Machinery
Introduction to Module 4

Machinery is an important part of many jobs in horticulture, especially in amenity settings such as parks and leisure facilities. It is also a vital part of production horticulture, with growers using an extensive range of machinery and implements. This module is aimed at the amenity end of the industry but the skills supported here can be applied to the use of machinery generally. It includes:

- reading operator manuals
- pre-start checks
- maintenance and fault finding
- using parts lists and diagrams.

Source material for this module has been taken from manuals and information for mowers used in parks, roadside maintenance and leisure facilities such as golf courses. It is important that learners are encouraged to apply the skills to machinery used in their own work setting.

Skills checklist

Machinery is used a lot in horticulture, ranging from small hand-held equipment to large machinery with complex attachments. You will probably rely upon mechanics and engineers to sort out major problems, but day-to-day maintenance and safety issues are your responsibility.

You need practical skills to handle machinery, but you also need a range of other skills in order to use and maintain machinery safely.

The following list includes some of the skills you will need if you are using machinery at work. Tick all the skills you have already and then look again at the checklist when you have used the materials.

Skills for using machinery	Now	Later
Using operator manuals		
Following instructions for routine maintenance		
Following instructions for fault finding		
Carrying out pre-start checks		
Keeping routine records		
Understanding diagrams in manuals		
Using a parts list and codes for machinery		

PAGES 4:1–4:4

Operator manuals

This theme relates closely to the mandatory unit CU2: *Monitor and Maintain Health and Safety*, and to the optional units for operating and maintaining machinery (CU11, L27, CU27). Many people working in horticulture use machinery. This will include production machinery in the commercial setting, for which operators will be given appropriate training. In the amenity horticulture sector, workers may be operating a wide range of hand-held, pedestrian and ride-on equipment, depending on where they work. They may be responsible for maintaining this equipment or have a maintenance department to deal with faults and defects. In the main, however, people are responsible for the day-to-day upkeep of their machinery and are ultimately responsible for the safe working of the equipment. Learners should be familiar with operator manuals and know how to use them effectively and efficiently. Understanding how format is used for different purposes is a valuable skill that will help them to use the manuals successfully.

Materials

Operator manuals for a wide range of machinery and equipment (often available on the Internet)

Learning outcomes

1 To understand that format of text often varies according to purpose (focus page, Tasks 1 and 2)
2 To understand how format and organisational features of text help you to find information (focus page, Tasks 1 and 2)

Introduction

- Ask learners about the types of equipment they use at work. List their responses on the board in the first column of a three-column table. Entitle the column: 'Equipment type'.
- In groups, ask learners to identify any known safety issues with using these machines. Share these with the whole group and add to next column ('Safety issues') on the board.
- In groups, ask learners to identify common problems or faults they have encountered with these machines. Share these with the group and add to the third column ('Common faults') on the board.
- Ask learners how they deal with safety issues and faults. Is it acceptable to pass them on or do they have some personal responsibility?
- Lead learners to the use of operator manuals to check safety procedures, carry out routine maintenance and find solutions to problems.
- Give learners a range of operator manuals to look at. What sort of information can they find? This might include safety information, pre-start checks, instructions for maintenance, etc. List these on the board, also in tabular form. Is there any difference between the ways different information is presented? Elicit the different formats from the group and write in the table. For example:

Information you can find	**How is it presented? (format)**
Pre-start checks	Table, bullet list
Contents	List, table with page numbers
Parts	Diagram, list, table

Focus page

- Use the texts on the focus page to show further examples of how format and layout are used for different information.
- Check that learners know and understand how to use the contents page and index, and understand the use of formats such as titles, subheadings, bullets and numbering.
- Draw attention to other features such as capital letters, bold text, symbols, etc. Point out that these are used to signpost information and to help us find our way around.
- The page contains a lot of technical vocabulary, some of which may be unfamiliar to learners. If necessary, explain the meanings of terms used. ESOL learners may need explanation of other non-technical vocabulary such as 'disengage'. It

may also be useful to look at the same format issues in a manual with which they are more familiar.

Curric. refs	NOS	Key Skills
Rt/L1.4	CU11	C2.1a
Rt/L2.6	L27	C2.1
Rt/L2.7	CU2	
	CU27	

Task 1

Locate information in operator manuals by using contents pages and format
Rt/L1.4
Rt/L2.6
Rt/L2.7

- Check that each learner has an operator manual for a machine – hand-held equipment, mowers of different types, tractors or even car manuals; all have very similar features. Manuals can be downloaded from the Internet.
- Ask learners to flick through their manual to familiarise themselves with the contents.
- Explain to learners that the purpose of the task is to locate information using clues such as headings, layout, etc. For many of the questions they simply need to write down the correct page number(s). Others require further information.

If the learner has difficulty

- Make sure learners who are likely to have difficulties with this task use a familiar or straightforward (i.e. clearly signposted) manual. It will be easier for them to find information if the manual concerns a familiar piece of machinery.
- Dyslexic learners may need support to do this task systematically and to identify how to locate information.
- Review the information discussed for the focus page.
- Look at the contents page and discuss the way it is laid out and how it can be used.
- Look at other features in the learner's manual and discuss the way they give you clues about content and purpose.
- Support learners for the first few questions by working alongside them, using questioning to lead them through each one. Withdraw support as they become more confident.
- Give assistance with reading technical terms in the manual.
- Be aware of vocabulary needs of ESOL learners.
- Take away the burden of writing and ask learners to give you their responses verbally.

Extension

Learners can compare the format of a range of manuals by exchanging within the group. Can they find the same information in another manual?

Task 2

Use format and key words to find information in extracts from mower operator manuals
Rt/L2.6
Rt/L2.7

- Remind learners that the layout or format of pages often gives a clue to their purpose and contents.
- Ask learners to look at both pages and explain that each box represents an extract or part from a manual.
- To find the information they need for each question, learners will need to think about the way they expect it to be presented, for example if they need a page number, they will be looking for an index or contents layout.
- Once learners have found the correct extract, they can read in more detail.

If the learner has difficulty

- You may need to explain terminology such as 'maintenance schedule'. Some learners may need support to understand the connection between this term and the question about 'maintenance checks'. Use of key words may help in this search.
- Part of the skill involved in this task is to understand that text with different purposes is presented in different formats. Check understanding using direct questions about format, using examples from other manuals. For example, fault finders are often in table format; warnings usually have a safety symbol; a parts list is a list of codes.
- It is more important at this stage that learners can find the correct type of information by using format, headings and layout. They can then be supported to extract the information they need.

Extension

- Give more questions related to the information on the two pages.
- Ask learners to set a quiz based on a workshop manual with which they are familiar. Other members of the group can answer the questions.

Theme assessment

Use a range of operator manuals in practical situations, preferably with the correct machinery. Ask learners to track down part numbers or to look for more specific information about checks, maintenance and fault finding.

Operator manuals

Focus

KT owner/operator manual

Models

KT – 915033

KT – 915034

KT – 915035

GB English

F Francais

D Deutsch

First check that you have the right manual

Model codes are often very similar.

Contents

Look at the way the manual is organised.

This is called the **format**.

Look for:

- contents
- graphics
- headings
- instructions
- safety information
- lists
- tables

Scan down the contents list to find the section and page number that you need.

OPERATION

WARNING
Read and understand the Safety section before proceeding.

Safety Interlock System

WARNING
Safety interlock failure and improper operation of unit can result in death or serious injury. Perform the following test procedure before each use.

If the unit does not perform as stated below, contact your dealer for repair.

Test	Steering lever	PTO	Parking brake	Engine
1	Neutral Lockout Position	Off	Engaged	Starts
2	Forward	Off	Engaged	Doesn't start
3	Neutral Lockout Position	On	Engaged	Doesn't start
4	Out of Neutral Lockout Position	Off	Disengaged	Doesn't start
5	Reverse	Off	Disengaged	Shuts off

Section headings use **bold text** and CAPITAL LETTERS.

Information, such as checks and fault finders, is often shown in tables.

Safety information may be signposted with symbols and written in **bold text**.

Stopping the engine

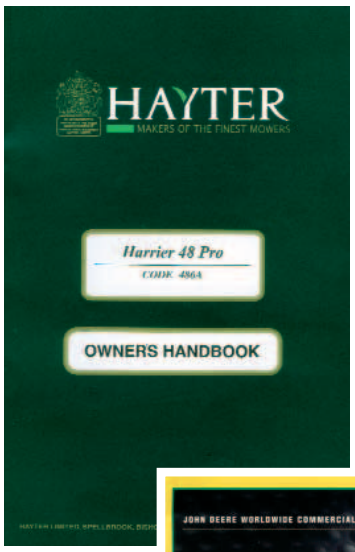
1. Stop unit.
2. Disengage PTO.
3. Set throttle lever to slow.
4. Turn ignition to off position and remove key.
5. Set parking brake.

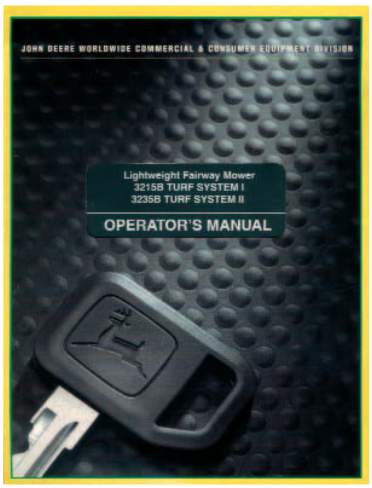
Instructions are often written in numbered steps. They tell you **what** to do, **how** to do it and **the order** to do it in.

Operator manuals

Task

You can use the layout of operator manuals to help you find your way around and get information quickly.





Task 1

Use your own manual to find this information. Record your answers on a separate sheet.

1 The name and model number(s) the manual covers.

2 A set of numbered instructions that must be followed in a particular order.

3 A checklist where everything should be done but the order is not important.

4 A diagram that shows you all the different components in one part of the machine.

5 A page number (use the contents page) for:
   a safety information
   b machine specifications
   c service or maintenance information.

6 A page to help you identify faults or problems.

7 Information that is in a table. What is the table about?

8 Warning signs for the following messages. Write down the page number for each one.
   a 'Stay clear of rotating parts'
   b Keep people away from machine while operating
   c Stand clear of discharge area
   d Do not touch parts that are hot from operation.

9 A diagram that helps you with a maintenance or repair job.

10 The section for pre-start checks.

Tip

- Look through the manual first to get a feel for the way it is laid out.
- You don't need to read every word to find this information. Use the contents page, the headings, graphics and layout to help you.

Rt/L1.4; Rt/L2.6; Rt/L2.7

Operator manuals

Task

Task 2

Use the extracts on pages 4:1–4:4 to find the information you need for these questions.

1 You have a Turfbuster Mower model ZX3331. What type of mower is this model? _____

2 When you are cleaning the battery, what is the last thing to re-connect? _____

3 You are trying to sort out a problem. Which page will you go to? _____

4 You need to replace a hose. Which page do you need? _____

5 What maintenance checks are needed every 50 hours? _____

6 You need to replace the bottom blade. What is the part number? _____

7 In the diagram, how many screws are needed to fix the bottom blade? _____

8 What is the description of item number 40? _____

9 What is the maximum slope you should operate on? _____

TURFBUSTERS

REDPERIL 3330SC
REDPERIL ZX 3331

Triple Turf Mower

Tough on the rough!

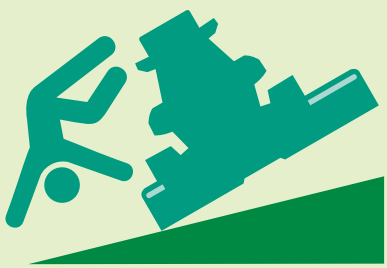
TURFBUSTERS

GREEN DEMON
Model 0031X 0033X 0031ZX

Pedestrian cylinder mower

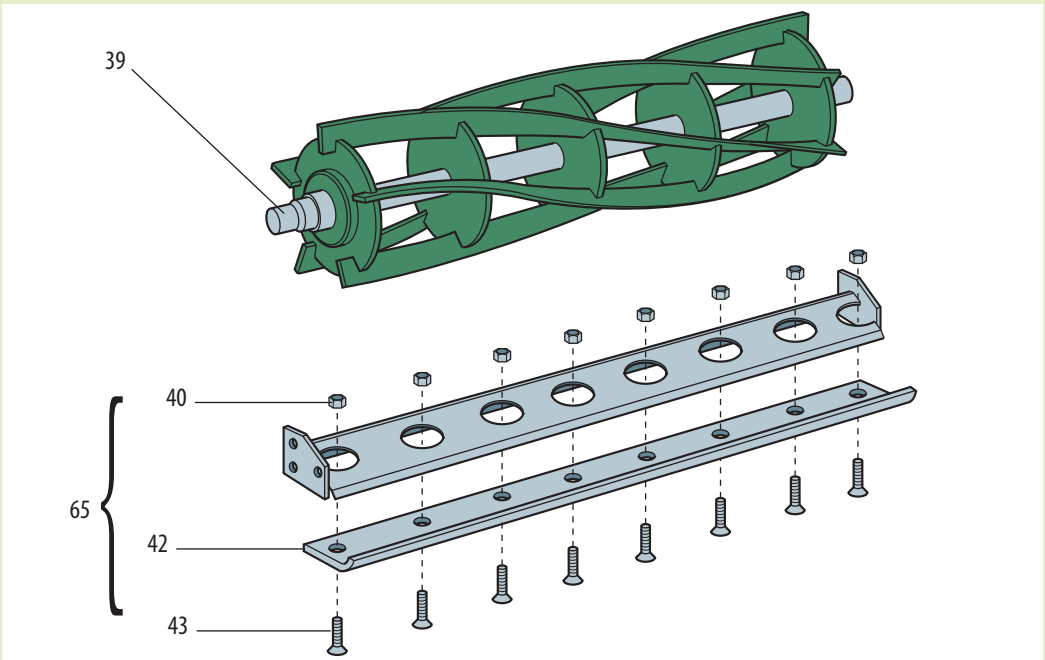
For a finer finish!

Go up and down slopes, not across.
DO NOT operate on slopes over 10°



Operator manuals

CUTTERHEAD PARTS

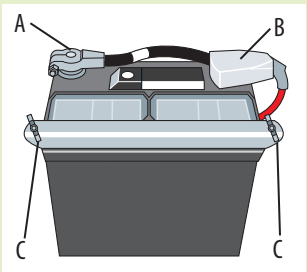


Parts list Cutterhead

Item no	Description	Part no
39	Cylinder 4 blade Cylinder 6 blade	823004 823006
40	Nut M10	HJK10045
42	Bottom blade	824009
43	Screw Soc Hd M10	01234
65	Bottom blade assembly	827554B

Cleaning battery

1. Remove negative (black) cable (A) from battery first.
2. Remove positive (red) cable (B).
3. Remove two wing nuts (C).
4. Remove battery.
5. Clean battery with weak baking soda solution – terminals, cable ends, battery ledge.
6. Rinse all parts with clean water. Let battery dry.
7. Install battery. Connect negative cable last.



MAINTENANCE SCHEDULE

Interval	Task	Action
Every 25 hours	Check battery Lubricate unit	Clean battery terminals
Every 50 hours	Check blades and mountings Clean air filter	Sharpen or replace blades Tighten all nuts and bolts to correct torque Replace fasteners that are missing or damaged
Every 100 hours	Check all belts	Replace worn or damaged belts (see Hydrostatic Belt Replacement)

PAGES 4:5–4:6

Pre-start checks

It is important to carry out a series of checks before using a piece of machinery. This is particularly important in situations in which a number of people use the same machine. Larger companies and organisations usually have a system of checks, and a maintenance department that will deal with reported defects. Individuals working alone or in small teams will be responsible for checking and maintaining their own machines. Learners should be able to follow a checklist to ensure that they complete all the necessary checks. This may mean using either a pre-set format like the one shown on the focus page or the list from an operator manual.

Materials

Pre-shift checklist from the Source material (0:12)

Defect reporting form from the Source material (0:14)

Operator manuals

Machinery if available

Learning outcomes

1 To understand and locate information presented in a table (focus page, Tasks 1 and 2)

2 To complete a form in table format (focus page, Task 2)

Introduction

- Set the scenario to learners of using a mowing machine with which they are not familiar. The machine seizes up because of lack of coolant. The machine has to go back to the depot – their boss is upset because it is out of service. Whose responsibility is it?
- On a more critical level – whose responsibility is it if an accident is caused because of a loose guard on a strimmer?
- Learners must be aware that they are responsible for both their own health and safety and the health and safety of others, including colleagues and the public. They cannot assume that machines are in good order. They have to complete pre-start checks.
- Ask learners to find the pre-start checklists in their own manual. These may vary from very simple checks for smaller machinery to more extensive checks on tractors with attachments.

Focus page

- Go through the example shown on the focus page. Ask learners to read through the notice, 'To all staff', and ask some direct questions about the instructions. *How many things are in the A4 folder? What are they? Who should complete this form? How often should it be completed? What do you think the 'DO NOT USE' notice is for? Why shouldn't it be removed from the vehicle?*
- Ask learners if they have come across similar checklists or forms at work. Go through the format, making sure learners are confident with the tabular layout and rows and columns. It is most important that learners understand the need to complete all checks. The key is to track down the left-hand column and complete each check in order. They must also track across to the correct day to fill in the box. It is important that they always make an entry. Check the 'Day' column to make sure that each box is filled in.
- Discuss how to use scanning skills to locate information quickly. This relies on looking for key words. For example, if you need to find out about when the tyres were last checked, you look for the key words 'wheels' or 'tyres' to locate the row to check.
- As you go through the table, discuss with learners what might be involved with each check. What will they be looking for?
- Check that learners are familiar with all the abbreviations and technical language on the form. You may need to explain the word 'rectify'.
- Give learners a copy of the checklist and give some examples: *It's Thursday. Clock hours are …; Engine oil level is low …; Left-hand indicator is faulty.'*

- You may need to discuss what is meant by 'clock hours' and how this is used to calculate how long the machine has been in use. (Note: one of the questions in Task 1 asks for the calculation involved on the page.)
- Discuss with learners what action should be taken if defects are found. How should this be recorded? With so little space on a form, they need to be brief and to the point. Any additional details should be completed on the Defect reporting form. (Note: these are covered on page 4:14).
- Discuss questions that may be asked for clarification as a form is completed.

Curric. refs	NOS	Key Skills
HD1/L1.1	L27	N1.1
HD1/L1.2	CU11	
Rt/E3.7	PR05.1	
Rt/L1.4	CU27.1	
SLlr/L1.2		
Wt/L1.2		

Task 1

Extract information from the pre-shift checklist on the focus page
HD1/L1.1
Rt/E3.7

- Direct learners towards the partially completed form on the focus page and the discussion that you had around this.
- Remind them how to find the correct box for information by moving down the checks and across to the correct day.
- Check that they understand the 'True/False' style of question. They could do this work in pairs then discuss how they arrived at the answers.

If the learner has difficulty

- Assist learners who are having difficulty by supporting them to use the tabular format.
- Learners who have problems with visual tracking skills will have difficulty keeping their place in rows and columns on a table. Use a ruler or piece of paper to help with this. An L-shaped or inverted-L-shaped card can help with tracking on a table.
- Some learners may have problems with the scanning skills required to answer these questions and may need support to decide what key words to look for.
- Make sure learners understand the abbreviations for the days of the week.
- Make sure learners understand what they have to do to find the clock hours.
- Put the statements on cards for learners to sort into true statements and false statements.

Extension

- Ask learners to complete a Defect reporting form (from the Source material) for Monday.
- Produce a written description of faults for a particular machine (E.g. machine x was used for y hours before a fault was reported on day z. An x form was completed.)

Task 2 19

Listen to a person completing the checklist and use the pre-shift checklist to record this
Rt/L1.4
SLlr/L1.2
Wt/L1.2
HD1/L1.2

- Remind learners that the best way to ensure they complete all the checks is to work through the sheet in a systematic way, marking each part of the form as they go.
- Explain the task. Point out that this person is checking through each item on the list as if working with a partner (the learner) who is filling in the form.
- Play the whole audio clip through. Learners follow down the form and tick off each section that is referred to as it is mentioned. Is anything missed out?
- Play the audio clip a second time. Encourage learners to tick off the things that are OK.
- Play the audio clip once more and ask learners to complete the items that need more information. Spelling is not important for this task.

If the learner has difficulty

- Some learners will have difficulty listening and completing the form. Advise them just to listen the first time. Discuss what has been found on the machine, what was OK and what was wrong.
- Ask different groups of learners to listen out for different things and complete just that section of the form.
- Provide partially completed forms for some learners to complete.

- Support learners the second time through to tick each item with a pencil. It may be easier at this stage to work their way down the left-hand column. They can then transfer the information into the column for Monday.
- As learners listen for a third time, ask them to mark the checks where something was wrong. The details can be completed afterwards.
- You could read the audio clips aloud more slowly if this is more appropriate to the learner.
- Check any difficulties that ESOL and other learners may have with understanding words such as 'top up', 'on the mark', 'hanging off', 'a bit mucky'. These may need to be explained in context.
- Use a highlighter pen to indicate the correct row/column for specific pieces of information.

Extension

- Discuss in pairs other common faults or defects that learners may encounter with each of these checks. Draw on their own experience with machinery and equipment. It would be useful to make a list of the most common faults (the top three) found under each heading.
- Discuss other ways in which learners can ensure that all checks are completed if they have no checklist (e.g. working from top to bottom or front to back of the vehicle). It is important to establish a routine for checks.

Theme assessment

- Observe learners completing a pre-start check on a machine in the training setting. Practical application of this task is critical.
- When assessing learners in the workplace, check that they complete pre-start checks in a systematic way.

Pre-start checks

Focus

All operator manuals will have a list of pre-start or daily checks. Some companies will also have a checklist that you must complete every time you use the machine.

Make sure **you know what you have to do.**

Use a **systematic** approach.

The best way to tackle a checklist like this is to start at the top and work your way down.

To all staff

Every machine will have an A4 folder in the cab. This will contain a Pre-shift Checklist, Defect Reporting Forms, a DO NOT USE sign and an Instruction Sheet.

It is the responsibility of the first driver of the day to complete a Pre-shift Checklist. This must be completed every day that the vehicle is used.

The folder MUST NOT be removed from the vehicle.

Failure to complete pre-shift checks will be considered a breach of Health and Safety regulations.

Pre-shift Checklist

Vehicle registration: DR21 TYP	Week no: **15**						
Item to be checked	Sat	Sun	Mon	Tues	Wed	Thurs	Fri
1 Clock hours	1543		1550	1613			
2 Fluid levels (engine, hydraulics, transmission, battery)	✓		✓	✓			
3 Coolant level	✓		Topped up	✓			
4 Wheels (wheel studs, tyre condition)	✓		✓	Damage to rear offside tyre			
5 Light/horn/wipers/indicators/mirrors	✓		✓				
6 All glass: lights/lenses/mirrors/ trailer lights	✓		✓				
7 Check hydraulics for leaks	✓		✓				
8 Brakes/handbrake	✓		✓				
9 Guards all fitted (inc PTO)	✓		Cracked PTO cover				
10 Defect reporting form reference number if applicable			2034				
Comments							
Initials	JKL		AH				

All defects that cannot be rectified immediately must be recorded on a defect reporting form.
Do not drive a vehicle if you have any concerns about its safety.

Track down the checklist, stopping to complete each check.

Track across to the right day to complete the box.

For example, you are now on Check 4 for Tuesday.

There isn't much room here. Keep **writing** clear and simple.

Put details in the defect reporting form.

Make sure you are familiar with any **technical words** or **abbreviations** on the checklist.

If you need to find information in the checklist, use **scanning** skills to find it.

You will be trained to carry out these checks. Use the operator manual for more information.

Pre-start checks

Task

Task 1

Use the Pre-shift Checklist on the focus page to see what is wrong with this machine.

1 The machine was used on Saturday, Sunday and Monday. True/False
2 The coolant was topped up on Tuesday. True/False
3 The PTO cover was found to be cracked on Monday. True/False
4 The machine worked for 7 hours on Saturday. True/False
5 A defect reporting form was filled in on Monday. True/False

Tip

Make sure you have the correct day for each check.

19

Task 2

Listen to this operator working his way through the checklist on Monday morning. Use the Pre-shift checklist in the Source material to tick off everything that is OK and record any faults he finds.

Know how to fill in and use a checklist.

HD1/L1.1; Rt/E3.7; Rt/L1.4; SLlr/L1.2; Wt/L1.2

PAGES 4:7–4:10

Routine maintenance

Wherever machinery is used, it is important that it is well maintained. This may be carried out by a maintenance team or by the individuals who use the machinery on a day-to-day basis. For many workers in amenity and commercial settings, machinery failure means lost time, which can be critical to reaching working targets. Several NVQs include units on machinery and some learners will be working towards an NPTC Certificate of Competence in machinery. Pre-start checks and routine maintenance will be assessed as part of these qualifications. This theme develops some of the reading skills required to read and understand machinery manuals, in particular using format and interpreting technical language.

Materials

Operator manuals

Machinery for practical if possible

White board or flipchart

Learning outcomes

1 To understand the format of instructions (focus page, Task 1)

2 To follow instructions by using order and supported diagrams (focus page, Tasks 1 and 3)

3 To read and interpret language of instructions including technical words (focus page, Tasks 3 and 4)

Introduction

- Ask learners what they understand by the term 'routine maintenance'. This may include discussion about the meaning of both words.
- Ask learners to list all the routine machinery maintenance jobs they can think of. Collate these on the board.
- What might the consequences be of NOT completing these jobs?

Focus page

- Having highlighted the jobs – 'What'?' –, the next questions are 'How?' and 'When?'. Look at the Maintenance Schedule on the focus page. Are the jobs that the group have highlighted on this schedule?
- Look in other operator manuals to compare this maintenance schedule with others. Flag up the use of conditionals such as 'if'. These are occasions when learners must make a judgement or choice for themselves. For example, if they are using a machine heavily, in adverse conditions, they may need to complete routine jobs more frequently.
- Look at the sets of instructions on the page. These are for a pedestrian rotary mower and a ride-on fairway cutter. Emphasise the common features of these instructions:
  - There is usually a set order to complete the job.
  - They are supported by diagrams, which show either a method or the location of parts and components.
  - There is often some important detail or technical information that must be read carefully.
- You may need to explain language use and learners may need to check vocabulary. Make sure learners have some strategies for unpicking difficult language (e.g. longer sentences containing several points can be split, to make them more manageable: 'Tip the mower onto its left-hand side thus ensuring that the air cleaner is kept uppermost to prevent engine damage.'). Check that learners are familiar with the glossary and can use it.
- Some ESOL and dyslexic learners may need explanation of expressions such as 'carried out'.
- Ask learners some direct questions related to order, diagrams and detail based on the information on the focus page.
- Complete the statement at the top of the focus page.

Curric. refs	NOS	Key Skills
Rw/L1.2	CU27	C1.2
Rt/L1.3	L27	
Rt/L1.2	CU11	
Rt/L1.1	PR05	
Rt/L1.4		

Task 1

Follow a set of instructions about servicing the air cleaner
Rt/L1.3
Rt/L1.4
Rw/L1.2

- Remind learners about the format of instructions and the possible consequences of not following them carefully.
- Explain the convention of referring to the numbered parts on the diagram in the instructions (e.g. 'Loosen the screws (1)').
- Also explain the convention of Fig. 2. When encountering this kind of 'exploded' diagram, a good strategy is to spend some time locating each of the numbered parts, before starting to follow the instructions. Sometimes there is a key to help with this but sometimes – as in this set of instructions – the part names are 'buried' in the text.
- Ask learners to read through the instructions and make sure they are clear about the job outlined before they attempt the questions.
- Introduce the task and remind learners that they also need to use information from the focus page to complete the questions.

If the learner has difficulty

- First put the instructions in a setting. *What sort of machine is this? Can you see what part of the machine the diagram represents?* Use a real machine if available. *What does the air filter system do? Why does it need to be maintained?*
- Support learners to read through the instructions, identifying any problem words, for example they may need support to understand the link between 'after servicing, install the pre-cleaner' and 'When do you re-install the pre-cleaner?' Note the conditional 'if' used here.
- Learners may want to create a notebook of words.
- Read the instructions for learners to listen to as they read.
- Take learners through the questions one at a time, supporting them to locate the information and to use the diagram.
- Provide a series of diagrams for the learner to match with each instruction before answering the questions.
- Ask the learner to explain the process.

Extension

Completing the task on a mower would be the best application of this task. Alternatively, learners can talk a partner through the process.

Task 2

Follow another set of instructions about servicing the air cleaner
Rt/L1.3
Rt/L1.4
Rw/L1.2

- Explain that the instructions for Task 2 are also for maintaining air cleaners on a mower. These instructions are displayed on a cylinder mower.
- Ask learners to look through the set of instructions. Discuss the different look of these instructions. What features are similar? Which are different? (Ensure learners realise that 'every 25 hours' refers to every 25 hours of use.)
- Make sure learners are aware of the questions in thought bubbles, and are happy with the multiple-choice style of question. Recognise that question 4 needs some thought.
- What difference do the words 'if' and 'may' make to the maintenance schedule?

If the learner has difficulty

- Learners may have difficulty reading upper-case letters. Words lose their distinctive shapes when written entirely in upper case; they become very flat and it is hard to distinguish one letter from another and one word from another. Learners may need support to read this information. Helping them to understand why it is more difficult may help them to deal with the text in this format.
- Some of the technical words may need interpreting. Strategies should be established that are practical and useful to the individual. These may include predicting from the context, looking words up, collecting words in a notebook or asking someone.

- Note the use of conditional sentences (e.g. 'If paper element …') and ensure that learners understand how this affects meaning.
- Relating the diagram to a real workplace air cleaner (ideally with its own instructions) will help to make this interpretation easier. You would need to devise a similar set of questions to test the learner's understanding of the workplace diagram.

Extension

Ask learners to discuss the difference between this method for servicing air cleaners and the previous method.

Task 3

Follow a set of instructions about servicing the air cleaner where whole components need replacing
Rt/L1.3
Rt/L1.4
Rw/L1.2

- Explain that the instructions for Task 3 are also for maintaining air cleaners. These instructions are for a large ride-on fairway mower. The implications of getting these instructions wrong may be costly!
- Discuss carrying out the instructions in the correct order. *How could it go wrong? What are the implications for getting it wrong? What can help get it right?*
- Discuss with learners the different appearance of these instructions. *What features are similar? Which are different?*
- Ask learners to read through the set of instructions and highlight any words that are unfamiliar or that they are not sure about. These should be looked up or discussed before the questions are attempted. This can be done as a group activity, with the words and definitions written on the board.
- Explain the task. Emphasise the need for careful reading.

If the learner has difficulty

- The technical language in this task may be a barrier to understanding. Check that learners can interpret the language first.
- Put the instructions into context. This is a different type of machine, with a control console and a sophisticated system for indicating when maintenance needs to be done. Understanding the 'big picture' will help learners to understand the instructions.
- Ask learners to look carefully at the pictures. These will aid understanding and support the information they are reading.

Extension

- Explain the job described to a partner.
- Carry out a workplace task using a set of instructions.

Theme assessment

- Give pairs a job each from the list on the flipchart (completed in the focus session) and get them to look the job up in their manuals. Find out how often these jobs should be done and how they should be done. How are the instructions presented?
- Practical activities on real machines are the best way to apply the skill of following written instructions.

Routine maintenance

Focus

Instructions tell you what to do and how to do it. Sometimes you have to make decisions. Look for **or** and **if**. It may mean you have to choose.

Every operator manual will give advice on maintenance:

- **What** to do.
- **When** to do it.

There will also be instructions about **how** to do it

Numbered instructions should be followed in order.

For example, you must take out the oil filler dipstick **before** you can empty the oil.

Doing jobs in the right order prevents damage to the machine and YOU, and avoids making the job more difficult!

What may happen if you remove the oil when the engine is hot?

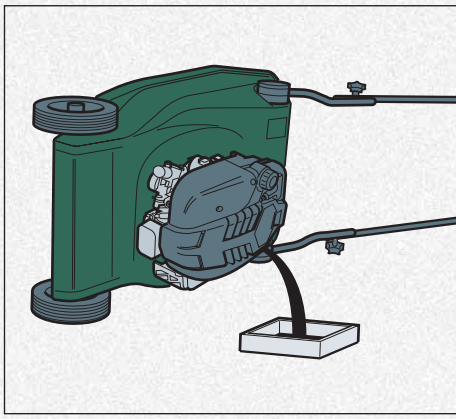
Instructions may have some **technical details** or **specifications** that you must understand and comply with.

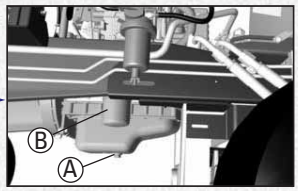
Look for pictures and labels to help you find the correct method.

Maintenance Schedule for the L99 Lawnmower	
First 5 hours	After the first 5 hours change the engine oil
Daily	• Check the oil level. • Remove grass debris from around the engine, exhaust and airways in top cowl and underside of the deck housing. • Remove grass debris from the grassbag and check for signs of damage. • Check the condition of the guards and safety devices and the cutterblade.
25 hours **or** every season (*whichever is soonest*)	• Change the engine oil **if** continuously operating under heavy load or high ambient temperature. • Service the air cleaner. • Lubricate wheels, pivot points and linkages and grease inner control cables at point of entry and exit from their outer casing. • Check the clutch cable adjustment. • Sharpen the cutterblade.
50 hours or every season	• Change the engine oil.

OIL SERVICE

1. Drain fuel by running the engine until the fuel tank is empty.
2. Remove the spark plug lead.
3. Allow the engine to cool.
4. Drain the oil while the engine is warm (not hot).
5. Tip the mower over onto its left-hand side, thus ensuring that the air cleaner is kept uppermost to **prevent engine damage**.
6. Remove the oil filler dipstick and drain the oil into a suitable container.
7. Refill with new oil of the recommended SAE viscosity grade.





3. Place a container at oil drain location under machine.
4. Remove oil drain plug (A).
5. Wipe dirt from around oil filter

Routine maintenance

Task

There are seasons when you need your machines every day. Good maintenance is one way to ensure that machines won't let you down when you need them most.

Air cleaner service

See Fig. 2

To service the air cleaner

1. Loosen the screws (1) and remove cover (2).
2. Carefully remove pre-cleaner (3) and cartridge (4).
3. Wash in a solution of liquid detergent and water. Allow to dry thoroughly before fitting.

   If very dirty, replace.

   • Do not use petroleum solvents.
   • Do not use compressed air.
   • Do not oil the cartridge.
4. After servicing, install the pre-cleaner and cartridge in the assembly base (5).
5. Replace the cover and securely tighten the screw.

Tip

Use these numbers to identify different parts of the air cleaner.

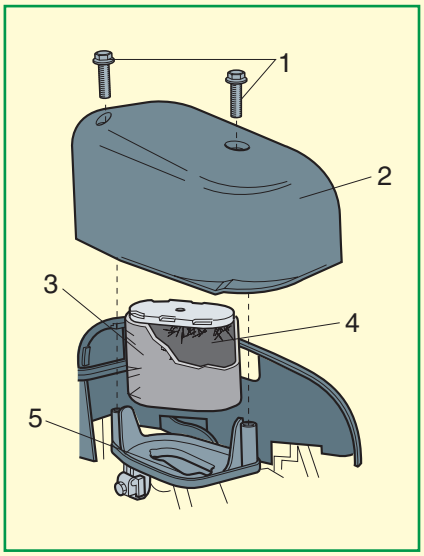


Fig. 2

Task 1

Use the information on this page and the focus page to answer the following questions.

1 What is the first thing you need to do? _____

2 How many screws are there? _____

3 What do you use to clean the air cleaner? _____

4 Give an example of a cleaner you might use. _____

5 Is it correct to use petroleum solvents to clean it? _____

6 What should you do if the air cleaner is really dirty? _____

7 When do you re-install the pre-cleaner and cartridge? _____

8 What is part number (5) on the diagram? _____

Routine maintenance

Task

These instructions look quite different, but they are also about the routine maintenance of air cleaners what needs to be done and when.

Dual means 'two'. What two elements are referred to here?

How often do you need to maintain:
- *the foam element?*
- *the paper element?*

DUAL ELEMENT AIR CLEANER MAINTENANCE

FOAM ELEMENT CLEAN EVERY 25 HOURS

1. **WASH IN DETERGENT AND WATER AND DRY THOROUGHLY**
2. **SATURATE IN ENGINE OIL AND SQUEEZE OUT EXCESS**

PAPER ELEMENT CLEAN EVERY 100 HOURS

1. **IF PAPER ELEMENT IS DIRTY, TAP GENTLY ON YOUR HAND TO REMOVE DUST**
2. **IF PAPER ELEMENT IS EXTREMELY DIRTY, INSTALL NEW ELEMENT**

OPERATING IN DUSTY CONDITIONS MAY REQUIRE DAILY MAINTENANCE

How?

CAPITAL LETTERS can be difficult to read. This is because all the letters are the same height. It makes the spaces between the words harder to see.

Task 2

Read the instructions and answer these questions.

1 Which of the elements needs to be washed in detergent and water?
a The paper element **b** The foam element **c** The whole thing

2 The words *saturate in engine oil* mean:
a Completely soak it in engine oil **b** Dip it in engine oil
c Spray it with engine oil

3 You need to install a new paper element when:
a it is very dusty **b** every 100 hours
c when it is extremely dirty

4 Why do **you** think the paper element will need more maintenance in dusty conditions?

Watch out for new words. A dictionary or glossary may help you.

Routine maintenance

Task

These instructions also look quite different, but they are also about the routine maintenance of air cleaners.

Task 3

1 What is part (A)? _____

2 What must you do before you remove the cover?

_____

3 The primary element (B) should be thrown away. True/False?

4 What should you do to the air cleaner cover while it's off the machine?

_____

5 If the restriction indicator shows a vacuum of 500 mm or more, what should you do?

_____

6 How many air cleaner filter elements are on this machine?

_____

What are they called?

_____

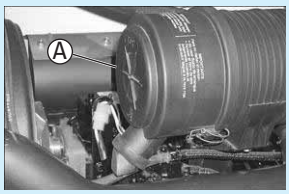
There is some technical language here.

Before you answer the questions, look through the text and highlight any words that you have not come across before. Find out what they mean by talking them over with a friend or looking them up in the glossary.

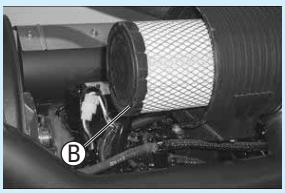
Changing Air Cleaner Elements

IMPORTANT: Avoid damage! Do not disturb filter unless air filter restriction indicator shows red plunger in window.

When red plunger in air restriction indicator is up to the window, change the primary element.



1 Stop engine. Remove cover (A).
NOTE: Clean inside of air cleaner cover once removed.



2 Remove and discard primary element (B).
3 Install new element into housing.
4 Install cover.
5 Start engine. Check air restriction indicator.

If indicator shows 500 mm of vacuum or more, change secondary filter.

Task 4

Look back over the last three tasks. Two of the filters are cleaned by hand and re-installed. With the other filter you have to replace the whole component. Which is which?

Cleaned by hand: _____

Replace whole component: _____

PAGES 4:11–4:12
Fault finding

Machine operators may find themselves having to deal with minor problems with machinery or equipment. The operator manual will be their first point of reference if working alone. As they get to know their machinery, they will become familiar with common faults and problems and know how to deal with them, but will still need to refer to the manual for less routine problems. Learners completing units such as L27 will need to show knowledge and understanding of the types of problems that may occur with equipment and machinery and know how to deal with them. This knowledge is also reflected in the performance criteria (e.g. L27.1.5). You must identify any problems with the equipment and machinery and take correct action.

Generally 'fault finding' is presented in tables that give a range of possible solutions for each problem. Learners need to familiarise themselves with this format. This theme develops the skills needed to extract information from this kind of table.

Materials

Operator manuals

Troubleshooting table from Source material (0:14)

Set of cards (Problem, Cause, Remedy) about fault finding, one set per group (see below for details)

Flipchart with blank table, or interactive whiteboard with card contents to cut and paste into table

Learning outcomes

1 To use a fault-finding table to identify faults and possible remedies (focus page, Tasks 1 and 2)

Introduction

- Give each group a mixed set of cards showing problems, causes and remedies. These should be straightforward problems relating to a range of familiar machinery and equipment, for example:
  - strimmer not cutting/run out of cord/refill cord
  - chainsaw cutting badly/blunt chain/sharpen chain
  - flat tyre on truck/puncture or lack of pressure/repair or pump up.
- Make sure there is at least one problem that could have several possible causes (e.g. problem: starter turns slowly; causes: low battery power, low battery output or loose connection; remedies: service battery, new battery, check connections).
- Each group sorts the cards into sets. Put the results from this card-sort into a table on the flipchart or cut and paste on an interactive whiteboard. Point out how the three items relate to each other. You have a problem; you think about possible causes or faults that may be causing the problem; you identify the fault through a process of elimination; you can then correct it.
- Discuss with the group what to do if the fault is not an obvious one. How can they find out what might be wrong? Encourage learners to verbalise both the process and particular problems, causes and solutions.

Focus page

- Look together at the fault-finding table on the focus page.
- Make sure learners are clear about the contents of each column, as identified by the headings. Learners may not know the word 'remedy' – it can be interpreted as 'cure', 'solution' or 'putting it right'.
- Explain any terms unknown to the group (e.g. 'run rough').
- Use the example on the focus page to demonstrate how to use the table by searching for the problem and tracking across to the possible faults. Explain that there is often more than one possible fault and that they must decide which is appropriate by a process of elimination. Having decided what the fault is, they can then put it right.
- The main skills used here are scanning for the problem and then tracking carefully across to the faults and to the correct remedy. Encourage learners to track with their fingers or with a ruler/piece of paper.

- Ask learners to find other examples of fault-finding/'troubleshooting' tables in their operator manuals and identify common features and differences.

Curric. refs	NOS	Key Skills
HD1/E2.1	L27	N1.1
Rw/L1.2	CU11	C1.2
Rt/L1.4	CU27	
Rt/L1.5	PR05	

Task 1

Fault find for four different scenarios using a troubleshooting table
Rt/L1.4
Rt/L1.5
Rw/L1.2
HD1/E2.1

- Check that all learners have a copy of the Troubleshooting table from the Source material. Explain that this is taken from an operator manual for a pedestrian rotary mower. (You may need to explain or show them what this is.)
- Remind learners of the headings and format of the information.
- Explain to learners that for each question they need to use the information they are given to find the problem, decide on the possible faults and then identify appropriate remedies.

If the learner has difficulty

- Talk through the graphics and written information to establish what is happening. Ask direct questions to support the learner. What is the problem here?
- Help learners to scan for the correct section in the table by identifying key words (e.g. smoke).
- Having identified the correct section, learners may find it easier to isolate that section. This allows them to focus on a small amount of information, rather than experience information overload.
- Use a straight edge to support tracking activities. This is particularly relevant when moving from the fault to the remedy, where there are no guidelines in the table. Learners with poor tracking skills may lose their place.

Extension

In pairs, ask learners to create more scenarios that can be resolved using the same troubleshooting table.

Task 2

Use the table in a different way to identify the consequences of allowing faults to develop
Rt/L1.4
Rt/L1.5
Rw/L1.2

- Check that learners were confident with Task 1. If they had difficulty using the table in a conventional way, give more practice scenarios rather than continue with this task.
- Explain that the table can be used in reverse to see the consequences of allowing faults to develop. Use the example given on the page. *These faults may lead to this problem.*
- Explain how the task should be done by completing the sentences.
- Tell learners to check the whole table for each fault, as it may occur more than once.

If the learner has difficulty

- Make sure learners are looking in the correct column (Possible fault).
- Support learners to scan for the given fault by using key words (e.g. spark plug, clutch). They can then track back to the 'Problems' column. Use a ruler or the edge of a piece of paper to help with tracking.
- Support learners to complete the sentences once they have found the problem. Read the first part of the sentence aloud and ask them to add the problem phrase. This is a reading exercise – grammar, punctuation and spelling do not have to be accurate. You can write the answer for them if necessary.

Extension

Use a fault-finding chart that is presented differently. These can often be downloaded from manufacturers' websites.

Theme assessment

- Create a quiz for learners based on the Troubleshooting table in the Source material.
- Having the skills to look up faults will give learners confidence in work situations. Practical activities using operator manuals and real machinery will be more engaging and relevant to learners.

Fault finding

Focus

Most machines go wrong at some time. Operator manuals have a section on finding faults. This is usually a table that gives a list of common problems and some suggestions about what might be the cause of the problems. It may also give advice about how to put them right.

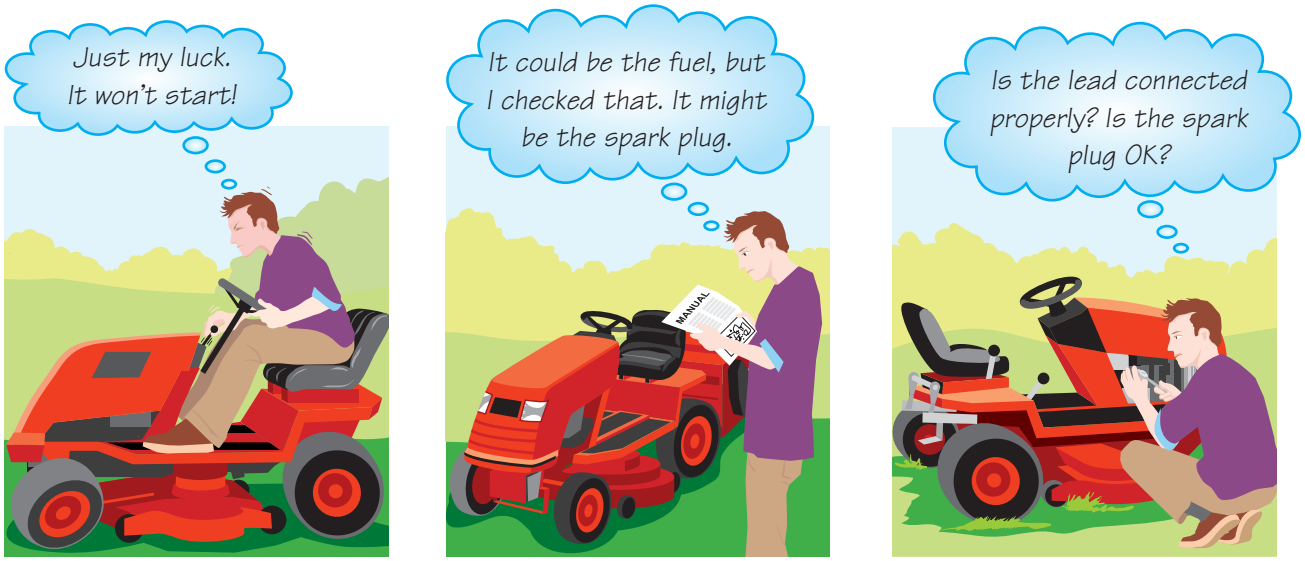
This is how it works …

1 Look down the problem column to find the problem you are having.

2 Look through the list of possible faults. Check them one at a time.

3 Find the remedy. Put it right.

Problem	Possible fault	Remedy
Engine will not start	Fuel starvation – no fuel, faulty fuel hose Incorrect/contaminated fuel Spark plug lead disconnected Faulty spark plug Throttle setting incorrect Engine brake not released	Fill fuel tank Drain fuel tank and fill with correct fuel Connect spark plug lead Clean and adjust gap or replace Set throttle to 'fast' position Operate engine stop lever
Engine runs rough	Faulty spark plug connection Faulty spark plug Air cleaner element blocked Incorrect/contaminated fuel	Check spark plug connection lead Clean and adjust gap or replace Clean or replace air cleaner element Drain fuel tank and fill with correct fuel



It's important that you track across from column to column correctly – from the problem to the fault, and from the fault to the remedy.

You can also track back the other way to see what kind of problems will occur if you allow faults to develop.

Fault finding

Task

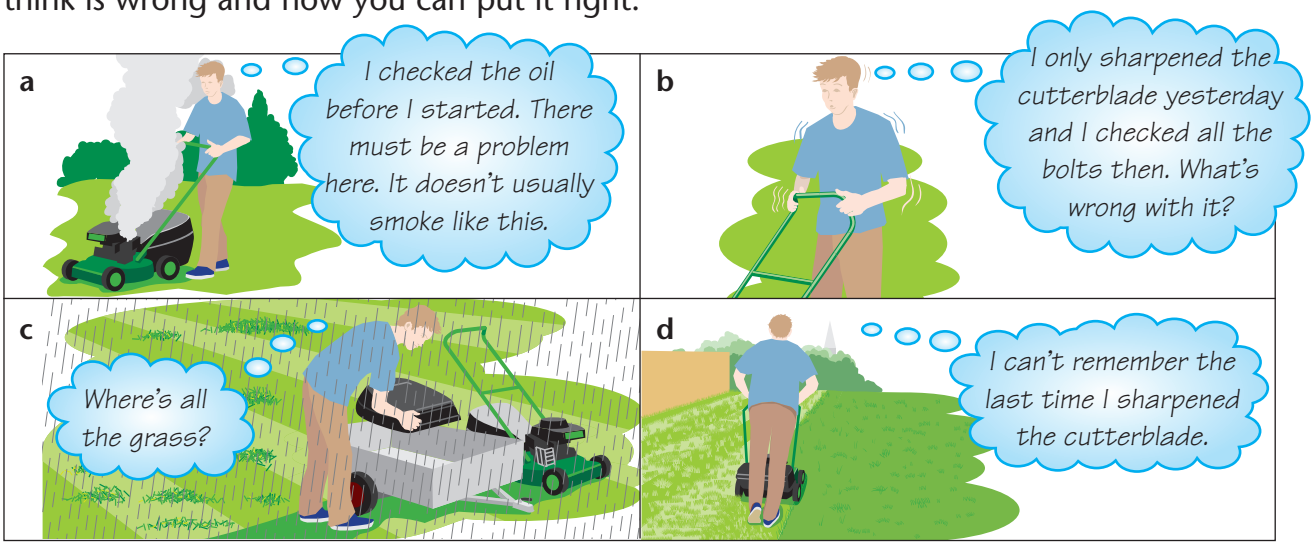
Every operator manual will have a section to help you if things go wrong. This may be called fault finding or troubleshooting.

Tip

There are several possible faults for each problem. Decide which you think it is.

Task 1

Use the Troubleshooting table in the Source material to track down the faults illustrated below. Make a note of what you think is wrong and how you can put it right.



Task 2

If you don't maintain your machine, faults will probably occur and cause problems.

Use the Troubleshooting table the other way round to see what problems might result from the following faults.

Troubleshooting

Problem	Possible fault	Remedy
Engine will not turn over	Engine stop lever released Incorrect oil level Obstruction under deck	Operate engine stop lever Check oil level Remove obstruction
Engine smokes	Excess oil level Air cleaner cartridge oil soaked or blocked	Check oil level Service air cleaner

1 If the spark plug lead is disconnected …
2 If the clutch cable is not adjusted correctly …
3 If the cutterblade is worn or out of balance …
4 If the air cleaner gets blocked …
5 If the fuel becomes contaminated …

Tip

More than one problem could occur as the result of these faults. Make sure you scan carefully down the faults column to find the possible problems.

Fault finding using a table.

Rt/L1.4; Rt/L1.5; Rw/L1.2; HD1/E2.1

PAGES 4:13–4:14

Reporting faults

Larger companies such as contractors, commercial growers, local authorities and big golf courses will have a fleet of machinery that is used by several operatives. They will also have a maintenance department or workshop that deals with the routine maintenance and repair of vehicles and equipment. The systems in place for tracking the service and repair history of a machine will vary from company to company. Some employers still rely on verbal reporting but increasingly, written reports are required to ensure that machines are safe to use and that faults are dealt with efficiently. Operatives have a responsibility to report faults promptly and effectively to ensure the health and safety of other users and the efficiency of operations.

Taking the correct action to deal with machinery problems contributes to L27.1: *Identify any problems with the equipment or machinery and take the correct action*, and PR05.1.7: *Record defects and damage of the equipment and ensure that appropriate action is taken for any correction*.

Materials

Defect reporting form from Source material (0:13)

Fault-reporting forms or systems as outlined in different workplace settings

Operator manuals

Learning outcomes

1 To understand the need to report faults and defects (focus page)
2 To read and complete a defect reporting form (focus page, Tasks 1–3)

Introduction

- Set scenarios in which learners need to report faults or damage to a machine. Include one that is found at the pre-start check and another that involves damage that occurred while working. In both cases, learners need to make a decision about the safety and usability of the machine.
- Discuss the different systems learners have in their own workplaces for dealing with faults or damage that needs to be dealt with in a workshop. These will probably range from none at all, to verbal reporting, to more formal systems.
- Discuss with learners why it is important to report faults and what is important when reporting any problems. Refer back to Module 1, *Reporting incidents*.
- Identify key points such as being clear; giving the facts and details; sticking to the relevant information; following the system.

Focus page

- Look first at the models for reporting information verbally. Why is one better than the other? You may need to explain the colloquial language to ESOL learners (e.g. 'That thing's had it again'). You may need to discuss other terms used to describe something that doesn't work. Be aware that ESOL learners will need to learn the correct language for oral fault reporting.
- Introduce the defect reporting form. (Check that learners know what is meant by a defect.) Ask learners to think about the reasons for having a system like this. Make sure they understand the type of setting in which this is used.
- Go through aspects of the form step by step: reading the form for instructions and information; checking the small print; using the headings to identify the type of information required; being accurate and clear.
- Pay particular attention to the section in which learners need to describe the defect or damage. Discuss the amount and type of information required here. Why is it not enough to say, 'It doesn't work!'? Introduce vocabulary to describe non-functioning machinery.

Curric. refs	NOS	Key Skills
Rw/E3.2	L27	C1.3
Wt/L1.2	PR05	
Rt/L1.1		

Task 1

Read a defect reporting form, including the small print
Rw/E3.2

- Remind learners of the general necessity for preparing and keeping written records.
- Remind learners of the importance of reading through a form first.
- Point out to learners that this form is similar but not the same. They must read the form carefully to check that they understand it and know what to do with it when completed.

If the learner has difficulty

- Read through the Defect Reporting Form with the learner and check that they understand the language.
- The answer to Question 1 cannot be found on the form. Where would a good place to look?
- Help learners to find the information they need to answer the remaining questions by scanning for words to link the question to the form, and then reading carefully for details.

Extension

Look at defect reporting forms from the workplace and answer similar questions based on these.

Task 2 20

Use scenarios to write a brief but accurate description of a defect or fault
Wt/L1.2

- Remind learners of the need to be accurate but brief in their description on the form. The purpose of this description is to direct the workshop mechanic to the problem.
- Explain that only part of the form needs to be completed for these tasks.
- Use audio clips or read out the scenarios to learners to reduce the amount of reading needed to complete the task.
- Learners can do this work in pairs and share their notes with others.

If the learner has difficulty

- Read through or listen to the scenarios more than once and discuss with the learner what has happened. Build the 'big picture'.
- Ask the learner to say what they want to record first. You may need to do the writing for them.
- Encourage them to be clear and concise in what they say but include all the details that the mechanic will need to get started.

Extension

Learners work in pairs and give each other scenarios that the other learner must interpret and write down. They may need to use workshop manuals for this in order to find common faults or part names.

Task 3 21

Complete a defect reporting form in full
Rt/L1.1
Wt/L1.2

- Check that all learners have a copy of the Defect reporting form from the Source material.
- They can use today's date and their own details to complete the form.
- The audio clip should be used to reduce the amount of reading needed to complete the task.

If the learner has difficulty

- Ask the learner to use the completed form on the focus page as a model. Check that they know what information needs to be added for each heading.
- It might be useful to work through each chunk of what the person said about the fault and think about what problem is being described in each part.
- Ask the learner to describe the defect carefully before writing it down. Use spellings in the script to help with technical words. You may need to do the writing in order to take away this burden.
- Dyslexic and less-able learners may benefit from a master copy showing the headings; they could write these headings on a memory card for future reference.

Extension

- In pairs, list some common problems for certain types of machines or use the list created in the first focus page (page 4:1).
- Identify in pairs the faults and defects that learners can safely deal with themselves and those that would need to be referred to the workshop for attention and/or spare parts.

Theme assessment

The skills of reporting problems practised here can be applied to writing evidence statements for learners' portfolios, where they need to be accurate and to the point and include detail but not irrelevant information. Ask learners to describe in writing any problem they have dealt with at work. Use headings to structure this: Date, Location, Problem, How I dealt with it. Learners need to be able to complete forms such as these in a way that is clear and easy to understand.

Reporting faults

Focus

Companies running big fleets of machinery have a separate maintenance workshop. If you have a problem with a machine you have to report it. This may be done verbally and in writing.

It will help other people if you can be **clear** and **precise** about the problem.

Not helpful

That thing's had it again. Something on the deck is loose. It's rattling really loudly.

Helpful

I was using the front mower today. The gear box mounting plate looks really worn. I think it needs welding up.

DRF3004

Greenstuff and Co

DEFECT REPORTING FORM

To be completed by operator and given to Manager/Supervisor immediately.

Vehicles with identified defects should NOT be used until they have been inspected by workshop staff or permission has been given by the Manager/Supervisor.

Name of person reporting defect Tim Edwards

Date 3rd June 2005 Time 7.30am

Location Top Farm

Vehicle registration and/or machine ID

John Deere WD23 4EX

Description of defect

PTO guard missing. Leaky hydraulics

Name of manager/supervisor informed A. Boss

For Manager/Supervisor to complete:

Date received 3rd June 2005 Time 10.30 am

Action taken returned to workshop for repair

Signature A. Boss

Must be signed before detaching top copy. Top copy to be given to workshop supervisor. Bottom copy to be kept in tractor file.

Read all the information on the form. This may include **instructions** about filling in the form and also other **important** information.

Complete **straightforward information** accurately and clearly.

Make sure **details** are accurate.

Be **clear and precise** about defects.

Include details but **keep to the point.**

Read the whole form including the small print.

Reporting faults

Task

If you need to report machinery defects in writing, you must be clear and specific, so that faults can be tracked down and solved quickly.

Task 1

1 What is another word for 'defect'? _____

2 Who do you give the defect reporting form to after you have completed it?

_____

3 What happens to the top copy of this form?

_____

4 What happens to the bottom copy of this form?

_____

5 Who should sign the form? _____

6 When can you use the machine again? _____

Task 2

20

Vehicle registration and/or machine ID

.....

Description of defect

.....

Complete this part of the form for each of the problems described.

1 *I've been on the greens this morning with the JD 22. We're not getting a very good finish. The bottom blade doesn't look too good. It's quite worn and a couple of screws are missing.*

2 *I've been strimming around the front entrance today. The guard on the Jacobi is badly cracked. Can the workshop get another one?*

3 *I had the Paulson rotary on the verges today and I hit a huge bit of metal. I don't know how it got there, but the blade is split.*

Tip

Keep to the point and include important details.

Task 3

21

Look at what this machine operator says. Complete the form in the Source material. Include your own details and describe the fault accurately.

I was using the Kumota front mower this morning on the fourth fairway. There's a lot of vibration on the mower deck. I think the drive belt is a bit slack. It probably needs to be replaced.

PAGES 4:15–4:16

Parts

Exploded diagrams are a common feature of operator manuals for equipment and machinery. They show the position of each part in relation to another, and the parts list, which is derived from this diagram. The format of these can be quite daunting. If learners are responsible for maintaining machines, they will need to be able to interpret diagrams and to identify spare parts from the part number. This theme develops the skills needed for understanding exploded diagrams and looking up parts' numbers.

Materials

A range of operator manuals – ideally one per learner for a range of machinery and equipment

Real equipment or parts of equipment that can be used for demonstration purposes

Slide/OHT or photocopies of an exploded diagram

Parts diagram and Parts list from Source material (0:15–16)

Learning outcomes

1 To understand the format of exploded diagrams (focus page, Task 3)

2 To extract information from part lists presented in tables (focus page, Tasks 1–3)

Introduction

- If possible, give pairs of learners a piece of equipment or part of a piece of machinery. Ask them to dismantle this carefully and to lay out the parts in the correct formation, so that they can see clearly how it fits back together. Change pairs and ask another pair to reassemble the component.
- Show a slide or an OHT of an exploded diagram or give out photocopied handouts. Explain that this works in the same way. A machine is shown in parts and the diagram shows how they relate to each other. It also numbers the parts so that they can be identified and the relevant part number found.
- Some learners may become confused by the two numbers: one is the reference number on the diagram; the other is the part number, which is used when ordering parts. Check that learners know which is which.
- With a machine in front of them, ask learners to find particular parts by using the diagram. The degree of difficulty here will depend on the knowledge of the learners.

Focus page

- Use the scenario at the top of the focus page to flag up the need to identify part numbers accurately when ordering spare parts. Refer to the focus page and go through the points on the page. This diagram is taken from a Hayter rotary mower.
- Ask learners to find other examples in their manuals if they have them. Pick out the common features such as the numbering (some may be labelled). Diagrams are also used in manuals to support instructions. These may also be numbered or labelled, but do not give part numbers.
- Ask learners to find parts-number lists that relate to the diagrams. These may be on the same page. Demonstrate how the numbers on the diagram relate to the parts list, by taking learners through the example shown on the focus page.
- Parts on the parts list are described in reverse: Washer – Plain; Bolt – Handlebar; Cable – Clutch. Learners need to understand that the type of part is listed first, followed by its description or location.
- Use the information on the focus page to practise looking for easily recognisable parts and looking up part numbers.

Curric. refs	NOS	Key Skills
Rt/L1.3	L27	C1.2
HD1/L1.1	CU27	N1.1
Rt/L1.4	PR05	
Rt/L1.5		

Task 1

Find the correct part from a parts list by using number codes
Rt/L1.4
HD1/L1.1
Rt/L1.5

- Explain to learners that this task provides practise at using the parts list. They do not need to use the diagram. The parts list on the page has all the information they need.
- Introduce the scenario that they have already identified the numbers from the diagram, and this is their list. They now need to look up the description and part number.
- Discuss the impact of making an error in copying down a part number incorrectly.

If the learner has difficulty

- Support learners through the first question. Once they have found number 1 on the list they need to track across and copy the description and part number into the answer table. They may find a ruler or the edge of a piece of paper useful.
- Many learners have difficulty retaining sequences of numbers, and dyslexic learners in particular may have difficulty copying codes. They will need to break the task down into clumps of numbers. Encourage learners to check codes digit by digit if necessary.
- Some learners may benefit from enlarged lists and diagrams.
- Use three sets of cards labelled 'No.', 'Description' and 'Part. No.' for learners to match using the parts list as a guide. This could be done in pairs. These can also be used for Tasks 2 and 3.

Extension

Look up the parts and identify them on the Parts diagram in the Source material.

Task 2

Find the correct part from a parts list by scanning for words
Rt/L1.4
HD1/L1.1
Rt/L1.5

- Remind learners that on some occasions they will know the name of the part and will not need to use the diagram.
- Ask learners to scan for the parts on the list and write down the part number and the quantity they need of each.
- Remind them that there may be many of the same type of part and that they must look carefully for the description, for example, 'I know I need a bolt, but what kind of bolt and where is it for?'.

If the learner has difficulty

- Describe the process of scanning to learners who are having difficulty. It can be described as looking for a familiar face in a crowd. Learners need to look carefully at the words first to try and fix them in their visual memory. They can then search the column systematically for the words they need. Learners with a strong visual memory will find key words more easily than others.
- The added difficulty with this task is that part names are often presented in reverse order (e.g. Cable – Clutch) in the parts list; however, the task has been presented to show words in the same order.

Extension

Set a similar exercise using the parts list/exploded diagram of a machine that learners are familiar with.

Task 3

Find the correct part from a parts list by using a parts diagram and a parts list
Rt/L1.4
Rt/L1.5
HD1/L1.1

- Remind learners how to find a particular part by looking at the exploded diagram, identifying the number and then using the parts list.
- Check that all learners have both a diagram and the correct parts list they need for this task.
- Tell learners that they only need to record the correct part number for each item.

If the learner has difficulty

- The parts to be found are the most easily identified on the diagram, but learners with less vocational knowledge may require additional support.

- Talk learners through the process step by step, supporting them to find the part on the diagram first, writing this down as a reminder and then using the parts list.
- Ask learners to check codes carefully.

Extension

Complete the same activity with a range of manuals.

Theme assessment

- Use the exploded diagram and parts list in a practical situation with machinery.
- Give scenarios of parts that need replacing most often, such as filters, hoses, spark plugs, etc.

Parts

Focus

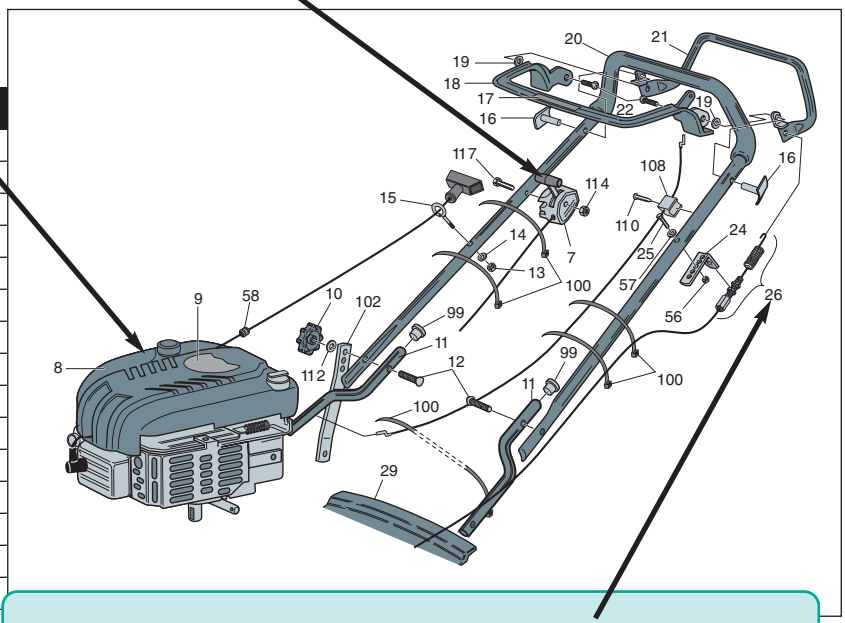
Have you got a thingy for my what's-its-name?

Sorry sir, there are lots of models of that machine – you'll have to give me a part number.

Operator manuals have diagrams to help you identify exactly which part you need.

Diagrams like the one below are called **exploded diagrams**. They show all the parts of the machine as if they have been laid out in order, but not connected.

Each part is given a number.



Parts List

No	Description	Part no
7	Throttle control switch	486031
8	Engine B/S Intek edge 55 OHV	486040
9	Decal engine	486005
10	Knob – Handlebar	480088
11	Handlebar – Lower	480168W
12	Bolt – Handlebar	09785
13	Nut – Nylon insert	09544
14	Washer – Plain	09472
15	Guide rope	305093
16	Pin – Pivot	340182
17	Decal – Engine stop	331046
18	Lever – Engine	340179
19	Washer – Nylon	09688
20	Handlebar	341029
21	Lever – Clutch	306094W
22	Screw	09687
23	Cable guide	480123
24	Bracket – Cable clutch	306108
25	Screw	09704
26	Cable – Clutch	480094
29	Deflector – Rear	480140
56	Nut	09657
57	Washer	09658
58	Rope Stop	MU42189
99	Plug – Tube	300160
100	Tie – Cable	3966
102	Brace – Support	486039W
110	Screw	09358
112	Washer	09475
114	Nut	09438

Once you have found the part on the diagram you use the Parts List to **look up** the part number.

For example: you need to replace the clutch cable. This is number 26 on the diagram. Look up 26 on the Parts List to get the part number. Check that it is a clutch cable.

OR

You can **scan** down the description column to find the major parts if you know the exact name.

Take care! Words like cable, bolt, screw and bracket appear many times. You need the diagram to make sure you have the right one.

Parts

Task

Parts on machines wear out. They also get broken or just get lost. Diagrams and parts lists can help you to find the right spare parts.

Tip

Take care to copy codes accurately. It is important that they are correct.

Task 1

These numbers have been taken from the Parts diagram in the Source material. Use the Parts list to find a description and part number for each one.

No.	Description	Part no.
1	_____	_____
11	_____	_____
15	_____	_____
24	_____	_____

Tip

Scan down the **Description** column and look for key words.

Remember there will be more than one lever listed and many bolts.

Task 2

Scan down this parts list to find the right part number for each part needed. How many of each are needed?

Part needed	Part no.	Qty
Cable guide		
Lever for the clutch		
Throttle control switch		
Bolt for handlebar		

Task 3

Use the Parts diagram and Parts list in the Source material to find these parts. Write down the correct part number for each one.

Clamp boss outer
Spring deflector
Screw Pozi Pan Taptite
Rear deflector
Rod deflector
Screw

Parts List

No	Description	Part no	QTY
1	Mainframe – Casting	486015V	1
2	Plate – Location RH	480083V	1
3	Clamp – Boss Inner	480084W	2
4	Clamp – Boss Outer	480085W	2
5	Nut – Nycloc Insert 'T' Type	09441	4
6	Key – Woodruff	1662	1
7	Throttle control switch	486031	1
8	Engine B/S Intek edge 55 OHV	486040	1
9	Decal engine	486005	1
10	Knob – Handlebar	480088	2
11	Handlebar – Lower	480168W	2
12	Bolt – Handlebar	09785	2
13	Nut – Nylon insert	09544	1
14	Washer – Plain	09472	1
15	Guide rope	305093	1
16	Pin – Pivot	340182	2
17	Decal – Engine stop	331046	1
18	Lever – Engine	340179	1
19	Washer – Nylon	09688	2
20	Handlebar	341029	1
21	Lever – Clutch	306094W	1
22	Screw	09687	2
23	Cable guide	480123	1
24	Bracket – Clutch cable	306108	1
25	Screw	09704	1
26	Cable – Clutch	480094	1
29	Deflector – Rear	480140	1

Rt/L1.4; Rt/L1.5; HD1/L1.1

Check it

1 In which section of an operator manual would you find information about how often to change the oil in the machine?

A Safety

B Operation

C Maintenance schedule

D Specification

Rt/L1.4

For best performance

Cut grass when it is dry.

Keep mower blades sharp.

Keep mower deck properly levelled.

Adjust antiscalp rollers to prevent scalping.

Do not travel too fast.

Mow with the engine set at full throttle.

2 Which section of the manual does this advice come from?

A Controls and features

B Operation

C Service and adjustment

D Accessories and attachments

Rt/L1.3

3 'The defect has been rectified'. What is the best explanation of this sentence?

A The fault has been mended.

B The fault has wrecked the machine.

C The problem has been modified.

D The machine has been modified.

Rw/L1.2

Oil service

1 Drain fuel by running the engine until the fuel tank is empty.

2 Remove the spark plug lead.

3 Allow the engine to cool.

4 Drain the oil while the engine is warm (not hot).

5 Tip the mower over onto its left-hand side thus ensuring that the air cleaner is kept uppermost to prevent engine damage.

6 Remove the oil filler dipstick and drain the oil into a suitable container.

Refill with new oil of the recommended SAE viscosity grade.

4 Look at this information on oil service. Which instruction gives you a warning?

A 1

B 3

C 5

D 7 Rt/L13

5 What does 'viscosity' mean?

A Sticky

B Oily

C Oil

D Stickiness Rw/L1.3

6 Which of these statements is correct?

A When you drain the oil the engine has to be running.

B When you drain the oil the engine has to be hot.

C When you drain the oil the spark plug has to be connected.

D When you drain the oil the air cleaner has to be uppermost. Rt/L1.3

7 Which of these is a remedy for a common problem with a mower?

A Replace plug.

B Fuel starvation.

C Faulty spark plug.

D Spark plug head disconnected. Rw/L1.2

8 On a defect reporting form, under which section should you write details of what you did about the fault you found?

A Name of person reporting defect

B Action taken

C Location

D Description of defect Wt/L1.1

9 You need to write something on the defect reporting form about a fault you have experienced. Which of these is the most appropriate?

A The box thing fell off again.

B The box dropped off.

C The grass collection box is loose and fell off three times.

D The collection box is very loose. I think someone broke it. Wt/L1.4

Parts List

No	Description	Part no	QTY
7	Throttle control	486031	1
8	Engine B/S Intek edge 55 OHV	486040	1
9	Decal engine	486005	1
10	Knob – Handlebar	480088	2
11	Handlebar - Lower	480168W	2
12	Bolt – Handlebar	09785	2
13	Nut – Nylon insert	09544	1
14	Washer - Plain	09472	1
15	Guide rope	305093	1
16	Pin – Pivot	340182	2
17	Decal – Engine stop	331046	1
18	Lever - Engine	340179	1
19	Washer - Nylon	09688	2
20	Handlebar	341029	1
21	Lever – Clutch	306094	1
22	Screw	09687	2
24	Bracket – Cable clutch	306108	1
25	Screw	09704	1

10 You need to replace a lever on the clutch assembly of a mower. What's the part number?

A 306094

B 18

C 340179

D 22 Rw/E3.4

Audio

PAGES 4:5–4:6

Pre-start checks

Task 2 19

Right let's have a look then.

Clock hours 3575 OK?

Fluid levels. Engine – oil looks like it could do with topping up – I can do that. Better write it down.

Hydraulic fluid – just about OK. I'm sure I topped that up the other day. Transmission fluid – good.

Battery – that's all sealed so no problem.

What's next? Coolant – on the mark. Tick.

And the wheels. No cracks, no splits, pressure good and wheel nuts all good.

Lights – on/off – no problem.

Horn (toot!) – yes definitely!

Wipers working.

indicators left… and right…all fine

Mirror adjustment – check.

And the next – glass. Well I can hardly see through this windscreen so I bet the rest is filthy too. I'll give it a wipe.

This nearside trailer light is hanging off.

Hydraulics. Best have a look underneath – no drips, no marks on the tarmac. That back hose looks a bit mucky though. A bit stained. We'd better write that down.

Brakes – well I hope so. Yes OK. Nearly done.

Guards – Where's the PTO guard? What's going on? I don't think I can take it out without that!

PAGES 4:13–4:14

Reporting faults

Task 2 20

1 I've been on the greens this morning with the JD 22. We're not getting a very good finish. The bottom blade doesn't look too good. It's quite worn and a couple of screws are missing.

2 I've been strimming around the front entrance today. The guard on the Jacobi is badly cracked. Can the workshop get another one?

3 I had the Paulson rotary on the verges today and I hit a huge bit of metal. I don't know how it got there, but it split the blade.

Task 3 21

I was using the Kumota front mower this morning on the fourth fairway. There's a lot of vibration on the mower deck. I think the drive belt is a bit slack. It probably needs to be replaced.

Answers

PAGES 4:1–4:4

Operator manuals

Task 1

Show your answers to your teacher.

Task 2

1 Triple turf mower
2 The negative cable
3 Page 22
4 Page 27
5 Check blades and mountings; clean air filter
6 824009
7 8 screws
8 Nut M10
9 10 degrees

PAGES 4:5–4:6

Pre-start checks

Task 1

1 False
2 False
3 True
4 True
5 True

Task 2

Pre-shift Checklist

Vehicle Registration: DR21 TYP	Week no: **15**						
Item to be checked	Sat	Sun	Mon	Tues	Wed	Thurs	Fri
1 Clock hours			3575				
2 Fluid levels (engine, ✓ hydraulics, ✓ transmission, ✓ battery ✓)			✓ Engine oil topped up				
3 Coolant level			✓				
4 Wheels (wheel studs, tyre condition)			✓				
5 Light/horn/wipers/indicators/mirrors			✓				
6 All glass: lights/lenses/mirrors/ trailer lights			✓ Dirty. Nearside trailer light damaged				
7 Check hydraulics for leaks			Back hose stained				
8 Brakes/handbrake			✓				
9 Guards all fitted (inc PTO)			No PTO guard				
10 Defect reporting form reference number if applicable							
Comments							
Initials							

All defects that cannot be rectified immediately must be recorded on a defect reporting form.
Do not drive a vehicle if you have any concerns about its safety.

PAGES 4:7–4:10

Routine maintenance

Task 1

1 Loosen the screws (1).
2 2
3 A solution of liquid detergent and water.
4 Washing-up liquid.
5 No
6 Replace it
7 After servicing
8 The assembly base

Task 2

What 2 elements are referred to here?
Foam element and paper element.

How often do you need to maintain

- the foam element (every 25 hours)
- the paper element (every 100 hours or daily if conditions are very dusty)

1 **b**
2 **a**
3 **c**
4 Because it will become clogged up much more quickly in these conditions.

Task 3

1 The cover
2 Stop the engine
3 True
4 Clean the inside
5 Replace the secondary cleaner
6 Two: the primary element and the secondary element.

Task 4

Tasks 1 and 2 are about filters that are cleaned manually. Task 3 is about filters that have to be replaced.

PAGES 4:11–4:12

Fault finding

Task 1

a What's wrong? Air cleaner cartridge could be soaked with oil or blocked/Oil level could be too high
What's the cure? Service the air cleaner/Check the oil level

b What's wrong? Cutterblade out of balance
What's the cure? Balance the cutterblade

c What's wrong? Wet grass and/or discharge chute blocked
What's the cure? Unblock discharge chute. Mow dry grass

d What's wrong? Cutterblade worn
What's the cure? Sharpen the cutterblade

Task 2

1 If spark plug lead is disconnected, *the engine may not start.*
2 If the clutch cable is not adjusted correctly, *the mower may not self-propel.*
3 If the cutterblade is worn or out of balance, *there may be an uneven cut and the engine may vibrate excessively.*
4 If the air cleaner gets blocked, *the engine may smoke.*
5 If the fuel becomes contaminated, *the engine may not start.*

PAGES 4:13–4:14

Reporting faults

Task 1

1 Fault
2 The supervisor
3 It is given to the workshop supervisor.
4 It is put in the machine file.
5 The Manager/Supervisor
6 When it has been inspected by workshop staff **or** permission has been given by the Manager/Supervisor.

Task 2

1 Vehicle registration and/or machine ID – JD22 mower
Description of defect – Bottom blade worn. Screws missing.
2 Vehicle registration and/or machine ID – Jacobi strimmer
Description of defect – badly cracked guard.
3 Vehicle registration and/or machine ID – Paulson rotary
Description of defect – split blade.

Task 3

Show your completed form to your teacher.
Machine ID: Kumota front mower
Description of defect: vibration on mower deck

PAGES 4:15–4:16

Parts

Task 1

No.	Description	Part no.
1	Mainframe – Casting	4860145V
11	Handlebar – Lower	480168W
15	Guide rope	305093
24	Bracket – Clutch cable	306108

Task 2

Part needed	Part no.	Qty
Cable guide	480123	1
Lever for the clutch	306094W	1
Throttle control switch	486031	1
Bolt for handlebar	09785	2

Task 3

Clamp boss outer: 480085W
Rear deflector: 480140
Spring deflector: 480131
Rod deflector: 480062
Screw Pozi Pan Taptite: 09575
Screw: 09704

Check it

1 C
2 B
3 A
4 C
5 D
6 D
7 A
8 B
9 C
10 A