# **APPRENTICESHIP** & CERTIFICATION

**Study Guide Powerline Technician** 



Department of Advanced Education, Skills and Labour

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## **Apprenticeship and Certification**

**Study Guide** 

# **Powerline Technician**

(Based on 2013 NOA)

Government of Newfoundland and Labrador Department of Advanced Education, Skills and Labour Apprenticeship and Trades Certification Division

> Version 5 April 2019

# **Table of Contents**

Introduction	3
Exam Process	4
Before the Exam	4
During the Exam	4
After the Exam	4
Exam Format	5
Exam Content	9
Understanding the National Occupational Analysis (NOA)	9
Exam Breakdown	. 11
NOA Sub-tasks	. 12
Task Profile Checklist	. 13
Create a Study Plan	. 17
Resources - Websites	. 20
Resources – Book List	. 21
Conclusion	. 22

#### Appendices:

Appendix A:	Regional Offices	. 23
Appendix B:	Calculator Use	. 24
Appendix C:	Answer Sheet Example	. 25

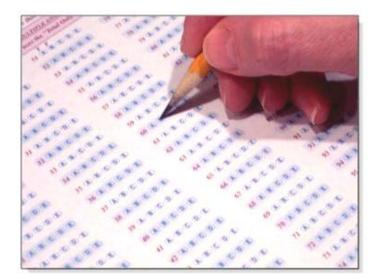
## Introduction

This Study Guide has been developed by the Newfoundland and Labrador Department of Advanced Education, Skills and Labour, Apprenticeship and Trades Certification Division, to assist apprentices and trade qualifiers as they prepare to write the Interprovincial (IP) Red Seal Exam. IP Exams are available for all Red Seal trades. For a list of Interprovincial trades please refer to the Department of Advanced Education, Skills and Labour website: <u>https://www.aesl.gov.nl.ca/app/trades.html</u>

#### Some of the specific goals of this guide are:

- ⇒ to help you understand the skills and knowledge that might be covered on the exam
- ⇒ to help you identify your strengths and weaknesses
- ⇒ to provide organization and structure for a course of study
- ⇒ to provide a list of resources to help you with your study plan
- ⇒ to support and supplement the teaching and learning process

This study guide outlines the theoretical portion of the program. The intent is not to replace technical training provided under the guidance of instructors. Rather, it is a tool to be used in conjunction with formal training.



## **Exam Process**

#### **Before the Exam**

You must contact the nearest Apprenticeship and Trades Certification Divisional office to make request to write the IP Red Seal exam (*See Appendix A for a list of regional offices*). Upon approval, the Apprenticeship Program Officer (APO) will notify you of your eligibility to write the exam, and provide you with scheduling information. If you require special accommodations due to a disability or language barrier, please contact your regional office for information on applying for this service.

#### **During the Exam**

#### You must bring:

- personal identification such as a photo or signature ID or valid Newfoundland and Labrador driver's license
- □ your notification letter

#### The following will be provided:

- □ a calculator (see Appendix B for calculator information)
- □ all other items required such as pencils, scrap paper, etc.

#### Important Note:

Personal cell phones, calculators, or other electronic equipment are NOT allowed into the exam room. If you do bring them, they will be stored away and returned to you when you have completed the exam.

## After the Exam

Results will be mailed to you approximately seven to ten days after completion of the exam. All necessary instructions and information will be provided in the results letter.

The percentage mark you obtained will be provided. You will also be given a section by section breakdown, showing how many questions were in each section, as well as the number of questions in each section you completed successfully.

If you are successful in obtaining a 70% or more on your exam, you will be issued a Newfoundland and Labrador Certificate of Qualification with a Red Seal endorsement.

## **Exam Format**

All IP Red Seal exams are written in multiple-choice format. Each exam has between 100 and 150 questions. A multiple choice question consists of a stem (a complete question) followed by four options (A, B, C, D). The stem contains all the information necessary to answer the question. The options consist of the one correct answer and three "distracters." Distracters are incorrect. (*See Appendix C for a sample answer sheet*).

IP Red Seal exams contain three types of questions:

#### Level 1 Knowledge and Recall

Questions at this level test your ability to recall and understand definitions, facts, and principles.

#### Level 2 Procedural and Application

Questions at this level test your ability to apply your knowledge of procedures to a new situation.

#### Level 3 Critical Thinking

Questions at this level test your ability to interpret data, solve problems and arrive at valid conclusions.

On the following pages, examples of each of the three types of questions are provided.

#### Level 1 Examples:

1. Which procedure is to be completed before removing a bayonet fuse from a transformer?

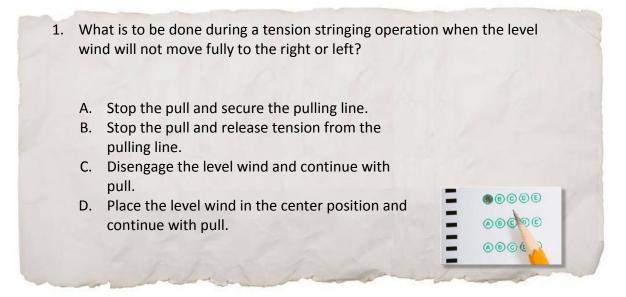
- A. Pressure relief valve needs to be pulled.
- B. Secondary cables need to be disconnected.
- C. Voltage check needs to be performed.
- D. Transformer oil needs to be drained.

0000 00000 0000

- 2. After isolation and before working on an underground primary cable, how is a capacitive charge dissipated?
  - A. Employ a fast acting disconnect.
  - B. Apply protective grounding.
  - C. Coat conductors with an anti-oxidant.
  - D. Make use of protective rubber matting.

- 3. Where is a link stick connected when changing a dead-end unit on an energized line?
  - A. In series between the hoist and sling.
  - B. In parallel with a nylon hoist.
  - C. Between the hoist and grip.
  - D. Between the cross arm and sling.

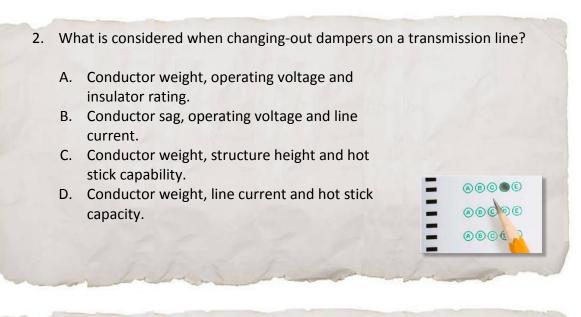
#### Level 2 Examples:



**3008** 

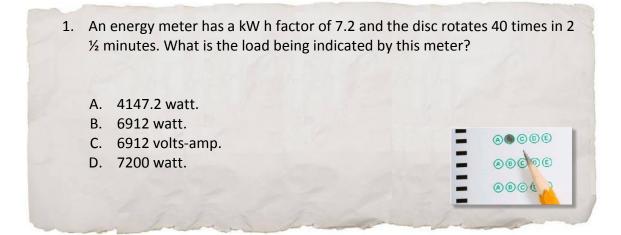
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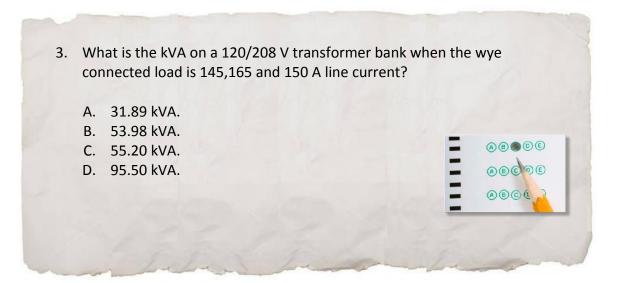


Which information is required when installing a fused disconnect switch?
 kV rating of the line, kVA load and feeder fault current.
 kV rating of the line, line current and feeder fault current.
 kV rating of the line and the load, and feeder fault current.
 kV rating of the line, kVA load and continuous current flow.

#### Level 3 Examples:



- 2. What is the compressive force on the dead-end pole (T x H/L) if the height of the pole is 10 m, the tension is 570 kg and the guy is placed 14 m from the pole?
  - A. 40.71.
  - B. 79.8.
  - C. 407.14.
  - D. 798.



Source of Questions: <u>www.red-seal.ca/s.1mpl.2.2x.1mQ.5.2st.3.4ns-eng.html?tid=194</u>

ABCOE

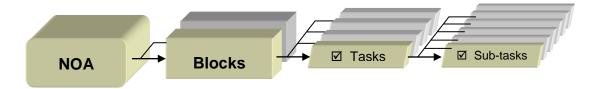
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## **Exam Content**

## Understanding the National Occupational Analysis (NOA)

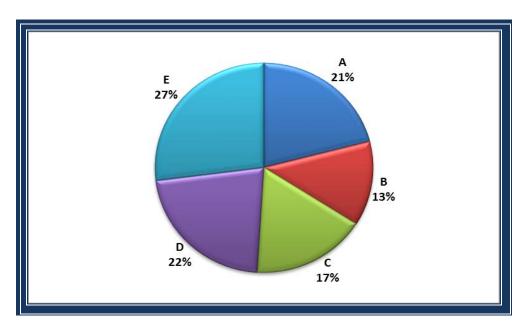
The NOA is a document used for Red Seal trades that describes the knowledge, skills and abilities required by a fully competent tradesperson working in that trade. The content for the IP Red Seal exam is based on the NOA. The NOA is an excellent tool to use as you study for the Red Seal exam. NOAs can be found at <u>www.red-seal.ca</u>.

NOA material is organized into major content areas called **BLOCKS**. The blocks are further broken down into **TASKS** and **SUB-TASKS**.



### **NOA Pie Chart**

The NOA Pie Chart presents the block percentages in the form of a pie chart which tells you the approximate number of questions from each block. For example, 21% of the questions on the **Powerline Technician** Exam will be based on **Block A**.



#### **Powerline Technician (Operating)**

	BLOCK TITLES						
Block A	Common Occupational Skills	Block D	Auxiliary Equipment				
Block B	Structures	Block F	Operation Maintenance and Denair				
Block C	Conductor Systems	Block E	Operation, Maintenance and Repair				

#### **Exam Breakdown**

The **Powerline Technician** IP Red Seal Exam has 125 questions. The following table shows a breakdown of the approximate number of questions that come from each NOA block. It is important to note that the number of questions can change at any time. When you are ready to write your exam, you may contact your regional office to verify the number of questions (See Appendix A).

		# of Questions		
Block A	Common Occupational Skills	26		
Task 1	Uses and maintains tools and equipment			
Task 2	Accesses work area			
Task 3	Organizes work			
Task 4	Establishes safe work environment			
Task 5	Uses live-line methods			
Block B	Structures	17		
Task 6	Installs poles			
Task 7	Installs steel structures			
Block C	Conductor Systems	21		
Task 8	Installs overhead conductors			
Task 9	Installs underground and underwater cable			
Block D	Auxiliary Equipment	27		
Task 10	Installs lighting systems			
Task 11	Installs voltage control equipment			
Task 12	Installs protection equipment			
Task 13	Installs metering equipment			
Task 14	Installs communication equipment			
Block E	Operation, Maintenance and Repair	34		
Task 15	Task 15         Operates distribution and transmission systems			
Task 16	Task 16         Maintains distribution and transmission systems			
Task 17	Task 17         Repairs distribution systems			
Task 18	Repairs transmission systems			
	Total	125		

#### **NOA Sub-tasks**

The following *NOA Task Profile Checklist* outlines the blocks, tasks and sub-tasks for your trade. The IP Red Seal exam is written to test your knowledge and abilities regarding the sub-tasks in the NOA. This chart can be used to review your current knowledge. You can review by placing a checkmark ( $\checkmark$ ) next to those you understand fully.

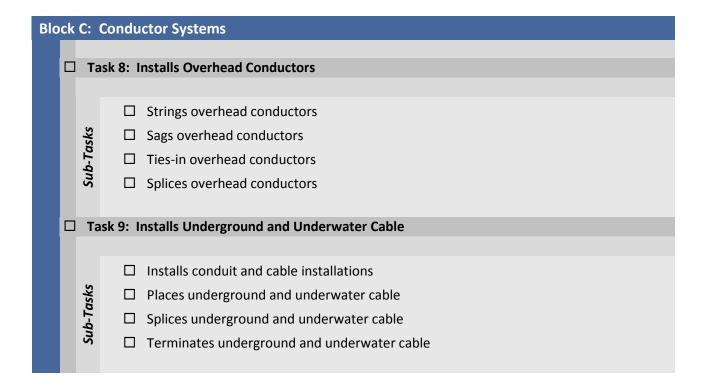
Place your focus on those you do not understand and study them until you are comfortable with the material. Think of possible questions in that particular content area.

The NOA also contains a list of "supporting knowledge and abilities" for each sub-task. They are the skills and knowledge you must have to perform a sub-task. The supporting knowledge and abilities identified under each sub-task will be very helpful as you review. The list can be found in the NOA for your trade.

## Task Profile Checklist Based on 2013 NOA Powerline Technician

Blo	ck	A:	Occupa	ational Skills							
		Task 1: Uses and Maintains Tools and Equipment									
		S		Maintains hand, power and powder-actuated tools and equipment							
		Task		Maintains electrical measuring and testing equipment							
		Sub-Tasks		Uses rigging, hoisting and lifting equipment							
		•,		Uses personal protective equipment (PPE) and safety equipment							
		Та	ask 2: Ac	ccesses Work Area							
		syst		Climbs poles and structures							
		Sub-Tasks		Uses access equipment							
		Su		Uses on- and off-road equipment							
		Та	ask 3: O	rganizes Work							
				Interprets codes, regulations and procedures							
		sks									
		Sub-Tasks		Interprets plans, drawings and specifications							
		Sub		Prepares worksite							
				Plans job tasks and procedures							
	П	Та	ask <u>4</u> . Fa	stablishes Safe Work Environment							
		S		Controls powerline hazards							
		Sub-Tasks		Controls environmental hazards							
		Sub-		Performs lock-out and tag-out procedures							
	П	Ta	ask 5 : U	Jses Live-Line Methods							
				Uses cover-up							
		sks		Uses rubber gloves							
		Sub-Tasks		Uses bare-hand methods							
		Su		Uses fiberglass reinforced plastic (FRP) tools (sticks)							

Blo	Block B: Structures						
		Та	ask 6: I	nstalls Poles			
				Frames poles			
		asks		Sets poles			
		Sub-Tasks		Installs pole guys and anchors			
		Та	ask 7: In	istalls Steel Structures			
				Installs footings (NOT COMMON CORE)			
		syst		Assembles steel structures			
		Sub-Tasks		Erects steel structures			
		Su		Installs steel structure guy wires and anchors			



Blo	ock	D:	Auxiliary Equipment
		Та	ask 10: Installs Lighting Systems
		ks	Installs street lights
		Sub-Tasks	Maintains street lights
		-	ask 11: Installs Voltage Control Equipment
		10	
			Installs transformers
		S	Installs capacitors
		Tasl	□ Installs voltage regulators
		Sub-Tasks	□ Installs switches
		•,	Installs reactors (NOT COMMON CORE)
			· ·
		Та	ask 12: Installs Protection Equipment
			□ Installs reclosers
		Sub-Tasks	Installs sectionalizers
		b-Tc	Installs fuses
		Su	Installs lightning arrestors
		τ.	- 1. 1.2. Installs Materiae Fusion and
		18	ask 13: Installs Metering Equipment
		S	Installs primary metering equipment
		Tasks	<ul> <li>Installs secondary metering equipment</li> </ul>
		Sub-T	
			ask 14: Installs Communication Equipment
		sks	Installs cellular antennas (NOT COMMON CORE)
		Sub-Tasks	Transfers communication lines
		Sut	

Blo	Block E: Operation, Maintenance and Repair								
	Task 15. Operator Distribution and Transmission Systems								
		Та	sk 15: Operates Distribution and Transmission Systems						
		sks	Operates overhead and underground transmission systems						
		Sub-Tasks	Operates overhead and underground distribution systems						
		Sut	Performs station switching						
		Та	sk 16: Maintains Distribution and Transmission Systems						
			Inspects distribution and transmission systems						
		ks	Maintains poles						
		Sub-Tasks	Maintains steel structures						
		Sub	Maintains system components						
			Trims trees						
		Та	sk 17: Repairs Distribution Systems						
			Troubleshoots overhead distribution systems						
		isks	Troubleshoots underground distribution systems						
		Sub-Tasks	Repairs overhead distribution systems						
		Su	Repairs underground distribution systems						
		Та	sk 18: Repairs Transmission Systems						
		10							
			Troubleshoots overhead transmission systems						
		sks	Troubleshoots underground transmission systems						
		Sub-Tasks	Repairs overhead transmission systems						
		Sul	Repairs underground transmission systems						

## **Create a Study Plan**

As you prepare for your exam, it is important to plan a schedule. The following two tables will help you stay on track.

The first table is a **"Weekly Study Plan."** In this table list the areas you will focus your study for each day. You should include items you need to review as well as items you need to study. Remember, more time will be needed for study in areas you find difficult, whereas you may only require review in areas you are more familiar with. As you work through the NOA subtask list you can start to fill in this table.

The second table is a **"Study Time Table."** It is important to create a study schedule where you determine the best days of the week and times of day for you to study.

Print several copies of these tables and fill out for each week of study. It is important to stick to your study schedule.

## Weekly Study Plan for Week of: \_\_\_\_\_\_

	Area of Study 1	Area of Study 2	Area of Study 3	Area of Study 4	Area of Study 5	Area of Study 6
Mon.						
Tues.						
Wed.						
wea.						
Thu.						
Fri.						
Sat.						
Sun.						

## Study Time Table for Week of: \_\_\_\_\_

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
8:00 AM - 9:00 AM							
9:00 AM - 10:00 AM							
10:00 AM - 11:00 AM							
11:00 AM - 12:00 Noon							
12:00 Noon 1:00 PM							
1:00 PM - 2:00 PM							
2:00 PM - 3:00 PM							
3:00 PM - 4:00 PM							
4:00 PM - 5:00 PM							
5:00 PM - 6:00 PM							
6:00 PM - 7:00 PM							
7:00 PM - 8:00 PM							

## **Resources - Websites**

Study information can be drawn from a variety of sources. A sample list of study materials (websites and books) is provided below. These and other helpful resources may be found in a local college bookstore, on the internet, or at your place of employment. You may also be able to borrow them from an apprentice or journeyperson in your trade.

Study Strategies and Exam Preparation Guide

The *Study Strategies & Exam Preparation Guide* is meant to be used in conjunction with this study guide. It provides direction and information on such areas as study habits, test preparation and test taking techniques.

Exam Preparation Guide website: www.aesl.gov.nl.ca/app/publications/exam\_prep\_guide.pdf

Plan of Training (POT)

A *Provincial Plan of Training* details the full scope of learning for a particular occupation, including both technical training competencies and industry experiences necessary to write an IP Red Seal exam (and complete the requirements for Red Seal Certification), or to write a provincial examination. The Plan of Training is based on the NOA.

POT Website: www.aesl.gov.nl.ca/app/plans.html

#### Red Seal Website

**National Occupational Analysis -** The NOA is a document used for Red Seal trades that describes the knowledge and abilities required by a fully competent tradesperson working in that trade. The content for the IP exam is based on the NOA.

Red Seal Website: www.red-seal.ca

Powerline Technician PRACTICE Exam

This is **NOT** an IP exam. This is a practice exam provided by the Inter-provincial Standards Red Seal Program. It was developed using similar question types to that of a Red Seal exam. The exam is intended to be used for self-assessment in preparation for writing an IP Exam.

Practice Exam Website: www.red-seal.ca/s.1mpl.2.2x.1mQ.5.2st.3.4ns-eng.html?tid=194

**Glossary of Terms** 

This Red Seal website also lists a Glossary of Terms which will be helpful in preparing for your IP exam! <u>www.red-seal.ca/trades/powerlinetech/2013n.4.1 .1ppb gl.4ss.1ry-eng.html</u>

## **Resources – Book List**

The books listed below are sorted according to NOA blocks as referenced throughout this study guide. You can use this list to help you obtain information on specific topics. It is not necessary to use these books specifically, as you may find others that will be equally beneficial.

Book	Block A	Block B	Block C	Block D	Block E
Delmar's Standard Text of Electricity, 4 <sup>th</sup> edition	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	~
The Guide Book for Lineman's and Cableman's Handbook	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	~
Practical Problems in Mathematics for Electricians, 6 <sup>th</sup> edition	~		~	~	
The Field Guide for Powerline Workers, 1 <sup>st</sup> edition	~	~	~	~	~
Electrical Essentials for Powerline Workers, 2 <sup>nd</sup> edition	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	~
Distribution Transformer Handbook, 4 <sup>th</sup> edition				$\checkmark$	~
Hot Stick Manual	$\checkmark$				~

#### If you wish to obtain any of the resources listed above, here is the reference information:

- □ *Delmar's Standard Text of Electricity*, 4<sup>th</sup> edition, Delmar Publishers, 2008, Herman, S., ISBN 978-1418065805
- □ The Guide Book for Lineman's and Cableman's Handbook, McGraw-Hill, Mack, J., and Shoemaker, T.M., ISBN 978-0071467896
- Practical Problems in Mathematics for Electricians, 6<sup>th</sup> edition, Delmar Publishers, 2001, Herman, S., ISBN 978-0766838970
- The Field Guide for Powerline Workers, 1<sup>st</sup> edition, Delmar Publishers, 2006, Soelen, W.V., ISBN 978-1418014872
- □ *Electrical Essentials for Powerline Workers*, 2<sup>nd</sup> edition, Delmar Publishers, 2004, Soelen, W.V., ISBN 978-1401883584
- Distribution Transformer Handbook, 4<sup>th</sup> edition, Alexander Publications, Item #774
- □ *Hot Stick Manual*, A.B. Chance Company, Product Code #100, UPC #09635906801, www.hubbellcatalog.com/hps/datasheet.asp?PN=100&FAM=hot\_line\_tools

#### Disclaimer

Various external resources (websites, textbooks) have been listed in this study guide to assist an individual in preparing to write an IP Red Seal Exam. This does not mean the Department of Advanced Education, Skills and Labour, Newfoundland and Labrador endorses the material or that these are recommended as the best resources. There may be other resources of equal or greater value to an individual preparing for an IP Red Seal exam. The Department of Advanced Education, Skills and Labour has no control over the content of external textbooks and websites listed, and no responsibility is assumed for the accuracy of the material.

## Conclusion

We hope this guide has provided you with some useful tools as you prepare for your IP Red Seal exam. If you have any questions regarding your IP Red Seal exam please contact your regional office (*see Appendix A for a list of regional offices*).

We appreciate your comments and feedback regarding the usefulness of this study guide. If you have any comments or suggestions, we welcome your feedback. The feedback form at the end of this guide can be used for this purpose.

If you have any questions regarding your IP Red Seal exam, please contact one of the following regional offices:

#### Department of Advanced Education, Skills and Labour Apprenticeship and Trades Certification Division Toll Free: 1-877-771-3737 www.aesl.gov.nl.ca/app/contact.html

Corner Brook	Grand Falls-Windsor
Conner Brook	
1-3 Union Street	42 Hardy Avenue
Aylward Building, 2 <sup>nd</sup> Floor	Grand Falls-Windsor, NL
Corner Brook, NL A2H 5M7	A2A 2J9
Telephone: (709) 637-2366	Telephone: (709) 292-4215
Facsimile: (709) 637-2519	Facsimile: (709) 292-4502
Clarenville	St. John's
45 Tilley's Road	P.O. Box 8700
Clarenville, NL	1170 Topsail Road
A5A 1Z4	Mount Pearl, NL A1B 4J6
Telephone: (709) 466-3982	Telephone: (709) 729-5688
Facsimile: (709) 466-3987	Facsimile: (709) 729-5878

#### Happy Valley – Goose Bay

163 Hamilton River Road Bursey Building Happy Valley – Goose Bay, NL AOP 1EO

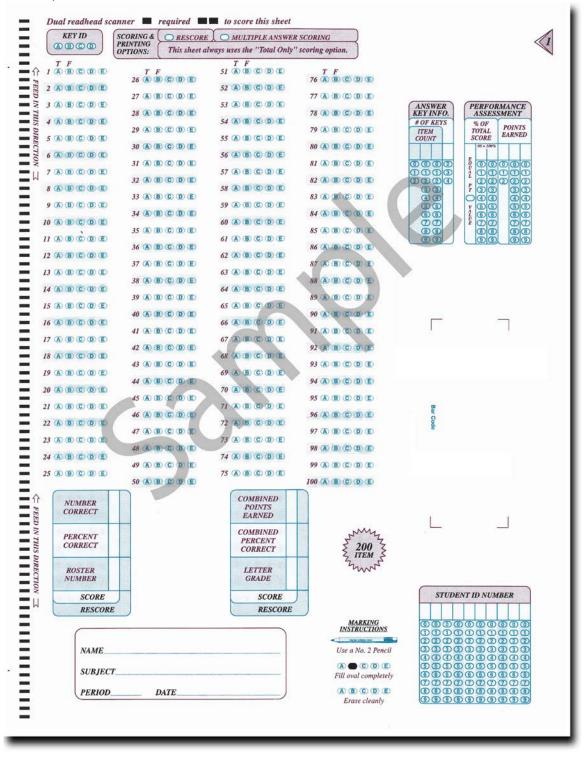
Telephone:(709) 896-6348Facsimile:(709) 896-3733

## Appendix B: Calculator Use

The picture below shows a calculator with the same functions as the one you will be provided with during your exam. It is advisable to borrow or purchase one with similar functions so that you can familiarize yourself with it before you write your exam.



With your exam you will be given an answer sheet like the one below. When answering multiple choice questions be sure to fill the circle completely and fill the circle that corresponds to the question on the exam.



## Feedback Form Study Guide – Powerline Technician

Please answer the following:

(1)	This Study Guide is a useful tool for exam preparation.			
	□ strongly agree	□ agree	□ disagree	□ strongly disagree
(2)	The topics contained in the guide are arranged in a logical order.			
	□ strongly agree	□ agree	□ disagree	□ strongly disagree
(3)	The design and format of the guide caught my attention.			
	□ strongly agree	□agree	□ disagree	□ strongly disagree
(4)	The instructions throughout the guide are clear and to the point.			
	□ strongly agree	□ agree	□ disagree	□ strongly disagree
(5)	The resources listed in this guide are suitable and valuable.			
	□ strongly agree	□ agree	□ disagree	□ strongly disagree
(6)	The guide should contain more information.			
	□ strongly agree	□ agree	□ disagree	□ strongly disagree
Suggested information/resources to include:				

Additional Comments:

Please complete this form and return via fax or mail to the following:

Department of Advanced Education, Skills and Labour Apprenticeship and Trades Certification Division Standards and Curriculum Unit 45 Tilley's Road, Clarenville, NL A5A 1Z4 Fax: (709) 466-3987

