

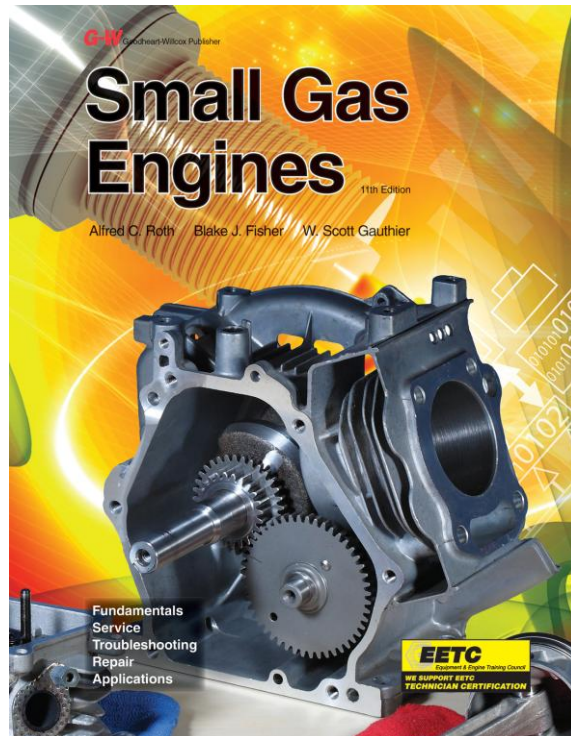
*Correlation of*  
**Small Gas Engines, by Roth, Blake, Gauthier**  
**(Goodheart-Willcox Publisher ©2017)**  
to  
**Precision Exams Small Engines Standards**

Goodheart-Willcox is pleased to partner with Precision Exams by correlating *Small Gas Engines* to their Small Engines standards. Precision Exams standards and Career Skills Exams were created in concert with industry and subject matter experts to match real-world job skills and marketplace demands. Students who pass the exam and performance portion of the exam can earn a Career Skills Certification.

The correlation chart below lists the Standards, Objectives, and Indicators for the Small Engines exam in the left column. Corresponding content from *Small Gas Engines* that can be used by a student to help achieve the standard, objective, or indicator is listed in the right column.

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Standards / Objectives / Indicators	Textbook Pages
<b>Standard 1: Understand General Shop Safety.</b>	
Objective 1. Learn safe working habits and procedures. Pass a safety test with 100 percent.	3–10, 13–28, 371–373
Indicator 1 Personal safety.	3–10, 13–28, 371–373, 338–389
Indicator 2 Tool and equipment safety.	13–28, 79–81, 372–373, 382–383, 401–402, 437–438
Indicator 3 Workplace safety.	3–10, 13–28, 371–373
Objective 2. Comply with safety rules for working with automotive chemicals.	4–5, 9–10, 371–373
Indicator 1 Chemical manufacturers provide a material safety data sheet (MSDS) for each chemical they produce.	10

**Correlation of *Small Gas Engines* to Precision Exams Small Engines—page 2**

<b>Standards / Objectives / Indicators</b>	<b>Textbook Pages</b>
Indicator 2 Store chemicals in properly labeled containers.	4–5, 9–10, 372
Objective 3. Identify the harmful exhaust gases encountered in the small engine field and the hazards they present.	6, 152–155, 372
Indicator 1 Hydrocarbons (HC) and carbon monoxide (CO).	6, 152–155, 372
<b>Standard 2: Understand Basic Hand Tools, Fasteners, and Shop Equipment.</b>	
Objective 1. Identify, size, and measure metric and standard fasteners.	43–57
Indicator 1 Bolts, nuts, lock washers, keys, cotter pins, and snap rings.	43–57
Indicator 2 Right-hand and left-hand threads, and coarse and fine threads.	47–49
Objective 2. Correctly identify and use basic hand tools.	13–40
Indicator 1 Screwdrivers, wrench, sockets, drive handles, extensions, pliers, hammer, chisels, punches, files, hacksaw, pullers, vises, drill bits, grinder.	13–28
Indicator 2 Describe the use of each of the above tools.	13–28
Objective 3. Identify and demonstrate use of basic measuring tools (accurate to 1/32" or 1 mm).	28–40
Indicator 1 Micrometers, rulers, feeler gauges, compression gauges, and digital multimeter (DMM).	28–40, 79–81, 248–250
Objective 4. Use reference manuals or information systems to find service procedures and specifications.	250–254
Indicator 1 Computer oriented.	250–254
Indicator 2 Printed manuals.	250–254
Indicator 3 Owner's manuals.	250–254
<b>Standard 3: Identify and Perform Basic Services on a Small Engine.</b>	
Objective 1. Locate and identify basic engine components.	97–116, 307–322
Indicator 1 Identify engine components.	97–116, 307–322
<ul style="list-style-type: none"> <li>Block, crankshaft, camshaft, piston, cylinder head, connecting rod, valve train, timing components</li> </ul>	97–113

**Correlation of *Small Gas Engines* to Precision Exams Small Engines—page 3**

<b>Standards / Objectives / Indicators</b>	<b>Textbook Pages</b>
<ul style="list-style-type: none"> <li>Fuel systems: carburetor, filter, lines, tank.</li> </ul>	142–150, 159–184, 257–274, 277–283
<ul style="list-style-type: none"> <li>Ignition systems: spark plug, magneto, coil.</li> </ul>	189–204, 285–302
<ul style="list-style-type: none"> <li>Cooling system: cooling fins, shroud, and flywheel.</li> </ul>	114, 223–230, 312
<ul style="list-style-type: none"> <li>Lubrication system: dipstick, oil slinger or pump, oil plug, oil.</li> </ul>	210–219, 236–238
<ul style="list-style-type: none"> <li>Exhaust system: muffler, exhaust gasket.</li> </ul>	150–152, 242–243, 385, 432
Objective 2. Change engine oil and filter on a small engine. Use proper disposal methods for waste oil.	9, 236–238, 398, 425–432
Indicator 1 Check fuel filter.	143, 259–260, 384–385, 464
Indicator 2 Check air filter.	146–150, 240–242, 384, 432
Indicator 3 Change and gap spark plug.	239–240, 286–289
Indicator 4 Remove and sharpen lawn mower blade.	378–379, 433
Indicator 5 Check oil level.	236–237, 385, 393, 398
Indicator 6 Perform an oil change.	236–238, 398, 425–432
Objective 3. Understand the four-stroke cycle.	89–92, 95
Indicator 1 Intake.	89–90
Indicator 2 Compression.	90
Indicator 3 Power.	90–91
Indicator 4 Exhaust.	91
Objective 4. Understand the two-stroke cycle.	92–95
Indicator 1 Intake/compression.	92–94
Indicator 2 Power/exhaust.	92–94
Indicator 3 Explain the differences and similarities between 2-cycle and 4-cycle engines.	89–95
Indicator 4 Intake and exhaust ports on 2-cycle engines versus valves on 4-cycle engines.	89–95
Indicator 5 Correctly mix 2-cycle oil and gasoline mixture.	141, 213–214
<b>Standard 4: Perform a Diagnosis on a Small Engine.</b>	

**Correlation of *Small Gas Engines* to Precision Exams Small Engines—page 4**

<b>Standards / Objectives / Indicators</b>	<b>Textbook Pages</b>
Objective 1. Understand combustion, internal and external, as it relates to the four elements of combustion.	85–88, 89–94
Indicator 1 Fuel.	85–88, 89–94
Indicator 2 Air.	85–88, 89–94
Indicator 3 Compression.	85–88, 89–94
Indicator 4 Spark.	85–88, 89–94
Objective 2. Troubleshoot fuel system problems.	142–150, 257–274, 277–283
Indicator 1 Carburetor.	142–150, 159–184, 257–274, 277–283
Indicator 2 Fuel tank/filter.	142–150, 257–274, 277–283
Indicator 3 Fuel lines/pumps.	142–150, 257–274, 277–283
Indicator 4 Air filter/box.	142–150, 240–242
Objective 3. Troubleshoot ignition system problems.	189–204, 285–302
Indicator 1 Perform spark test.	285–286
Indicator 2 Remove and replace spark plug.	239–240, 286–289
Indicator 3 Check and gap spark plug.	239–240, 286–289
Indicator 4 Check magneto, air gap, and kill-wire.	289–302
Objective 4. Troubleshoot compression problems.	246–250
Indicator 1 Perform a compression test.	248–249
Indicator 2 Define a wet test.	248–249
Indicator 3 Perform a cylinder leak-down test.	249–250
<b>Standard 5: Disassemble and Reassemble a Small Gas Engine.</b>	
Objective 1. Identify major small gas engine components and parts.	307–322, 325–336, 339–353, 355–366
Indicator 1 Cylinder block.	97–98, 325–329
Indicator 2 Side cover.	150, 316–317
Indicator 3 Cylinder.	97–98, 325–329
Indicator 4 Crankshaft and crank gear.	98–99, 329–332
Indicator 5 Connecting rod.	107–109, 335–336
Indicator 6 Bearing.	107–109, 331–332
Indicator 7 Piston.	100–107, 332–335
Indicator 8 Piston-pin (wrist-pin).	107, 334
Indicator 9 Rings (compression ring/oil control ring).	103–106

**Correlation of *Small Gas Engines* to Precision Exams Small Engines—page 5**

<b>Standards / Objectives / Indicators</b>	<b>Textbook Pages</b>
Indicator 10 Tappets/lifters.	111, 345, 352
Indicator 11 Valves (intake/exhaust).	110, 341–342
Indicator 12 Valve spring and valve retainer.	110, 341–342
Indicator 13 Camshaft.	110–113, 339–341
Indicator 14 Cylinder head.	97–98, 363
Indicator 15 Head gasket.	58–60, 363
Indicator 16 Reed valve (2-stroke).	110
Objective 2. Disassemble a small gas engine.	307–322
Objective 3. Inspect major small gas engine components and parts.	307–322, 325–336, 339–353, 355–366
Indicator 1 Cylinder head torque pattern.	59–60, 314–315, 363–364
Indicator 2 Inspect the cylinder.	325–329
Indicator 3 Ring end gap.	358–359
Indicator 4 Inspect the piston.	319–321, 332–336, 357–362
Indicator 5 Connecting rod, bearing clearance (plastic gauge).	330–332, 361–362
Indicator 6 Check crankshaft endplay.	365
Indicator 7 Check valve clearance.	352–353, 363–364
Indicator 8 Inspect valve and valve seat.	341–342, 353
Objective 4. Recondition, repair, or replace components and parts.	235–254, 257–274, 285–302, 325–336, 339–353, 355–366
Objective 5. Reassemble a small gas engine.	355–366
<b>Standard 6: Solve Basic Mathematical Equations Related to Automotive.</b>	
Objective 1. Solve whole number problems with two- and three-digits.	31–35, 122–125, 129, 333, 335
Indicator 1 Addition.	31–35
Indicator 2 Subtraction.	129, 333, 335
Indicator 3 Multiplication.	122–125
Indicator 4 Division.	122–125
Objective 2. Solve fraction problems.	31–35, 122–125, 129, 333, 335
Indicator 1 Addition.	31–35, 67
Indicator 2 Subtraction.	129, 333, 335
Indicator 3 Multiplication.	122–125
Indicator 4 Division.	122–125

**Correlation of *Small Gas Engines* to Precision Exams Small Engines—page 6**

<b>Standards / Objectives / Indicators</b>	<b>Textbook Pages</b>
Objective 3. Solve decimal problems with two- and three-digits.	31–35, 122–125, 129, 333, 335
Indicator 1 Addition.	31–35
Indicator 2 Subtraction.	129, 333, 335
Indicator 3 Multiplication.	122–125
Indicator 4 Division.	122–125
Objective 4. Solve basic ratio-to-proportion problems.	127, 141, 160, 213–214, 258–259
Indicator 1 Fuel/air mixture.	160, 258–259
Indicator 2 Oil/gas mixture.	141, 213–214
<b>Standard 7: Understand the Importance of Employability and Work Habits.</b>	
Objective 1. Integrity.	484–487
Objective 2. Punctuality.	484–485
Objective 3. Staying on task.	484–485
Objective 4. Productive team worker.	486–487
Objective 5. Leadership.	487

Standards / Objectives / Indicators	Textbook Pages
<b>Standard 8: Understanding of the Small Vehicle Technician as a Profession and Will Develop Professional Skills for the Workplace.</b>	
Objective 1. As a participating member of the SkillsUSA student organization, complete the SkillsUSA Level 1 Professional Development Program.	—
Indicator 1 Complete a self-assessment inventory and identify individual learning styles.	478–480
Indicator 2 Discover self-motivation techniques and establish short-term goals.	478–480, 484–488
Indicator 3 Determine individual time-management skills.	485
Indicator 4 Define future occupations.	478–480
Indicator 5 Define awareness of cultural diversity and equity issues.	—
Indicator 6 Recognize the benefits of conducting a community service project.	—
Indicator 7 Demonstrate effective communication skills with others.	484–487
Indicator 8 Participate in a shadowing activity.	479
Indicator 9 Identify components of an employment portfolio.	479–484
Indicator 10 Explore what is ethical in the workplace or school.	486
Indicator 11 Demonstrate proficiency in program competencies.	484–488
Indicator 12 Explore what is ethical in the workplace or school.	486
<ul style="list-style-type: none"> <li>• State the SkillsUSA motto.</li> </ul>	—
<ul style="list-style-type: none"> <li>• State the SkillsUSA creed.</li> </ul>	—
<ul style="list-style-type: none"> <li>• Learn the SkillsUSA colors.</li> </ul>	—
<ul style="list-style-type: none"> <li>• Describe the official SkillsUSA dress.</li> </ul>	—
<ul style="list-style-type: none"> <li>• Describe the procedure for becoming a SkillsUSA officer.</li> </ul>	—
Objective 3. Display a professional attitude toward the instructor and peers.	484–487