



Small Engine Mechanics

This Trail Badge is designed to build up the Body of Christ as well as equip the Trailman. An understanding of how small engines work can be used as a ministry, a hobby, and a profession. Small engines are used to make our lives easier and more productive: lawn care, construction, recreation, and agriculture, among others.

Name _____

This Trail Badge will serve to instruct you in the basic operation and theory of a four-stroke engine. You may need to use the internet and the library. You will need a mentor who has knowledge of small engines and how they work. You should be able to take apart a small four-stroke engine and put it back together with minimal help from a mentor.

Do the following requirements (1-4)

- _____1. Read 1 Corinthians 12:12-27 and explain how the principle Paul is teaching can relate to a small engine.
- _____2. List 3 examples of machines in everyday life that use a small 4-stroke engine and describe how the engine improves production and use of the machine.
- _____3. Acquire a small engine and prepare your work space.
- _____4. Participate in a work space safety orientation with your Mentor or Instructor to include:
 - _____a. Safety with liquid fuels and chemicals, including proper ventilation
 - _____b. Safety with hand tools
 - _____c. Cleanliness
 - _____d. Organization
 - _____e. Fire Extinguisher availability, proper classification for fuel fires, and operation

Identification: Do the following requirement (5):

- _____5. With a drawing of a 4-stroke engine, do the following:
 - _____a. Describe the operation and cycle of the 4-stroke engine
 - _____b. Point out the major parts of a 4-stroke engine and its starting system
 - _____c. Identify the basic hand tools required to disassemble and reassemble the engine.
 - _____d. List the common bolt sizes used in the engine

- _____e. Describe or show the commonly used grease and degreasers

Inspection and Investigation: Do the following requirements (6-9):

- _____6. Describe and Demonstrate the following:
 - _____a. Use of the basic tools required to disassemble and reassemble the engine.
 - _____b. Removal of the blower housing and shrouds
 - _____c. Removal of the cylinder head and fuel system
- _____7. Investigate and Perform the following:
 - _____a. Describe the condition of the combustion chamber
 - _____b. Remove the crankcase breather cover and describe the condition
 - _____c. Use a feeler gauge to measure valve clearance
 - _____d. Remove the flywheel and describe the condition
 - _____e. Measure the Bore diameter and Stroke
- _____8. Investigate and Perform the following:
 - _____a. Remove and clean the crankcase cover
 - _____b. Describe the camshaft and the cam timing
 - _____c. Remove the piston and the camshaft
 - _____d. Describe the Splash Lubrication System
 - _____e. Clean the crankcase
 - _____f. Remove and inspect the crankshaft
- _____9. Describe the 4-stroke engine using engine components

Installation and Operation: Do the following requirements (10-11):

- _____10. Reassemble and Reinstall the following:
 - _____a. Reinstall the crankshaft
 - _____b. Reinstall the camshaft and tappets
 - _____c. Check piston and rod movement
 - _____d. Install the oil slinger
 - _____e. Reinstall the crankcase cover with a new gasket
 - _____f. Reinstall the flywheel
 - _____g. Check the crankshaft end play
 - _____h. Check the rotation of the crankshaft
 - _____i. Reinstall the cylinder head

- _____j. Reinstall the blower housing and shrouds
 - _____k. Check the operation of the kill switch
 - _____l. Clean the carburetor and fuel tank
 - _____m. Describe the operation of the carburetor
- _____11. Start the engine and review

Note to the Mentor:

"A good mentor imparts wisdom, character, and craft" - John Sowers, Relevant Magazine, Issue 77

This Trail Badge should take a minimum of 12-15 hours and will require a 4-5 hp lawnmower engine. These engines are readily available at repair shops, scrap yards, yard sales, and from friends and relatives. Usually, these engines can be found for around \$20. A small assortment of hand tools and a very few specialized tools will be needed as well as a space where the engine can be stored between working sessions. It may be necessary to show an operation, then ask the Trailman to perform the same operation on their own, repeating it as necessary to acquire proficiency and/or understanding.

To demonstrate his understanding, the Trailman should be able to:

- 1) Describe the basic parts/components*
- 2) Discuss their operation*
- 3) Disassemble and reassemble a basic 4-stroke engine*

Resources:

Basic 4-stroke Engine Course such as the one available at: www.crankinengines.com

Single Cylinder L Head Repair Manual: Briggs & Stratton Part # 270962

Website: <http://auto.howstuffworks.com/engine2.html>

Website: <http://www.animatedengines.com/otto.html>

Trail Badge Mentor Signature

Date

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