SkillsUSA
2010 Contest Projects

Power Equipment Technology

Click the “Print this Section” button above to automatically print the specifications for this contest. Make sure your printer is turned on before pressing the button.

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SkillsUSA Competition Test
Power Equipment Technology

EXAMINATION INSTRUCTIONS

Read these directions silently to yourself.

This examination has 100 questions; each followed by four possible answers. Some questions have drawings associated with them. Read each question and study any drawings; then select the BEST ANSWER. Mark your answers on the Answer Sheet as shown below. **Do not mark in the test booklet.**

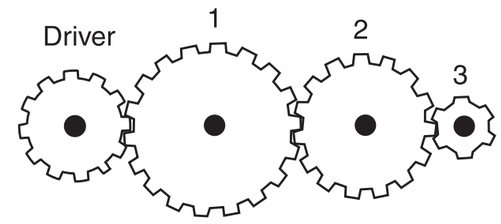
Please read the sample question below:

Please read <u>all</u> answers before selecting your response!

SAMPLE QUESTION:

Which gear will turn in the same direction as the driver gear?

A. 1
B. 2
C. 3
D. None of the above



Fill in the correct answer on the answer sheet.

Sample Question **Answer Sheet** A B C D

WHEN INSTRUCTED, PLEASE TURN THE PAGE AND BEGIN THE TEST.

I. Two Stroke Cycle Engine Questions

1. A two-stroke engine that “hunts” or has erratic idle is likely to have:
   A. An air leak.
   B. A defective ignition module.
   C. Restricted jets.
   D. Both A & B (140)

2. With a typical “lean” piston seizure of an engine, you will notice the majority of the score marks on:
   A. The intake side of the piston.
   B. The piston ring land area.
   C. The exhaust side of the piston.
   D. None of the above (117)

3. While analyzing a “Lean Seizure,” the basic cause of failure would be:
   A. Too much fuel.
   B. Not enough fuel.
   C. Not enough air.
   D. Improper fuel/oil ratio. (72)

4. To complete one power cycle, the crankshaft of a two-stroke engine must rotate:
   A. One revolution.
   B. Two revolutions.
   C. Four revolutions.
   D. None of the above (51)

5. Improper torque on two-stroke engine fasteners could cause:
   A. Air leaks.
   B. Poor operating characteristics.
   C. Thread damage.
   D. All of the above (33)

6. The piston stroke from B.D.C to T.D.C. achieves which of the following?
   A. Intake and transfer phase
   B. Exhaust and transfer phase
   C. Compression and exhaust phase
   D. Compression and intake phase (25)

7. What is the purpose of transfer ports in the cylinder?
   A. To get the fuel/air mixture from the crankcase to the combustion chamber.
   B. To get the fuel/air mixture from the cylinder to the crankcase.
   C. To get the fuel/air mixture from the carburetor to the crankcase.
   D. To get the fuel/air mixture from the crankcase to the carburetor. (24)

8. The two-stroke engine depends on:
   A. A higher percentage of air to fuel mixture than a comparable four-stroke engine.
   B. An oil reservoir to hold the lubricating oil.
   C. A sealed crankcase.
   D. Crankcase venting for all-position operation. (22)

SkillsUSA Competition Test
Power Equipment Technology

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9. Technician A says a properly designed two-stroke exhaust system can help draw in the fresh intake charge and prevent it from escaping out the exhaust port. Technician B says its ONLY function is to reduce noise. Who is correct?
   A. A only
   B. B only
   C. Both A & B
   D. Neither A nor B (18)

10. In an all position diaphragm carburetor, the metering diaphragm's main function is:
   A. To pump fuel into the engine.
   B. To keep air from entering the fuel mixture.
   C. To control fuel flow through the carburetor.
   D. All of the above (3)

11. Two-stroke engines commonly use a _____ design to take in the fuel-air mixture.
   A. Piston port
   B. Rotary valve
   C. Reed valve
   D. All of the above (1)

12. A spark plug's heat range refers to:
   A. The speed that the temprature rises.
   B. The temperature of the spark plug body.
   C. Its range of heat dissipation.
   D. The voltage required to fire the plug. (5)

13. Air cooled two-stroke engine oils:
   A. Are all are pretty much the same.
   B. Are not much different than automotive-type motor oils.
   C. Have different certifications depending on engine design and use.
   D. Should only be used if they are NMMA (BIA) certified. (6)

14. The air entering an engine provides:
   A. An atomized fuel mixture.
   B. A coolant for internal engine parts.
   C. For proper operation of the carburetor.
   D. All of the above. (7)

15. Which components are **NOT** part of a two-stroke engine's fuel system?
   A. A carburetor and fuel filter.
   B. A fuel tank vent and fuel line.
   C. A crankcase and fuel tank.
   D. An air filter cover and muffler. (8)

17. Excess carbon deposits are more likely to be found in engines that:
   A. Operate with changing engine RPM.
   B. Have a lean carburetor adjustment.
   C. Have additives in the gasoline.
   D. Run under constant load and speed. (142)

18. When the piston is moving downward, the pressure in the crankcase:
    A. Increases.
    B. Decreases.
    C. Reverses.
    D. Vents. (11)

19. What is the function of the piston rings in a two-stroke engine?
    A. To maintain compression.
    B. To transfer heat from the piston.
    C. To keep combustion gases from entering the crankcase.
    D. All of the above. (12)

20. The average four-stroke lawnmower engine runs at approximately 3000 RPM and produces 25 power strokes per second. How many power strokes per second does a high performance two-stroke chain saw engine produce at 12,000 RPM?
    A. 220
    B. 200
    C. 120
    D. 100 (15)

21. Using a torque wrench to tighten the flywheel nut helps prevent:
    A. Flywheel distortion.
    B. Flywheel key shearing.
    C. Crankshaft damage.
    D. All of the above. (96)

22. Carbon removal is important because it:
    A. Restores horsepower.
    B. Helps engines to run cooler.
    C. Reduces the risk of detonation.
    D. All of the above. (97)

23. Oiled foam elements should be cleaned by:
    A. Cleaning in solvent, drying and re-oiling.
    B. Cleaning in carburetor cleaner, drying and re-oiling.
    C. Cleaning in soapy water, drying and re-oiling.
    D. Tapping on a hard surface and re-oiling. (98)

24. When servicing a carburetor it is recommended to:
    A. Replace the fuel filter.
    B. Inspect the fuel line.
    C. Clean the fuel tank.
    D. All of the above. (99)

25. During disassembly, ball type main bearings should be routinely inspected by:
    A. Checking radial and axial free play.
    B. Turning the bearing and checking for roughness.
    C. Measuring the ball to race clearance.
    D. Both A and B. (100)

92. Negative battery cables are removed first:
    A. To help prevent open circuits.
    B. Only on side terminal batteries.
    C. To help prevent short circuits to ground.
    D. All of the above. (8)

93. While using an analog ohmmeter, the needle points to  . This symbol represents:
    A. High resistance.
    B. Low resistance.
    C. The battery test position.
    D. Reversed polarity of the leads. (11)

94. A high resistance connection in a circuit causes:
    A. Increased battery voltage.
    B. Decreased battery voltage.
    C. Increased current flow.
    D. Decreased current flow. (12)

95. The open-circuit voltage test on a good alternator stator should result in:
    A. Voltage the same as battery voltage.
    B. Zero volts.
    C. One-half of battery charge.
    D. Higher than battery voltage. (21)

96. While attempting to start an engine the starter solenoid clicks repeatedly but will not turn the engine over. The first component to check is the:
    A. Key switch.
    B. Solenoid.
    C. Battery.
    D. Starter motor. (22)

97. The ignition coil contains two windings. The one with less turns is the:
    A. Secondary winding.
    B. Lamination.
    C. Stator.
    D. Primary winding. (23)

98. The ignition coil is a type of :
    A. Transistor.
    B. Transformer.
    C. Rheostat.
    D. Capacitor. (24)

99. A magneto ignition systems produces a spark when the:
    A. DC current flows from the primary to secondary windings.
    B. AC current flows from the secondary to primary windings.
    C. Primary circuit opens inducing current in the secondary windings.
    D. Points close. (28)

100. In a Capacitive Discharge Ignition System, what is charged by the exciter coil?
    A. Silicon Control Rectifier.
    B. Primary circuit.
    C. Secondary circuit.
    D. Capacitor. (29)

IV. Electrical Questions Continued

84. When the insulation of a hot-side wire wears off and the bare copper wire touches the steel frame of the tractor, which type of circuit fault is formed?
A. Open.
B. Closed.
C. Shorted.
D. Shared. (63)

85. When soldering an electrical wiring connection, use:
A. Acid core flux.
B. Rosin core flux.
C. Either A or B.
D. Neither A nor B. (61)

86. One of the first areas to inspect when troubleshooting a faulty charging system is the:
A. Regulator.
B. Diodes.
C. Battery and connections.
D. Alternator output with a digital multimeter. (41)

67. Ammeters are connected:
A. To unpowered circuits.
B. In series with loads.
C. In parallel with loads.
D. None of the above. (14)

88. An engine cranks over too slowly. A technician places a 12-volt probe light on the starter motor terminal and it lights. This indicates that:
A. The starter motor is defective.
B. The polarity is correct.
C. The starter is receiving enough amperage.
D. Voltage is getting to the starter motor. (5)

89. Standard diodes:
A. Act as an electrical stop in both directions.
B. Allow current flow in both directions.
C. Allow current flow in only one direction.
D. Have small miniature moving parts. (4)

90. Current needed to charge a battery is:
A. Alternating current.
B. Direct current.
C. Negative current.
D. None of the above. (1)

91. A material that prevents electrical current from transferring from one conductor to another is called:
A. Amperage.
B. Resistance.
C. An open circuit.
D. An insulator. (7)

II. Four Stroke Cycle Engine Questions

26. An engine that has failed by over speeding could MOST likely cause a:
A. Collapsed float.
B. Broken connecting rod.
C. Warped cylinder head.
D. None of the above. (150)

27. Technician A says ignition components may break down, causing poor performance as they heat up. Technician B says engine temperature will not affect ignition performance because combustion occurs more easily in a hot engine. Who is correct?
A. Technician A is correct.
B. Technician B is correct.
C. Technician B if engine is OHV.
D. Technician B if engine is liquid cooled. (141)

28. An excessively discolored crank-pin would be caused by:
A. Abrasive material in the oil.
B. A bent crankshaft.
C. An over speeding engine.
D. Insufficient lubrication. (125)

29. An engine is leaking oil around the governor shaft during operation. What is the first test that should be performed in trying to determine the cause of the leak?
A. Test for excessive exhaust back pressure that could be pressurizing the crankcase.
B. Test compression to determine if ring wear blow-by is pressurizing the crankcase.
C. Test crankcase vacuum with a manometer.
D. Test for high pressure at the governor shaft bearing. (116)

30. A crankcase breather valve:
A. Allows positive pressures to exit the crankcase.
B. Allows air to enter the engine only.
C. Cleans air entering the crankcase.
D. Allows air to enter and exit the crankcase. (114)

31. Variable ignition timing can:
A. Increase low speed performance.
B. Increase high speed performance.
C. Improve ease of starting.
D. Do all of the above. (107)

32. In a CDI ignition system, what is triggered creating a path to ground through the coil?
A. Capacitor
B. SCR
C. Exciter coil
D. Primary circuit (101)

33. At high altitudes re-jetting the carburetor may be necessary because:
A. Less fuel is available.
B. More oxygen is available.
C. Less oxygen is available.
D. The air temperature is cooler. (88)

34. Connecting rod to crankshaft clearance can be measured BEST using:
    A. A telescoping micrometer.
    B. Plastigage.
    C. Vernier caliper.
    D. Thickness gauge. (81)

35. Piston rings control oil consumption BEST when:
    A. They always remain flat against the cylinder wall.
    B. They flex slightly to use the edge of the piston ring.
    C. The ring end gaps are below .001”.
    D. The oil ring has become as wide as possible. (78)

36. A correctly honed cylinder wall will have a crosshatch pattern of:
    A. 0 to 10 degrees.
    B. 15 to 20 degrees.
    C. 30 to 45 degrees.
    D. 60 to 90 degrees. (69)

37. If the piston is at Top Dead Center, but **NOT** on the compression stroke, what position will the valves be in?
    A. Both valves will be open slightly.
    B. Both valves will be closed.
    C. The intake valve will be open slightly, with the exhaust valve closed.
    D. The exhaust valve will be open slightly, with the intake valve closed. (64)

38. Valve seats that are too narrow cause:
    A. Valve shearing.
    B. Valve overheating.
    C. Valve seat deposits.
    D. Excessive valve overlap. (61)

39. Using a torque wrench to tighten the flywheel retainer helps prevent:
    A. Flywheel damage.
    B. Flywheel key shearing.
    C. Crankshaft thread damage.
    D. All of the above. (53)

40. Horsepower is BEST defined as:
    A. A force acting on a radial distance from a point of rotation.
    B. Volumetric efficiency of an engine.
    C. A timed rate of doing work.
    D. Opposite of torque. (45)

41. To complete one operating cycle the crankshaft of a four-stroke engine must rotate:
    A. One-half revolution.
    B. One revolution.
    C. Two revolutions.
    D. Four revolutions. (42)

42. As temperature drops from 80 degrees F. to 30 degrees F., battery output:
    A. Decreases.
    B. Increases.
    C. Stays the same.
    D. Is not affected. (32)

75. Which of the following does not describe a brake system?
    A. Disc
    B. Band
    C. Drum
    D. Linear (26)

76. There are three types of V-belt; classic, narrow, and double.
    A. True
    B. False (29)

77. If a hydrostatic transaxle unit is noisy:
    A. The brake setting is too tight.
    B. Check the inlet oil filter.
    C. Check the oil level.
    D. All of the above. (105)

78. If a hydrostatic transaxle unit is low on power:
    A. Check the engine overloading.
    B. Check bypass valves.
    C. Check operating temperatures.
    D. All of the above. (106)

79. Excessive filter restriction in a pump suction line can cause:
    A. Air bubbles from leaky gaskets.
    B. Cavitation erosion.
    C. Pump noise.
    D. All of the above. (107)

80. Some transaxles are sealed airtight and should not have oil added to them.
    A. True
    B. False (102)

IV. Electrical Questions

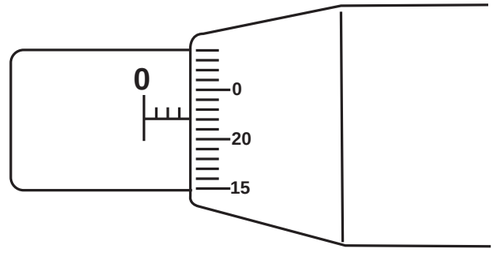
81. What code is marked on a safety switch that would indicate that there should be continuity between the terminals when the switch plunger is out?
    A. NA.
    B. NO.
    C. NC.
    D. NB. (76)

82. A 0.2-volt drop is observed across the starter solenoid contacts with the engine cranking. What should be done to the system?
    A. Nothing--it is acceptable.
    B. Install a larger battery.
    C. Replace the cable or component.
    D. None of the above. (68)

83. Electrical circuits may be protected against shorts by:
    A. Switches.
    B. Relays.
    C. Circuit breakers / fuses.
    D. All the above. (65)

43. Which of the following formulas describes Ohm's law?
    A. Volts = Amps X Ohms
    B. Amps = Volts X Ohms
    C. Ohms = Volts X Amps
    D. Volts = Amps – Ohms (30)

44. Read the following standard (non-metric) micrometer. What is the correct answer?
    A. .620 inches
    B. .097 inches
    C. .022 inches
    D. .977 inches (19)



45. Recommended torque for a cylinder head bolt is 384 inch pounds. What is the foot pound equivalent?
    A. 26 foot-pounds
    B. 32 foot-pounds
    C. 36 foot-pounds
    D. 42 foot pounds (13)

47. A four-stroke engine gets its name from:
    A. The number of cylinders it has.
    B. The number of valves used in the engine design.
    C. The number of piston movements during a combustion cycle.
    D. The number of engineers who designed the original engine. (1)

48. If a four-stroke engine misses under load the problem could be:
    A. A fouled spark plug.
    B. An improper spark plug gap.
    C. A weak valve spring.
    D. All of the above. (2)

49. Fuel tanks are vented to:
    A. Prevent an explosion.
    B. Increase engine speed.
    C. Prevent a vacuum.
    D. Increase the vacuum. (3)

50. An engine that runs rich and blows black smoke is MOST likely a symptom of:
    A. Low compression.
    B. Restricted air intake.
    C. Tight valves.
    D. Weak ignition system. (142)

66. If the drive system is engaged, the clutch is activated, and there is no output, which area would you inspect?
    A. Belt
    B. Input
    C. Final Drive
    D. All of the above (21)

67. What effect does reducing the outer diameter of the input pulley have on the input speed of the drive system?
    A. Reduces.
    B. Increases.
    C. Stays the same.
    D. None of the above. (20)

68. A declutching mechanism:
    A. Automatically returns to neutral when the clutch is applied.
    B. Is no longer used in lawn and garden vehicles.
    C. Is only used in gear drive transaxles.
    D. Stops the input rotation when clutch is applied. (18)

69. Belt guides have only one purpose, which is to keep the belt from falling off the pulleys.
    A. True
    B. False (17)

70. Transaxles contain:
    A. A differential.
    B. A transmission.
    C. A set of axles.
    D. All of the above. (3)

71. The purpose of a transmission is:
    A. To provide a neutral between forward and reverse.
    B. To provide low axle speeds for high torque operations.
    C. To transfer power from the engine to the differential.
    D. All of the above. (4)

72. A spring tensioned idler:
    A. Prevents the overloading of a drive unit's input shaft.
    B. Requires little or no adjustment.
    C. Is always better in application than a solid mounted tensioner.
    D. Both A and B. (6)

73. Vehicle opperator manuals dictate and caution should be taken when towing any vehicle with regard to the transmission.
    A. True
    B. False (11)

74. The most common cause of hydraulic system failure is _____:
    A. Contamination.
    B. High oil temperature.
    C. Leakage.
    D. Wrong fluid. (145)

51. Burned valves are MOST likely a result of:
    A. Excessive valve clearance.
    B. Insufficient valve clearance.
    C. Unleaded fuel.
    D. Rich air/fuel mixture. (127)

52. The specific gravity of the electrolyte in a discharged battery, compared to the specific gravity of electrolyte in a charged battery will be:
    A. Lower.
    B. Heavier.
    C. Higher.
    D. The same. (25)

53. According to Ohm's law, if the voltage is 110, and the resistance is 11 ohms, the current would be:
    A. 1 ampere.
    B. 10 amperes.
    C. 11 amperes.
    D. 100 amperes. (26)

54. The electromotive force that causes electrons to flow in a circuit is measured in:
    A. Amps.
    B. Ohms.
    C. Volts.
    D. Watts. (27)

55. In a magneto ignition system the breaker points open:
    A. As primary voltage starts to build.
    B. To start induction in the primary windings.
    C. As primary voltage peaks.
    D. To reduce cross firing. (108)

56. The type of current obtained from a storage battery is called:
    A. Alternating current.
    B. Alternating direct current.
    C. Direct current.
    D. Rectified current. (31)

57. The inside chamfer on a piston ring:
    A. Transfers heat to the cylinder wall.
    B. Improves the seal against the cylinder wall.
    C. Helps control oil consumption.
    D. Is designed to reduce reciprocating weight. (79)

58. Connecting rod to crankshaft clearance should be measured:
    A. If diagnosing an internal engine noise problem.
    B. When installing new lower end parts.
    C. During any reassembly.
    D. All the above. (80)

59. What is the MOST appropriate tool for measuring valve guide wear?
    A. Inside micrometer
    B. Small hole gauge
    C. Dial bore gauge
    D. Dial indicator (20)

60. Which tool should NOT be used to measure cylinder I.D.?
    A. Vernier caliper
    B. Cylinder bore gauge/dial indicator
    C. Inside micrometer
    D. Telescoping gauge (24)

III. Driveline & Hydraulics Questions

61 A lawn tractor has broken an axle. The most likely cause is:
    A. Defective axle from the manufacturer.
    B. Normal wear.
    C. Customer abuse through overload.
    D. None of the above. (139)

62. A lawn tractor had three belts replaced last year. The first belt turned over in the pulley sheaves. The others had to be overly tensioned to eliminate slippage and both failed in a short time. What was the most likely cause?
    A. The use of an incorrect type of belt dressing.
    B. Worn pulley sheaves.
    C. There is no problem; this is typical.
    D. None of the above. (136)

63. If no recommendations are given for lubrication change intervals on mechanical transaxles, the lubrication should be changed at:
    A. 6 months or 200 hours of operation.
    B. 8 months or 200 hours of operation.
    C. 10 months or 200 hours of operation.
    D. Only during internal mechanical service. (100)

64. The brake/clutch pedal on a gear-type transmission / transaxle is properly adjusted if:
    A. The input pulley slips on the v-belt and the brake is not binding.
    B. The drive belt slips when the drive pulley slips.
    C. The drive belt is fully disengaged and the brake is applied.
    D. The input shaft is held firmly and the wheels are free to turn. (95)

65. When attaching a wheel to an axle, you should:
    A. Pre-heat components prior to assembly.
    B. Apply loctite to shaft and assemble.
    C. Clean components and apply rust preventative and assemble.
    D. Paint parts and assemble. (32)

2010
Power Equipment Technology
Station # 2 – Parts Identification

SCENARIO - TANAKA

Please Read Carefully.

On the table, you have five parts for a Tanaka TBC255PF Grass Trimmer; each labeled A, B, C, D, or E.

DO NOT REMOVE THE PARTS FROM THE BAGS!

Locate the correct PART NUMBER for each part using the TBC255PF Illustrated Parts Manual.

Write the correct PART NUMBER on the score sheet next to the letter of the bagged part.

When you have completed the Tanaka parts lookup, move on to the next page and the Briggs & Stratton/ Simplicity parts lookup.

When you have completed all three of the manufacturer's parts lookup, raise your hand and the judge will come and collect your score sheet.

Do not write in the Illustrated Parts Manual.

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Station # 2 – Parts Identification

SCENARIO - SIMPLICITY

This section of Station #2 tests your ability to:

- Identify parts
- Locate replacement parts

A customer brought you this part from his Simplicity Regent Series tractor and said he thinks he has his machine's issue narrowed down to this very part. Using the Illustrated Parts List given to you, answer the questions on your score sheet.

When you have completed the Simplicity parts lookup, move on to the next page and the Kohler parts lookup.

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Station # 2 – Parts Identification

SCENARIO - KOHLER

This third section of Station #2 tests your ability to identify parts:

1. Use the engine identification decal above for reference when looking up the part. List the engine model and spec numbers on the score sheet.

2. Locate the reference number on the illustrated parts list.
3. Determine what the service part number is using the parts list.
4. Give a brief description illustrating your knowledge of the function of the individual part identified.

Each contestant must enter the required information on the Score Sheet.
Do not write on this page.

2010
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Station # 3 - Service Writing

SCENARIO

Please Read Carefully.

This station will test your ability to perform customer service which might include both verbal and written skills. In your station you will find a Yard Machine Mower as well as a Miller Welder.

Your first task is to place your contestant number just below the Service Order number.

Scenario 1:

Customer Name: Eddie Van Halen
1985 Hager Road
Tucson, AZ 20060
Phone: 962-126-1955

The lawnmower was a gift and he has been complaining that it starts hard and when it does run it seems to hunt. Because the unit was a gift he seems to be uncomfortable in putting money into the unit.

Please fill out the service order to help the technician successfully repair the unit. You may ask questions; however, the judge can only answer yes or no questions.

Scenario 2:

The customer (played by a judge) has just purchased a Miller Welder and asks you about service support. Tell the customer about the service support you offer at your fictitious dealership.

Score
_____

SkillsUSA Champions at Work®

Contestant Number
_____

2010
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Station # 4 – Starter Repair

SCORE SHEET

Briggs & Stratton Recoil Starter Assembly

(75 points)

This section of the competition tests your ability to:

- Effectively repair recoil assemblies

A customer brought you this recoil starter assembly from his brand new Briggs & Stratton Professional Series 8.75 Ft/lbs Torque Power Engine. The rope shows some signs of fraying. The customer saw this and wants it replaced before it breaks.

1. Roughly how many turns did it take to wind the spring adequately when installing the rope? _____

2. Roughly how many inches of the starter rope are in the recoil currently?
_____

3. What number designation rope size is this?
_____

4. Is this starter worth repairing or is it better to replace the whole assembly?
Repair _____ Replace _____

Score
_____

SkillsUSA Champions at Work®

Contestant Number
_____

2010
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Station # 5 – Ignition Systems

SCORE SHEET
(95 points)

This station will test your knowledge of the ignition systems used on Kohler engines. You will be required to perform some basic tests and record the results. You will also need to write a brief description of the reason and function of some components to verify your understanding of the purpose for the part.

1. What is the function of a SAM? _____
   _____ _____ **(10 points)**
2. What does the acronym ASAM stand for?
   _____ _____ **(10 points)**
3. What does the acronym DSAM stand for?
   _____ _____ **(10 points)**

Test each module to see if they are functioning correctly and record your findings, by writing **Pass** or **Fail** after the question.

4. Module #1 _____ **(10 points)**
5. Module #2 _____ **(10 points)**
6. Module #3 _____ **(10 points)**
7. What code was used to test module #1? _____ **(10 points)**
8. What code was used to test Module #2? _____ **(10 points)**
9. What code was used to test Module #3? _____ **(10 points)**
10. Without seeing the engine, how would you determine if the SAM is from a single cylinder or twin cylinder engine? _____ **(5 points)**

Score
_____

Contestant Number
_____

2010
Power Equipment Technology
Station # 6 – Failure Analysis

SCORE SHEET

Briggs & Stratton 120412

(75 points)

This section of the competition tests your ability to identify what the cause of the failure is and how it may have occurred. The components provided are from a model 120412-0023-E1 and displays one example of the five major engine failures normally encountered by the air-cooled engine service technician. The major engine failures are dirt ingestion, insufficient lubrication, overheating, over speeding, and breakage.

Perform the following tasks:

Using measuring tools and your knowledge of major engine failures, examine the engine parts supplied and answer the following questions to the best of your ability.

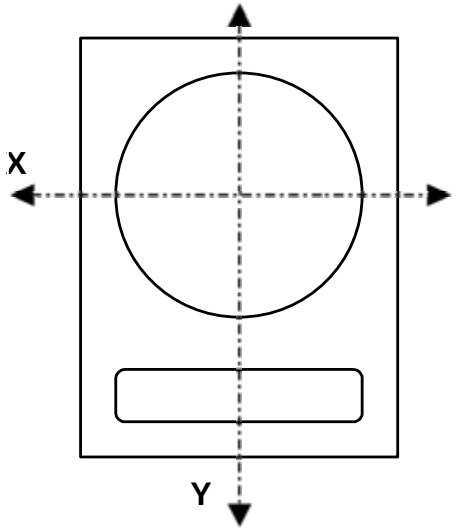
1. Measure the cylinder bore and record your findings;

Cylinder # _____

Top **X** _____
Y _____

Middle **X** _____
Y _____

Bottom **X** _____
Y _____



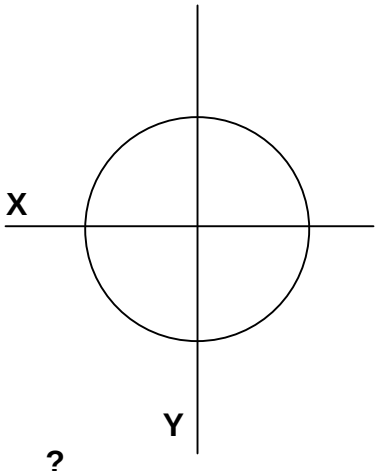
2. Measure the crankshaft and record your findings;

Crankshaft # _____

PTO Bearing **X _____**
Y _____

Crank Pin **X _____**
Y _____

Mag Bearing **X _____**
Y _____



3. What caused the engine to fail (pick one) _____?

A. Dirt Ingestion
B. Insufficient Lubrication
C. Overheating
D. Over speeding
E. Breakage

4. What action would you consider taking to help repair the engine for the customer? Pick the best option listed based on a shop labor rate of $45.00 per hour _____.

A. Sell the customer the following individual parts, new cylinder block, crankshaft, piston with rings and connecting rod, and crankcase cover?

B. Sell the customer a new piston with rings, connecting rod and crankcase cover and oversize the cylinder bore to the next good dimension?

C. Sell the customer a short block?

D. Sell the customer a new replacement engine?

Score
_____

SkillsUSA Champions at Work®

Contestant Number
_____

2010
Power Equipment Technology
Station # 7 – Internal

SCORE SHEET

Echo SRM-265 Power Head

Please Read Carefully.

In front of you is an SRM-265 Echo Power Head along with the necessary tools to perform the following tasks.

1. What is the spark plug gap? _____ 10 pts_____
2. What is the engine compression? _____ 20 pts_____
3. What is the air gap on the ignition module? _____ 20 pts_____
4. What type of ignition does this have? _____ 20 pts_____
5. What type of clutch is used? _____ 20 pts_____

Once you have finished these steps, ask the judge to check where you are and then reassemble the unit. Do not reassemble until the judge has looked at your work.

6. Correctly reassemble the power head 5 pts _____

Score
_____

SkillsUSA Champions at Work®

Contestant Number
_____

2010
Power Equipment Technology
Station # 8 – Measurement

SCORE SHEET

This station will test your knowledge of using basic measurement tools. Please read the questions carefully and answer based on your measurements. All tools needed are provided for you and you may write on this sheet. **Each question is worth 10 points.**

1. **Cylinder Head Gasket Kit: 15 041 07-S.** You have been contacted by your source of parts supply to check your stock of head gaskets. It's possible that the wrong head gasket was packaged in the kit. Measure the thickness of the head gasket on the outside edge and record your findings below to the nearest hundredth.
   - _____

2. **Oil Dipstick: 15 038 04-S** A customer has brought his engine into the shop for you to look at. He is complaining that when he installed the 15 038 04-S dipstick it reads low on oil, but with his old dipstick it reads full. Measure the width of the crosshatching on his new dipstick and record your measurement to the nearest tenth.
   - _____

3. **Crankshaft: 15 014 04-S** Measure the connecting rod journal and record your measurement below to the nearest thousandth.
   - _____

4. **Valve, Exhaust: 15 016 01-S** Measure the valve stem diameter near the middle and record your measurement to the nearest thousandth.
   - _____

5. **Camshaft Kit: 15 010 06-S** Measure the camshaft bearing surface outer diameter at the gear and lobe ends. Record your measurements to the nearest thousandth.

    - Gear End: _____
    - Lobe End: _____

6. **Piston Kit: 15 874 01-S** Using the feeler gauges, measure the top, middle, and oil control ring to groove side clearance. Record your measurements to the nearest ten-thousandth.

    - Top Compression Ring-To-Groove Side Clearance: _____
    - Middle Compression Ring-To-Groove Side Clearance: _____
    - Oil Control Ring-To-Groove Side Clearance: _____

7. **Spark Plug:** Measure the gap on the spark plug. The recommended plug gap is 0.040 in. (1.02 mm).

    - Is the plug gapped correctly? **YES or NO**

Score
_____

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Contestant Number
_____

2010
Power Equipment Technology
Station # 9 – Running Adjustments

SCORE SHEET

Briggs & Stratton Engine

(75 points)

This station will test your ability to troubleshoot and adjust engine speed.

In front of you is a Briggs & Stratton OHV Engine that needs the top no load RPM and idle RPM set properly. Consult the repair manual for RPM and adjustment information. A tachometer, manual and tool are supplied for you. Once you feel you have it set, call the judge over to verify your final RPM readings for idle and top no load speed.

	Judge's Score
1. What is the top no load RPM for this engine? _____	**(10 pts) _____**
2. What is the Idle RPM for this engine? _____	**(10 pts) _____**
3. Does this engine utilize a governed idle system? _____	**(5 pts) _____**
4. (Judges: Was correct Top no load RPM achieved?)	**(25 pts) _____**
5. (Judges: Was correct Idle RPM achieved?)	**(25 pts) _____**

2010
Power Equipment Technology
Station # 10 – Two Cycle Running

SCENARIO - TANAKA

Please Read Carefully.

This Tanaka TBC255PF grass trimmer was recently purchased at a freight salvage sale by your customer.

The original carburetor and spark plug were damaged.

The customer installed a new carburetor and a new spark plug.

Following the customer repair, the trimmer is difficult to start.

When it does start, it runs erratically.

1. **Safely troubleshoot the trimmer.**

2. **Identify and replace any missing parts and repair it to proper operating condition.**

3. **Ask the judge for any parts which need to be replaced, by part number, using the Illustrated Parts List.**

Do not write on or in the Illustrated Parts List.

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STATION #10
TWO-CYCLE TROUBLESHOOTING
TOOLS PROVIDED

TBC225PF Illustrated Parts List
TBC225PF General Maintenance Sheet
Ignition Spark Tester
VOA Meter
Digital Tachometer
3mm T-Handle Allen Wrench
4mm T-Handle Allen Wrench
Needle-Nosed Pliers
Hemostat
Spark Plug Wrench
Phillips-Tip Screwdriver
Feeler Gauge
Air Gap Strips (Set of 4)

Score
_____

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Contestant Number
_____

2010
Power Equipment Technology
Station # 11 – Carburetor Service

SCORE SHEET

This Station will test your knowledge of a basic Walbro carburetor used on a single cylinder Kohler engine. You will be required to identify the correct color of the various parts listed below. You will use some colors more than once. Colors used are: Black, White, Blue, Green, Red, Orange, and Gold.

1.	Choke Valve (Plate)	_____	**(5 Points)**
2.	Idle Air Bleed	_____	**(5 Points)**
3.	Main Air Bleed	_____	**(5 Points)**
4.	Venturi	_____	**(5 Points)**
5.	Throttle Valve (Plate)	_____	**(5 Points)**
6.	Bowl Vent	_____	**(5 Points)**
7.	Fuel Inlet	_____	**(5 Points)**
8.	Shut-down Solenoid	_____	**(5 Points)**
9.	Float	_____	**(5 Points)**
10.	Main Jet	_____	**(5 Points)**
11.	Idle Orifice (Port)	_____	**(5 Points)**
12.	Progression Orifices (Ports)	_____	**(5 Points)**
13.	Idle Mixture Adjustment Screw	_____	**(5 Points)**
14.	Idle Speed Adjustment Screw	_____	**(5 Points)**

15.	Is the main jet on this carburetor adjustable?	**YES / NO (1 Point)**
16.	The shut-down solenoid closes off the fuel inlet to the bowl?	**YES / NO (1 Point)**
17.	Can you adjust the float on this carb?	**YES / NO (1 Point)**
18.	Is the idle adjustment screw limited in its amount of travel?	**YES / NO (1 Point)**
19.	The shut-down solenoid is electrically grounded through the carb?	**YES / NO (1 Point)**

2010
Power Equipment Technology
Station # 12 – Wildcard

SCENARIO – HYDRO-GEAR

Please Read Carefully.

Step 1

Using the exploded view of the ZT2800/ZT3100 Hydrostatic Transaxle provided, write the correct reference number next to the five part descriptions listed on the score sheet. Upon completion, turn in the score sheet to the judge.

Step 2

Remove and inspect the charge pump assembly and look for any signs of wear and/or damage to the Gerotor.

Show the judge that you have removed the Gerotor.

Reassemble the charge pump assembly, taking care to return it to the original orientation.

Do not write on the exploded view.