

Development of A 4-H Project Book: Ready, Set, Mow!

Master's Project

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Section 1 – Introduction

Need for Project

Lawnmowers are a commonality in all aspects of society. From rural areas to green spaces in cities, mowing grass is part of daily life in the United States. The U.S. Bureau of Labor Statistics found that in the year 2020, 13% of Americans engaged in “lawn and garden care” (U.S. Bureau of Labor Statistics, 2021). Though useful, lawnmowers present a risk to operators and bystanders. Between 2004 and 2013 there were an estimated 9,350 lawnmower related injuries to children ages 20 and under per year, hardly a change from the 9,400 annual injuries to the same age range between 1990 and 2004 (Bachier & Feliz, 2016; Vollman & Smith, 2006). As lawn mower technology and safety components continue to increase, one justifiable cause of such a steady rate of injury could be a lack of lawnmower safety education for youth operators and bystanders. Therefore, given the magnitude of the problem, there is a need for materials to educate youth on operating lawnmowers.

The 4-H Program

Youth education and development takes on many forms and is present in many programs across the United States. One such program is 4-H, which is delivered by the Cooperative Extension Service, and reaches nearly 6 million youth each year (National 4-H Council, 2021b). These county-based programs are grounded in Cooperative Extension’s mission and history related to agriculture, science, mechanical arts, and education. 4-H provides hands-on, experiential education opportunities to youth in all 50 states, the District of Columbia, Guam, Puerto Rico, and the U.S. Virgin Islands (National 4-H Council, 2008).

Youth involved in 4-H range in age from five to nineteen years old. Younger members, ages five to eight do not complete an actual project, but rather participate in leader directed activities that explore topics such as health, earth and the environment, citizenship, plants and animals, science and technology, personal development, and creative arts (The Ohio State University Extension, 2022). Older members, ages nine to nineteen have a much more active experience in 4-H as many program areas are member directed. One such area is the completion of project books, which contain a wealth of information and activities.

Projects can be completed by participating in activities through organized project groups or by carrying out the activities individually under the guidance of a parent or other adult (The Ohio State University Extension, 2022). Project books focus on engaging youth with the experiential learning model through experience, reflection, generalization, and application activities (Horton et al., 1999). 4-H programs also take on many other forms such as in-school and after-school programs, camping programs, teen-teacher programs, such as CARteens, and 4-H clubs (Carver & Enfield, 2006). 4-H programs promote positive youth development by involving programmatic strategies that assist youth in the successful transition to adulthood (National Research Council and Institute of Medicine, 2002). Positive youth development is essential to developing skills such as taking initiative, learning responsibility, teamwork, effective communication, and confidence in social situations, all of which will aid youth in the transition to adulthood (Lerner et al., 2011).

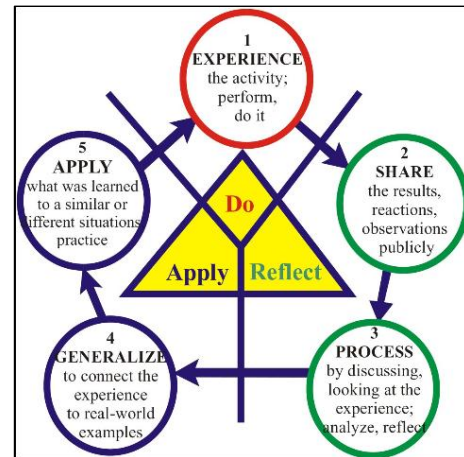
John Dewey introduced the theory of experiential learning in 1938, and in 1984 David Kolb expanded this theory and developed the experiential model we are most

familiar with today. Though not always rooted in theory, 4-H has been utilizing a “learn by doing” approach since the early 1900’s. 4-H programs center around the belief that “youth learn best when they are actively involved in relevant, real-world situations”

(Carlson, 1998, p. 44). The core element of engaging 4-H youth in these situations comes from their involvement with projects throughout their time in the programs. The role of projects is to set the stage for the development of reflective practices and inquiry that can be transferred to more situations (Ayas & Zeniuk, 2001). The 4-H experiential learning model is based on Kolb’s

Figure 1:

4-H Experiential Learning Model



model, but is modified to include 5 steps: experience, share, process, generalize, and apply; shown in figure 1 (Norman & Jordan, 2006). Participants experience the activity through doing it, they then share their experience by describing what happened. This is followed by participants processing the experience to determine what parts were most important and what information falls under common themes. Participants then generalize from their experience and relate it to their daily lives, in a prelude to applying what they learned to a new situation (Norman & Jordan, 2006). Reflection, in either oral or written form, is a core component of experiential learning theory. Most often in 4-H projects, written reflection occurs through the use of project books which engage youth in the experiential learning model and allow them to track their progress as they complete a project (Horton et al., 1999). Though some 4-H projects give the option for oral reflection, reflecting in written form may lead to deeper processing compared to oral

reflection (Moon, 2004). Based off the experiential learning model, most reflection formats include a review of the experience content, a review of participant's emotional reactions, a discussion of concepts and relationships that can be summarized from the experience, and finally a call to generalize and apply the learning to a new scenario.

Youth Safety Education

Learning through experience is a concept that many are familiar with, especially when it comes to safety. All warnings, guards, and safety procedures unfortunately are in place due to enough people being injured in a way that these safety features aim to prevent, and the agricultural industry is no exception. Research has shown that the most common agent of injury on farms is the tractor for both youth and adults (Jepsen, 2018). On most farms, it is common for children to begin operating tractors anywhere from the age of 4 to 16 (Freeman et al., 1998). A study on childhood agricultural fatalities in Indiana and Wisconsin found that tractors were involved in 50% of all fatal injuries to children ages 1 through 17 (Carrabba Jr. et al., 2001). In an effort to reduce injuries and fatalities while increasing safety awareness with tractors, education and operation training have been widely used. One educational program that has addressed this problem is the 4-H Tractor Program that is designed to train youth in the safe maintenance and operation of tractors and machinery. This program began with youth attending informal instructional meetings, completing student manuals, and demonstrating their knowledge and skills through optional operating contests. A study conducted on past participants of this program in Indiana found that 86.3% of respondents agreed or strongly agreed that they were safer tractor operators because of their participation in the program and 97.1% agreed or strongly agreed that the

program was effective at teaching youth to be safe tractor and machinery operators (Carrabba Jr. et al., 2001). An implication of the study was to produce new teaching materials which was accomplished with the rollout of a 4-H project book series in the late 2000's. This series of four project books utilize the 4-H experiential learning model to take youth on an in-depth learning initiative on topics of tractor safety, maintenance, and operation (Tormoehlen, 2007, 2008, 2009a, 2009b).

Though tractors are one of the most common sources of youth injury on the farm, another piece of machinery that causes injury to youth both on and off the farm is the lawnmower. Mowing grass is part of daily life in the United States for many people regardless of their community's population density. The U.S. Bureau of Labor Statistics found that in the year 2020, there was a 10.3% increase in the number of Americans engaged in "lawn and garden care" from 2019 (U.S. Bureau of Labor Statistics, 2021). With more Americans taking part in lawn care, it is important to increase safety efforts, especially for youth. Lawnmower related injuries in children ages 20 and under averaged 9,350 per year between 2004 and 2013, which is not much of a change from the average of 9,400 per year between 1990 and 2004 (Bachier & Feliz, 2016; Vollman & Smith, 2006). It is easy to make the assumption that rural youth are safer since they may be more likely to grow up around equipment, but rural areas had an incidence rate of 7.26 injuries per 100,000 cases, while urban areas had an incidence rate of 1.47 injuries per 100,000 cases between 2005 and 2017 (Shah et al., 2020). According to a study conducted with data from the U.S. Consumer Product Safety Commission's National Electronic Injury Surveillance System between 2005 and 2015, injury rates showed that children up to age 4 were more likely to be injured than older children, but

after age 12, the number of injuries increases with age (Harris et al., 2018). A study by the American Society of Plastic Surgeons suggest that continued advocacy and education are both needed to encourage manufacturers to fully implement safety recommendations and operators to practice safety recommendations, but ultimately the responsibility falls on the operator; 16 recommendations were provided of which 15 recommendations pertain to the practices in place by the operator, and only 1 recommendation could be implemented by manufacturers (Khansa et al., 2021). As lawn mower technology and safety components continue to increase, one justifiable cause of such a steady rate of injury could be a lack of lawnmower safety education to youth operators and bystanders. While injury prevention and safety education efforts should be a major point of emphasis for all children, evidence suggests that efforts should be further targeted for rural communities (Shah et al., 2020). With the steady rate of lawn mower injuries among children, 4-H provides an optimal fit for the development of educational curriculum for lawn mowers, especially in trying to reach rural youth.

Available Educational Resources

A review of 4-H projects that are available for youth yielded no explicit results for projects on lawnmowers (National 4-H Council, 2021a). Currently there is a national project book series on small engines which lets youth explore an engine on a push mower. Each of the three books briefly mentions push mowers, but has a primary focus of engine components, maintenance, and repair (Small Engines Curriculum Collection, n.d.). Up until 2018, there was also an Ohio 4-H lawn care project book that briefly mentioned mowing but focused more on the plant health and maintenance of the lawn,

rather than the lawn mower. At the national level, there is a competition for youth to showcase their knowledge of mowers and display their operational skills, however this is based on the small engine curriculum, factsheets, and question and answer information, rather than a comprehensive program. A team of 4-H volunteers who lead the Indiana Tractor & Mower 4-H Contest from Purdue University recognize the need for a comprehensive program that goes along with the competition for youth (T. Carrell, personal communication, December 4, 2021). While lawnmowers are included in curriculum and contests, there is not a dedicated resource focused on educating youth about lawnmowers.

Objectives & Procedures

This project has a primary goal of developing a 4-H project book that will educate youth on the safety, operation, and maintenance of lawn mowers. This goal will be met through the following objectives:

1. Describe the characteristics of lawnmower safety, operation, and maintenance that will educate youth in 4-H.
2. Develop activities based on the experiential learning model that has been adapted to the national 4-H curriculum.
3. Develop a training and practice guide based on the national 4-H lawn mower competition.
4. Provide a draft project book for evaluation in the 2022 4-H year.
5. Publish the project book for use in the 2023 4-H year.

Procedures

This project will focus on developing a curriculum for a 4-H project book that educates youth on safety, operation, and maintenance of lawnmowers. The development of curriculum content will be guided by input from a panel of experts from

The Ohio State University and Purdue University. The names and positions of panel members are listed in table 1.

Table 1
Panel of Expert Members

Name	Position / Role
Tony Carrell	4-H Extension Specialist from Purdue University and Leader of Indiana State 4-H Tractor Committee
Jane Wright	Ohio 4-H Curriculum Manager and Interim Director of Extension Publishing
Dee Jepsen	State Agricultural Safety and Health Leader of Ohio
Aaron Pedigo	Indiana State 4-H Tractor Committee Member
Chris Lake	Indiana State 4-H Tractor Committee Member
Andy Coats	Indiana State 4-H Tractor Committee Member
Vicki Coats	Indiana State 4-H Tractor Committee Member

Section 2 – Project Procedures

Content Development Procedures

The content for the 4-H project book was developed through a review of multiple sources including print and digital resources, a series of 4-H books on small engines, the panel of experts, and personal expertise from the author team. The development of content for the book occurred over several months which included several rounds of revisions until a final draft version was agreed upon. The drafted version was then pilot tested and used to collect feedback from 4-H volunteers in both Ohio and Indiana, while the final version was being developed by a graphic designer.

The content development of the book started in November 2021. I met with Dr. Jepsen, the State Agricultural Safety and Health Leader of Ohio, and we started by reviewing a current 4-H book series on small engines. These books primarily discuss small engines, but each had several references to push mowers in activities of the books, which were used to model potential activities for the current 4-H book. Using Dr. Jepsen's expertise in developing safety materials and my professional experience as a

landscaper, we used the types of activities and topics that were in the small engine 4-H books to develop a list of initial topics to be included in this 4-H book, shown in table 2. I then began writing the content for these topics, referencing my professional experience and several operator's manuals for the content. An activity was then determined for each topic that would allow youth to engage with the content. One such example is the *Getting to Know Your Mower* activity which prompts youth to look at the identifying information of their mower such as serial number and engine information; and then write it in their book for quick reference. All topics had written content and at least one associated activity before presenting the initial draft to the Purdue panel of experts.

Table 2
List of Topics Throughout Development of Book

Initial Topics to Be Included (11/19/21)	Revised List of Topics (1/31/22)	Final Included Topics (3/12/22)
Types of Mowers	Types of Mowers	Types of Mowers
PPE	Parts	Parts
Warnings & Cautions	Controls	PPE
Terrain & Rollovers	PPE	Safety Labels
Parts	Safety Labels	Riding Safety
Oil Maintenance	General Maintenance	Controls
Blade Maintenance	Cut Control & Height	Push Mower Operation
Filter Maintenance	Mowing Patterns	Cut Control
Tire Maintenance	Blade Sharpening	Mowing Patterns
Controls	Storage	Practice Pages
Operation	Riding Safety	General Maintenance
Storage	Push Mower Operation	Blade Sharpening
Skills	Troubleshooting	Storage
	Starting a Business	Troubleshooting

On December 4th, I met with members of Purdue Extension over Zoom and presented on the topics that I had developed. The group of twelve people consisted of five members of this project's panel of experts, along with 4-H judges and leaders. The members of this group oversee the Indiana 4-H lawnmower and tractor operation state contests. Based on their experience, they were able to provide detailed

recommendations of information that should be incorporated in this 4-H book. Specific recommendations included: *“there needs to be references to operator’s manuals to ensure kids understand their machine”*; *“specific parts that we have them identify on the parts-id test need to be included, such as discharge chute, oil fill cap, dipstick, spark plug, and PTO switch”*; and *“the activities need to be hands on and make the kids operate their mower before the competitions.”*

The group also provided an overview of the Indiana state contest and explained the components of the contest which included: (a) a written test that assesses mower information, safety, and parts identification; (b) a physical parts identification and pre-trip check; and (c) an operational obstacle course that includes turning, backing up, and a serpentine. They further explained that they would like to see components of this course included in the 4-H book so that youth could practice prior to their judged competitions.

The suggestions from the Purdue group were incorporated and the topics and content were updated to reflect the revisions. The topics of the 4-H book at this stage are reflected in Table 2 under January 2022. I held another meeting with Dr. Jepsen to bring her up to date on the Purdue meeting and discuss the revisions that I had made. We agreed to move forward to the next phase of formatting the content into a 4-H project book, which would be completed with the guidance of Jane Wright, the Ohio 4-H Curriculum Manager and Interim Director of Extension Publishing. Throughout February and March, Dr. Jepsen and I met with Jane on a weekly basis where she provided expertise on 4-H project book creation and formatting and showcased multiple recently released 4-H books, including an ATV Safety Project that was very similar in layout to what we all envisioned for this book. Jane also provided a publishing template that

guided me in organizing the content into a 4-H project book that could be sent to the graphic design team. Along with the template, Jane provided a deadline of April 1st to have this process complete so that the book could be sent to her graphic design team to be published for the 2023 4-H year.

Assembly & Analysis Procedures

Using the final content topics that were agreed upon by the panel of experts, I began to organize the content into the 4-H project book template. This step also included the creation of activity and side note titles, a glossary of key terminology, and reflection questions at the end of each project section. The creation of each of these components was done with reference to the *Characteristics of Experiential Activities* table, shown in figure 2 below, that identifies various characteristics of well-planned experientially based learning activities (Horton et al., 1999).

Figure 2
Characteristics of Experiential Activities

Page 1 Characteristics Experiential Activities	Student Ownership For Outcomes	Problem Solving	Results Personal	Failure	Examine & Explore Own Values	Learn From Consequences, Mistakes & Successes	Engaged Intellectually, Emotionally, Socially, Soulfully & Physically	Stressful or Jeopardy- like Situation	Start With Learner's Experience	Relationship To The Topic	Everything is Connected to Everything Else
Druian-Owens Owen	✓										
Luckman	✓	✓	✓	✓	✓	✓	✓				
Joplin				✓	✓		✓	✓	✓	✓	✓
Williamson		✓				✓	✓	✓			
Chapman										✓	
Proudman				✓	✓	✓	✓			✓	✓
Herbert				✓		✓	✓				
Hutchings & Wutzdorff							✓		✓		
Warren		✓									
Jernstedt	✓	✓					✓	✓	✓		
Knapp								✓	✓		
Reynolds		✓									
Quinsland & Van Ginkel							✓				
King	✓		✓	✓							
Heidin & Conrad		✓					✓				✓
Gibbons & Hopkins	✓	✓						✓			
Prochazka			✓								
Carver		✓					✓		✓		
Steinaker & Bell			✓						✓		

The template was completed and submitted to the graphic designer by the deadline of April 1st. The template was then copied, and I began to develop it into a draft 4-H book that would be used for reference in the 2022 4-H year and for an evaluation of the book. This process involved identifying images that complimented the activities and content to provide visual explanation of the information. A final approval between panel of expert members Dr. Jepsen and Tony Carrell, 4-H Extension Specialist from Purdue University and the Leader of Indiana State 4-H Tractor Committee, was completed prior to sending the draft out for use as an informational reference source for Indiana 4-H advisors and youth who were involved in the lawnmower competition for the 2022 year.

The other purpose of the drafted 4-H book was to obtain feedback through an evaluation of the book components (content, titles, images, layout, etc.), as a combined and finished product. To analyze the content of the book, an evaluation was developed using Qualtrics software. This evaluation consisted of questions that referred to the content within each type of section of the book; activities, reflections, and practice pages; along with questions that addressed the book as a whole. A copy of the evaluation can be found in Appendix A. A conversation with IRB was prompted to ensure exclusion of a review, due to this being an evaluation where no information on respondents would be collected. Exclusion was granted and this evaluation along with copies of the book were handed out and emailed to all judges and volunteers for the Indiana and Ohio 4-H lawn mower state competitions at the respective state fairs. This resulted in a potential outreach of 31 people to evaluate the book. While at the fair, several 4-H judges spoke to me about the book and gave me brief feedback on it.

Section 3 – Project Content

Draft Project Book Evaluation

The evaluation of the book was sent out in the form of a survey via email to 4-H leaders and volunteers at the Ohio and Indiana state mower competitions (see Appendix A). Along with the survey, a digital PDF draft version of the book draft was sent for reference while completing the survey (see Appendix B). This resulted in a potential outreach of 31 people to evaluate the book. The survey consisted of questions that evaluated the content, skill level, and overall organization of each section and activity of the book, along with a set of questions focusing on the book in its entirety. Participants were asked to select the activities and sections of the book that they wanted to evaluate and then the survey jumped to the questions that focused on those areas. Participants were asked to score the area of the book on a scale from 1 (*lowest*) to 10 (*highest*), along with the option to provide additional comments.

When asked about the “Activity” areas in the book, participants were asked to evaluate (a) the appropriateness of the activity to both the junior and senior age groups (b) the clarity of the instructions; (c) the appropriateness of the “More Challenges” activity; (d) the relevance of the content to current industry practices; (e) the content of the “background” information; (f) the effectiveness of the “Manual Moment” to encourage youth to look at their operator’s manual; (g) the appropriateness of the glossary words; (h) the relevance of the activity title to the activity content; (i) the clarity of tables, figures, graphics, and photos; and (j) the clarity and comprehensibility of the text, images, and the overall organization of the activity. When asked about the “Talking It Over” areas of the book, participants were asked to evaluate how well each question encouraged youth to engage in the respective part of the experiential learning cycle,

along with being asked how well the set of questions prompted youth to think about the respective project area as a whole. When asked about the “Practice Pages” areas of the book, participants were asked to evaluate (a) the clarity of the need to reference the operators manual, (b) the clarity of the instructions for the activity, (c) the comprehensibility of the graphic used to describe the layout of the obstacle course, (d) the appropriateness of the additional challenge in the “Mastering Your Skills” section, and (e) the effectiveness of the activity at teaching the intended skill. Participants were also asked to reference the book in its entirety and evaluate (a) the appropriateness of the content and activities to both the junior and senior age groups; (b) the relevance of the content to current industry practices; (c) the thoroughness and completeness of the content; (d) the relevance of headings and titles to section content; (e) the clarity and quantity of tables, figures, graphics, and photos; and (f) the clarity and comprehensibility of the text, images, and the overall organization of the book. The complete survey can be found in Appendix A.

The survey had a very low response rate of 6% ($n = 2$). The feedback received from these respondents indicated that the strongest aspects of the book included the “Manual Moment” sections ($M = 8.50$), glossary ($M = 8.00$), illustrations ($M = 8.00$), and readability ($M = 8.00$). The survey respondents indicated that the areas of the book that could use the most improvement included the differences between the junior and senior level activities ($M = 3.50$) and the backgrounds ($M = 5.50$).

Aside from the survey, qualitative feedback was also collected. This was completed in person at the Indiana State Lawnmower Competition and included conversations with 15 people. Through these interactions, both positive ($n = 12$) and

constructive ($n = 3$) criticism was collected. The positive feedback spanned many sections of the book and included several comments on the book as a whole. Responses about the practice pages included “practice pages are a good idea,” and “Practice pages will be very helpful for operation and the competition course.” Feedback on the activities of the book included “has good pictures of the controls,” “Pictures are helpful for the control activity,” “The jack picture is good at identifying the proper way to lift the mower,” and “The parts activity looks engaging.” Finally, responses on the book as whole included “this book fills a gap and provides a good source of information for kids,” “Looks good and it will definitely teach our kids more about mowers than what is currently available,” and “The book is a great idea as it is needed to provide guidance and not just information for a contest.”

There were three constructive responses about the book. Regarding the glossary, two comments were received “add a note to direct people to the glossary in the back of the book,” and “add pictures or images to the glossary.” A notable concern and response from a 4H member was that “there are a lot of words in the book compared to other books.”

After reviewing the survey responses and feedback with the panel of experts only one significant change was made to the content of the book which was the omission of the activity levels for junior and senior age ranges. In discussions with panel members from Purdue, their goal in having this division was to make the book an easier resource for youth participating in the state 4-H Lawnmower Competition as the contest is divided into two age groups. After seeing how the divided activities looked in a book format, they were open to combining the activities that could be done by youth of any age.

This aligned with the recommendations and discussion that occurred with Jane Wright who noted that the division of activities based on age was a common occurrence in past 4-H publications, newly published 4-H project books are moving away from this style to use space more effectively in the book and increase full use of the book. Based on the qualitative feedback, a note was made to the graphic design team to ensure a lot of images would be used throughout the book and that large sections of text would be broken up to make readability easier. Though limited responses were gathered, useful information was collected and implemented into the book. The draft version of the book and associated notes were submitted to the graphic design team for edits, and they completed the final formatting of the book.

Findings & Results

The result of this project was a 4-H book titled “Ready, Set, Mow!” which includes 13 different activities on the topics of mower safety, operation, and maintenance (See Appendix C). The book is organized into sections based on these topics and includes another section titled “Practice Pages” which prompts youth to develop their operational skills and confidence with some obstacle courses. The book can be used with all types of mowers, riding, zero-turn, or push, as the layout of the activities and topics covered apply to each.

The first section of the book focuses on mower safety and includes five activities. The first activity is *Getting to Know Your Mower* which encourages youth to identify key information about the make, model, and type of mower that they have, while learning about the various types of mowers that exist. *Pieces and Parts* is the next activity in which youth develop their ability to identify important components of their mower and learn what each part does. The third activity is *Dress for Success* where youth learn

about Personal Protection Equipment (PPE) required for mowing and allows them to compare their current mower attire to what should be worn to be dressed safely. The *Sticking to Safety* activity encourages youth to identify safety labels on their mowers and to reference their operator's manual to develop an understanding of what the labels mean. Finally, this section includes *Riding Safety*, an activity that allows youth to review the layout of their yard and identify potential hazards that they should be aware of when mowing. Collectively, these activities give youth a foundational understanding of safety issues that should always be reviewed before operating a new machine.

The second section of the book, titled *Making the Cut*, encourages youth to be intentional with their thought processes while operating their mowers. The first activity, *You're in Control*, teaches youth about the various controls that are needed to operate a mower and prompts them to identify and explain what each does. This activity also encourages youth to test each of the controls in an open area to see what each does. This is followed by *Pushing Along*, an activity that focuses on push mowers. Youth are encouraged to learn the starting and shut-off procedures for their mower and then prompted to go through these procedures to fully understand how their mower runs. The third activity is *Making a Clean Cut*, which brings in the topic of cutting height. Youth are encouraged to try mowing at several different heights and then comparing them to the measured height of the grass to make sure the mower is cutting true to its settings. Finally, youth are encouraged to learn about mowing patterns in *Your Yard is Looking Good*. Youth are prompted to mow in two different patterns and then asked to compare the differences that they notice. This teaches youth to think about how they can stripe their lawn.

The next section of the book contains the practice pages which consist of four different obstacle courses for youth to develop their maneuvering skills. These practices mirror various components of the actual skills course that youth can compete in at the state 4-H lawnmower operation competition. While each activity focuses on a different component of operating, each one is designed to increase in difficulty by narrowing the course, increasing speed, and attempting in reverse once the skill is developed. The first practice is called *Start, Go, Stop, Repeat*, and encourages youth to practice starting and stopping their mower. This is followed by *Turning it Around*, where youth practice turning at a wide radius to gain experience of knowing where the edge of the deck is in relation to the course. The next practice, *Turning on a Dime*, builds off the second practice, but this time the course is set up so that youth must do a serpentine pattern through the course. This develops their skill in turning at a much tighter radius. The final practice, *Putting it Together*, encourages youth to set up an obstacle course that incorporates all the previous courses so that they can combine their skills. Youth can record their progress and time spent practicing in the practice record located at the back of the book.

The final section of the book, *Mower Maintenance*, encourages youth to become familiar with common maintenance practices for their mower. The section starts out with the activity, *Time for Tools*, which prompts youth to identify the service intervals for their mower from the operator's manual. They are also asked to write down the last time each service was completed and to make a schedule for the next service. *Sharpening Your Skills* follows which encourages youth to go through the process of sharpening the blade of their mower with assistance from their project helper. The third activity is *Shed*

Time which focuses on having youth identify the steps needed to store their mower both in season and out of season. The final activity, *Troubleshooting Tips*, walks youth through the steps needed to troubleshoot a mower that won't start. They are also asked to reference their operator's manual to identify what specific problems may be the most common on their mower.

Apart from the practice pages, each section also includes a *Talking it Over* page. This page contains four questions which encourage youth to experientially reflect on the section by sharing, reflecting, generalizing, and applying what they have learned. Each of these reflection points is completed through a written question that relates back to an activity from the section. Each activity within these sections also includes a *Manual Moment* which mentions how the operator's manual can be used to learn more about the topic covered in that activity and encourages youth to always reference their operator's manual for the most relevant information. In the end of the book there is also a glossary which contains pertinent terms that appear throughout the book along with their definition as it relates to the topic of lawnmowers.

Discussion & Implications

Ready, Set, Mow! is intended to be a project book for all 4-H youth regardless of age. The panel of experts and I acknowledge that some activities such as *Sharpening Your Skills* may only be suitable for older youth. However, each activity can be completed with the guidance and assistance of the youth's project helper. This project is intended to serve as a guide for youth to learn about mowers and it is repeatedly stated that youth should always reference their operator's manual before engaging in an activity. The project can be completed within one 4-H year and can be repeated if a

different type of mower is used each time. If youth are repeating the project, they should complete different learning experiences and leadership activities to encourage growth of their knowledge and experiences.

From a 4-H leader or volunteer viewpoint, *Ready, Set, Mow!* is a project for youth interested in not only mowers, but also lawncare, small engines, or machinery. It is meant to be an introductory book for the topic of lawnmowers and after completing the project, youth who want to learn more about the topics covered in this project can take other projects to continue expanding their knowledge and experiences. One recommended project is the current small engine 4-H project series that focuses specifically on the engine component of machinery. From the standpoint of the 4-H state lawnmower operation competition, this book is meant to be a supplemental guide for information that youth may be assessed on in a contest. The practice pages directly correlate to various components of the competition course and serve as a way for youth to practice and develop their skills prior to the competition.

Recommendations

One recommendation is the expansion of content. While this book is an introductory level book and focuses only on lawnmowers, it provides a foundation for future books to be developed. Project books on other lawncare machinery such as weed-eaters, leaf blowers, and rototillers could be created to educate youth on pieces of machinery that are not recommended to youth by manufacturers. Other topics such as starting a lawncare business and maintaining lawn health could serve as next books for youth who are interested in entrepreneurship or entering a career in the lawncare industry.

Another recommendation for this book is to identify ways in which youth will be assessed on what they learned through the completion of the project book. Typically projects like this are judged based on a poster created by youth along with a review of the book for completeness. While these methods are useful for many projects, *Ready, Set, Mow!* has the potential to have a skill-based assessment that youth can engage in to demonstrate what they have learned. Activities such as part identification, use of an operator's manual, proper PPE, and others could all be developed from the activities in the book. This paired with a look into the completeness of the project book would provide a thorough evaluation of the knowledge and skills gained by youth that take the project.

A recommendation from the perspective of the lawnmower operation contest is to change information for the competition to reflect more of the content of the book. Information that youth are quizzed on at the contest could come directly from the project book rather than factsheets and other sources. While no changes are expected to occur right away, many members of the panel of experts agreed that this book could serve as the basis for the written part of the test in future years.

Conclusion

This project achieved the intended goal of developing a 4-H project book that educates youth on the safety, operation, and maintenance of lawn mowers. Through the development, evaluation, revision, and publication of *Ready, Set, Mow!* a new resource was created that fills the gap of educational materials for youth. The completion of this project fulfills recommendations by other organizations that sought to reduce lawnmower

injuries to youth through education. This project was funded through a USDA NIFA grant under the program Safety in Agriculture For Youth.

The 4-H project book will be available for use starting in the 2023 4-H year. It will be available via The Ohio State University Extension 4-H Project website. The book is also being submitted to the National 4-H Review Board for content review so that it can be made available to 4-H youth nationally, starting in 2024.

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Appendices

Appendix A

Ready, Set, Mow! Evaluation Survey

Q1 Thank you for taking the time to evaluate our new 4-H Project Book: *Ready, Set, Mow!* We look forward to getting your feedback so that we can ensure *Ready, Set, Mow!* provides a great learning experience for youth that are interested in lawnmowers.

Please indicate your role in 4-H below, then click the arrow to begin the survey.

- ☐ 4-H Advisor (1)
- ☐ 4-H Volunteer (2)
- ☐ 4-H Extension Agent (3)
- ☐ 4-H Parent (4)
- ☐ 4-H Member (5)
- ☐ Other (6)

Intro-A This section of the evaluation will prompt you to evaluate one or more of the **Activities** found in *Ready, Set, Mow!* Feel free to evaluate as many or as few as you would like to.

Q1-A Please select the all activities from the book you want to evaluate.

- ☐ Getting to Know Your Mower (1)
- ☐ Pieces and Parts (2)
- ☐ Dress for Success (3)
- ☐ Sticking to Safety (4)
- ☐ Riding Safety (5)
- ☐ You're In Control (6)
- ☐ Pushing Along (7)
- ☐ Making A Clean Cut (8)
- ☐ Your Yard Is Looking Good (9)
- ☐ Time for Tools (10)
- ☐ Sharpening Your Skills (11)
- ☐ Shed Time (12)
- ☐ Troubleshooting Tips (13)

Q2-A Please rate the following aspects of the *Field/1* Activity.

Question	Score Out of 10 (10 being the highest)
How well does the activity match the skill set of the youth in the junior age group (Ages 8-12)? (1)	

How well does the activity match the skill set of the youth in the senior age group (Ages 13-18)? (2)	
How clearly are the instructions for the activity communicated? (3)	
Does the "More Challenges" section provide an appropriate additional activity for the topic? (4)	
Is the content up-to-date and relative to the current state of machinery in use? (i.e. will the activity stay relevant over the next 5 years) (5)	
Does the content in the "Background" seem thorough and complete for the topic of the activity? (6)	
Does the "Manual Moment" effectively encourage youth to reference their operator's manual before, during, or after the activity? (7)	
Are the glossary words appropriate for the topic? (i.e. should other words be used also, or instead of the current list) (8)	
Does the activity heading match the content within the unit? Use the comment box for recommendations of activity titles. (9)	
Are tables and figures easy to understand, and do they work together to clarify the activity? (Not all activities will have these) (10)	
Do the illustrations (graphics and photos) effectively complement, explain, and clarify the content? (Consider quality and whether the quantity of illustrations is adequate.) (11)	
Is the text clear, correct, and written such that it is easily comprehended by its intended audience? (Consider sentence length, grammar, spelling and clarity of writing.) (12)	
Does the organization of the publication facilitate understanding of the content? (Consider major headings, logical order of materials, sidebars, index or table of contents, etc., if needed.) (13)	

Q3-A Please provide any comments about your responses.

Intro-T This section of the evaluation will prompt you to evaluate one or more of the **Talking It Over** activities found in *Ready, Set, Mow!* Feel free to evaluate as many or as few as you would like to.

Q1-T Please select all the *Talking It Over* sections from the book you want to evaluate.

- ☐ Mower Safety (Page 20) (1)
- ☐ Making The Cut (Page 30) (2)
- ☐ Mower Maintenance (Page 44) (3)

Q2-T Please rate the following aspects of the *Talking It Over* section.

Question	Score Out of 10 (10 being the highest)
How well does the "Share" question encourage youth to share their understanding of the project area? (1)	
How well does the "Reflect" question encourage youth to reflect on what they have learned in the project area? (2)	
How well does the "Generalize" question encourage youth to think about other situations where they would use what they learned in the project area? (3)	
How well does the "Apply" question encourage youth to apply what they have learned in the project area to a new situation? (4)	
Do the questions effectively prompt youth to think about the entirety of the project area? (i.e. too much or too little focus on one activity in a project area) (5)	

Q3-T Please provide any comments about your responses.

Intro-P This section of the evaluation will prompt you to evaluate one or more of the **Practice Pages** found in *Ready, Set, Now!* Feel free to evaluate as many or as few as you would like to.

Q1-P Please select the all Practice Pages from the book you want to evaluate.

- ☐ Practice 1: Start, Go, Stop, Repeat (1)
- ☐ Practice 2: Turn It Around (2)
- ☐ Practice 3: Turning On A Dime (3)
- ☐ Practice 4: Putting It Together (4)

Q5-P Please rate the following aspects of *Mastering Your Skills*

Question	Score Out of 10 (10 being the highest)
Does the introduction clearly communicate the need to reference operator's manual? (1)	
Are the instructions for the activity clearly communicated? (2)	
How well does the graphic explain the layout of the course to be set up? (3)	
Does the "Mastering Your Skills" section provide enough additional challenge to the activity? (4)	

Does the activity effectively teach the intended skill (listed in the introduction) to youth? (5)

Q6-P Please provide any comments about your responses.

Intro-E This section of the evaluation will prompt you to evaluate *Ready, Set, Mow!* as a whole book. This is the final section of the evaluation.

Q1-E Please rate the following aspects of the *Ready, Set, Mow!* 4-H Project Book in its entirety

Question	Score Out of 10 (10 being the highest)	Additional Comments or Suggestions
How well does the content match the skill set of the youth in the junior age group (Ages 8-12)? (1)		
How well does the content match the skill set of the youth in the senior age group (Ages 13-18)? (2)		
Are the activities appropriate for the youth in the junior age group? (3)		
Are the activities appropriate for the youth in the senior age group? (4)		
Is the content up-to-date and relative to the current state of machinery in use? (i.e. will the book stay relevant over the next 5 years) (5)		
Does the content of the publication seem thorough and complete? (6)		
Do the chapter headings match the content within the unit? (7)		
Are tables and figures easy to understand, and do they work together to clarify the activities? (8)		
Do the illustrations (graphics and photos) effectively complement, explain, and clarify the content? (Consider quality and whether the quantity of illustrations is adequate.) (9)		
Is the text clear, correct, and written such that it is easily comprehended by its intended audience? (Consider sentence length, grammar, spelling and clarity of writing.) (10)		
Does the layout effectively communicate the information to the intended audience? (Consider positioning of illustrations, choice of color, white space, font, binding, and overall visual appeal.) (11)		

Q2-E Please use the space below to provide any comments, or suggestions that you might have for the project book in its entirety.

C-1 Thank you for taking the time to complete this evaluation of our new 4-H Project Book: *Ready, Set, Mow!*

We greatly appreciate your feedback and look forward to making *Ready, Set, Mow!* available next year.

Appendix B

Draft Version of Ready, Set, Mow!



Name _____

Age (as of January 1 of the current year) _____

County _____

Club or group name _____

Project helper _____



THE OHIO STATE UNIVERSITY

EXTENSION



Disclaimer

This book is currently an unpublished draft and being used for pilot testing to obtain feedback for a master's degree project. For any questions regarding its use or content, please contact Forrest Lang at Lang.485@osu.edu.

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Note to the Project Helper

Congratulations! A 4-H member or other youth has asked you to serve as a project helper. You may be a parent, relative, project leader, friend, club advisor, or another important person. Your duties begin with helping the youth create and carry out a project plan, as outlined in the Project Guide. As a project helper, it is up to you to encourage, guide, and assist. How you choose to be involved helps to shape the learner's life skills and knowledge of the importance of mower safety and operation.

Your Role as Project Helper

Your contributions are critical to delivery of the 4-H program, which is committed to providing experiences that strengthen a young person's sense of belonging, generosity, independence, and mastery. Your interactions should support positive youth development within the framework of the Eight Essential Elements (also known as the Eight Key Elements):

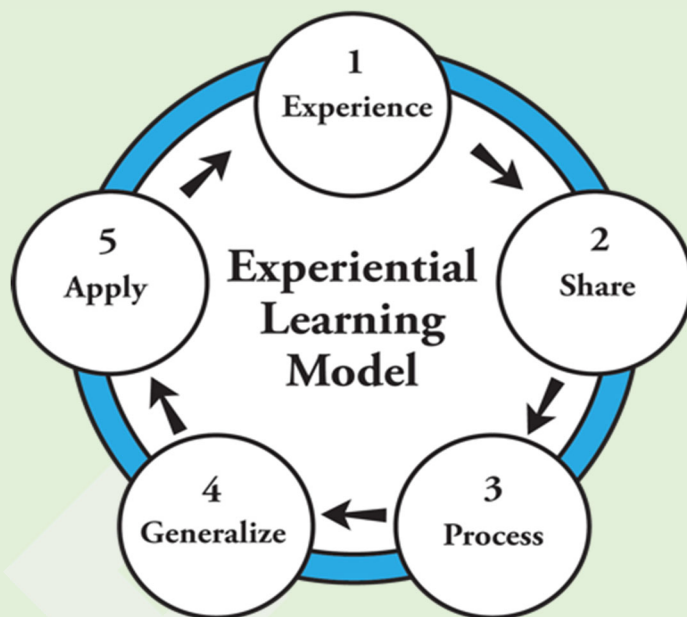
1. A positive relationship with a caring adult
2. An inclusive environment
3. A safe emotional and physical environment
4. Opportunity for mastery
5. Engagement in learning
6. Opportunity to see oneself as an active participant in the future
7. Opportunity for self-determination
8. Opportunity to value and practice service to others

For more information on the Eight Essential Elements, please refer to the *Ohio 4-H Volunteer Handbook* available online at **ohio4h.org**. On a practical level, your role as a project helper means you will strive to do the following:

- Guide the youth and provide support in setting goals and completing this project.
- Encourage the youth to apply knowledge from this project book.
- Serve as a resource person.
- Encourage the youth to go beyond the scope of this project book to learn more about mower safety and operation.

What You Should Know About Experiential Learning

The information and activities in this book are arranged in a unique, experiential fashion (see model). In this way, a youth is introduced to a particular practice, idea, or piece of information through an opening (1) **experience**. The results of the activity are recorded on the accompanying pages. The learner then (2) **shares** with the project helper what was done and (3) **processes** the experience through a series of questions that allow for (4) **generalizing** and (5) **applying** the new knowledge and skill.



1: Pfeiffer, J.W., and J.E. Jones, Reference Guide to Handbooks and Annuals

What You Can Do

- Review the Learning Outcomes (project skill, life skill, educational standard, and success indicator) for each activity to understand the learning taking place. See the back of the book for the Summary of Learning Outcomes.
- Become familiar with each activity and the related background information. Stay ahead of the learner by trying out activities beforehand.
- Begin the project by helping the learner establish a plan. This is accomplished by reviewing the Project Guide.
- After each project area is completed, conduct a debriefing session that allows the learner to answer the review questions and share results. This important step improves understanding from an experiential learning perspective.
- Help the learner celebrate what was done well and see what could be done differently. Allow the learner to become better at assessing his or her own work.
- In the Project Guide, date and initial the activities that have been completed.

Project Guide

Welcome to *Ready, Set, . . . Mow!* You are about to learn proper mower operation techniques and safety practices. By completing the activities in this book, you will be better prepared to safely operate a lawn mower.

Ready, Set, . . . Mow! is designed for youth of all ages that have experience, or are learning how to mow. This is a complete project for getting familiar with your mower, selecting protective gear, mastering operating techniques, understanding routine maintenance, and enhancing your safety practices. Prior to beginning the project and frequently throughout the project, youth should reference and become familiar with their operator's manual for their specific mower. Youth should always follow manufacturer's age requirement recommendations for safe operation.

The amount of time for each activity varies, but this project can be completed in one year. Members who want to repeat the project may do so, if they pick a different type of mower (push, riding, zero-turn) to focus on each year. Members should also complete a new project book with different learning experiences, different leadership/citizenship experiences, and a new practice record.

Check your county's project guidelines (if any) for completion requirements in addition to the ones below, especially if you plan to prepare an exhibit for the fair.

Ohio 4-H offers plenty of projects similar to the topics on mower safety and operation. If you want to do more projects like this one, check the Family Guide or visit Project Central at projectcentral.ohio4h.org.

Want to continue learning about mower safety and operation? Consider doing a self-determined project. Visit ohio4h.org to learn more.

Project Guidelines Junior Level

- Step 1: Complete **all thirteen** activities, practice pages, and **all** the Talking It Over questions.
- Step 2: Take part in **at least two** learning experiences.
- Step 3: Become involved in **at least two** leadership/citizenship activities.
- Step 4: Complete a project review.

Project Guidelines Senior Level

- Step 1: Complete **all thirteen** activities, practice pages, **all** the Talking It Over questions, and **six** "More Challenges" activities.
- Step 2: Take part in **at least four** learning experiences.
- Step 3: Become involved in **at least four** leadership/citizenship activities.
- Step 4: Complete a project review.

Step 1: Project Activities

Complete **all thirteen** activities, practice pages, and all the Talking It Over questions. The More Challenges activities are optional for the junior level. As you finish activities, review your work with your project helper. Then ask your project helper to initial and date your accomplishment.

Activity	Date Completed	More Challenges	Project Helper Initials
PROJECT AREA: Mower Safety			
1. Getting to Know Your Mower			
2. Pieces and Parts			
3. Dress for Success			
4. Sticking to Safety			
5. Riding Safety			
Talking It Over			
PROJECT AREA: Making The Cut			
6. You're in Control			
7. Pushing Along			
8. Making A Clean Cut			
9. Your Yard Is Looking Good			
Talking It Over			
PRACTICE PAGES			
1. Start, Go, Stop, Repeat			
2. Turn it Around			
3. Turning On A Dime			
4. Putting it Together			
PROJECT AREA: Mower Maintenance			
10. Time For Tools			
11. Sharpening Your Skills			
12. Shed Time			
13. Troubleshooting Tips			
Talking It Over			

Step 2: Learning Experiences

Learning experiences are meant to complement project activities, providing the opportunity for you to do more in subject areas that interest you. Think of a few learning experiences you could do to show the interesting things you are learning about in this project? Here are some ideas:

- Attend a clinic, workshop, demonstration, or speech related to mower safety and operation.
- Help organize a club or group meeting based on this project.
- Go on a related field trip or tour.
- Prepare your own demonstration, illustrated talk, or project exhibit.
- Participate in a county fair or other judging event.
- Plan your own learning experience.

Once you have a few ideas, record them here. Complete **at least two** learning experiences. Then, describe what you did in more detail. Ask your project helper to date and initial in the appropriate spaces below.

Plan to Do	What I Did	Date Completed	Project Helper Initials
<i>Demonstration</i>	<i>Showed club or group members the proper attire needed for safe mower operation</i>	<i>5/5/YR</i>	<i>F.L..</i>

Step 3: Leadership and Citizenship Activities

Use what you learn to give back to your community! Choose **at least two** activities from the list below (or create your own) and write them in the table. Record your progress by asking your project helper to initial next to the date as each one is completed. You may add to or change these activities at any time. Here are some examples of leadership/citizenship activities:

- Teach someone about mower safety and operation.
- Help someone else prepare for project judging.

- Host a workshop to share tips about mower safety and operation.
- Encourage someone to enroll in Ready, Set, ... Mow!
- Arrange for a mower safety and operation speaker to visit your club or other group.
- Plan your own leadership/citizenship activity.

Leadership/Citizenship Activity	Date Completed	Project Helper Initials
<i>Organized a field trip to a lawn care business.</i>	<i>6/12/YR</i>	<i>F.L.</i>

Step 4: Project Review

All finished? Congratulations! After you've completed the activities in this book, you are ready for a project review. This process will help assess your personal growth and evaluate what you have learned. Use the space below to write a summary of your project experience. Be sure to include a statement about the skills you have learned and how they might be valuable to you in the future.

Now, set up a project evaluation. You can do this with your project helper or another knowledgeable adult. If you are a 4-H member, it can be part of a club evaluation or part of your county's project judging.

Project Area: Mower Safety

Activity 1: Getting to Know Your Mower

Mowers come in all shapes and sizes but can be broken down into three main types: Push, Riding, and Zero-Turn. Each of these has advantages and disadvantages: **push mowers** are great for small areas, **riding mowers** are great for large open areas, and **zero-turn mowers** are great for large areas with a lot of **obstacles**. Let's explore and learn what makes your mower unique!



What to Do

Step 1: Get the **Operator's Manual** for your mower and head over to your mower.

Step 2: Looking at your mower, and referencing the Operator's Manual, find the following information:

Type of Mower: Push ☐ Riding ☐ Zero-Turn ☐

Manufacturer (Brand): _____

Model: _____

Serial Number: _____

Mowing Width: _____

Engine Size: _____

Fuel Type: _____

Oil Capacity: _____

Oil Type: _____



More Challenges

To learn more about other types of mowers, visit your local lawnmower dealership and ask questions to a representative. Share your experience with your 4-H club or project helper.



Background

Engineering continues to improve mowers and provide a lot of different options on all types of

Manual Moment



The Operator's Manual for your mower is the answer book to any questions that you might have during this project and beyond. Operator's Manuals include everything about the mower, along with safety, maintenance, and operation information. The manual serves as the legal resource from the manufacturer to make sure the mower is operated the way it was designed.

Look for more *Manual Moments* throughout the book!

mowers. Push mowers are generally the same size but can have many features including: electric or pull start, self-propelled movement, and mulching bags. Riding mowers can have multiple sizes of **mower decks**, different types of attachments, a hitch to pull a trailer, and various engine locations. Zero turn mowers come in multiple sizes but are more standardized as far as controls and shape of the machine.

Mowers can have different types of power. Many are powered by gasoline and some by diesel fuel. Electric powered mowers are becoming more common. Electric mowers run off a rechargeable battery, like a power tool.

Did you know?

There are also autonomous mowers, just like a robotic vacuum cleaner, that do not require an operator.

Glossary words

Push Mowers
Riding Mowers
Zero-Turn Mowers
Obstacles
Operator's Manual
Mower Deck



Resources

<https://www.toro.com/en/homeowner/walk-behind-mowers>

https://www.cubcadet.com/en_US/lawn-mowers

Project Area: Mower Safety

Activity 2: Pieces and Parts

Though there are many variations of mowers, they all have similar parts. All mowers have a deck which shields the **blades** that cut the grass. Most mowers have an **engine** and **fuel tank** that powers the functions of the mower. Electric mowers however have a **motor** and **battery** that powers the mower. **Tires** are another common part on all mower types. All mowers also have a steering system to help you navigate.



What to Do

Step 1: Take a picture or draw your mower and include it below.

Step 2: Label the following parts on it:

- Body
- Deck
- Tires
- Discharge Chute
- Headlights
- Taillights
- ROPS
- Number of blades
- Engine or motor
- Fuel tank or battery
- Steering Controls
- Oil Fill Cap



Step 3: Identify what each part does and provide a brief explanation.

More Challenges

Find a mower that is the same type as yours, but a different brand, and identify similarities and differences between the part locations on each. Share these with your project helper.

Background

Mowers have many parts that move at the same time. Once the engine starts, all parts should be treated as if they can start moving at any time. When inspecting a mower or performing maintenance, always make sure that the mower is turned off and the key is removed.

This will prevent anyone from starting the mower while you inspect or work on it. All new mowers have labels or stickers that identify important components, such as the parts you labeled in the activity. These are sometimes worn off on older mowers, but the important parts are

color coded so that you can still identify them. The **PTO**, or blade engagement for example is always yellow for easy identification. Another part that is common across all mowers is a **discharge chute**. This is a critical piece to the safe operation of your mower as it prevents debris from being thrown from the mower. If your mower does not have a discharge chute, it may have a **mulching bag** on the back instead.

Did you know?

Reel push mowers can contain less than 10 parts as they mainly include a handle, two wheels, and a reel that has blades on it.

Glossary words

Blades	Engine
Fuel Tank	Motor
Battery	Tires
Discharge Chute	PTO
Mulching Bag	Schematics

Resources

https://www.briggsandstratton.com/na/en_us/support/maintenance-how-to/browse/history-of-the-lawn-mower.html

Manual Moment



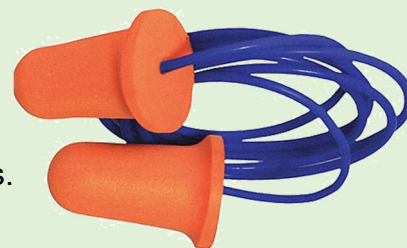
The Operator's Manual

can be referenced to find part numbers and **schematics** that show how the many parts of your mower fit together. The schematics should always be referenced when work is being done on your mower and parts are being removed or replaced.



Project Area: Mower Safety

Activity 3: Dress for Success



While mowing can be a relaxing and rewarding task, it is dangerous. Engines are loud and mowers have many **hazard points** that you should always be respected. Always follow the safety rules while operating a mower and protect yourself by wearing **Personal Protective Equipment** (PPE). By wearing clothing designed for mowing, you can stay comfortable and safe.

What to Do

- Step 1: Get dressed in something from each of the categories below.
- Step 2: Take a picture to include in your book, then read the background section to see how well your outfit protects you.
- Step 3: Fill out the table with what you chose correctly, and what you need to add or change in your outfit.
- Step 4: If repeating this project, identify what you are wearing that is different than what you would wear for the other type of mower and explain why.

Clothing Item	Clothing You Picked Is Safe	You Need to Find Something Else
Shirt		
Pants		
Footwear		
Hearing Protection		
Eye Protection		
Sun Protection		



More Challenges

Ask an adult to get dressed to mow the lawn. Identify any issues with their outfit and explain to them what items they should wear instead. If they are dressed correctly, give them a compliment for being a well-dressed role model.

Background

Mowers are very loud and usually operate in a range of 80-100 decibels. Compare this to a normal volume conversation which is 60 decibels. The best way to protect your hearing while mowing is to wear **hearing protection**, such as earplugs or earmuffs that block out the sound of the mower. The most protective footwear is a pair of over the ankle leather boots with low

heels. This type of footwear provides great traction as you get on and off of your mower, or great traction and protection from debris if you are operating a push mower. You should always wear pants that cover your entire leg and aren't loose which will help prevent anything from scratching your legs. You should also always wear a shirt that fits relatively tight as loose-fitting clothes are more likely to get snagged or caught on part of the mower. When you are mowing, dust and pieces of grass can fly up, especially if it is windy. You should wear **eye protection**, such as safety glasses to protect your eyes from any flying debris. You should also always wear safety glasses when servicing your mower as dirt and dust are common during maintenance. Mowers have a lot of moving parts on them. If you have long hair, you

Manual Moment



The Operator's Manual for your mower provides descriptions of all the hazards of mowing. It also includes a list of recommended PPE for properly operating your mower. Find the section that discusses PPE and write the page number here for quick reference ____.

should pull it back so that it cannot get caught in any moving parts. Mowing is usually done when the weather is nice, but the sun can also be a hazard during nice weather because it can cause sunburn and exhaustion. One way to prevent sunburn on your face, head, and neck is to wear a sunhat. Hats with a 3" brim all the way around help limit the exposure to the sun and keep you cooler when it's hot. You should also wear sunscreen on any exposed skin that is not covered by your clothing. It's a good idea to wear gloves when you service your mower because parts can be hot and sharp.

Did you know?

Your hearing never heals itself after being exposed to damaging noises. This is why it is very important to always wear hearing protection, especially for sounds higher than 90 decibels.

Glossary words

Hazard Points

Personal Protective Equipment

Hearing Protection

Eye Protection

Resources

Mowing & Trimming Safety:

https://www.osha.gov/sites/default/files/2019-03/mowing-trimming_safety_manual.pdf



Project Area: Mower Safety

Activity 4: Sticking to Safety

All mowers have **safety labels** on them which identify areas of the mower to pay extra attention. These labels are usually brightly colored and explain the type of **hazard point** in that area. The most common labels are found on the mower deck, the engine, and fuel tank. These areas have the most danger associated with them, so it is very important that you know where these areas are and understand the danger with them.



What to Do

- Step 1: Look at your mower and take pictures, or draw the symbols that are on each safety label
- Step 2: Look in your operator's manual to identify the meaning of each of the symbols.



More Challenges

Your friend has an older mower that have tattered or missing labels. Identify which labels are needed to properly warn against the dangers of the mower.

Background

While there are many dangerous areas on mowers, here are a few to pay extra attention.

The blades are the most dangerous part of the mower. Your mower should have a warning that shows the dangers of getting your hands or feet near the blades while the mower is operating. Lots of areas of the mower will get hot. The heat from the engine will cause this, but also the heat from the sun if it is a very sunny, hot day. Pay attention to where these areas are and avoid touching them. The gas tank of the mower will be labeled with a warning. This is because gas fumes are extremely explosive and hazardous. Always open the gas tank or refuel in a well vented area. You should also wait to refill your fuel tank until the engine is cool, especially if the engine is close to the fuel tank. The engine is an area with a lot of hazards. There can be sharp edges, very hot parts, and many moving parts. Always make sure to turn the mower off and let it cool down any time you are looking at the engine.

Manual Moment



Your Operator's Manual will go over every hazard of your mower. Many times, the label that is on your mower, is further explained in the operator's manual. While the stickers draw your attention to hazards, you should always look in the Operator's Manual to fully understand what the labels mean.

Did you know?

Safety labels didn't always come on mowers. Labels were added because enough people were injured by mowers and the manufacturers needed a way to alert the operators of dangerous areas on the machine.



Glossary words

Safety Labels

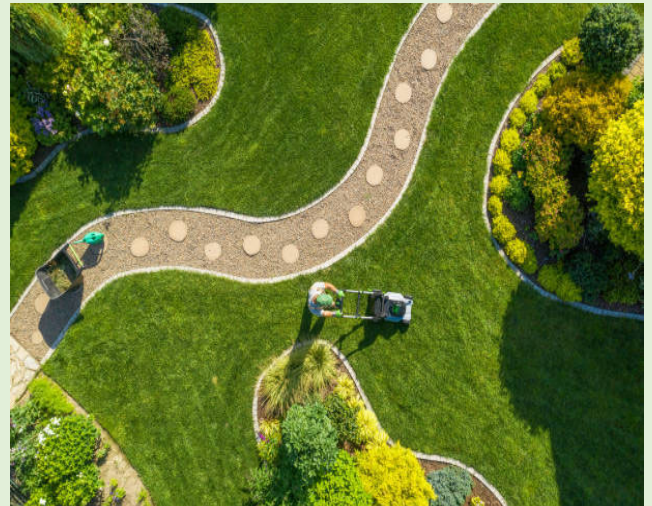
Hazard Points



Project Area: Mower Safety

Activity 5: Riding Safety

Now that you know a little about mower safety, you're one step closer to getting to operate the mower. This section reviews safe operation when using the mower. While it is important to know how to be safe around mowers, it is even more important to know how to be safe when using and riding your mower.



What to Do

- Step 1: While mowing isn't very challenging, you do have to be aware of your surroundings and the terrain. Take an arial picture or draw a layout of your yard and include it in the space below. Make sure to include any hills or ditches.
- Step 2: Identify anything you might have to mow around (trees, flowerbeds, porch, etc.), and label them on your drawing.
- Step 3: Draw arrows to show how you normally go around the obstacles with your mower along with which direction you would mow any hills or ditches.



More Challenges

Make a list of all the **safety switches** and lockouts that your mower has, then test each one out to make sure they work.

Background

When operating your mower, you must always be aware of **obstacles** such as flowerbeds, trees, or driveways. There are also loose obstacles to be aware of such as sticks and branches, toys, and garden hoses. Getting your mower too close to these can cause debris to be thrown out of the mower. A good rule of thumb when going around any obstacle is to make

Manual Moment



Along with part breakdowns, your Operator's Manual includes all the safety systems included on your mower. From the handle switch on push mowers, to the seat weight switch on riding and zero turn mowers, your Operator's manual will explain how each safety system works and how you can test them.

sure that you go slow and have the **discharge chute** of the mower pointed in a safe direction with no one around. When operating your mower on a hill, you need to be aware of how steep the hill is. If the hill is over 15° you should travel up and down it, but if it is less than 15°, you can travel side to side on it. When using a push mower, you should never stand downhill from the mower in case you slip. Some larger Zero turn mowers have a **Roll Over Protection System** (ROPS) on them due to how sharp they can turn. These systems protect you in case your mower rolls over on a hill or in a ditch.

Mowers also have safety features that help prevent dangerous situations. Many riding and zero turn mowers have a seatbelt or safety switch in the seat that will shut the mower off if you get up with it on. Push mowers have a safety switch in the handle and if you let go, the mower will shut off.

Did you know?

More people are injured as a bystander when debris comes out of the chute than from operating a mower.

Glossary words

Safety Switches

Obstacles

Discharge Chute

Roll Over Protection System



Project Area: Mower Safety

Talking It Over

SHARE How do you rate your level of understanding about lawnmower safety?

REFLECT What are some consequences to not wearing hearing protection and other PPE while mowing?

GENERALIZE Why is it important to know the obstacles in your mowing area before you begin mowing?

APPLY What would you do first if a neighbor asked you to use their mower, but you have never run one like it before?

Space For Additional Pictures or Drawings



Project Area: Making The Cut

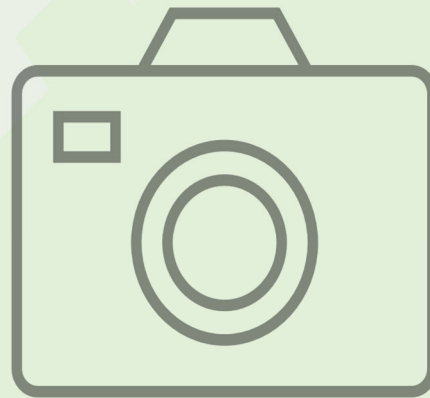
Activity 6: You're In Control

Alright, now that you fully understand the safety of a mower, you can get into the operation of a mower. Mowers have many different types of controls, all of which do something different to help get your yard mowed. Push mowers usually have only a few controls to understand, but many riding and zero turn mowers have a wide variety of controls to understand.



What to Do

- Step 1: Draw or take a picture of all the controls of your mower.
- Step 2: Get familiar with the operation section of your operator's manual by looking through it and identifying what all the controls do.
- Step 3: Provide a summary of what each control does. Controls you should identify include
- Throttle
 - Steering
 - forward and reverse
 - blade engagement
 - Brake Pedal
 - Parking Brake
 - Ignition Switch
 - Choke
 - Deck Height Control



More Challenges

Take your mower to a spot in your yard and practice starting the mower according to the operator's manual. Then go through all the controls, making sure each function operates as it should. Make sure to do this in an open space away from obstacles so that you can check the blade engagement. Tell your project helper about anything interesting you noticed.

Background

As mentioned before, mowers come in a variety of styles and with a variety of controls. These controls are typical for the type of mower it is. Riding mowers utilize pedals to move around. These usually include a **brake pedal**, and forward and reverse pedals. Sometimes the forward and reverse functions will be two



separate pedals. Riding mowers use a **steering wheel** which is connected to the front wheels. As the operator turns the steering wheel, the wheels turn and cause the mower to turn also. Zero turn mowers do not have pedals and are controlled with **motion control levers** that control the back wheels of the mower. When one of the levers gets pushed forward or backwards, the wheel on the same side moves in the same direction of the lever. To move forward the levers are pushed forward together

and then pulled backwards to move in reverse. Both riding and zero turn mowers have a **throttle** lever that increases the speed of the engine. They both also have an engagement button that must be pulled out to activate the mowing blades. Push mowers usually have either an **electric start** or **pull start**, along with a **choke**. Once a push mower is started the blade is spinning as they do not have a separate engagement for the blades. Sometimes these mowers have a **self-propelled** function and will drive the back wheels, so you have to “push” it less.

Did you know?

Most zero turn mowers, and riding mowers that have separate forward and reverse pedals utilize a **hydrostatic** system.

Glossary words

Brake Pedal

Throttle

Self-Propelled

Steering Wheel

Electric Start

Hydrostatic

Motion Control Levers

Pull Start

Choke

Manual Moment



Your Operator's Manual will have an entire section addressing the controls of your mower. This is to make sure the manufacturers clearly communicate how to properly use the functions of your mower.

Project Area: Making The Cut

Activity 7: Pushing Along

While riding and zero turn mowers are great for large areas, some smaller areas are best serviced by a push mower. Push mowers require some knowledge and skill to make sure your yard will look good.

What to Do

This activity will only be completed if you are using a push mower for the project.

- Step 1: Get your mower out and review the controls on your mower.
- Step 2: Using your Operator's Manual, go through the starting process that is explained.
- Step 3: Once the mower is started, go through the shut off procedure that is explained in your Operator's Manual.
- Step 4: Write about what was the easiest and most challenging parts of this activity below.



More Challenges

Now that you know how to start and stop your push mower, demonstrate the proper way to turn your mower on and off with your project helper, 4-H club, or a family member.

Background

Push mowers offer the most diversity of any style of mower, but also operate very similarly

to each other. Here is some general information to help you better understand how to operate your push mower.

When starting your mower, you need to make sure that the **choke** is engaged (if it has one). On gas mowers, a choke is used to help start the mower. Once the engine is running, slowly depress the choke back in until the engine is idling at a normal speed.

Manual Moment



Your Operator's Manual is a great reference to use for starting a mower. It will describe step-by-step actions for you to check prior to starting your mower. It will do the same for turning off the mower.

Most push mowers have a **safety switch** hooked into the handle. This must be depressed in order to start the mower and keep it running. This is a safety feature that prevents the mower blades from spinning when you are not in a safe position.

You should always start push mowers in the area you plan on mowing. This makes sure that you do not cut anything while taking the mower from the

storage space to the mowing area.

While running your mower, you need to always watch for obstacles. One good thing about push mowers is that they are simpler to maneuver around obstacles such as trees or flower beds. Always make sure to keep the mower level with the ground and never tip the mower up on two wheels. If your yard has hills or ditches, pay attention to the **slope** of the hill. Push mowers should be operated up and down hills, or alongside hills that are less than 15°. Always make sure that you are standing uphill from the mower in case you slip or trip.

Did you know?

The first lawnmower was invented in the year 1830 in England and somewhat resembles the push mower that is common today.

Glossary words

Choke

Safety Switch

Slope



Project Area: Making The Cut

Activity 8: Making A Clean Cut

Now that you are familiar with the controls of your mower, it is time to practice changing the height of your mower blades. The height of your blades is important for the health of your lawn. When grass is too short, it has a scalped appearance and may not be bright green. The height of a mower plays an important role to have a good-looking lawn. You need to make sure you cut the grass at the appropriate height for the season and weather conditions. It's important to check, and possibly change this setting, every time you mow. It is important to know the cut height you have it set to mow.

What to Do

With an adult's permission, find a spot in your yard that you can test out your mower at different heights.

- Step 1: Go to the area and mow one spot (turn the blades on and then back off and move to a spot right beside that spot).
- Step 2: Do this for several different mower deck adjustment heights of your choice along with a setting of 3 inches.
- Step 3: Once you are done cutting the grass in your spots, take pictures of the spots
- Step 4: Measure the actual length of the grass with a ruler. Include the settings, measurements, and pictures below.

Deck Adjustment Height Setting	Actual Measured Height of Grass
3"	



More Challenges

Give a demonstration on adjusting your mower height and why it is important to your 4-H club, project helper, or community member.

Background

Mowers can cut grass at many different heights. The **cutting height** is usually changed by a lever on most riding and zero turn mowers, and by adjusting the wheel height on push mowers. All of these adjustments raise or lower the deck which affects how close the blades are to the ground. Longer grass has more leaf surface to take in sunlight. This enables it to grow thicker and develop a deeper root system. This deeper root system helps grass survive droughts, tolerate insect damage, and fight diseases. The longer blades also help the soil retain moisture by shielding it from the sun. The Environmental Protection Agency (EPA) suggests that you cut your grass around 3 inches. While the type of grass in your yard will have a certain ideal length, generally most grass species are healthiest between 2.5 and 3.5 inches. You should be mowing often enough so that you are never cutting more than 1/3rd of the height of the grass blades. Most experts agree that the best time to mow your yard is either the mid-morning or late afternoon. Both of these times are during the cooler parts of the day. Cutting your grass in the middle of the day when the sun is full can cause your grass to wilt, especially if it gets cut. Always make sure to check your local laws as sometimes mowing can only be done during certain hours of the day. Mowing can also be restricted during **Knozone action days** and by local weather services.

Manual Moment



Adjusting the deck is important to make sure that you are cutting at the correct height. Most mower decks have two positions, one for mowing, and one for transporting or traveling with your mower. This is important to keep the mower deck from dragging on the ground. Reference your operator's manual to identify the proper heights for each activity.

Did you know?

By maintaining healthy grass in your yard, you can actually reduce the number of weeds without the use of herbicides.

Glossary words

Cutting Height

Knozone Action Days

Resources

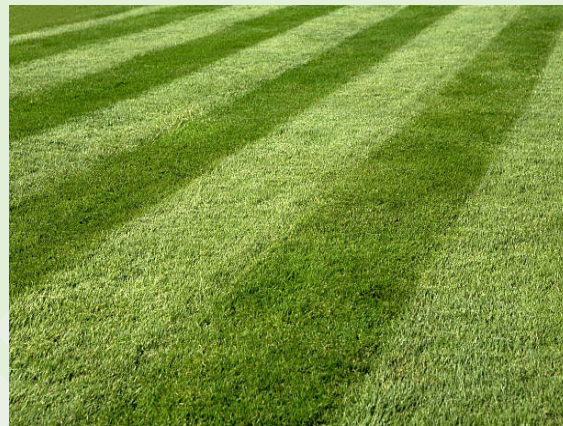
https://www.epa.gov/sites/production/files/2014-04/documents/healthy_lawn_healthy_environment.pdf



Project Area: Making The Cut

Activity 9: Your Yard Is Looking Good

You have probably seen yards that look very clean and have lighter and darker green stripes in them. Have you ever wondered how those stripes got there? The person mowing that lawn probably mows in a specific **mowing pattern** which causes the grass to fold one direction and make the stripes. In this project area you will get a chance to practice making these stripes and learn more about why those stripes occur.



What to Do

- Step 1: With permission, find a spot in the yard where you can make a few different mowing patterns.
- Step 2: Mow in a back-and-forth pattern like the one in figure 1 below.
- Step 3: Go to a different area of your yard
- Step 4: Mow in a round pattern like the one in figure 2 below.
- Step 5: Take pictures of both and compare. Explain why you think they look different from each other.

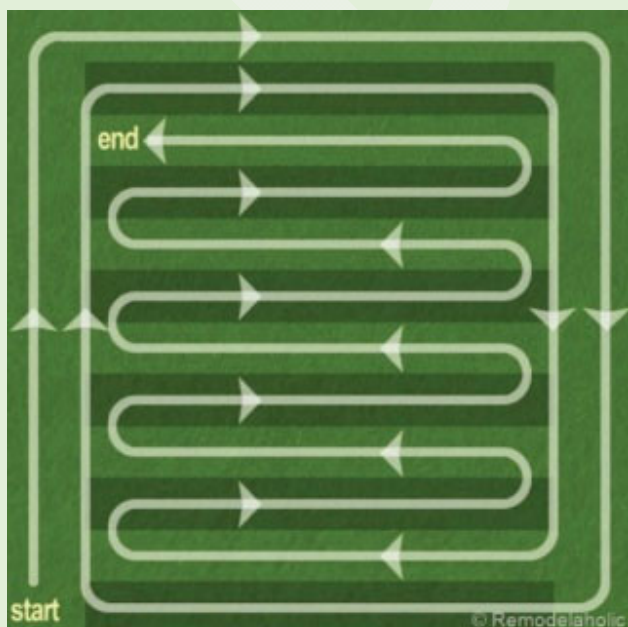


Figure 1: Back & Forth Pattern

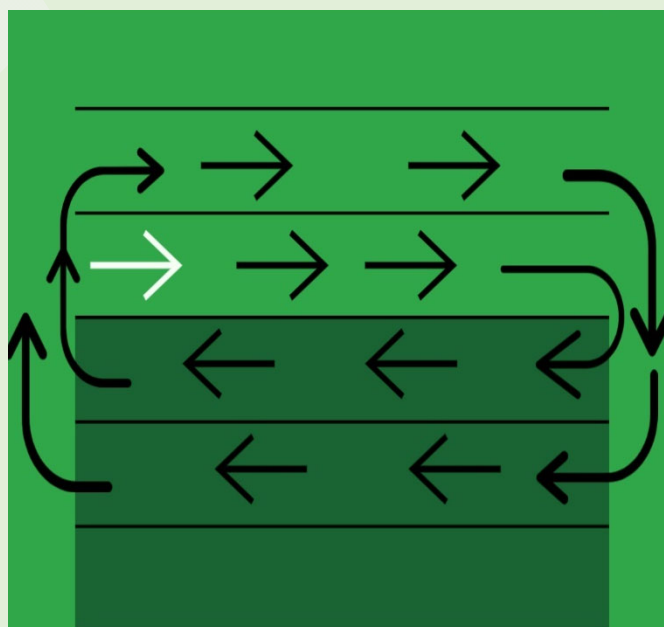


Figure 2: Round Pattern

More Challenges

Mow your entire yard with stripes one direction, take a picture, and then mow it in a perpendicular pattern the next time you mow. Compare the two pictures and share what you notice.

Background

As you mow, you want to **overlap** a little on each pass to make sure that all the grass is getting cut. If you don't overlap at all, you run the risk of leaving a thin strip of grass un-mowed. Lining up your tires with the previous pass is a good rule of thumb. To prevent grass buildup and to make the stripes, you should mow each pass in the opposite direction. This allows the grass clippings to spread out across the yard. It also lays the grass down in different directions which is what causes the stripes. For example, one pass you will make north to south, and the next pass will be made south to north. Rotating the directions that you mow will help your yard stay healthier as well. Rotating can be as simple as mowing North to South one time, then mowing East to West the next time that you mow. More than likely your yard has some trees, flower beds, or other obstacles that you will have to mow around. The best way to mow these is to make sure the discharge chute of the mower is pointed away from them as you mow around them. This will keep grass from getting thrown on the obstacle. You should also only get as close as you feel comfortable. Some obstacles you won't be able to get all the grass and you will have to come back in with a string trimmer to get the rest.

Did you know?

Some companies make special roller bars for mowers that make sure the stripes in the grass are very defined.

Glossary words

Mowing Pattern

Overlap

Manual Moment



Understanding how and when to properly turn the blades on and off is critical to ensuring your yard looks good. Reference your operator's manual to understand the process for your specific mower.



Project Area: Making The Cut

Talking It Over

SHARE Pick your favorite activity from this project area and summarize what you learned.

REFLECT Why is it important to know where all the controls are on your mower?

GENERALIZE Describe what could happen if your mower was set to the wrong height while mowing

APPLY Identify something in your yard that would prevent you from mowing in a stripe pattern. How would you still be able to stripe your yard?

Space For Additional Pictures or Drawings



Project Area: Practice Pages

Practice 1: Start, Go, Stop, Repeat

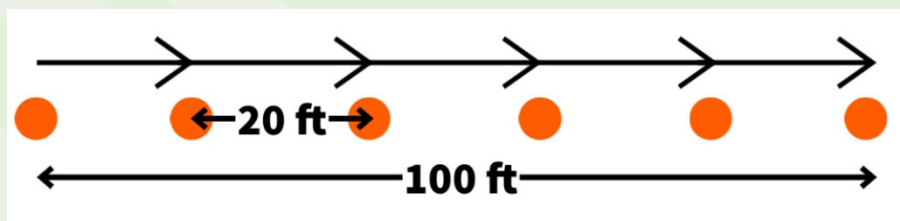
Always reference your Operator's Manual for age limitations for your specific mower. If you are under the age of 16, adult supervision is required.

Skill: Properly start your mower, slowly accelerate, and come to a smooth safe stop.

Before starting to practice, be sure to review your operator's manual, paying close attention to the operating warnings and starting procedures. Remember to always wear the proper PPE while operating your mower. The first step of becoming a skilled mower operator is to master a couple of basic skills, including driving in a straight line and braking. Learning these basics is essential in advancing your abilities as a mower operator. This activity should be done with the mower blades off. Record your practice in the practice record at the back of the book.

What To Do

- Step 1: Find a place to practice. Your practice area should be a flat, off-road area, away from obstacles.
- Step 2: Bring along six objects to use as markers. Plastic bottles or milk cartons with some rocks in them work well, or small safety cones if you have them.
- Step 3: Place the markers in a straight line close to 100 feet long, putting a marker about every 20 feet.
- Step 4: Start your mower using the proper starting procedure outlined in your operator's manual, and drive straight along the markers, making smooth stops at each marker. Practice several times at a low speed.
- Step 5: Repeat this exercise, going a little faster each time. Make sure you are still practicing smooth controlled stops.



Mastering your Skills

Now that you got the hang of this, try doing the same activity in reverse. When you are backing up, make sure that you are constantly looking at your surroundings and checking over both shoulders to avoid any blind spots. Repeat the same steps above, only operating your mower in reverse.

Project Area: Practice Pages

Practice 2: Turning It Around

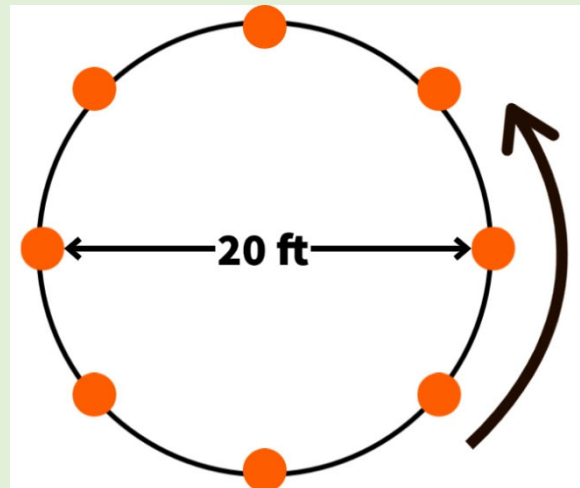
Always reference your Operator's Manual for age limitations for your specific mower. If you are under the age of 16, adult supervision is required.

Skill: Making wide turns and determining turn radius

Before starting to practice, be sure to review your operator's manual, paying close attention to the operating warnings. Remember to always wear the proper PPE while operating your mower. The first step of becoming a skilled mower operator is to master a couple of basic skills, including turning and understanding turning radius. Learning these basics is essential in advancing your abilities as a mower operator. This activity should be done with the mower blades off. Record your practice in the practice record at the back of the book.

What To Do

- Step 1: Find a place to practice. Your practice area should be a flat, off-road area, away from obstacles.
- Step 2: Bring along at least 8 objects to use as markers. Plastic bottles or milk cartons with some rocks in them work well, or small safety cones if you have them.
- Step 3: Make a circle with a 10-foot radius in your practice area.
- Step 4: Drive clockwise around the circle, staying a distance away from the markers that you feel comfortable with. Then repeat going counterclockwise. The closeness of your mower to the markers should be judged from the outer edge of your mower deck, not the tires.
- Step 5: Repeat this exercise, getting a little closer to the markers each time. The goal is to get as close to the markers as possible, without hitting them, while making a smooth steady turn.



Mastering your Skills

Now that you got the hang of this, try doing the same activity in reverse. When you are backing up, make sure that you are constantly looking at your surroundings and checking over both shoulders to avoid any blind spots. Repeat the same steps above, only operating your mower in reverse. While turning for long distances in reverse is uncommon, having to turn while backing up for a short distance is very common and this will help you develop that skill.

Project Area: Practice Pages

Practice 3: Turning On A Dime

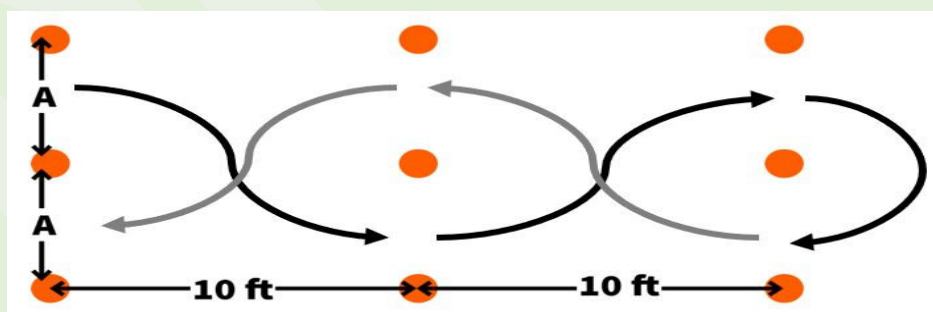
Always reference your Operator's Manual for age limitations for your specific mower. If you are under the age of 16, adult supervision is required.

Skill: Making sharp turns and determining turning radius

Before starting to practice, be sure to review your operator's manual, paying close attention to the operating warnings. Remember to always wear the proper PPE while operating your mower. The first step of becoming a skilled mower operator is to master the basic skill of making sharp turns. Learning this basic skill is essential in advancing your abilities as a mower operator. This activity should be done with the mower blades off. Record your practice in the practice record at the back of the book.

What To Do

- Step 1: Find a place to practice. Your practice area should be a flat, off-road area, away from obstacles.
- Step 2: Bring along 9 objects to use as markers. Plastic bottles or milk cartons with some rocks in them work well, or small safety cones if you have them.
- Step 3: Measure the width of your mower. The distance "A" in this activity will be the measured width, plus 12 inches. Set up the markers accordingly.
- Step 4: Drive through the course in the pattern shown below. Once completed, repeat the pattern, but start at the section where you stopped.
- Step 5: Once you feel comfortable, repeat this exercise by shortening the distance "A" by 4 inches until it is only 4 inches wider than your mower. This will help you get used to tight turning situations.



Mastering your Skills

Now that you got the hang of this, try doing the same activity in reverse. When you are backing up, make sure that you are constantly looking at your surroundings and checking over both shoulders to avoid any blind spots. Repeat the same steps above, only operating your mower in reverse. While turning for long distances in reverse is uncommon, having to turn while backing up around obstacles is very common and this will help you develop that skill.

Project Area: Practice Pages

Practice 4: Putting it Together

Always reference your Operator's Manual for age limitations for your specific mower. If you are under the age of 16, adult supervision is required.

Skill: Combining skills learned to more complex course

Before starting to practice, be sure to review your operator's manual, paying close attention to the operating warnings. Remember to always wear the proper PPE while operating your mower. Now that you have mastered several basic skills needed for mower operation, you can start challenging yourself with more difficult courses. This activity should be done with the mower blades off. Record your practice in the practice record at the back of the book.

What To Do

- Step 1: Find a place to practice. Your practice area should be a flat, off-road area, and can have some basic obstacles in it.
- Step 2: Bring along at least 12 objects to use as markers. Plastic bottles or milk cartons with some rocks in them work well, or small safety cones if you have them.
- Step 3: Taking the courses that were completed in the previous three practice pages, set up your own course and add in obstacles that allow you to practice each of the following skills at least once. You can use natural obstacles in your practice area as well, such as trees or rocks.
- Driving forward straight
 - Coming to a stop
 - Making a wide turn (at least a 10-foot radius)
 - Making a sharp turn
 - Backing up straight
 - Backing up while turning
- Step 4: Draw or take a picture of your course layout and label each of the above obstacles. Include the picture in the practice record at the back of the book.
- Step 5: Drive your course and get a good feel for it.
- Step 6: Repeat by making a different course or having your project helper develop a course for you to go through.

Project Area: Mower Maintenance

Activity 10: Time for Tools

Your mower does a great job with taking care of your lawn, but you need to do a great job at taking care of your mower. Routine **maintenance** is important to make sure your mower stays healthy and keeps your yard looking great for years to come.



What to Do

Step 1: Using your operator's manual, identify the maintenance intervals for the parts of your mower listed in the chart below. If a part does not apply to your mower, simply put N/A

Step 2: Identify when the last time each service was completed

Step 3: Make a schedule for these service intervals

Part or Service	Service Interval	Last Service Date	Next Scheduled Date	Date Completed
Oil Change				
Clean Air Filter				
Tire Pressure				
Mower Belt				
Sharpen Blades				
Clean Deck				
Clean Radiator				
Replace Fuel Filter				
Check Spark Plug				

More Challenges

With the assistance of your project helper, complete one full maintenance interval with your mower. Take before and after pictures of each part and give a presentation on what you did.



Background

Keeping up with the service on your mower is very important to making sure it runs right and lasts a long time. One critical component is the oil which helps keep parts of the engine from seizing up and getting too hot. As the oil gets older, it needs to be changed out. The oil also passes through an **oil filter** that cleans the oil and keeps dirt out of the engine and should be replaced every time you change the oil. Blades are another key component of your mower. Blades need to be inspected, cleaned, and sharpened to make sure your mower is making a clean cut on your lawn. If you have a riding or zero-turn mower, your mower probably has a belt on it that helps transfer power from the engine to the deck. Over time, belts can become worn out or frayed and need to be inspected to make sure they are still in good shape. If your mower runs off gas or diesel, the engine mixes the fuel with air which it burns for energy. The air first passes through an **air filter** to make sure it is clean and free from dirt particles. Because mowing can get dusty and messy, the air filter needs to be cleaned to make sure good air flow is getting to the engine, but if the air filter is too dirty, then it should be replaced by a new one. The tires are also a critical part to the function of your mower and should be checked frequently to make sure that the tire pressure is within the correct range. The proper air pressure is included on the sidewall of the tire, and in the operator's manual. The most frequent item to check on your mower is the fuel level. If your mower runs off gas or diesel, it will need to be refilled regularly. Refilling should always be done in a well vented area that will allow the harmful gas vapors to dissipate into the air. If you have an electric mower, you should make sure that once the batteries are charged, you take them off the charger to prevent over charging. You should also store batteries indoors in the winter to prevent them from freezing.

Manual Moment



Your Operator's Manual not only informs you about safety and operation, but includes everything you need to know to take care of your mower. It is a great practice to mark these pages in your operator's manual to have quick reference to them.

Did you know?

With proper maintenance, some mowers can last well over 30 years.

Glossary words

Oil Filter

Air Filter

Maintenance



Project Area: Mower Maintenance

Activity 11: Sharpening Your Skills

Your blades are one of the most important parts of your mower. Without them, your mower would simply drive around and make noise. It is important to keep the blades sharp so that they cut through the grass. Dull blades can rip and tear the grass which will make the lawn look unhealthy. Blades become dull over time and should be inspected regularly.

What to Do

Depending on your age, you will need your project helper for this activity.

- Step 1: Using a **jack**, lift your mower so you can look at the blades. When jacking up your mower, you should make sure that the mower is on level ground and that the parking brake is engaged. Use **jack stands** or blocks that are rated for the weight of the mower and make sure the mower is secure before you look at the blades.
- Step 2: When looking at the blades see if they have any nicks or appear dull, take them off to further inspect.
- Step 3: Take a picture of the edge of your blade before doing any work on them.
- Step 4: With the assistance of your project helper sharpen your blades.
- Step 5: Balance your blades once each side is sharp, resharpening as needed to maintain balance.
- Step 6: Take a picture of the blades after the work has been completed. Attach the pictures in your book.
- Step 7: Reinstall the blades and test them out in the yard.



More Challenges

Visit your local lawncare provider or mower dealer and have them show you their process for sharpening and balancing blades. Share your experience with your project helper or 4-H club.

Background

Sharpening blades include a two-step process, sharpening and balancing. When sharpening your blade, you should sharpen it at a 30° angle. This will provide a nice edge to cut through the grass and prevent buildup of clippings in the deck. The blade should also be sharpened until all the nicks and gouges are removed.



Blades need to be balanced which means they should weigh the same on each side. As you are sharpening a blade, whatever you do to one side, you should do to the other side. This will prevent unnecessary vibrations when the blade is spinning at operating speed. You can get a small **blade balancer** or simply suspend the blade from a string and see if it sits level. If it leans to one side, sharpen that side further.



Manual Moment



Blades are an important part of your mower. Your operator's manual will have an entire section on care and maintenance of the blades. It is important that you understand how to inspect the blades and change them for your specific mower, as all mowers vary slightly.

Did you know?

There are special sharpeners made just for mower blades that make sure the blade is sharpened to the correct angle.

Glossary words

Jack

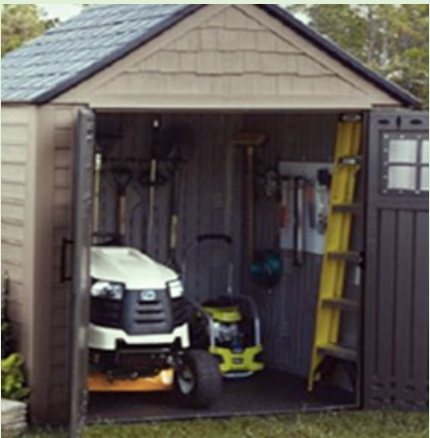
Jack Stands

Blade Balancer

Project Area: Mower Maintenance

Activity 12: Shed Time

Your mower is an expensive and important machine. It should be cared for and stored in a place that keeps it out of the weather. Your mower should be properly stored not only in the winter, but during the mowing season too. Proper storage will help make the maintenance easier and make your mower have a longer life.



What to Do

Step 1: Reference your operator’s manual for storage suggestions for your mower. Identify which of the following tasks are needed for in-season and/or out of season storage.

Task	In-Season	Out of Season
Cleaning The Deck		
Charging The Battery		
Adding Fuel Additive		
Disconnect Battery		



More Challenges

Demonstrate the process of how to get your mower ready for out of season storage to your project helper or 4-H club.

Background

During the season, the way that you store your mower is very important. After you are done mowing, you should always clean debris off of the deck. This can be done with a garden hose, pressure washer, air compressor, or leaf blower. By getting all the grass clippings off of your deck, you keep any grass from rotting and sticking

to the deck which will cause buildup over time. The buildup can cause your deck to rust and fall apart.

Another thing to check during the season is the fuel level. It's always a good idea to make sure your mower has at least a half tank of fuel in it so that it can easily start the next time you go to use it.

Over wintering, or out of season storage, takes a little bit more work depending on where you live. It's a good idea to add a **fuel stabilizer** to the gas tank to make sure the gas stays good throughout the off season.

This will aid with starting your mower for the first-time next season. Your operator's manual may also recommend draining the fuel tank prior to storing for the winter.



Manual Moment



Your Operator's Manual will lay out specific instructions for storage of your mower. By following these steps each year, you will make sure that your mower lasts for many years to come!

Just like during the season, cleaning your mower's deck off before the winter is also important. You should make sure all grass is cleaned off so that it doesn't rot or provide a home for rodents looking for a warm place.

If your mower has a battery, it will lose charge if your mower does not run for a long time. To avoid this, make sure you disconnect the battery cables from your mower's battery. When doing this, always disconnect the negative cable first, but reconnect the positive cable first.

If you have an electric mower, it is best to remove the battery from the mower and store in a place that will not experience below freezing temperatures.

Did you know?

Some mower decks have a connection for a hose that will help you wash the underside of the deck.

Glossary words

Fuel Stabilizer



Project Area: Mower Maintenance

Activity 13: Troubleshooting Tips

Sometimes you can follow all the steps, listen to all the instructions, and your mower may still not start. This happens to everyone and is nothing to get worried about. Usually, it is a simple fix.

What to Do

Step 1: Reference your operator's manual and find the troubleshooting section. This section will review the most common problems that you may experience with your mower.

Step 2: Identify three problems that may occur and in your own words, describe below how to fix them.

1. _____

2. _____

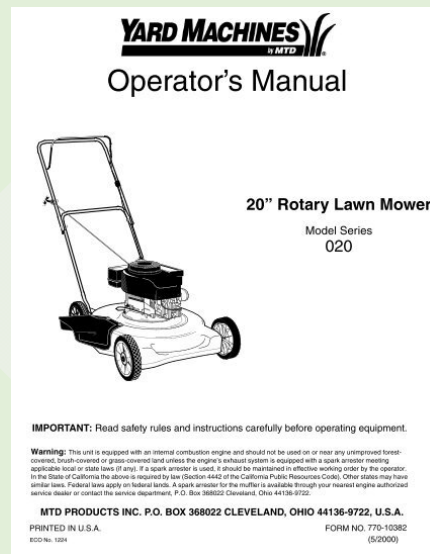
3. _____

More Challenges

Identify a common problem with the operation of mowers and demonstrate to your 4-H club how to check for the problem and fix it.

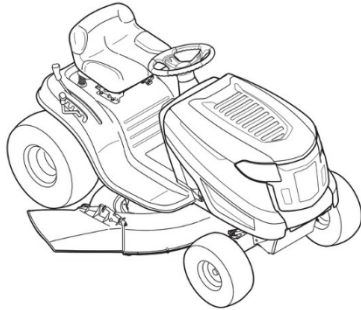
Background

Sometimes mowers won't start right away, this can be caused by a number of situations. One situation is that a safety switch is not





OPERATOR'S MANUAL



Lawn Tractor — Pony

⚠ WARNING

READ AND FOLLOW ALL SAFETY RULES AND INSTRUCTIONS IN THIS MANUAL
BEFORE ATTEMPTING TO OPERATE THIS MACHINE.
FAILURE TO COMPLY WITH THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.

TROY-BILT LLC, P.O. BOX 361131 CLEVELAND, OHIO 44136-0019

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Form No. 769-03502
(November 13, 2007)

engaged. These switches need to be engaged in order to start the mower. Examples are a handle on a push mower, the PTO, parking brake, neutral lever, and seat or seatbelt.

If nothing happens once you have all the safety switches engaged, next check the battery connection. Sometimes the connections can become loose or corroded. By cleaning the connections with a wire brush, the problem should be solved. If this still doesn't help, then you should check to make sure your battery is charged. This can be done by checking the charge with a **voltmeter**.

If your mower has good charge and turns over and sounds like it wants to start but won't, the issue could be a bad **spark plug**. Spark plugs get

dirty during use and eventually fault out. By removing your sparkplug and holding it against the block while trying to start the engine you can see if there is a spark or not.

Finally, if your spark plug is good, the issue could be that your gas is either too low, or old. By adding new gas to the tank, this should solve the issue. If this still doesn't solve the problem, you should check the fuel filter on the mower to ensure gas is getting through.

Did you know?

Many people can make a business out of servicing lawnmowers for other people in their communities.

Glossary words

Voltmeter

Spark Plug

Troubleshooting

Manual Moment



Most operator's manuals have a **troubleshooting** section to help guide you through any issues that you might have when starting your mower. While some are simple fixes, others can be important issues that need to be addressed by a mechanic. Never perform work that you do not feel confident and comfortable performing.

Project Area: Mower Maintenance

Talking It Over

SHARE What is a part of your mower that you didn't realize needed to be checked or serviced before completing this project area?

REFLECT What could happen if you do not perform regular maintenance on your mower?

GENERALIZE What steps should you do before performing any maintenance work on your mower?

APPLY Your friend has a mower that won't start. They have tried everything that they know, but they don't have the manual. The mower is the same type as your mower, just a different brand. How would you go about helping them?

Glossary

Air Filter: An engine part that prevents dirt from coming in with the air into the engine

Battery: An object that stores electricity for later use

Blades: Sharpened pieces of metal that spin and cut grass

Blade Balancer: A device used to check the weight distribution of a blade

Brake Pedal: Used to slow down and bring a vehicle or machine to a stop when depressed

Choke: A valve used to restrict the flow of air to into the engine to help start a cold engine

Cutting Height: The distance from the ground to the sharpened edge of the blade where the grass will be cut.

Discharge Chute: A plastic or rubber piece that attaches to the mower deck and prevents debris from being thrown

Electric Start: A starting system that uses a battery and key or button to start the engine

Engine: A machine that converts the energy in fuel into a mechanical force

Eye Protection: Goggles or shatter resistant glasses or shield worn over the eyes to prevent dust and other debris from entering the eye.

Fuel Stabilizer: A petroleum product added to fuel to extend its life

Fuel Tank: The storage location on the mower that holds fuel to be used by the engine

Hazard Points: Parts of the mower that present a danger to the operator.

Hearing Protection: Earplugs or earmuffs that reduce the volume of sound entering the ears

Hydrostatic: A mower that runs on a system of hydraulics rather than using belts and gears

Jack: A device for lifting heavy objects, most often vehicles or machinery

Jack Stands: a stand whose height can be adjusted and is used to support a piece of machinery that has been raised by a jack

- Knozone Action Days:** Days when the air quality may become unhealthy for everyone, but certain groups including children and the elderly should avoid spending a lot of time outside. Restrictions are placed on operation of unnecessary equipment, such as mowers.
- Maintenance:** Steps taken on equipment and machinery to insure continued operation and long life
- Motion Control Levers:** Arms on a zero-turn mower that are used to steer, drive forward, and backup
- Motor:** A machine that converts electrical energy into a mechanical force
- Mower Deck:** The housing that covers the mower blades
- Mowing Pattern:** The directions that an area is mowed, including paths around obstacles
- Mulching Bag:** An attachment for mowers that collects the grass clippings so they can be used for mulch or compost
- Obstacles:** Anything that gets in the way of mowing in a strait line. Examples include trees, sidewalks, toys, garden hoses, flowerbeds, etc.
- Oil Filter:** An element that cleans and removes debris from the oil in the engine
- Operator's Manual:** A book containing all the information about a specific mower including safety, operation, and maintenance
- Overlap:** The distance the mower deck hangs over the previous mowing pass
- Personal Protective Equipment:** clothing and equipment that is worn or used in order to provide protection against hazards
- PTO:** Short for Power Take-Off, this is the system that allows mechanical energy to be transferred from the machine to an external attachment, such as a mower deck
- Pull Start:** A starting system that uses a rope that must be pulled to spin the engine
- Push Mowers:** Mowers that require the operator to push them during operation.
- Riding Mowers:** Mowers that have a seat, pedals, and steering wheel, and the operator rides on the mower.

- Roll Over Protection System:** Also called a ROPS, is a system or structure intended to protect equipment operators from serious injury in the event the equipment rolls over. The system consists of a seatbelt and roll over bar.
- Safety Labels:** Stickers on the mower that identify hazards and warn the operator against them
- Safety Switches:** mechanical or electrical lockouts that must be engaged before the mower can be started. If they become disengaged, the mower will shut off to protect the operator.
- Schematics:** Drawings that show how all parts of a mower fit together
- Self-Propelled:** A optional function on push mowers that provides drive to the rear wheels of the mower and allows the operator to not have to push as much
- Slope:** a surface of which one end or side is at a higher level than another; a rising or falling surface such as a hill
- Spark Plug:** A part of an engine that contains an air gap where a spark is produced to ignite gasoline in the engine
- Steering Wheel:** A wheel attached to a column that attaches to the axle of a mower and allows the wheels to be turned
- Throttle:** A lever that controls the speed of the engine
- Tires:** A rubber covering, typically inflated, or surrounding an inflated inner tube, placed around a wheel to form a flexible contact with the ground
- Troubleshooting:** The steps taken to identify potential causes and solve a problem
- Voltmeter:** an instrument for measuring the charge of a battery
- Zero-Turn Mowers:** Mowers that have a seat and Motion Control Levers that control the movement of the mower, and the operator rides on the mower.

Practice Record

Use this page to record your practice sessions of the practice pages. Attach additional pages if you need more space.

[illegible]

Practice Record Pictures

Use the space below to include any pictures or drawings of your courses that you set up for practicing your skills.



Photos? Receipts? Notes?

DRAFT

Summary of Learning Outcomes

Activity	Project Skill	Life Skill	Educational Standard*	Success Indicator
Project Area: Mower Safety				
1. Getting to Know Your Mower	Identifying important information and understanding the operator's manual	Reading operator's manual		Checks manual before using a new piece of equipment
2. Pieces and Parts	Identifying important parts of a mower	Developing an understanding of what makes a mower		Becomes familiar with the parts of a new machine before operating
3. Dress for Success	Identify proper attire for mowing	Preventing personal injury		Wear proper mowing attire
4. Sticking to Safety	Identifying safety label meanings	Preventing personal injury		Looks up the meaning of new labels
5. Riding Safety	Identifying obstacles that need to be watched for when mowing	Preventing injury and property damage		Looks over an area fully before mowing
Project Area: Making The Cut				
6. You're in Control	Identifying the controls of a mower	Identifying control functions before use		Goes through functions of controls before operating a new piece of equipment
7. Pushing Along	Identifying the controls and starting a push mower	Identifying control functions before use		Goes through functions of controls before operating a new piece of equipment
8. Making A Clean Cut	Identifying proper mowing height	Quality assurance		Checks to make sure mower is cutting at proper height when mowing
9. Your Yard Is Looking Good	Mowing stripes into yard	Performing quality work		Is able to stripe a yard with the mower
Project Area: Mower Maintenance				
10. Time For Tools	Identify routine maintenance	Equipment care		Performs preoperational checks and
11. Sharpening Your Skills	Sharpen mower blades	Equipment care		Checks routinely to make sure blades are in good condition
12. Shed Time	Proper storage of mower	Equipment care		Cleans mower before storage
13. Troubleshooting Tips	Properly troubleshoot mower	Problem solving		References manual to start mower if it doesn't start

**I pledge my head to clearer thinking,
My heart to greater loyalty,
My hands to larger service,
and my health to better living,
for my club, my community, my country,
and my world.**

ohio4h.org

Want to know more about 4-H? Find your local program at
4-h.org/find.

This book is an unpublished draft being used in a pilot test to gather
feedback from participants.

Other Ohio State University Extension, 4-H Youth Development
publications are available through local OSU Extension offices and
online at **extensionpubs.osu.edu**. Ohio residents get the best price
when they order and pick up their purchases through local Extension
offices.

Appendix C

Final Version of Ready, Set, Mow!

Ready, Set, ... Mow!

Name _____

Age (as of January 1 of the current year) _____

County _____

Club or group name _____

Project helper _____



THE OHIO STATE UNIVERSITY
EXTENSION





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NOTE TO THE PROJECT HELPER

Congratulations! A 4-H member or other youth has asked you to serve as a project helper. You may be a parent, relative, project leader, friend, club advisor, or another important person. As a project helper, it is up to you to encourage, guide, and assist. How you choose to be involved helps to shape the learner's life skills and knowledge.

Your Role as Project Helper

Your contribution is critical to delivery of the 4-H program, which is committed to positive youth development (PYD). The 4-H Thriving Model, the theory of change for positive youth development, connects high-quality program settings to the promotion of youth thriving. That's where you come in.

High-quality 4-H program settings provide youth a place to belong, matter, and explore their personal spark. These components, along with strong relationships with caring adults and supportive peers, help ensure that 4-H programs provide a nourishing **developmental context**—a place where youth feel a sense of belonging and can grow.

LONG-TERM OUTCOMES

- Academic or Vocational Success
- Civic Engagement
- Employability & Economic Stability
- Happiness & Wellbeing

DEVELOPMENTAL OUTCOMES (Positive Youth Development)

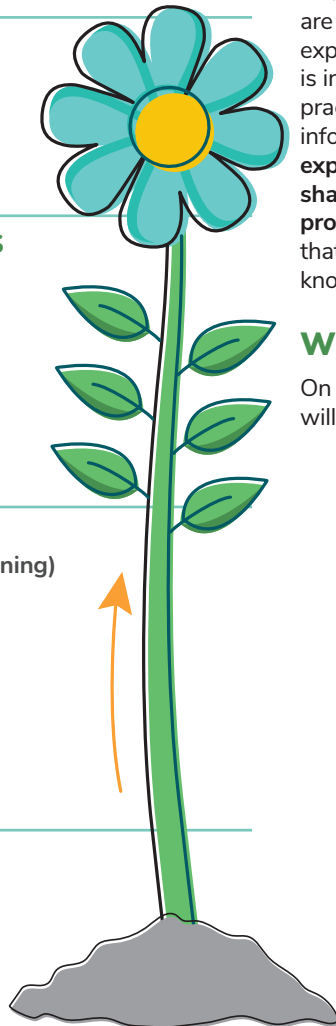
- Positive Academic Attitude
- Social Competence
- Personal Standards
- Connection with Others
- Personal Responsibility
- Contribution

YOUTH THRIVING (Social, Emotional & Cognitive Learning)

- Growth Mindset
- Openness to Challenge & Discovery
- Hopeful Purpose
- Prosocial Orientation
- Transcendent Awareness
- Positive Emotions
- Goal Setting & Management

DEVELOPMENTAL CONTEXT (4-H Programs)

- Sparks
- Belonging
- Relationships
- Engagement



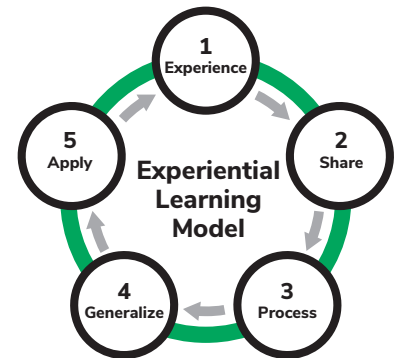
High-quality 4-H programs contribute to PYD through the intentional promotion of social, emotional, and cognitive learning. This process is described by seven indicators of **youth thriving** (see model).

Youth who experience program settings with these intentional social, emotional, and cognitive indicators achieve key positive youth **developmental outcomes**. They are then also more likely to achieve **long-term outcomes** marked by academic or vocational success, civic engagement, employability and economic stability, and happiness and well-being.

For more information on the 4-H Thriving Model of Positive Youth Development, please go to **helping-youth-thrive.extension.org**.

What You Should Know About Experiential Learning

The activities in this book are arranged in a unique, experiential fashion. A youth is introduced to a particular practice, idea, or piece of information through an opening **experience** (1). The learner **shares** (2) with the project helper what was done and **processes** (3) the experience through a series of questions that allow for **generalizing** (4) and **applying** (5) the new knowledge and skill.



Source: Pfeiffer, J.W., and J.E. Jones, *Reference Guide to Handbooks and Annuals*. © 1983 John Wiley & Sons, Inc. Reprinted with permission of John Wiley & Sons, Inc.

What You Can Do

On a practical level, your role as a project helper means you will strive to do the following:

- Review the Learning Outcomes for each activity to understand the learning taking place. See the inside back cover for the Summary of Learning Outcomes.
- Become familiar with each activity, including the background information. Stay ahead of the learner by trying out activities beforehand.
- Help the learner establish a plan by reviewing the Project Guide. As a resource person, limit your involvement to providing support.
- As activities are completed, conduct debriefing sessions that allow the learner to share results and answer questions. This important step improves understanding. In the Project Guide, date and initial completed activities.
- Help the learner celebrate what was done well and see what could be done differently. Allow the learner to become better at assessing their own work. Encourage exploration of the topic beyond the scope of this project book.



Project Guide

Welcome to *Ready, Set, . . . Mow!* You are about to learn proper lawn mower operation and safety practices. By completing the activities in this book, you will be better prepared to safely operate a lawn mower.

Ready, Set, . . . Mow! is for youth of all ages who are learning how to mow or who already have some experience. Even experienced mowers will find new knowledge here. This is a complete project for becoming familiar with your mower, selecting protective gear, mastering operating techniques, learning routine maintenance, and enhancing your safety practices. Prior to beginning the project and frequently throughout the project, reference and become familiar with the operator's manual for your specific mower. Always follow manufacturer's age requirement recommendations for safe operation.

The amount of time required to complete each activity varies, but the project is easily completed within one year. Check your county's project guidelines (if any) for completion requirements in addition to the ones below, especially if you plan to prepare an exhibit for the fair.

The project can be repeated if a different type of mower (push, riding, or zero-turn) is the focus each year. If you repeat this project, complete a new project book with different learning experiences, different leadership/citizenship experiences, and a new practice record each year.



Youth taking this project
need access to a lawn mower
and a yard to mow.

This is my _____ (first, second, or third) year taking this project.

Project Guidelines

STEP 1. Complete **all thirteen** activities, practice pages, and **all** the Talking It Over questions.

STEP 2. Take part in **at least two** learning experiences.

STEP 3. Become involved in **at least two** leadership/citizenship activities.

STEP 4. Complete a project review.



Step 1: Project Activities

Complete **all thirteen** activities, practice pages, and all the Talking It Over questions. The More Challenges activities are optional. As you finish activities, review your work with your project helper. Then ask your project helper to initial and date your accomplishment.

Activity	Date Completed	Project Helper Initials
PROJECT AREA: Mower Safety		
1. Getting to Know Your Mower		
2. Pieces and Parts		
3. Dress for Success		
4. Sticking to Safety		
5. Riding Safety		
Talking It Over		
PROJECT AREA: Making the Cut		
6. You're in Control		
7. Pushing Along		
8. Making a Clean Cut		
9. Your Yard Is Looking Good		
Talking It Over		
PRACTICE PAGES		
1. Start, Go, Stop, Repeat	Record your practice sessions in the Practice Record.	
2. Turn It Around		
3. Turning on a Dime		
4. Putting It Together		
PROJECT AREA: Mower Maintenance		
10. Time for Tools		
11. Sharpening Your Skills		
12. Shed Time		
13. Troubleshooting Tips		
Talking It Over		



Step 2: Learning Experiences

Learning experiences are meant to complement project activities, providing the opportunity for you to do more in subject areas that interest you. Think of a few learning experiences you could do to show the interesting things you are learning about in this project? Here are some ideas:

- Attend a clinic, workshop, demonstration, or speech related to mower safety and operation.
- Help organize a club or group meeting based on this project.
- Prepare your own demonstration, illustrated talk, or project exhibit.
- Go on a related field trip or tour.
- Explore the education and training necessary for careers in this topic area.
- Participate in a county fair or other judging event.
- Plan your own learning experience.

Once you have a few ideas, record them here. Complete **at least two** learning experiences. Then, describe what you did in more detail. Ask your project helper to date and initial in the appropriate spaces below.

Select learning experiences that are appropriate for your age and skill level.

Plan to Do	What I Did	Date Completed	Project Helper Initials
<i>Demonstration</i>	<i>Showed club or group members the proper attire needed for safe mower operation</i>	<i>4/5/YR</i>	<i>F.L.</i>



Step 3: Leadership and Citizenship Activities

Use what you learn to give back to your community! Choose **at least two** leadership/citizenship activities from the list below (or create your own) and write them in the table. Record your progress by asking your project helper to initial next to the date as each one is completed. You may add to or change these activities at any time. Here are some examples of leadership/citizenship activities:

- Teach someone about mower safety and operation.
- Help someone else prepare for project judging.
- Host a workshop to share tips about mower safety and operation.
- Encourage someone to enroll in *Ready, Set, . . . Mow!*
- Arrange for a mower safety and operation speaker to visit your club or other group.
- Plan your own leadership/citizenship activity.

Leadership/Citizenship Activity	Date Completed	Project Helper Initials
<i>Organized a field trip to a mower dealer.</i>	<i>5/12/YR</i>	<i>F.L.</i>



Project Guide



ACTIVITY 1

Getting to Know Your Mower

Words in **bold** throughout this book are defined in the glossary.

MOWERS COME IN ALL SHAPES AND SIZES but can be broken down into three main types: push, riding, and zero-turn. Each of these has advantages and disadvantages: **push mowers** are great for small areas, **riding mowers** are great for large open areas, and **zero-turn mowers** are great for large areas with a lot of **obstacles**. Let's explore and learn what makes your mower unique!

WHAT TO DO

Estimated time: 30 minutes

STEP 1. Get the **operator's manual** for your mower and head over to your mower.

STEP 2. While looking at your mower and referencing the operator's manual, find the following information:

What	Information
Type of mower (circle one):	PUSH RIDING ZERO-TURN
Manufacturer (brand)	
Model	
Serial number	
Mowing width	
Engine size	
Fuel type	
Oil capacity	
Oil type	

Learning Outcomes

Project skill: Becoming familiar with mower and mower operator's manual • **Life skill:** Processing information •

Educational standard: AFNR-CCCS CS.03.04.03.a. Read and interpret operating instructions related to operation, storage and maintenance of tools and equipment related AFNR tasks.

• **Success indicator:** Identifies information about mower using mower and operator's manual



More Challenges

To learn more about other types of mowers, visit your local lawnmower dealership and ask questions to a representative. Share your experience with your 4-H club or project helper.

BACKGROUND

Design engineers continue to improve mowers and provide a lot of different options on all types of mowers.

- Push mowers are generally the same size but can have different features, including electric or **pull start, self-propelled** movement, and **mulching bags**.
- Riding mowers have **mower decks** of various sizes, different types of attachments, hitches to pull trailers, and various engine locations.
- Zero-turn mowers come in multiple sizes but are more standardized as far as controls and shape of the machine.

Mowers also can have different types of power. Many are powered by gasoline, and some are powered by diesel fuel. Electric-powered mowers are becoming more common. Electric mowers run off a rechargeable **battery**, like a power tool.

Did you know?

There are also **autonomous** mowers that, just like a robotic vacuum cleaner, do not require an operator.



Resources

Lawn mowers come with all kinds of features. Take a look at these collections to see some of the latest:

- toro.com/en/homeowner/walk-behind-mowers
- cubcadet.com/en_US/lawn-mowers



Manual Moment

The operator's manual for your mower is the answer book for any questions you might have during this project and beyond. Operator's manuals include everything about the mower, along with safety, **maintenance**, and operation information. The manual serves as the legal resource from the manufacturer to make sure the mower is operated the way it was designed.



ACTIVITY 2

Pieces and Parts

ALTHOUGH THERE ARE MANY KINDS of mowers, they all have similar parts. All mowers have a deck that shields the blades that cut the grass. Most mowers have an engine and fuel tank that powers the functions of the mower. Electric mowers, however, have motors and batteries for power. Tires are another common part on all mower types. All mowers also have a steering system to help you navigate.

WHAT TO DO

Estimated time: 1 hour

STEP 1. Draw, take, or print a picture of your mower and attach it to this page. Label these parts:

- body
- deck
- tires
- discharge chute
- headlights
- taillights
- roll over protection system (ROPS)
- number of blades
- engine or motor
- fuel tank or battery
- steering controls
- oil fill cap

DRAW OR ATTACH IMAGE(S) TO THIS PAGE.

Learning Outcomes

Project skill: Identifying mower parts • **Life skill:** Visualizing information • **Educational standard:** AFNR-CCCS CS.03.04.02.a. Identify standard tools, equipment and safety procedures related to AFNR tasks. • **Success indicator:** Correctly labels and describes mower parts



STEP 2. Identify what each part does and provide a brief explanation.

Part	Function
body	
deck	
tires	
discharge chute	
headlights	
taillights	
ROPS	
number of blades	
engine or motor	
fuel tank or battery	
steering controls	
oil fill cap	

More Challenges

Find a mower that is the same type as yours, but a different brand. Identify similarities and differences between the part locations on each. Share these with your project helper.



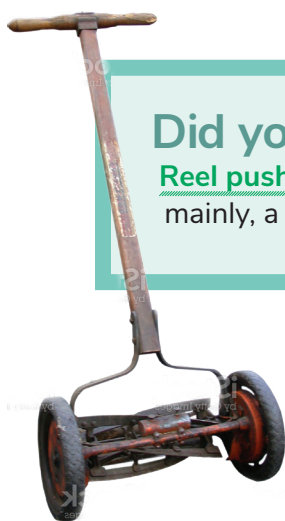


BACKGROUND

Mowers have many parts that move at the same time. Once the engine starts, all parts should be treated as if they can start moving at any time. When inspecting a mower or performing maintenance, always make sure the mower is turned off and the key is removed. This prevents anyone from starting the mower while you inspect or work on it.

All new mowers have labels or stickers that identify important components, such as the parts you labeled in the activity. These are sometimes worn off on older mowers. The important parts, however, are color coded so they can still be easily identified.

The **power take-off (PTO)** or blade engagement, for example, is always yellow for easy identification. Another part that is common across all mowers is a discharge chute. This piece, which prevents debris from being thrown from your mower, is critical to safe operation. If your mower does not have a discharge chute, it may have a mulching bag on the back instead.



Did you know?

Reel push mowers often contain less than ten parts. They include, mainly, a handle, two wheels, and a reel with blades on it.



Resources

Are you a history fan? Here's a brief history of the lawn mower: briggsandstratton.com/na/en_us/support/maintenance-how-to/browse/history-of-the-lawn-mower.html

Manual Moment

Use the operator's manual to find part numbers and **schematics** that show how the many parts of your mower fit together. The schematics should always be referenced when work is being done on your mower and parts are being removed or replaced.



ACTIVITY 3

Dress for Success

EVEN THOUGH MOWING can be a relaxing and rewarding task, it is dangerous. Engines are loud, and mowers have many **hazard points** that must be respected. Always follow the safety rules while operating a mower and protect yourself by wearing **personal protective equipment (PPE)**. By wearing clothing designed for mowing, you can stay comfortable and safe.

WHAT TO DO

Estimated time: 30 minutes to 1 hour

STEP 1. Get dressed as if you are going to mow. Include these items: shirt, pants, footwear, hearing protection, eye protection, sun protection.

STEP 2. Take a picture and attach it to this page.

ATTACH IMAGE TO THIS PAGE.

Learning Outcomes

Project skill: Selecting safe clothing and PPE for mowing • **Life skill:** Preventing personal injury
• **Educational standard:** AFNR-CCCS CS.03.04.01.b. Analyze and demonstrate adherence to protective equipment requirements when using various AFNR tools and equipment. • **Success indicator:** Selects safe clothing and PPE for mowing



STEP 3. Assess your clothing according to the standards below. Is your clothing safe, or do you need to find something else to wear? Place a check in the appropriate column.

Clothing Item	Yes, clothing is safe.	No, clothing could be safer. I'll find something else.
Is your shirt tight around your body and not loose fitting?		
Are you wearing long pants so your legs are protected from scratching?		
Does your footwear protect your feet from injury and provide traction?		
Are you wearing earplugs or earmuffs for hearing protection?		
Are you wearing safety glasses for eye protection?		
Are you wearing a hat and sunscreen for sun protection?		
Total Safety Score (0-6)		

STEP 4. If repeating this project, identify what you are wearing that is different from what you would wear for the other type of mower. Explain.

More Challenges

Next time you see an adult you know using a mower, ask them about what they are wearing. If they are dressed correctly, give them a compliment for being a well-dressed role model. If you see a way for them to be safer, suggest a change and explain why.





The sun's harmful rays are present even on cloudy days, so always wear sunscreen and a hat.

BACKGROUND

Follow these general guidelines anytime you are mowing.

- Mowers are very loud and usually operate in a range of 80-100 decibels. For comparison, normal volume conversation is 60 decibels. The best way to protect your hearing while mowing is to wear hearing protection such as earplugs or earmuffs that block out the sound of the mower.
- The most protective footwear is a pair of over-the-ankle leather boots with low heels. This type of footwear provides great traction as you get on and off your mower or great traction and protection from debris if you are operating a push mower.
- Pants that cover your entire leg and are not loose help prevent scratches and injuries.
- Wear a shirt that fits close to your body. Loose-fitting clothes cause issues when they get snagged or caught on part of the mower.
- Dust and pieces of grass can fly up when mowing, especially if it is windy. Always wear eye protection such as safety glasses to protect your eyes from any flying debris. Wear safety glasses when servicing your mower too. Dirt and dust are common during maintenance.





Did you know?

Your hearing never heals itself after being exposed to damaging noises. It is very important to always wear hearing protection, especially for sounds higher than 90 decibels.

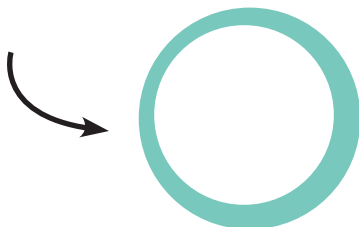


- Mowers have a lot of moving parts. If you have long hair, tie it back so it cannot get caught in any moving parts.
- Mowing is usually done when the weather is nice. The sun, however, is also a hazard when it causes sunburn and exhaustion. To prevent sunburn on your face, head, and neck, wear a sunhat. Hats with a 3-inch brim all the way around help limit exposure. When it is hot, a hat also keeps you cooler.
- Wear sunscreen on any exposed skin that is not covered by your clothing.
- Wear gloves when you service your mower. Parts can be hot and sharp, and gloves protect your hands.



Manual Moment

Use the operator's manual for your mower to review descriptions of all the hazards of mowing. The manual also includes a list of recommended PPE to properly operate your mower. Find the section that discusses PPE and write the page number here for quick reference.



Resources

Mowing and Trimming Safety for the Landscaping and Horticultural Services Industry (2009) is available for free download at [osha.gov/sites/default/files/2019-03/mowing-trimming_safety_manual.pdf](https://www.osha.gov/sites/default/files/2019-03/mowing-trimming_safety_manual.pdf). Read its easy lessons about safe operation of mowers and trimmers and then take the quizzes.



ACTIVITY 4

Sticking to Safety

ALL MOWERS HAVE safety labels to identify areas of the mower that need extra attention. These labels are usually brightly colored and explain the type of hazard in that area. The most common labels are found on the mower deck, engine, and fuel tank. These areas have the most danger associated with them, so it is very important to know where these areas are and understand the exact nature of the danger they present.

WHAT TO DO

Estimated time: 1 hour

Find the safety labels on your mower. Draw, take, or print a picture of each one and attach the images to this page. Look in your operator's manual to identify their meanings.

DRAW OR ATTACH IMAGES TO THIS PAGE.

Learning Outcomes

Project skill: Identifying the meaning of safety labels on a mower • **Life skill:** Preventing personal injury • **Educational standard:** AFNR-CCCS PST.02.02.02.a. Examine and identify safety hazards associated with equipment, machinery and power units used in AFNR power, structural and technical systems (e.g., caution, warning, danger, etc.). • **Success indicator:** Locates, recreates, and interprets safety labels on a mower





More Challenges

Let's say your friend has an older mower with tattered or missing labels. What labels are needed to properly warn against the dangers of the mower? Is there a way to replace them? Share your recommendation with your project helper.



BACKGROUND

Pay extra attention to these mower areas that are particularly dangerous.

- The blades are the most dangerous part. Your mower should have a warning that shows the dangers of getting your hands or feet near the blades while the mower is operating.
- Lots of areas on a mower get hot. The heat from the engine causes this, but also the heat from the sun if it is a sunny, hot day. Pay attention to where these areas are and avoid touching them.
- The gas tank of the mower should have a warning label because gas fumes are extremely explosive and hazardous. Open the gas tank and refuel in a well-ventilated area. Also, wait to refill your fuel tank until the engine is cool, especially if the engine is close to the fuel tank.
- The engine is an area with a lot of hazards. There can be sharp edges, very hot parts, and many moving parts. Always make sure to turn the mower off and let it cool down before looking at the engine.

Did you know?

Mowers did not always come with safety labels. Labels were added because there were lots of mower injuries. Manufacturers needed a way to alert the operators of dangerous areas on the machine.

Manual Moment

Use your operator's manual to go over every hazard on your mower. Many times, the label that is on your mower is further explained in the operator's manual. While the stickers draw your attention to hazards, always look in the operator's manual to fully understand what the labels mean.



ACTIVITY 5

Riding Safety

YOU ARE NOW ONE STEP CLOSER to getting to operate the mower! This section reviews safe operation. While it is important to know how to be safe around mowers generally, it is even more important to know how to be safe when using and riding your mower.

WHAT TO DO

Estimated time: 1 hour, depending on area being mowed

STEP 1. Mowing might not seem very challenging, but you do have to be aware of your surroundings and the terrain. On a separate piece of paper, draw a layout of your yard. Include any hills or ditches.

STEP 2. Identify anything you might have to go around, like trees, flowerbeds, porches, etc. Label them on your drawing.

STEP 3. Draw arrows to show how you normally go around the obstacles with your mower. Also indicate which direction you would mow any hills or ditches.

DRAW OR ATTACH IMAGES TO THIS PAGE.

Learning Outcomes

Project skill: Identifying potential mowing hazards • **Life skill:** Preventing personal injury
• **Educational standard:** AFNR-CCCS CS.03.03.04.c. Create a plan to mitigate the level of contamination or injury identified as a risk in the workplace. • **Success indicator:** Identifies path for avoiding potential mowing hazards in a specific space



More Challenges

Make a list of all the safety switches and lockouts on your mower, then test each one to make sure it works.



BACKGROUND

When operating your mower, you must always be aware of obstacles such as flowerbeds, trees, and driveways. Be on the lookout for loose obstacles too, such as sticks and branches, toys, and garden hoses. Getting your mower too close to these can cause debris to be thrown out of the mower. A good rule of thumb when going around any obstacle is to make sure you go slowly and have the discharge chute of the mower pointed in a safe direction with no one around.

When operating your mower on a hill, be aware of how steep the hill is. If the hill has over a 15° slope, you should travel up and down it. If it has a slope less than 15°, you can safely travel side to side. When using a push mower, *never* stand downhill from the mower, in case you slip. Some larger zero-turn mowers have a roll over protection system (ROPS) due to the sharpness of their turns. These systems protect you in case your mower rolls over on a hill or in a ditch.

Mowers also have safety features that help prevent dangerous situations. Many riding and zero-turn mowers have a seatbelt or safety switch in the seat that shuts the mower off if you get up. Push mowers have a safety switch in the handle. If you let go, the mower shuts off.



Did you know?

More people are injured as bystanders when debris comes out of the chute than from operating mowers.

Manual Moment

Along with parts identification, your operator's manual includes all the safety systems included on your mower. From the handle switch on push mowers to the seat weight switch on riding and zero-turn mowers, your operator's manual explains how the safety systems work and how to test them.



Talking It Over

SHARE How do you rate your knowledge about lawnmower safety?

REFLECT What are some consequences to not wearing hearing protection and other PPE while mowing?

GENERALIZE Why is it important to know the obstacles in your mowing area before you begin mowing?

APPLY What would you do first if a neighbor asked you to use their mower, but you never operated one like it before?



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PROJECT AREA: Making the Cut

ACTIVITY 6

You're in Control

NOW THAT YOU FULLY UNDERSTAND the safety of a mower, you can get into the operation of a mower. Mowers have many different types of controls, each of which does something different. Push mowers usually have only a few controls, but riding and zero-turn mowers have a wide variety. Your job is to understand them all.

WHAT TO DO

Estimated time: 1 hour

STEP 1. Draw, take, or print a picture of all the controls of your mower. Attach it to this page and label each control.

DRAW OR ATTACH IMAGES TO THIS PAGE.

Learning Outcomes

Project skill: Identifying mower controls • **Life skill:** Understanding systems • **Educational standard:** AFNR-CCCS PST.03.01.01.b. Analyze and explain how the components of internal combustion engines interrelate during operation. • **Success indicator:** Correctly labels and describes mower controls



STEP 2. Become familiar with the operation section of your operator's manual by looking through it and identifying what all the controls do. These are the ones you should cover:

- throttle
- steering
- forward and reverse
- blade engagement
- brake pedal
- parking brake
- ignition switch
- choke
- deck height control

STEP 3. Provide a summary of each control's function.

Control	Function
throttle	
steering	
forward and reverse	
blade engagement	
brake pedal	
parking brake	
ignition switch	
choke	
deck height control	

More Challenges

Take your mower to a spot in your yard and practice starting the mower according to the operator's manual. Then go through all of the controls, making sure each operates as it should. So you can check the blade engagement, do this in an open space away from obstacles. Tell your project helper about anything interesting you notice.



BACKGROUND

As mentioned before, mowers come in a variety of styles and with a variety of controls. These controls are typical for each type of mower.

- Push mowers usually have either an **electric start** or pull start, along with a **choke**. Once a push mower is started the blade is spinning, they do not have a separate engagement for the blades. Sometimes these mowers have a self-propelled function that drives the back wheels, so you have to “push” it less.
- Riding mowers use pedals to move around. These usually include a **brake pedal** and forward and reverse pedals. Sometimes the forward and reverse functions are two separate pedals. Riding mowers use a **steering wheel** that is connected to the front wheels. As the operator turns the steering wheel, the wheels turn and cause the mower to turn also.
- Zero-turn mowers do not have pedals and are controlled with **motion control levers** that control the back wheels of the mower. When one of the levers gets pushed forward or backwards, the wheel on the same side moves in the same direction of the lever. To move forward the levers are pushed forward together and then pulled backwards to move in reverse.
- Both riding and zero-turn mowers have a **throttle** lever that increases the speed of the engine. They both also have an engagement button that must be pulled out to activate the mowing blades.



Did you know?

Most zero-turn mowers and riding mowers that have separate forward and reverse pedals use a **hydrostatic** system.



Manual Moment

Use your operator's manual to learn about your mower's controls. Manufacturers typically include an entire section about controls that describes how to properly use them.



ACTIVITY 7

Pushing Along

WHILE RIDING AND ZERO-TURN MOWERS are great for large areas, some smaller areas are best serviced by a push mower. Push mowers require some knowledge and skill to make sure your yard looks good.

WHAT TO DO

Estimated time: 30 minutes

Get your mower out and review the controls. Read through the starting process and shut-off procedure in your operator's manual. Start your mower and then turn it off. Answer these questions.

According to the operator's manual, how many steps are described?

What is the first one?

Could you start your mower without doing all the steps? What do you think would happen if you did?

Learning Outcomes

Project skill: Starting and turning off a push mower • **Life skill:** Understanding systems •

Educational standard: AFNR-CCCS PST.02.02.01.c. Perform pre-operation inspections, start-up and shut-down procedures on equipment, machinery and power units as specified in owner's manuals. •

Success indicator: Starts and turns off a push mower



Complete this activity only if you are using a push mower for the project.



More Challenges

Now that you know how to start and stop your push mower, demonstrate the proper way to turn your mower on and off for your project helper or a family member.

BACKGROUND

Push mowers offer the most diversity of any style of mower, but also operate very similarly to each other. Here is some general information to help you learn how to operate your push mower.

- When starting your mower, make sure gas mowers, a choke is used to help start the mower. Once the engine is running, slowly press the choke back in until the engine is idling at a normal speed.
- Most push mowers have a safety switch hooked into the handle. This must be depressed in order to start the mower and keep it running. This safety feature prevents the mower blades from spinning when you are not in a safe position.
- Always start push mowers in the area you plan to mow. This ensures you do not cut anything while taking the mower from the storage space to the mowing area.
- While running your mower, constantly watch for obstacles. One good thing about push mowers is they are simpler to maneuver around obstacles such as trees or flower beds. Always keep the mower level with the ground and never tip the mower up on two wheels. If your yard has hills or ditches, pay attention to the slope. Push mowers should be operated up and down hills or side to side on hills that are less than 15°. Make sure you are standing uphill from the mower in case you slip or trip.

that the choke is engaged (if it has one). On



Did you know?

The first lawnmower was invented in 1830 in England and somewhat resembles the push mower that is common today.



Manual Moment

Refer to your operator's manual when starting a mower for the first time. It describes step-by-step actions for checking your mower before starting it. Read the whole section. Steps for turning the mower off are included too.



ACTIVITY 8

Making a Clean Cut

IT IS TIME TO PRACTICE

CHANGING the height of your mower blades. The height of the blades is important for the health and appearance of your lawn. When grass is too short, it has a scalped appearance and may not be bright green. Cut the grass to the appropriate height for the season and weather conditions. Check and, if necessary, adjust the height setting every time you mow. Always be aware of the height setting.



WHAT TO DO

Estimated time: 90 minutes

With permission from the owner of the yard, find a spot where you can test out your mower at different heights.

STEP 1. Go to the area and mow one spot. Turn the blades on, mow, turn the blades off, and then move to a spot right beside where you just mowed.

STEP 2. Do this for several different mower deck adjustment heights of your choice, including a setting of 3 inches.

STEP 3. When you are finished cutting the grass in your spots, take pictures of the spots and attach them to the next page.

Learning Outcomes

Project skill: Adjusting blade height on a mower • **Life skill:** Thinking critically • **Educational standard:** AFNR-CCCS PST.02.02.02.c. Adjust equipment, machinery and power units for safe and efficient operation in AFNR power, structural and technical systems. • **Success indicator:** Makes various adjustments to the blade height on a mower



ATTACH IMAGES TO THIS PAGE.

STEP 4. Measure the actual length of the grass with a ruler. Include the settings and the measurement that resulted from each.

Deck Adjustment Height Setting	Actual Measured Height of Grass
3 inches	



BACKGROUND

Mowers can cut grass at many different heights. The **cutting height** is usually changed by a lever on riding and zero-turn mowers, and by adjusting the wheel height on push mowers. All of these adjustments raise or lower the deck, which affects how close the blades are to the ground.

Longer grass has more leaf surface to take in sunlight. This enables it to grow thicker and develop a deeper root system, which helps grass survive droughts, tolerate insect damage, and fight diseases. The longer blades of grass also help the soil retain moisture by shielding it from the sun.

The Environmental Protection Agency (EPA) suggests cutting your grass to about 3 inches. Different types of grass have different ideal lengths, but generally speaking, most grass species are healthiest between 2.5 and 3.5 inches.

Mow often enough so you are never cutting more than one-third of the grass' height at a time. A drastic cut leaves a lawn vulnerable to weed invasion or can weaken and even kill grass.

Most experts agree the best time to mow your yard is mid-morning or late afternoon. Both of these times are cooler parts of the day. Cutting your grass in the middle of the day when the sun is full can cause your grass to wilt, especially if it gets cut too short. Some municipalities have laws that limit mowing to certain hours of the day, so be sure to check for local restrictions. Mowing can also be restricted during **Knozone Action Days** and by local weather services.

Manual Moment

Most mower decks have two positions, one for mowing and one for transporting or traveling. This is important to keep the mower deck from dragging on the ground. Refer to your operator's manual to identify the proper heights for each activity.



More Challenges

Give a demonstration about adjusting mower height and why it is important to a family member or your project helper.



Resources

Healthy Lawn, Healthy Environment: Caring for Your Lawn in an Environmentally Friendly Way, published by the EPA, is available for free online at [epa.gov/sites/production/files/2014-04/documents/healthy_lawn_healthy_environment.pdf](https://www.epa.gov/sites/production/files/2014-04/documents/healthy_lawn_healthy_environment.pdf)



Did you know?

By maintaining healthy grass in your yard, you can actually reduce the number of weeds without the use of herbicides.





PROJECT AREA: Making the Cut

ACTIVITY 9

Your Yard Is Looking Good

YOU HAVE PROBABLY SEEN YARDS that look very clean and have lighter and darker green stripes in them. Have you ever wondered how those stripes got there? The person mowing that lawn probably mows in a specific mowing pattern, causing the grass to fold one direction and make the stripes. Let's try making those stripes and learning more about why they occur.

WHAT TO DO

Estimated time: 1 hour, depending on area being mowed

STEP 1. With permission, find a spot in the yard where you can make a few different mowing patterns.

STEP 2. Mow in a back-and-forth pattern like the one in figure 1.

STEP 3. Go to a different area of your yard and mow in a round pattern like the one in figure 2.

STEP 4. Take pictures of both, attach them to this page, and explain here why they look different.

ATTACH IMAGES TO THIS PAGE.

Learning Outcomes

Project skill: Creating stripes with mowing patterns • **Life skill:** Completing a project or task •

Educational standard: AFNR-CCCS CS.03.04.03.b. Assess and demonstrate appropriate operation, storage and maintenance techniques for AFNR tools and equipment. • **Success indicator:** Implements at least two different mowing patterns that result in stripes



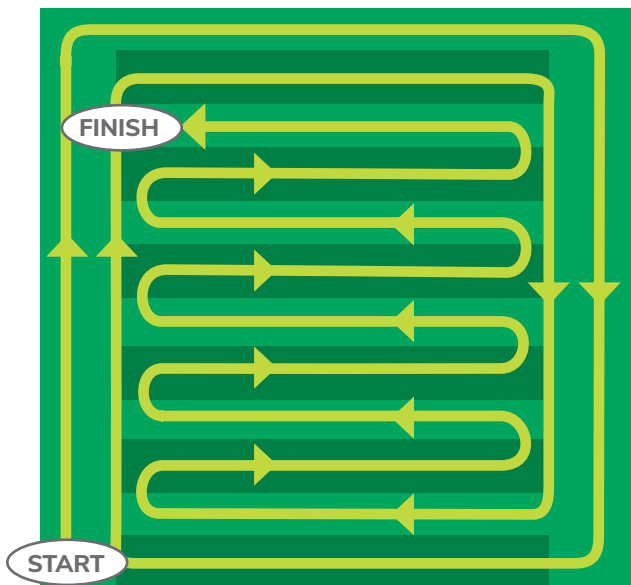


Figure 1.

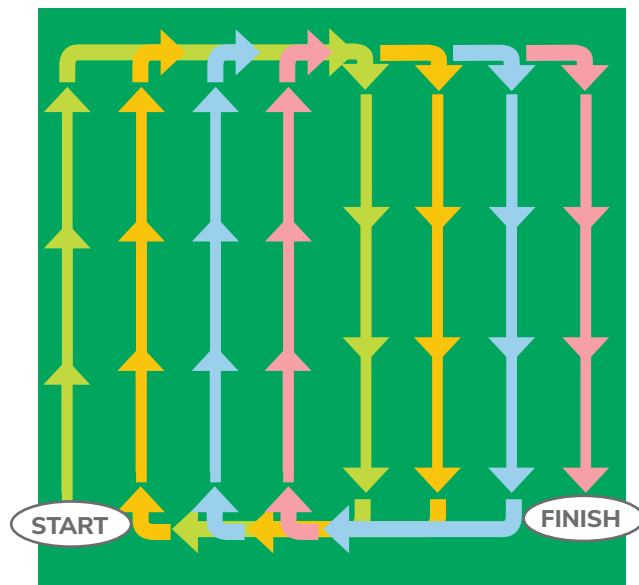


Figure 2.

More Challenges

Mow your entire yard with stripes one direction, take a picture, and then mow it in a perpendicular pattern the next time you mow. Compare the two pictures and share what you notice.

BACKGROUND

As you mow, overlap a little on each pass to make sure that all the grass is getting cut. If you don't overlap at all, you run the risk of leaving a thin strip of grass unmowed. Lining up your tires with the previous pass is a good rule of thumb.

To prevent grass buildup and to make the stripes, mow each pass in the opposite direction. This allows the grass clippings to spread out across the yard. It also lays the grass down in different directions, which is what causes the stripes. For example, make one pass north to south and the next pass south to north.

Rotating the direction you mow helps your yard stay healthier as well. Rotating can be as simple as mowing north to south one time, then mowing east to west the next time.

More than likely your yard has some trees, flower beds, and other obstacles to mow around. The best way to mow these areas is to make sure the discharge



chute of the mower is pointed away from them. This keeps grass from getting thrown on the obstacle. You should also get only as close as you feel comfortable. On some obstacles, you won't be able to get all the grass and will have to come back in with a string trimmer.



Resources

Would you like a career as a landscape designer, landscape technician, or engineer? The AgCareers website offers much more than job search assistance. Do you see yourself in any of the career profiles described here? agcareers.com/career-profiles/cp-results.cfm.

Manual Moment

Understanding how and when to properly turn the blades on and off is critical to ensuring your yard looks good. Refer to your operator's manual to learn the specifics for your mower.



Did you know?

Some companies make special roller bars for mowers that make sure the stripes in the grass are very defined.



Talking It Over

SHARE Look back over activities 6, 7, 8, and 9. Which was your favorite? Summarize what you learned in it.

REFLECT Why is it important to know where all the controls are on your mower?

GENERALIZE Describe what can happen if your mower is set to the wrong height while mowing.

APPLY Identify something in your yard that would prevent you from mowing in a stripe pattern. How can you still stripe your yard?



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PRACTICE 1

Start, Go, Stop, Repeat

*Always reference your operator's manual for age limitations for your specific mower.
If you are under the age of 16, adult supervision is required.*

BEFORE STARTING

to practice, be sure to review your operator's manual, paying close attention to the operating warnings and starting procedures.

Always wear the proper PPE while operating your mower.

The first step to becoming a skilled mower operator is to master a couple of basic skills, including driving in a straight line and braking. Learning these basics is essential in advancing your abilities as a mower operator. **This activity should be done with the mower blades turned off.**

Record your practice in the practice record at the back of the book.

WHAT TO DO

Estimated time: 30 minutes

STEP 1. Find a place to practice. Your practice area should be a flat, off-road area, away from obstacles.

STEP 2. Bring along six objects to use as markers. Plastic bottles or milk cartons with some rocks in them work well, or safety cones if you have them.

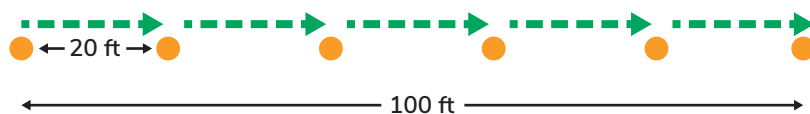
STEP 3. Place the markers in a straight line close to 100 feet long, putting a marker about every 20 feet. If you are using a push mower, the markers can be closer.

STEP 4. Start your mower using the proper starting procedure outlined in your operator's manual, and drive straight along the markers, making smooth stops at each marker. Practice several times at a low speed.

STEP 5. Repeat this exercise, going a little faster each time. Make sure you are still practicing smooth, controlled stops.

SKILL

Properly starting your mower, slowly accelerating, and coming to a smooth safe stop



Mastering Your Skills

Now that you have the hang of this, try doing the same activity in reverse. When you are backing up, make sure you are constantly looking at your surroundings and checking over both shoulders to avoid any blind spots.

Repeat the same steps above, only operating your mower in reverse.



PRACTICE 2

Turning It Around

*Always reference your operator's manual for age limitations for your specific mower.
If you are under the age of 16, adult supervision is required.*

BEFORE STARTING

to practice, be sure to review your operator's manual, paying close attention to the operating warnings.

Always wear the proper PPE while operating your mower.

The first step to becoming a skilled mower operator is to master a couple of basic skills, including turning and understanding turning radius. Learning these basics is essential in advancing your abilities as a mower operator. **This activity should be done with the mower blades turned off.**

Record your practice in the practice record at the back of the book.

WHAT TO DO

Estimated time: 45 minutes

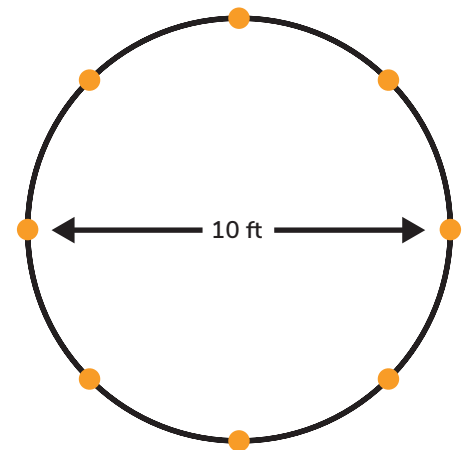
STEP 1. Find a place to practice. Your practice area should be a flat, off-road area, away from obstacles.

STEP 2. Bring along at least 8 objects to use as markers. Plastic bottles or milk cartons with some rocks in them work well, or safety cones.

STEP 3. Make a circle with a 10-foot radius in your practice area. If you are using a push mower, the radius can be smaller.

STEP 4. Proceed clockwise around the circle, staying a distance away from the markers that you feel comfortable with. Then repeat going counterclockwise. The closeness of your mower to the markers should be judged from the outer edge of your mower deck, not the tires.

STEP 5. Repeat this exercise, getting a little closer to the markers each time. The goal is to get as close to the markers as possible, without hitting them, while making a smooth steady turn.

**SKILL**

Making wide turns and determining turn radius

Mastering Your Skills

Now that you have the hang of this, try doing the same activity in reverse. When you are backing up, make sure that you are constantly looking at your surroundings and checking over both shoulders to avoid any blind spots. While turning for long distances in reverse is uncommon, having to turn while backing up for a short distance is very common. This practice helps you develop that skill.

Repeat the same steps above, only operating your mower in reverse.



PRACTICE 3

Turning on a Dime

*Always reference your operator's manual for age limitations for your specific mower.
If you are under the age of 16, adult supervision is required.*

BEFORE STARTING

to practice, be sure to review your operator's manual, paying close attention to the operating warnings.

Always wear the proper PPE while operating your mower.

The first step to becoming a skilled mower operator is to master the basic skill of making sharp turns. Learning this basic skill is essential in advancing your abilities as a mower operator. **This activity should be done with the mower blades turned off.**

Record your practice in the practice record at the back of the book.

WHAT TO DO

Estimated time: 45 minutes

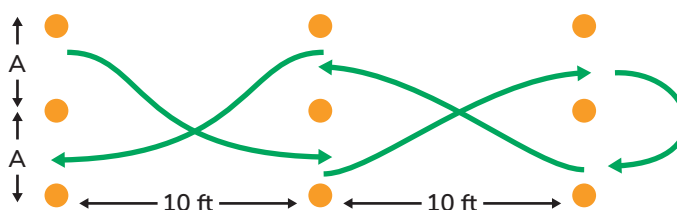
STEP 1. Find a place to practice. Your practice area should be a flat, off-road area, away from obstacles.

STEP 2. Bring along 9 objects to use as markers. Plastic bottles or milk cartons with some rocks in them work well, or small safety cones if you have them.

STEP 3. Measure the width of your mower. The distance "A" in this activity will be the measured width, plus 12 inches. Set up the markers accordingly.

STEP 4. Proceed through the course in the pattern shown below. Once completed, repeat the pattern, start at the section where you stopped.

STEP 5. Once you feel comfortable, repeat this exercise by shortening the distance "A" by 4 inches until it is only 4 inches wider than your mower. This will help you get used to tight turning situations.

**SKILL**

Making sharp turns and determining turning radius

Mastering Your Skills

Now that you have the hang of this, try doing the same activity in reverse. When you are backing up, make sure that you are constantly looking at your surroundings and checking over both shoulders to avoid any blind spots. While turning for long distances in reverse is uncommon, having to turn while backing up for a short distance is very common. This practice helps you develop that skill.

Repeat the same steps above, only operating your mower in reverse.



PRACTICE 4

Putting it Together

*Always reference your operator's manual for age limitations for your specific mower.
If you are under the age of 16, adult supervision is required.*

BEFORE STARTING

to practice, be sure to review your operator's manual, paying close attention to the operating warnings.

Always wear the proper PPE while operating your mower.

Now that you have mastered several basic skills needed for mower operation, you can start challenging yourself with more difficult courses. **This activity should be done with the mower blades turned off.**

Record your practice in the practice record at the back of the book.

WHAT TO DO

Estimated time: 1 hour

STEP 1. Find a place to practice. Your practice area should be a flat, off-road area, and can have some basic obstacles in it.

STEP 2. Bring along at least 12 objects to use as markers. Plastic bottles or milk cartons with some rocks in them work well, or safety cones if you have them.

STEP 3. Taking the courses that were completed in the previous three practice pages, set up your own course and add obstacles that allow you to practice each of the following skills at least once. You can use natural obstacles, such as trees and rocks, in your practice area as well.

SKILL

Combining skills learned to more complex course

Technique

Moving straight ahead

Coming to a stop

Making a wide turn (at least a 10-foot radius)

Making a sharp turn

Backing up straight

Backing up while turning

STEP 4. Draw or take a picture of your course layout and label each of the above obstacles. Attach the image to this page.

STEP 5. Proceed around your course and get a good feel for it.

STEP 6. Repeat by making a different course or having your project helper develop a course for you to go through.



ACTIVITY 10

Time for Tools

YOUR MOWER DOES A GREAT JOB taking care of your lawn, and you need to do a great job taking care of your mower. Routine maintenance is important to make sure your mower functions properly and keeps your yard looking great for years to come.

WHAT TO DO

Estimated time: 30 minutes

Using your operator's manual, identify the maintenance intervals for the following parts of your mower. Identify the last time each service was completed and make a schedule based on the service intervals.

Maintenance	Recommended Maintenance Interval	Date Last Completed	Next Date to be Completed
oil change			
clean air filter			
check tire pressure			
check mower belt			
sharpen blade			
clean deck			
clean radiator			
replace fuel filter			
change spark plug			

You might discover your operator's manual has a few pages set aside for a maintenance record. If it does, now would be an excellent time to start using it.

Learning Outcomes

Project skill: Making a plan for routine mower maintenance • **Life skill:** Managing resources •

Educational standard: AFNR-CCCS PST.02.01.01.b. Develop a preventative maintenance schedule for equipment, machinery and power units used in AFNR power, structural and technical systems. •

Success indicator: Makes a plan for routine mower maintenance





More Challenges

With the assistance of your project helper, complete one full maintenance interval with your mower. Take before and after pictures of each part and give a presentation on what you did.

BACKGROUND

Keeping up with the service on your mower is very important to making sure it runs right and lasts a long time.

- One critical component is the oil that keeps the engine running smooth. Oil helps keep parts of the engine from freezing or seizing up and getting too hot. As the oil gets older, it needs to be changed out. The oil also passes through an **oil filter** that cleans the oil and keeps dirt out of the engine. This filter should be replaced every time you change the oil.
- Blades are another key component of your mower. Without them, you wouldn't be able to cut any grass. Blades need to be inspected, cleaned, and sharpened to make sure your mower is making a clean cut on your lawn
- If you have a riding or zero-turn mower, your mower probably has a belt on it that helps transfer power from the engine to the deck. Over time, belts can become worn out or frayed. They need to be inspected to make sure they are still in good shape.
- If your mower runs on gas or diesel, the engine mixes the fuel with air that it burns for energy. The air first passes through an **air filter** to make sure it is clean and free from dirt particles. Because mowing can get dusty and messy, the air filter needs to be cleaned to make sure good air flow is getting to the engine. The operator's manual gives a recommendation for how many hours the air filter lasts under normal use. If the air filter is too dirty, then it should be replaced by a new one.



- The tires are also a critical part to the function of your mower. They should be checked frequently to make sure that the tire pressure is within the correct range. The proper air pressure is included on the sidewall of the tire, and in the operator's manual. If the tires are out of range, they should be filled up, or a flat tire could occur.
- The most frequent item to check on your mower is the fuel level. If your mower runs on gas or diesel, it needs to be refilled regularly. Refilling should always be done in a well-ventilated area that allows the harmful gas vapors to dissipate into the air.
- If you have an electric mower, you should make sure that once the batteries are charged, you take them off the charger to prevent over charging. You should also store batteries indoors in the winter to prevent them from freezing.

Did you know?

With proper maintenance, some mowers last over 30 years.



Manual Moment

Use your operator's manual not only for information about safety and operation, but also for everything you need to know to take care of your mower. It is a great practice to mark these pages in your operator's manual to have quick reference to them.



**OPERATOR
MANUAL**



ACTIVITY 11

Sharpening Your Skills

YOUR BLADES ARE ONE OF THE MOST important parts of your mower. Without them, your mower would simply drive around and make noise. It is important to keep the blades sharp so that they cut through the grass. Dull blades can rip and tear the grass which will make the lawn look unhealthy. Blades become dull over time and should be inspected regularly.

WHAT TO DO

Estimated time: 90 minutes

STEP 1. Jack up your mower so you can look at the blades. Make sure that the mower is on level ground and that the parking brake is engaged. Use jack stands or blocks that are rated for the weight of the mower and make sure the mower is secure before you look at the blades.

STEP 2. When looking at the blades, see if they have any nicks or appear dull. Take them off to inspect further.

STEP 3. Take a picture of the edge of your blade before doing any work on them.

STEP 4. With the assistance of your project helper, sharpen the blades.

STEP 5. Balance your blades after each side is sharp, resharpening as needed to maintain balance.

Regardless of your age, if you have not sharpened lawn mower blades before, do this activity with your project helper, parent/guardian, or other knowledgeable adult.

Learning Outcomes

Project skill: Sharpening lawn mower blades • **Life skill:** Mastering technology • **Educational standard:** AFNR-CCCS PST.02.01.02.c. Assess and adjust equipment (e.g., belts and drives, chains, sprockets, etc.) and maintain fluid conveyance components (e.g., hoses, lines, nozzles, etc.) to ensure proper functioning. • **Success indicator:** Sharpens lawn mower blades



STEP 6. Take a picture of the blades after the work has been completed. Attach the before and after pictures to this page.

BLADES BEFORE

BLADES AFTER

STEP 7. Reinstall the blades and test them out in the yard.

More Challenges

Visit your local lawncare provider or mower dealer and ask them to show you the process for sharpening and balancing blades. Share your experience with your project helper or peers.





BACKGROUND

Sharpening blades is a two-step process, sharpening and balancing. Sharpen your blade at a 30° angle. This provides a nice edge that cuts through the grass and prevents buildup of clippings in the deck. The blade should also be sharpened until all the nicks and gouges are removed.

Blades need to be balanced. That means they should weigh the same on each side. As you are sharpening a blade, whatever you do to one side do to the other side too. This prevents unnecessary vibrations when the blade is spinning at operating speed. You can get a small blade balancer or simply suspend the blade from a string to see if it sits level. If it leans to one side, sharpen that side further.

Resources

The National Council for Agricultural Education lists these sample careers in connection with the Power, Structural, and Technical Systems Career Pathway: diesel mechanic, machine operator, agricultural engineers, heavy equipment maintenance technician, equipment and parts managers, welders, machinists, GPS technicians, and remote sensing specialist. Talk to your high school counselor or ag teacher for more information about these and other ag-related careers.

Did you know?

Special sharpeners made just for mower blades help make sure the blade is sharpened to the correct angle.



Manual Moment

Blades are important components of your mower. Your operator's manual has an entire section on care and maintenance of the blades. Learn how to inspect and change the blades on your specific mower, as all mowers vary slightly.



ACTIVITY 12

Shed Time

YOUR MOWER IS AN EXPENSIVE AND important machine. It should be cared for and stored in a place that keeps it out of the weather. Your mower should be properly stored not only in the winter, but during the mowing season too. Proper storage makes maintenance easier and extends the life of the mower.

WHAT TO DO

Estimated time: 1 hour

Refer to your operator's manual for storage suggestions for your mower. Which of the following tasks are needed for in-season and/or out of season storage? Place a check in the columns that apply.

Task	In-Season	Out of Season
cleaning the deck		
charging the battery		
adding fuel additive		
disconnect battery		

At the end of lawn mowing season, complete the needed steps and store your lawn mower appropriately.

Learning Outcomes

Project skill: Cleaning and storing a mower • **Life skill:** Managing resources • **Educational standard:** AFNR-CCCS CS.03.04.03.b. Assess and demonstrate appropriate operation, storage and maintenance techniques for AFNR tools and equipment. • **Success indicator:** Cleans and stores mower in and out of season



More Challenges

Demonstrate how to get your mower ready for out-of-season storage to your project helper or peers.

BACKGROUND

During the season, the way you store your mower is very important. When you are finished mowing, always clean debris off the deck. This can be done with a garden hose, pressure washer, air compressor, or leaf blower. By getting all the grass clippings off the deck, you keep grass from rotting and sticking to it, which causes buildup over time. The buildup can cause your deck to rust and fall apart.

Another thing to check during the season is the fuel level. It is always a good idea to make sure your mower has at least a half tank of fuel in it. That helps it start easily the next time you use it.

Overwintering, or out-of-season storage, takes a little bit more work depending on where you live. It is a good idea to add a **fuel stabilizer** to the gas tank to make sure the gas stays good throughout the off season. This aids with starting your mower for the first time next season.

Just like during the season, cleaning off your mower's deck before the winter is also important. Make sure all grass is cleaned off, so it doesn't rot or provide a home for rodents.

If your mower has a battery, the battery loses charge when the mower is not started for a long time. To avoid this, make sure you disconnect the battery cables from your mower's battery. Always disconnect the negative cable first but reconnect the positive cable first.



Manual Moment

Your operator's manual lays out specific instructions for storage of your mower. By following these steps every winter, you will make sure your mower lasts for many years!

Did you know?

Some mower decks have a connection for a hose that allows you to wash the underside.



ACTIVITY 13

Troubleshooting Tips

SOMETIMES YOU CAN READ all the instructions and follow all the steps, and your mower still won't start. This happens to everyone and is nothing to worry about. Usually, it is a simple fix.

WHAT TO DO

Estimated time: 30 minutes

Find the troubleshooting section of your operator's manual. This section reviews the most common problems. Identify three possible problems that might occur. Name each problem and in your own words describe how to fix it.

PROBLEM 1. _____

PROBLEM 2. _____

Learning Outcomes

Project skill: Identifying common lawn mower problems and solutions • **Life skill:** Thinking critically
• **Educational standard:** AFNR-CCCS PST.03.03.03.a. Identify and examine the components of suspension and steering systems used in AFNR power, structural and technical systems. • **Success indicator:** Identifies three lawn mower operation problems and their solutions



PROBLEM 3.



More Challenges

Identify a common problem with the operation of mowers and demonstrate to your 4-H club or other group how to check for the problem and fix it.

BACKGROUND

Sometimes mowers won't start right away. This can have a number of causes. One possibility is that a safety switch is not engaged. These switches need to be engaged in order to start the mower. Some examples are a handle on a push mower, the PTO, parking brake, neutral lever, and seat or seatbelt.

If nothing happens once you have all the safety switches engaged, check the battery connection next. Sometimes the connections become loose or corroded. Cleaning the connections with a wire brush should solve the problem. If this still doesn't help, check to make sure your battery is charged. This can be done with a [voltmeter](#).

If your mower has good charge, turns over, and sounds like it wants to start but won't, the issue might be a bad [spark plug](#). Spark plugs get dirty during use and eventually fault out. By removing your spark plug and holding it against the block while trying to start the engine, you can see if there is a spark or not.

Finally, if your spark plug is good, the issue could be that your gas is either too low or old. Adding new gas to the tank should solve the issue. If this still doesn't solve the problem, check the fuel filter on the mower to ensure gas is getting through.



Manual Moment

The operator's manual guides you through any issues when starting your mower. Most solutions are simple fixes, but others are complex and need to be addressed by a mechanic. Never perform work that you do not feel confident and comfortable performing.



Did you know?

Many people make a business from servicing lawn mowers for other people in their communities.



Talking It Over

SHARE What is a part of your mower you didn't realize needed to be checked or maintained?

REFLECT What could happen if you do not perform regular maintenance on your mower?

GENERALIZE What steps should you do before performing any maintenance work on your mower?

APPLY Your friend has a mower that won't start. They have tried everything they know, but they don't have the manual. The mower is the same type as your mower, just a different brand. How would you go about helping them?



Glossary

air filter. An engine part that prevents dirt from coming in with the air into the engine.

autonomous. A lawn mower that functions on its own, without an operator.

battery. An object that stores electricity for later use.

blades. Sharpened pieces of metal that spin and cut grass.

brake pedal. Used to slow down and bring a vehicle or machine to a stop when depressed.

choke. A valve used to restrict the flow of air to the engine to help start a cold engine.

cutting height. The distance from the ground to the sharpened edge of the blade where the grass will be cut.

discharge chute. A plastic or rubber piece that attaches to the mower deck and prevents debris from being thrown.

electric start. A starting system that uses a battery and key or button to start the engine.

engine. A machine that converts the energy in fuel into a mechanical force.

eye protection. Goggles, shatter-resistant glasses, or shield worn over the eyes to prevent dust and other debris from entering the eye.

fuel stabilizer. A petroleum product added to fuel to extend its life.

fuel tank. The storage container on the mower that holds fuel to be used by the engine.

hazard points. Parts of the mower that present a danger to the operator.

hearing protection. Earplugs or earmuffs that reduce the volume of sound entering the ears.

hydrostatic. A mower that runs on a system of hydraulics rather than using belts and gears.

Knozone Action Days. Days when the air quality may become unhealthy for everyone, but certain groups including children and the elderly should avoid spending a lot of time outside. Restrictions are placed on operation of unnecessary equipment, such as mowers.

maintenance. Steps taken on equipment and machinery to insure continued operation and long life.

motion control levers. Arms on a zero-turn mower that are used to steer, drive forward, and backup.

motor. A machine that converts electrical energy into a mechanical force. (See engine for comparison.)

mower deck. The housing that covers the mower blades.

mowing pattern. The directions that an area is mowed, including paths around obstacles

mulching bag. An attachment for mowers that collects the grass clippings so they can be used for mulch or compost.

obstacles. Anything that gets in the way of mowing in a straight line. Examples include trees, sidewalks, toys, garden hoses, flowerbeds, etc.

oil filter. An element that cleans and removes debris from the oil in the engine.

operator's manual. A book containing all the information about a specific mower including safety, operation, and maintenance.



overlap. The distance the mower deck hangs over the previous mowing pass.

personal protective equipment (PPE).

Clothing and equipment that is worn or used to provide protection against hazards.

power take-off (PTO). The system that allows mechanical energy to be transferred from the machine to an external attachment, such as a mower deck.

pull start. A starting system that uses a rope that must be pulled to spin the engine.

push mower. A mower that requires the operator to push and guide it during operation.

reel push mower. A mower made with blades mounted on a reel that runs without fuel or electric power.

riding mower. A mower that has a seat, pedals, and steering wheel, and an operator who rides on the mower.

roll over protection system (ROPS). A system or structure intended to protect equipment operators from serious injury in the event the equipment rolls over. The system consists of a seatbelt and roll over bar.

safety labels. Stickers on the mower that identify hazards and warn the operator against them.

safety switches. Mechanical or electrical lockouts that must be engaged before the mower can be started. If they become disengaged, the mower shuts off to protect the operator.

schematics. Drawings that show how all parts of a mower fit together.

self-propelled. An optional function on push mowers that provides drive to the rear wheels of the mower and allows the operator to not have to push as much.

spark plug. A part of an engine that contains an air gap where a spark is produced to ignite gasoline in the engine.

steering wheel. A wheel attached to a steering column that connects to the axle of a mower and allows the wheels to turn.

throttle. A lever that controls the speed of the engine.

tires. A rubber covering, typically inflated or surrounding an inflated inner tube, placed around a wheel to form a flexible contact with the ground.

troubleshooting. The steps taken to identify potential causes and solve a problem.

voltmeter. An instrument for measuring the charge of a battery.

zero-turn mower. A mower with a seat and motion control levers that control the movement of the mower. The operator rides on the mower. Also called a zero-radius mower.



Summary of Learning Outcomes

Activity	Project Skill	Life Skill	Educational Standard*	Success Indicator
Project Area: Mower Safety				
1. Getting to Know Your Mower	Becoming familiar with mower and mower operator's manual	Processing information	AFNR CCCS CS.03.04.03.a. Read and interpret operating instructions related to operation, storage and maintenance of tools and equipment related AFNR tasks.	Identifies information about mower using mower and operator's manual
2. Pieces and Parts	Identifying mower parts	Visualizing information	AFNR CCCS CS.03.04.02.a. Identify standard tools, equipment and safety procedures related to AFNR tasks.	Correctly labels and describes mower parts
3. Dress for Success	Selecting safe clothing and PPE for mowing	Preventing personal injury	AFNR CCCS CS.03.04.01.b. Analyze and demonstrate adherence to protective equipment requirements when using various AFNR tools and equipment.	Selects safe clothing and PPE for mowing
4. Sticking to Safety	Identifying the meaning of safety labels on a mower	Preventing personal injury	AFNR CCCS PST.02.02.02.a. Examine and identify safety hazards associated with equipment, machinery and power units used in AFNR power, structural, and technical systems (e.g., caution, warning, danger, etc.).	Locates, recreates, and interprets safety labels on a mower
5. Riding Safety	Identifying potential mowing hazards	Preventing personal injury	AFNR CCCS CS.03.03.04.c. Create a plan to mitigate the level of contamination or injury identified as a risk in the workplace.	Identifies path for avoiding potential mowing hazards in a specific space
Project Area: Making the Cut				
6. You're in Control	Identifying mower controls	Understanding systems	AFNR CCCS PST.03.01.01.b. Analyze and explain how the components of internal combustion engines interrelate during operation.	Correctly labels and describes mower controls



Activity	Project Skill	Life Skill	Educational Standard*	Success Indicator
7. Pushing Along	Starting and turning off a push mower	Understanding systems	AFNR CCCS PST.02.02.01.c. Perform pre-operation inspections, start-up and shut-down procedures on equipment, machinery and power units as specified in owner's manuals.	Starts and turns off a push mower
8. Making a Clean Cut	Adjusting blade height on a mower	Thinking critically	AFNR CCCS PST.02.02.02.c. Adjust equipment, machinery and power units for safe and efficient operation in AFNR power, structural and technical systems.	Makes various adjustments to the blade height on a mower
9. Your Yard Is Looking Good	Creating stripes with mowing patterns	Completing a project or task	AFNR CCCS CS.03.04.03.b. Assess and demonstrate appropriate operation, storage and maintenance techniques for AFNR tools and equipment.	Implements at least two different mowing patterns that result in stripes

Project Area: Mower Maintenance

10. Time for Tools	Making a plan for routine mower maintenance	Managing resources	AFNR CCCS PST.02.01.01.b. Develop a preventative maintenance schedule for equipment, machinery and power units used in AFNR power, structural and technical systems.	Makes a plan for routine mower maintenance
11. Sharpening Your Skills	Sharpening lawn mower blades	Mastering technology	AFNR CCCS PST.02.01.02.c. Assess and adjust equipment (e.g., belts and drives, chains, sprockets, etc.) and maintain fluid conveyance components (e.g., hoses, lines, nozzles, etc.) to ensure proper functioning.	Sharpens lawn mower blades
12. Shed Time	Cleaning and storing a mower	Managing resources	AFNR CCCS CS.03.04.03.b. Assess and demonstrate appropriate operation, storage and maintenance techniques for AFNR tools and equipment.	Cleans and stores mower in and out of season
13. Troubleshooting Tips	Identifying common lawn mower problems and solutions	Thinking critically	AFNR CCCS PST.03.03.03.a. Identify and examine the components of suspension and steering systems used in AFNR power, structural and technical systems.	Identifies three lawn mower operation problems and their solutions

*The educational standards cited here are from the *Agriculture, Food, Natural Resources (AFNR) Career Cluster Content Standards* (2015) from the National Council for Agricultural Education. They can be viewed in their entirety at thecouncil.ffa.org/afnr.



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