose the causes of emissions or driveability concerns with stored or active diagnostic trouble codes (DTC); obtain, graph, and interpret scan tool data.
2.1.6. Identify fuel, air induction, and exhaust system components and configurations.
2.1.7. Diagnose emissions or driveability concerns without stored or active diagnostic trouble codes; determine needed action.
2.1.8. Diagnose driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, HVAC, automatic transmissions, non-OEM installed accessories, or similar systems); determine needed action.

2.1.9. Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor fuel economy, and emissions concerns; determine needed action.
2.1.10. Diagnose hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine needed action.
2.1.11. Test the operation of turbocharger/supercharger systems; determine needed action.
2.1.12. Use factory service information provided
2.1.13. Identify correct test procedures
2.1.14. Follow the correct test procedure
2.1.15. Identify connector pin-outs
2.1.16. Identify component locations
2.1.17. Use wiring schematics
2.1.18. Use provided test equipment correctly
2.1.19. Use a DVOM or DMM
2.1.20. Use a fuel pressure gauge
2.1.21. Use a repair order
2.1.22. Verify complaint
2.1.23. Repair vehicle
2.1.24. Verify repair was successful
2.1.25. Document diagnostic steps and repair process

AST-CPS 3.0 — Perform steering, suspension and wheel alignment to related tasks identified in the ASE Education Foundation Automobile Program Standards — Automobile Suspension and Steering Task List (ASE Test A4)

3.1. Prepare to complete a wheel alignment
3.1.1. Read and interpret a repair order
3.1.2. Perform complete pre-alignment inspection
3.1.3. Evaluate vehicle condition and readiness for alignment
3.1.4. Identify vehicle suspensions system and components
3.1.5. Identify vehicle steering system and components
3.1.6. Identify alignment procedure required
3.1.7. Take alignment measurements using alignment system provided
3.1.8. Record alignment measurements
3.1.9. Recall and record vehicle alignment specifications
3.1.10. Evaluate vehicle alignment condition
3.1.11. Explain vehicle alignment adjustment procedures
3.1.12. Explain advanced alignment diagnostic procedures
3.1.13. Explain use of aftermarket alignment products
3.1.14. Identify hybrid vehicle power steering system electrical circuits and safety precautions

AST-CPS 4.0 — Demonstrate application of environment, health and safety knowledge in auto service situations to related OSHA section 1910 standards and EPA standards

4.1. Identify and explain the use of personal protective equipment
4.2. Recall information about automotive-related EPA and OSHA requirements
4.3. Identify and explain the use of blood borne pathogens kits
4.4. Answer questions from a provided Safety Data Sheet (SDS)
4.5. Describe proper use of a fire extinguisher
4.6. Demonstrate knowledge of automotive lift safety best-practices
4.7. Demonstrate knowledge of automotive battery safety best-practices
4.8. Demonstrate knowledge of automotive high-voltage system safety best-practices

AST-CPS 5.0 — Demonstrate customer service skills to commonly accepted standards of performance

5.1. Answer questions posed by a customer
5.2. Use appropriate and professional manner in customer meeting
5.3. Clearly and effectively communicate with the customer information on the diagnosis and repair of the vehicle

AST-CPS 6.0 — Perform electronic circuit diagnosis, testing and wire repair to related tasks identified in Automobile Test A6 (Electrical/Electronic Systems) of "The Official ASE Study Guide of Automobile Tests"

6.1. Construct an electrical circuit from supplied material and a wiring diagram
6.2. Check electrical circuit operation
6.3. Take electrical readings on the circuit with a DVOM. ***Note:*** A shunt may be used when measuring current.
6.4. Diagnose and repair the circuit
6.5. Confirm the repair of the circuit

AST-CPS 7.0 — Perform electronic circuit diagnosis and testing, and hybrid vehicle test and safety precautions to related tasks identified in the ASE Education Foundation Automobile Program Standards — Automobile Electrical/Electronic Systems Task List (ASE Test A6)

7.1. Electrical circuit diagnosis through oscilloscope pattern interpretation
7.2. Use a provided oscilloscope
7.3. Answer questions based on oscilloscope readings
7.4. Explain basic oscilloscope operation
7.5. Identify high-voltage circuits of an electric or hybrid electric vehicle and related safety precautions.
7.6. Identify hybrid vehicle auxiliary (12 v) battery service, repair, and test procedures.

AST-CPS 8.0 — Perform service, testing and diagnosis of manual drive trains, axles, drive trains and transfer cases to related tasks identified in the ASE Education Foundation Automobile Program Standards — Automobile Manual Drive Train and Axles Task List (ASE Test A3)

8.1. Identify components of manual drive trains, axles, drive trains and transfer cases
8.2. Inspect clutch operating components for wear/damage and determine necessary action

8.2.1. Measure flywheel run-out and crankshaft endplay and determine necessary action
8.2.2. Inspect transmission/transaxle components for wear/damage and determine necessary action
8.2.3. Measure endplay/preloads on transmission/transaxle shafts and determine necessary action
8.2.4. Inspect, measure, reassemble and/or reinstall synchronizer assemblies
8.2.5. Inspect, measure, adjust and/or reassemble transaxle final drive assemblies
8.2.6. Check driveshaft phasing, measure driveshaft run out and measure driveshaft operating angles
8.2.7. Measure companion flange run- out and determine necessary action
8.2.8. Inspect ring gear and measure run-out and determine necessary action
8.2.9. Measure and adjust drive pinion depth and drive pinion bearing preload
8.2.10. Measure and adjust side bearing preload, ring and pinion gear backlash and backlash variation
8.2.11. Check ring and pinion gear contact patterns and determine necessary action
8.2.12. Measure rotating torque on a limited slip differential and determine necessary action
8.2.13. Inspect and reinstall limited slip clutch components

8.3. Use factory service information provided to complete tasks
8.4. Use tools provided to complete tasks
8.5. Determine which components need to be replaced or repaired in a given situation

AST-CPS 9.0 — Perform brake service, testing and diagnosis on a brake system on a bench to related tasks identified in the ASE Education Foundation Automobile Program Standards — Automobile Brakes Task List (ASE Test A5)

9.1. Identify brake components
9.2. Diagnose pressure concerns in the brake system using hydraulic principles
9.2.1. Fabricate brake lines (double flare and ISO types)
9.2.2. Inspect and measure brake drums and determine necessary action
9.2.3. Remove, inspect and install brake shoes, springs, pins, clips, levers, adjusters and other brake hardware
9.2.4. Remove, inspect and install wheel cylinders
9.2.5. Re-adjust brake shoes and parking brake before install brake drums
9.2.6. Remove, inspect, install caliper, pads and related hardware and determine necessary action
9.2.7. Clean, inspect and measure rotor with a dial indicator and a micrometer and determine necessary action
9.2.8. Check parking brake components; clean, lubricate, adjust or replace as necessary
9.2.9. Inspect brake booster and determine necessary action
9.2.10. Remove, clean, inspect, repack and install wheel bearings; install hub and adjust wheel bearings

9.3. Identify and inspect ABS components and determine necessary action
9.3.1. Diagnose ABS electronic controls and components

9.3.2. Test, diagnose and service ABS speed sensors, toothed rings and circuits using an oscilloscope or DVOM

9.4. Use factory service information provided to complete the above task

9.5. Use tools provided to complete the above task

AST-CPS 10.0 — Perform automatic transmission service, testing and diagnosis to related tasks identified in the ASE Education Foundation Automobile Program Standards— Automobile Automatic Transmission/Transaxle Task List (ASE Test A2)

10.1. Identify different components on the transmission

10.2. Diagnose and inspect a transmission on a bench

10.2.1. Check input or output shaft endplay and determine necessary action

10.2.2. Check clutch clearances and determine necessary action

10.2.3. Perform air checks on the clutches and determine necessary action

10.2.4. Measure pump clearances and determine necessary action

10.3. Diagnose electrical components on the transmission and determine necessary action

10.4. Adjust components of an automatic transmission

10.4.1. Perform valve body adjustments

10.4.2. Perform input or output shaft adjustments

10.4.3. Perform clutch pack adjustments

10.4.4. Perform range sensor adjustments

10.5. Disassemble and assemble components of an automatic transmission

10.5.1. Disassemble, assemble and inspect the planetary gear train and determine necessary action

10.5.2. Disassemble, assemble and inspect the front pump and determine necessary action

10.5.3. Disassemble, assemble and inspect the valve body and determine necessary action

10.5.4. Disassemble, assemble and inspect clutch packs and determine necessary action

10.6. Use factory service information provided to complete tasks

10.7. Use tools provided to complete tasks

10.8. Describe the operational characteristics of a hybrid vehicle drivetrain.

AST-CPS 11.0 — Perform engine measuring, inspecting, service and diagnosis on the head or block of an engine to related tasks in the ASE Education Foundation Automobile Program Standards — Automobile Engine Repair Task List (ASE Test A1)

11.1. Measure and inspect the pistons and connecting rods and determine necessary action

11.2. Measure and inspect cylinder diameter and determine necessary action

11.3. Measure and inspect cylinder taper and bore with a dial bore gauge and determine necessary action

11.4. Measure and inspect the cylinder head and determine necessary action

11.5. Measure and inspect valve guides and determine necessary action

11.6. Measure and inspect the valves and determine necessary action

11.7. Measure and inspect valve stem to guide clearance and determine necessary action

11.8. Measure and inspect the camshaft of crankshaft and determine necessary action

11.9. Measure and inspect the valve springs and determine necessary action
11.10. Measure and inspect valve timing and determine necessary action
11.11. Measure and inspect the timing chain or belt and determine necessary action
11.12. Identify the clearance specifications for any item requiring measuring and inspecting
11.13. Use the factory service information provided
11.14. Determine which components need to be replaced or repaired in a given situation
11.15. Use the precision engine measurement tools required for measuring or inspecting
11.16. Identify hybrid vehicle internal combustion engine service precautions

AST-CPS 12.0 — Use electrical service information resources

12.1. Locate specifications and other service information using electronic service information resources

AST-CPS 13.0 — 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. 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
- Use scientific notation
- Solve practical problems involving percentages
- Measure angles
- Find surface area and perimeter of two- dimensional objects
- Find volume and surface area of three- dimensional objects
- Apply transformations (rotate or turn, reflect or flip, translate or slide and dilate or scale) to geometric figures
- Solve problems using proportions, formulas and functions
- Use laws of exponents to perform operations

Science Skills

- Use the knowledge of potential and kinetic energy
- Use the knowledge of mechanical, chemical and electrical energy
- Use the knowledge of temperature scales, heat and heat transfer
- Use the knowledge of principles of electricity and magnetism
- Use the knowledge of static electricity, current electricity and circuits

- Use the knowledge of magnetic fields and electromagnets
- Use the knowledge of motors and generators

CONNECTIONS TO NATIONAL STANDARDS

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

Math Standards

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

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

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 apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language and genre to create, critique and discuss print and nonprint texts.
- 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 and 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.*