Helpful Helper’s Hints

The following hints are written for helpers who have little or no experience with small engines and related equipment. Even experienced helpers who are familiar with many of these hints may find them helpful. Some of the activities go beyond the small engine to science-related topics.

Level 1, Crank It Up!

Parts Are Parts
You can help youth by finding a machine powered by a small engine. The machine may be a lawnmower (push or riding), roto-tiller, snow thrower or other machine readily available. Be sure an operator’s manual is available, because it will provide much useful information. Not all the items listed in this activity will be available on all machines. For example, some engines will have a choke and others will have a priming bulb to create a rich mixture for starting.

Answer Key for Figure (top to bottom)
Left side: Gas tank, Oil fill, and Cutting height
Right side: On/Off switch, Speed control, Air cooling vents, Starter-pull, Air cleaner, Spark plug, Wheels, Mower blade

Crank It Up!
In starting the engine be sure youth follow the procedure listed in this activity. Also check the operator’s manual for the correct starting procedure. If the machine has a pull start, check to be sure youth have sufficient strength to start the engine safely. You may have to pull the rope to start the engine. If a youth is unable to start the engine, he or she may be unable to operate the machine safely. Allow the youth to start the engine only when you are present.

Time for Tools
Help youth find these tools. Many of them may be found in the home. This may be an opportunity for youth to start their own personal tool set, including a toolbox, if they have much interest in small engines. Most of these tools can be found at the local hardware store. If you do not have these tools and can’t afford them, you may want to take youth to a hardware or department store with hardware sections. In many of these stores you can obtain help in finding and identifying these tools without purchasing them.

Answer Key for Time for Tools
Box-end wrench ............. j
Container for gasoline....... h
Feeler gauge, wire .......... d
Hammer........................ g
Open-end wrench .......... c
Owner’s manual ........... m
Pliers ........................ a
Rags .......................... f
Screwdriver ................. b, k
Socket set ..................... i
Socket wrench, rachet .......... e
Spark plug socket ............. l

Parts Key for Table
a 5. Exhaust port/muffler
b 2. Carburetor
d 3. Cylinder head
g 1. Blower housing
f 4. Engine block and crankcase
e 7. Spark plug

Parts Key for Figure, (top to bottom)
Left side: 3, 6, 4
Right side: 7, 1, 2, 5

A Slippery Subject!
Youth may need some assistance in obtaining various grades of engine oil. Be sure the oils have different SAE (Society of Automotive Engineers) numbers, which indicate the viscosity (or resistance) to flow. The oil is available in one quart containers at most hardware stores. Youth may need some help timing the experiments. As the temperature decreases, the oil will flow more slowly. This is important because the oil must flow through some small passages such as bearings. If it is too cold and the oil is very stiff, or has a high viscosity, the bearings will not be properly lubricated.

Suck It Up!
Youth may need help finding a vacuum cleaner and the clothing materials with a wide range of weaves. When placing the material over the suction end of the hose, be sure the rubber band has sufficient strength to prevent material from being drawn into the hose. One source of dirt may be the dirt already collected in the vacuum cleaner bag. Youth may need help with the timing at the same time they are vacuuming the dirt. You will find that the tighter weave will prevent
Helpful Helper’s Hints

more dirt from entering the vacuum cleaner, which is the purpose of an air filter on an engine.

Cool It!
Any gasoline engine produces large quantities of heat, which must be removed from the engine. This is done by blowing air through and/or around the engine for air-cooled engines. By blowing air past the glass of hot water, the temperature will drop more quickly. The hot water can be tap water. Youth should not heat the water to boiling because of the risk of burns. Youth may need some help in reading the thermometers at the specific times listed. You may want to keep track of the time while youth read the thermometer.

Spark It Up!
Spark plugs provide the spark that ignites the fuel:air mixture. If the spark does not occur or is very weak, the engine will malfunction. After changing the engine oil and servicing the air cleaner, caring for the spark plug is the next most frequent engine maintenance. The spark plug electrodes may need to be cleaned or the gap may need adjustment. The small engine used in earlier activities can be used here. Youth must have a spark plug socket and a wire gauge. These are low-cost tools unless you purchase a full socket set, which often contains a spark plug socket.

Let It Breathe!
All gasoline or diesel fuel powered engines require air for mixing with and burning of the fuel. The air must be clean or the engine will have excessive wear internally over many hours of use. The air cleaner filters the dirt from the air during engine operation. Many engine manufacturers recommend servicing the air cleaner every 25 hours of operation and more frequently in dirty conditions. The service required for an air cleaner is based on the type of air cleaner. The operator’s manual is the best source of information for servicing.

Keep It Labeled!
Youth may need help finding a machine with the safety labels in place. Also review the operator’s manual for safety messages and to identify any missing safety decals. You should make youth aware of why some locations on these machines will cause serious injuries.

Close Clues! What to Wear?
Machines powered by small engines have caused many injuries. Wearing the proper clothing can minimize or even prevent those injuries. Review the Caution Corner section for information regarding clothing and other safety gear.

Lawn Ranger
Small engines are used in many machines for lawn and garden care. These machines are designed for a very specific purpose. Below is a key to assist you in matching the right tool to the correct mission.

Learn to Earn
The focus of this activity is finding information about careers related to small engines. Help youth find someone who works with small engines repair and is willing to take time to visit with the youth. Be sure to review the questions that are developed for the interview. Also be sure youth thank the person for the interview.

Wise Buys
The quality and price of parts and tools can vary. Visit an auto parts or hardware store with youth to obtain this information. Be sure to ask the people working in these stores about the quality. Be sure to read labels for helpful information. You may want to visit more than one store to obtain additional information.

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Mission | Tool
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cut the grass | lawnmower
clear long driveway after major winter storm | snow thrower
cut dead maple tree in backyard | chainsaw
prepare garden for spring planting | tiller
remove tall grass and weeds growing around a playground | string trimmer
remove overgrown grass along sidewalks | edger
move leaves into pile for bagging | leaf blower
chop leaves and clippings for composting or mulching | chipper/shredder
trim hedge | hedge trimmer