

CATA Curricular Code Change Proposal

Contest:	
Proposed By: (Name, School, Email)	
Issue: (Describe the reason/rationale for the proposed change.)	
Please answer yes or no to ALL the questions below.	
This proposal will require a contest to open out of rotation.	
The change will affect General Rules.	
The change will affect the awards needed.	
The proposed change will affect tabulations/scorecards.	
The proposed change will affect contest forms.	
The proposed change will affect contest hosting site. (e.g. additional facilities, new sections, additional scoring, etc.)	
If you answered yes to any of the above questions, you need to include the following signatures:	
CATA Approved Contest Advisor's Signature	
CDE Host Site Contest Coordinator's Signature	
If you answered yes to any of the above questions, please explain.	
<p>*It is recommended that you, or a representative, attend the pre-conference governing board meeting to answer any questions regarding proposed curricular code changes to contests that are requested to be opened out of rotation.</p>	

Description: (Describe what is changing.)

Proposed CATA Code Change: (Only include the section that the proposed change pertains to – do not include the entire contest. Reference numbered section. If editing text show new text with old text in parenthesis. For large changes set track changes in the Word document and attach the file, with edits, to this document when submitting.)

Proposed CATA Code Change: (continued)

****If unable to use the template, your proposed changes need to be submitted in the same format.***

SMALL ENGINES

Revised 6/2018

Purpose and Standards

The purpose of the contest is to stimulate an appreciation for small engine repair and serve as one method of training Future Farmers in the skills and safety practices needed in diagnosing engine malfunctions. Schools will be required to bring a prescribed list of tools. There will be a critique following the contest.

Foundation Standards: Mathematics Algebra 10 and Geometry 11, Listening and Speaking 1.8, 2.3, Technology 4.1, 4.2, 4.6, Problem Solving and Critical Thinking 5.1, 5.2, 5.3, Health and Safety 6.2, 6.4, 6.5, Ethics and Legal Responsibilities 8.3, Leadership and Teamwork 9.1, 9.2, 9.3.

Ag Mechanics Pathway Standards: Safety B 1.0, Engines and Machinery B 10.0, B11.0.

Contestants

The contest team will be made up of three members. Each member will compete in the Theory and Identification areas. The top ten teams based on the combined scores of Theory and Identification areas, will compete in the Problem Solving, Technical Skills, and Troubleshooting. The top five individuals, if they are not part of one of the top ten teams, will compete in the Problem Solving and Technical Skills area as well.

Classes

Class	Individual Points	Team Points
Identification	50	150
Theory Test	50	150
Problem Solving	50	150
Technical Skills	50	150
Troubleshooting		200
Total	200	800

Tiebreaker

1. Individual and team ties will be broken by individual's/team's scores on problem solving.
2. If a tie persists it will be broken by score on technical skills test.
3. If a tie persists it will be broken by score on theory test.
4. If a tie persists it will be broken by score on identification test.
5. If a tie persists it will be broken by the flip of a coin.

*In the qualifying rounds of Theory and Identification, ties will be broken by individual/team scores on theory. If a tie persists, follow 4 then 5 above.

Ties in the individual sub-contests will be broken by the highest individual overall score. Team sub-contests will be broken by the highest overall team score.

Sub-contest Awards

Sub-contest ribbons will be awarded to the top five individuals and teams in Theory, Identification, Technical Skills, and Problem Solving and to the top five teams in Troubleshooting.

Requirements of the Host Institution

The sponsoring institution will indicate the parts catalog and price guide format and the engine model number that will be used in the troubleshooting portion of the contest in the registration materials sent to the competing school. A list of troubleshooting engine specifications, for the judges will also be provided.

Rules

The contest is made up of the following areas:

- I. IDENTIFICATION (Time: 40 minutes)
 - A. Identification of engine parts and tools (50 points)

A key with the parts identified will be available at the end of the contest. All names used shall be those used by the manufacturer's engine or parts manual (16 horsepower or less). See Appendix I list.
- II. THEORY (Time: 40 minutes) (50 points - Maximum of 50 questions)
 - A. A written test on Basic Engine Theory including the following areas:

Compression	Troubleshooting
Carburetion	Fuels
Ignition	Cooling systems
Lubrication	Safety
Maintenance	Starters
 - B. Questions may be submitted by each school planning to compete at State Finals in the Small Engines Contest. They are to include the textbook page number, question and correct answer. They must be submitted by December 1 of each year to the Chairman at the school hosting the State Finals Contest.
 - C. Test questions will be derived from the following Reference Materials:
 1. Briggs Stratton Repair Manual – Single Cylinder 'L' Head and OHV (Intek)
 - a) [Textbook](#)
 2. FOS (Compact Engine by John Deere)
 - a) [Textbook](#)
 3. Small Gas Engines by Alfred C. Roth
 - a) [Textbook](#)
 4. Small Engines by Bruce Radcliff (American Technical Publications)
 - a) [Textbook](#)
 - D. The questions on this test will be theoretical in nature and will not include any references to exact engine specifications that should be looked up in the engine technical manual.
 - E. A copy of that year's written test will be provided to coaches as a hard copy or electronically.
- III. PROBLEM SOLVING: (Time: 40 minutes) (50 points)
 - A. Problem solving shall be made up of stations with 'hands-on' skills. A minimum of ten stations are required.
 - B. Each station will be equipped with the following:
 1. The specific components needed for the exercise.
 2. All tools needed to perform the task at the station.

3. All technical manual pages and reference sheets needed that explain the procedure.
 4. A list of all specifications needed to complete the exercise.
 - C. Examples of Problem Solving questions are:
 1. On what model engine are you working?
 2. To order a new head gasket for this model engine what is the part number?
 3. What is the valve clearance specification for this model engine?
 4. What high altitude jet would you use in this carburetor?
- IV. TECHNICAL SKILLS: (Time: 40 minutes) (50 points)
- A. Technical Skills shall be made up of stations with "hands-on" skills. A minimum of ten stations are required.
 - B. Each station will be equipped with the following:
 1. The specific components needed for the exercise.
 2. All tools needed to perform the task at the station.
 3. All technical manual pages and reference sheets needed that explain the procedure.
 4. A list of all specifications needed to complete the exercise.
 - C. Examples of "hands-on" exercises for Technical Skills are:
 1. Using a micrometer.
 2. Using a hole gauge and micrometer--measure valve guides, connecting rod journals, piston pin journals.
 3. Using a telescoping gauge and micrometer--measure cylinder bore.
 4. Using a dial indicator--measure crankshaft endplay.
 5. Using a feeler gauge--measure valve tappet clearance, point gap, armature air gap.
 6. Using a vibra tach--measure engine r.p.m.
 7. Using plug gauges as available from Briggs and Stratton--measure bearings, valve guides, breaker point plunger guides for "go no go" situations.
 8. Using a leak down tester to test engine compression.
 9. From displays of tools select those items needed for: pulling and installing valve seats; pulling and installing valve guides, etc.
 10. From displays of engine components: identify correctly assembled connecting rods and caps, ignition system, etc.
 11. Use of a billing statement and the calculations involved for parts and labor.
 12. Use of a digital multimeter.
- V. TROUBLESHOOTING THE SMALL ENGINE (200 points possible awarded to the team and no individual points to be awarded).
- A. A \$15.00 fee per team will be charged for maintenance and repair of engines used at the State Finals Contest each year. This fee will be given to the host providing the engines for the troubleshooting portion of the contest.
 - B. Other than the use of a leak down tester, all tools will be hand powered. All small engines will be of same type starters, carburetors, and ignition systems. Teams are allowed two (2) minutes for tool set up prior to starting trouble shooting. Trouble shooting score sheets will be returned with team results as soon as possible. Each troubleshooting judge should critique each team upon completion of the troubleshooting phase of the contest. Team members may not possess any engine parts except those that might be provided by contest sponsor. Written material will be limited to the appropriate Repair Manual and a list of common specifications for the engine being used in the contest. No score sheets, etc. will be allowed.
 - C. (Time: 60 minutes **repair time, 10 minute Diagnostic Period** ~~maximum~~). Engines will run for one minute.

1. Time will be stopped for any repairs required that are not a part of the engine scenario and/or bug introduced into engines.
 2. If time is stopped, teams will only be able to correct the issue outside the contest's intended scope.
 3. Upon completion of these repairs the time will resume.
 4. A 10-minute "Diagnostic Period" will commence after the first 10 minutes of troubleshooting. During the first 10 minutes, teams are to ask and record answers to troubleshooting questions, complete engine prechecks, and verify the customer's complaint. Repair time will be paused for the 10-minute "Diagnostic Period," during which competitors can use reference materials (Illustrated Parts List, Service Manuals, Work Order) to complete a "Diagnostic Approach Worksheet" (APPENDIX V). At the end of the Diagnostic Period, teams will turn in and present their diagnostic findings to the judge. During the "Diagnostic Period," students are not to inspect, make any repairs to the engine or order any parts. Teams that have not completed the initial tasks (questions, engine prechecks, or complaint verification) within the first 10 minutes will be allowed to do so during the "Diagnostic Period." At the end of the "Diagnostic Period," 50 minutes will remain to repair the engine.
- D. Common adjustments and repairs will need to be solved by the team in the contest. The team will work together on trouble shooting. Example:
1. Spark plug out of adjustment
 2. Governor linkage incorrect
 3. Carburetor out of adjustment
 4. Loss of compression
 5. Loose parts
 6. Obstructions
 7. Improper assembly
 8. Missing parts
 9. Worn or damaged parts
 10. Ignition system inoperable.
- E. The contestants will be judged on the following items:
1. Safety
 2. Proper use of tools
 3. Neatness of work
 4. Starting procedures
 5. Pre-start checks and diagnostics **diagnostic approach**
 6. Troubleshooting **and repair methods and diagnostic methods**
 7. Completion of work order
- Note: Appendix II and III
- F. If a team's troubleshooting judge deems the procedures and actions damaging to the engine and its components, the judge will have the team stop with appropriate points deducted on the Small Engines Troubleshooting Score Sheet.
- VI. TOOLS – Each team's toolbox should include tools commonly used in the repair and maintenance of small gas engines. **A current recommended tool list will be available for teachers to download from the CATA Curricular Code Website.**
1. ~~#2 Philips and Standard screwdrivers at least 8" in length~~
 2. ~~Sockets, Shallow 6 point 1/2" drive 15/16"~~
 3. ~~Flex handle 1/2" drive~~

4. ~~Nut drivers – 1/4", 5/16", 3/8", and 7/16"~~
5. ~~Sockets, Shallow 6 point – 3/8" drive 1/4" to 1/2"~~
6. ~~Extensions – 3/8" drive – 3" and 6"~~
7. ~~Ratchet – 3/8" drive~~
8. ~~Nut drivers – 7mm to 10mm~~
9. ~~Sockets, Shallow 6 point – 3/8" drive – 7mm to 10mm~~
10. ~~Allen wrench socket set – 3/8" drive – standard and metric~~
11. ~~Appropriate Repair Manual~~
12. ~~Ball Peen Hammer~~
13. ~~Calculator~~
14. ~~Container to drain fuel and/or oil into~~
15. ~~Combination wrenches: 3/8" to 5/8"~~
16. ~~Combination wrenches: 8mm to 10mm~~
17. ~~Engine anchoring device~~
18. ~~Flash light~~
19. ~~Flat feeler gauge set~~
20. ~~Torque wrenches – Foot lb and Inch lb~~
21. ~~Gasket scraper~~
22. ~~Governor adjustment tang benders~~
23. ~~Ignition Spark Tester~~
24. ~~Leak down tester and air tank~~
25. ~~Lighter~~
26. ~~Long nose pliers~~
27. ~~Pencil~~
28. ~~Rubber Mat – 12" x 12" to run engine on~~
29. ~~Safety Glasses (1 pair per member)~~
30. ~~Short 1/2 " drive extension~~
31. ~~Pliers Slip joint~~
32. ~~Soft faced mallet or dead blow hammer~~
33. ~~Spark Plug Gapping tool~~
34. ~~Sockets, Spark Plug 5/8", 3/4" and 13/16"~~
35. ~~Starter rope threading tool~~
36. ~~Storage containers used to put engine hardware into as it is removed~~
37. ~~Strap wrench – Used to hold flywheel when torquing~~
38. ~~Tachometer – Digital or mechanical~~
39. ~~Sockets, Torx – 3/8" drive – T-15, T-20 and T-30~~

APPENDIX I**IDENTIFICATION LIST**

Tools used for the identification portion of the contest are to be those commonly used in small gas engine repair. Some examples are listed in the table below. In regards to the engine parts, list the items shown serve only as a point of reference for study. Similar items from other brands of engines may be used.

TOOLS

Adjustable open end wrench	Ratchet handle
Allen wrench	Regular or slotted screwdriver
Ball peen hammer	Ring compressor
Battery pliers	Screw pitch gauge
Box end wrench	Six point socket
Center punch	Socket adapter
Cold chisel	Socket extension
Combination end wrench	Soft face hammer
Combination slip joint pliers	Spark plug gauge
Deep socket	Spark plug socket
Diagonal pliers	Spark tester
Drift punch	Speed handle
Flat feeler gauge	Strap wrench
Flex handle	Tachometer
Fuel clamp pliers	Torque wrench
Lever jawed wrench	Torx screwdriver
Long nose pliers	Torx socket
Nut driver	Universal joint
Offset screwdriver	Valve spring compressor
Open end wrench	Volt ohm milliamp (VOM) meter
Phillips screwdriver	Water pump pliers
Pin punch	

SPECIAL TOOLS

Briggs & Stratton Service Tools Catalog

ENGINE PARTS

The engine parts will be selected from the following: Briggs & Stratton Series 60000 to 260000.

Example:

Briggs & Stratton Illustrated Parts Lists specified below:

MODEL NUMBER	TYPE NUMBER
91200 TO 91299	0017
124700 TO 124799	0101
110400 TO 110499	N/A
261700 TO 267199	0020

APPENDIX II

Troubleshooting – General Information

Each team of three contestants will be given a maximum of one hour to diagnose and repair an engine, and complete a standardized work order (see example – Appendix III). The judge will act as the customer and the team will act as the service technicians. **Each team will be read a scenario by the judge. The scenario should include the type of equipment the engine is used on, where and how it was stored, use, etc.** Through a series of standard questions, asked by the team members, they will diagnose and repair the engine based on the responses received from the judge (see example below). Upon starting the engine, the team will then be required to complete a work order including costs for parts, labor, and sales tax. ~~Each judge will be provided with the standard questions and answers to the questions.~~ **Each judge will be provided with a written scenario and answers to the questions.**

EXAMPLE

Scenario

This engine is from a rototiller that has been used for one season. It was stored outside, uncovered for six months with no other use.

Standard Questions and Example Responses

Question: What is wrong with the engine?

Response: The (equipment type) will not run.

Question: How did the engine act when the problem occurred?

Response: It ran fine the last time I used it, but when I went to use it again, it would not start.

Question: Did you do anything to the engine prior to bringing it in?

Response: I removed the carburetor and looked inside. I also removed the float bowl and didn't see anything wrong, so I put it back together.

Question: What would you like us to do to the engine?

Response: Repair the problem.

Question: When was this engine last serviced?

Response: I had it serviced last year after using it on a job site. It's been sitting in my garage for the last six months.

Appendix III -- Small Engines Troubleshooting Score Sheet			
Team Name:	Judge's Name:	Possible	Earned
Points in these categories are variable			
Safety – Deduct 1 point for each infraction up to the maximum points in each line item.			
Wipes up oil and fuel spills as they occur		0 to 5	
Maintains safe work practices		0 to 5	
Each member wears safety glasses at all times		0 to 5	
	Total	15	
Tools and Parts – Deduct 1 point for each infraction up to the maximum points in each line item.			
a. Uses proper tool for the job		5	
b. Drops tools and parts – (Proper grip, careful not to drop tools and parts, etc.)		5	
c. Parts and Hardware installed correctly (not within the 3 systems below)		5	
d. Uses proper torque specifications and patterns using provided contest approved modified torque specification chart		5	
	Total	20	
Pre Start Checks (Points are all or nothing in this category. NOTE: Steps “a” through “e” can be done in any order.)			
a. Check for proper oil level		5	
b. Check Gasoline Quality and Level		5	
c. Starter Operational		5	
d. Air cleaner serviced or replaced		5	
e. Stop Switch Operational		5	
f. Customer Complaint Verified (Tried to start the engine to verify the complaint prior to making repairs. No Points will be deducted for necessary repairs made to verify the complaint or prevent engine damage. No diagnostic repairs)		5	
e. Customer Complaint Verified (Tried to start the engine to verify the complaint prior to making repairs.)			
	Total	30	
Diagnostic Method Criteria (Points awarded in this category must be 30, 15, or 0.)			
Diagnostic Approach			
An organized Diagnostic Method is used to isolate the engine problem and prior to a system disassembly. Team must explain their diagnostic method to the judge and the result of their testing to receive points. Method used and correct diagnosis = 30pts . Method used but incorrect diagnosis = 15pts . No diagnostic method used = 0pts . During the 10 minute “Diagnostic Period” teams will complete a Diagnostic Approach Worksheet. Teams will use information gained from the scenario, question responses, engine pre-checks, and verification of customer complaint to develop a diagnostic approach. Upon conclusion of the Diagnostic period, teams will present and submit Diagnostic Approach Worksheet to the judge. Once submitted, no changes may be made to the document. For scoring, SEE APPENDIX V “Diagnostic Approach Scoresheet Rubric”		See criteria	
	Total	35	
Procedurals Scoring – 0 points awarded for improper assembly or incomplete repairs in each area. No points will be given if a team fails to follow proper assembly of all components or if a judge must stop/correct a team for improper procedures that would result in engine damage.			
Fuel System (10pts) Required (circle one) Y N (Select only one Option “a” through “e”).			
a. Repairs Needed, correct procedures used and rational explanation given	(10 pts) or	Score in correct box	
b. Repairs Needed, correct procedures used and no or incorrect explanation given	(5 pts) or		
c. Repairs Not needed, but correct procedures used and rational explanation given	(5 pts) or		
d. Repairs Not needed, no explanation needed	(10 pts) or		
e. Improper or incomplete repairs done and/or Judge stopped team to avoid damage	(0 pts)		
	Total	10	
Ignition System (10pts) Required (circle one) Y N (Select only one Option “a” through “e”).			
a. Repairs Needed, correct procedures used and rational explanation given	(10 pts) or	Score in correct box	
c. Repairs Not needed and no procedures used (no explanation necessary) 15pts			0 or 5

Appendix III -- Small Engines Troubleshooting Score Sheet			
Team Name:	Judge's Name:	Possible	Earned
d. Team provides a clear explanation of what procedures were performed and why			
Procedurals – 0 Points awarded for improper assembly or incomplete repairs in this area			
b. Repairs Needed, correct procedures used and no or incorrect explanation given	(5 pts) or		
c. Repairs Not needed, but correct procedures used and rational explanation given	(5 pts) or		
d. Repairs Not needed, no explanation needed.	(10 pts) or		
e. Improper or incomplete repairs done and/or Judge stopped team to avoid damage		(0 pts)	
Total		10	
Compression System (10pts) Required (circle one) Y N (Select only one Option "a" through "e".)			
a. Repairs Needed, correct procedures used and rational explanation given	(10 pts) or	Score in correct box 0 or 5	
b. Repairs Needed, correct procedures used and no or incorrect explanation given	(5 pts) or		
c. Repairs Not needed, correct procedures used and rational explanation given	(5 pts) or		
d. Repairs Not needed, no explanation needed	(10 pts) or		
e. Improper or incomplete repairs done and/or Judge stopped team to avoid damage	(0 pts)		
Total		10	
RPM Adjustments – Points are all or nothing in this category – Host will determine ALL RPM settings. All settings must be accurately measured and adjustment procedure is explained if needed.			
b. Idle Speed RPM is correct [] – Team Reading: [] Adj. Explained: Y N N/A		5	
c. High Top No Load Speed RPM is correct [] – Team Reading: [] Adj. Explained: Y N N/A		5	
d. Engine runs for 1 minute within the allotted time after measuring & explaining the above engine RPM adjustments.		10	
Total		20	
Total points awarded for Troubleshooting		150	
Total points awarded for Work Order (Must be turned in to the judge within the one-hour time limit.)		50	
GRAND TOTAL		200	

Appendix IV

California FFA Small Engines Work Order

(Must be turned in to the judge within the one-hour time limit.)

	Team Name _____ Engine Number _____	Date Unit was Inspected _____ Date Unit was Completed _____				
			Judges Use Only!			
	Judge's Name	Engine Brand	Type of Equipment		Possible Awarded 10 pts	
	Model / Serial #	Type #	Code			
	Customer Comments: (5 questions at 2 pts ea.)				10 pts	
	1.					
	2.					
	3.					
	4.					
	5.					
	Work Performed: List each task performed on a separate line below and use the Flat Rate Labor Repair Chart description & hours provided to determine Labor Charge.				10pts	
	Labor Description		Labor Hours	Labor Charge		
	Labor Totals					
	Part #	Description	Qty	Unit Price	Total Price	10 pts
	Parts Total & Tax calculated from actual Parts Ordered		Parts Total		Math Check Only	
			Tax (8%)			

Labor Charge is \$75.00 per hour for work performed.	Labor Total			
Totals 2 points each	Grand Total		8 pts	
Legibility – 2 points or Zero (0) points – If any portion is not legible, no points will be awarded.			2 pts	
Judge's Signature:	Total Team Points Awarded		50 pts	

Flat Rate Labor Repair Chart

Labor Rate is \$75.00 per hour	Bill Time In hours
Repair/Adjustment Description	
Pre-Check & Diagnostics – Does not include repairs	0.2
Fuel System Repairs/Adjustments	
Carburetor Rebuild / Reassemble *	0.4
Carburetor Replacement *	0.2
Carburetor Spacer Replacement *	0.2
Carburetor / Fuel Line Obstruction Removal	0.2
Main Jet Replacement *	0.2
Float Repair/Replacement *	0.3
Carburetor Gasket(s) Replacement Only	0.2
Other Fuel System repair not listed - (must provide summary repair description on work order)	0.3
* = Time includes gasket replacement	
Ignition System Repairs/Adjustments	
Armature Air Gap Adjustment	0.2
Armature Replacement	0.3
Flywheel Key Replacement	0.5
Kill Switch Repair/Replace	0.2
Spark Plug Replacement/Adjust Gap	0.1
Other Ignition System repair not listed - (must provide summary repair description on work order)	0.3
Compression System Repairs/Adjustments	
Valve(s) Replacement	0.7
Valve(s) Clearance Adjustment	0.3
Push Rod(s) Replacement	0.5
Cylinder Head Gasket Replacement	0.7
Cylinder Head Replacement / Reassembly	0.7
Other Compression System repair not listed - (must provide summary repair description on work order)	0.5
Service	
25 Hour - Clean air filter	0.1
50 Hour - Clean air filter, Change engine oil, check muffler and spark arrester	0.2
100 Hour / Annual - Replace air filter, Replace pre-cleaner, Replace spark plug, Replace fuel filter, Clean air cooling system, Valve adjustment, Change engine oil	0.5

Starter Repair/Adjustments	
Rewind Starter assemble repair	0.3
Rewind Starter Replacement	0.2
Governor Repair/Adjustments	
Dynamic Adjustment	0.2
Linkage Repair/Replacement	0.3
Exhaust System Repair	
Obstruction Removal	0.2
Engine Repair - Other	
Other necessary engine repairs not listed above - (must provide summary repair description on work order)	0.2

Appendix V

Diagnostic Approach Worksheet

Team: _____

Judge: _____

-Systems in Need of Repair: (Circle all that apply)

Compression Fuel Ignition

-Team Diagnostics

Team Diagnostics should include information from scenario, customer responses, and results of precheck of the engine.

-Repair Method

What diagnostic equipment or repair techniques will be used to isolate and identify repairs needed for the engine.

Possible	Earned
10	
15	
10	
Total	

Diagnostic Approach Scoresheet Rubric

Systems in Need of Repair: 10 Points Possible

- Score is all or nothing in identifying engine systems in need of repair.

Team Diagnostics: 15 Points Possible

15 Points:

- The team includes all correct and pertinent information regarding the engine bug from the scenario.
- The team's diagnostics incorporate and accurately interpret customer comments.
- The results of all engine pre checks relevant to engine bugs are noted.
- The presentation to judge is comprehensive, showing a deep understanding of the problem.

10 Points:

- The team provides mostly correct information but is missing details specifically related to the engine bug from the scenario.
- Customer comments are included and correctly interpreted.
- Results of engine pre checks are documented, though there may be minor errors or omissions.
- The overall presentation to judge demonstrates a good understanding of the problem but lacks complete detail.

5 Points:

- The team's diagnostics are incorrect or incomplete, missing several key pieces of information.
- Customer comments may be misinterpreted or not included.
- The engine prechecks are either not thoroughly documented or contain significant errors.
- The presentation to judge shows a limited understanding of the problem.

0 Points:

- The team makes no attempt to perform diagnostics.
- No customer comments are included.
- Engine pre checks are not documented.
- The presentation to the judge lacks any meaningful content regarding the diagnostics of the engine issue.

Repair Method: 10 Points Possible

10 Points:

- The team correctly provides reasons for using diagnostic equipment and repair techniques to isolate and identify the necessary repairs for the engine.
- All repairs are addressed according to their stated Team Diagnostics prompt.
- The team quotes OEM specifications from technical publications and/or provided specification sheets from the host institution and curricular code, demonstrating adherence to manufacturer guidelines.

5 Points:

- The team provides some reasoning for using diagnostic equipment and repair techniques, but it may lack clarity or completeness.
- Most repairs are addressed from their stated Team Diagnostics prompt, but there may be minor omissions or errors.
- The team references OEM specifications, but the application of these specifications may be incomplete or partially incorrect.

0 Points:

- The team fails to provide reasoning for using diagnostic equipment and repair techniques, or the reasoning is incorrect.
- Repairs are not adequately addressed from their stated Team Diagnostics prompt.
- The team does not reference OEM specifications, or the references are incorrect and not used effectively.

APPENDIX VI-Torque Values

FASTENER	TORQUE	ADJUSTED TORQUE
Air Cleaner Base Screw	50 lb-in.	45 lb-in.
Air Cleaner Base Nut	40 lb-in.	35 lb-in.
Armature Screws	95 lb-in.	80 lb-in.
Blower Housing Screw	85 lb-in.	75 lb-in.
Connecting Rod Cap Screw	125 lb-in.	105 lb-in.
Control Panel Trim Screw	30 lb-in.	25 lb-in.
Crankcase Cover Screws	210 lb-in.	175 lb-in.
Cylinder Head Screws	210 lb-in.	175 lb-in.
Cylinder Heat Shield Screws	50 lb-in.	45 lb-in.
Flywheel Nut	65 lb-ft.	N/A
Fuel Tank Screw	85 lb-in.	75 lb-in.
Fuel Tank Nut	100 lb-in.	85 lb-in.
Governor Lever Nut	30 lb-in.	25 lb-in.
Low Oil Sensor Module Screw	85 lb-in.	75 lb-in.
Muffler Stud Nut	95 lb-in.	80 lb-in.
Oil Drain Plug	150 lb-in.	130 lb-in.
Rocker Arm Stud	120 lb-in.	100 lb-in.
Rocker Ball Locknut	70 lb-in.	60 lb-in.
Rocker Cover Screw	80 lb-in.	70 lb-in.
Spark Plug	180 lb-in.	155 lb-in.
Speed Control Bracket	85 lb-in.	75 lb-in.

Score Sheet Judging Criteria

I. Safety

- A. Wipes up oil and fuel spills as they occur – within 30 seconds of occurring is acceptable.
- B. Maintains safe work practices – this includes organized worktable, safe tool, and engine handling. Personal injury will incur maximum point deduction.
- C. Each member wears approved safety glasses at all times. – 1 pt deduction for each occurrence. If team member fails to have glasses on for more than 30 seconds, will incur maximum point deduction. No points will be deducted for removing safety glasses to read Technical Manuals or Illustrated Parts Lists.

II. Tools and Parts

- A. Uses proper tool for the job – examples of infractions include using the wrong size wrench/socket on a fastener, using a screwdriver to pry, or using a hex wrench in a torx fastener. Should not include: using a socket and extension as a nut driver, using common pliers to remove fuel lines, or using a screwdriver to loosen the oil fill cap.
- B. Drops tools and parts (proper grip, careful not to drop tools and parts, etc.) - examples of infractions for improper grip include not holding a torque wrench at the handle or balance point, touching the torque wrench on other than the handle while torquing, or using a closed fist grip while torquing the flywheel.
- C. Parts and hardware installed correctly (not within the three diagnostic areas) – examples of infractions include sheet metal components not fitted correctly, kill wire or spark plug wire routed incorrectly, or air filter cover incorrect.
- D. **Uses proper torque specifications and patterns using provided contest approved modified torque specification chart. Each infraction is 1 pt deduction. SEE Appendix VI**

III. Pre Start Checks

- A. Check for proper oil level – team checks that the oil level is within operating range.
- B. Check gasoline quality and level – team checks for sufficient fuel level and takes a fuel sample to check for contaminants.
- C. Starter operational – team checks for proper and safe starter operation. This includes checking starter rope for frays.
- D. Air cleaner serviced or replaced – team checks air filter for debris and replaces as needed.
- E. Stop switch operational – team tests the stop switch operation using an ignition tester as visual confirmation the stop switch is functioning.

1. All Pre Start Checks listed above must be done before the team attempts to start and verify customer's complaint to receive points for each area.

- F. Customer complaint verified – team tried to start the engine and duplicate the customer's complaint. The team must verify complaint prior to making repairs within the fuel, ignition, and compression systems. Points will not be deducted for necessary repairs made to verify the complaint or prevent engine damage. Acceptable repairs may include: starter rope repair; adding of engine oil; repair of the kill switch; clean out of contaminated fuel; fuel leak repair.

IV. ~~Diagnostic Method Criteria~~ **Diagnostic Approach**

- A. ~~The team should have a method of testing each of the three systems that directs them to the area with the problem. The team should have a logical explanation of how they came to their conclusion of what systems are malfunctioning. If a team disassembles the wrong system, points will be deducted from the Diagnostic Method Criteria portion of the score sheet only~~

- B. Each team will complete a diagnostic approach to determine the cause of engine issue or failure.
- C. During this approach teams will need to isolate the system(s) that are causing the problem with the engine and describe how they will repair the engine using this approach.
- D. Each team will be given 10 minutes to determine what they believe is the issue, the teams will fill out a worksheet with their plan of action and present that information to the judge prior to doing any repairs to the engine.
- E. The worksheet must be turned in to the judge at the conclusion of the 10 minute diagnostic period or will lose all possible points for this portion of scoring.
- F. Teams will not be allowed to work on the engine during the 10 minute diagnostic period.

V. Procedurals

- A. Procedurals will not earn points within the Fuel, Ignition, and/or Compression Systems when a team fails to correctly assemble or adjust parts within that system. Examples of a situation that would require a procedural include, but not limited to misadjusted valves, magneto on backwards, improper magneto gap, carburetor spacer on backwards (NOTE: Protrusion must be installed toward the carburetor with a gasket on both sides), governor linkage installed incorrectly, not scraping old gasket material before installing a new gasket, not replacing all required gaskets for the repair.

VI. Fuel System, Ignition System, Compression System

- A. Repairs needed, correct procedures used and rational diagnostic explanation given – 10 points will be awarded if the team corrected the problem within the area with no procedurals and explained diagnostic rationale.
- B. Repairs needed, correct procedures used and no or incorrect explanation given – 5 points will be awarded if the team disassembles and assembles system components that were necessary and did so with procedurals but gave no diagnostic explanation. ~~Points will be deducted from the Diagnostic Method portion of the score sheet if this occurs.~~
- C. Repairs not needed, but correct procedures used and rational diagnostic explanation given - 5 points will be awarded if a system is not part of the problem but the team used and explained diagnostic rationale.
- D. Repairs not needed so no diagnostic explanation needed – 10 points will be awarded if a team does nothing with a system because it is not necessary.
- E. When improper or incomplete repairs are done and/or a Judge stops the team to avoid damage to the engine – 0 points will be awarded.

VII. ~~RMP~~ RPM Adjustments

- A. ~~Non-governed idle, governed idle, and high-speed engine~~ **Idle Speed & Top No Load Speed** RPM will be measured using a tachometer. The judge will verify the team's measurement is correct and within the desired settings. If necessary, the team will properly explain how each of the governor adjustments would be made according to factory procedures to bring the engine into specification. Zero (0) points will be awarded if the team fails to accurately measure and/or describe approved speed adjustment procedures or fails to identify the engine is out of specification range for each speed adjustment area.

VIII. Work Order Documentation

The Labor Guide is based on Briggs allowed times where available and designed to bring industry time management practices to the CDE.

- A. Teams will use the standard repair descriptions and times when documenting the repair on the Work Order.
- B. Teams will need to clearly define when “Other” work is performed that is not listed in the Labor Guide.
- C. Judges will score the Labor and Parts charges on the Work Order portion of the contest as if they were the actual customer. Specifically, Teams should not be docked points if they perform additional work and/or replace parts that make sense and are properly explained as part of the scenario but not listed on the answer key.
- D. The Parts Total, Tax, Labor Total and Grand Total score is a math check only based on the Teams actual work performed & parts replaced.