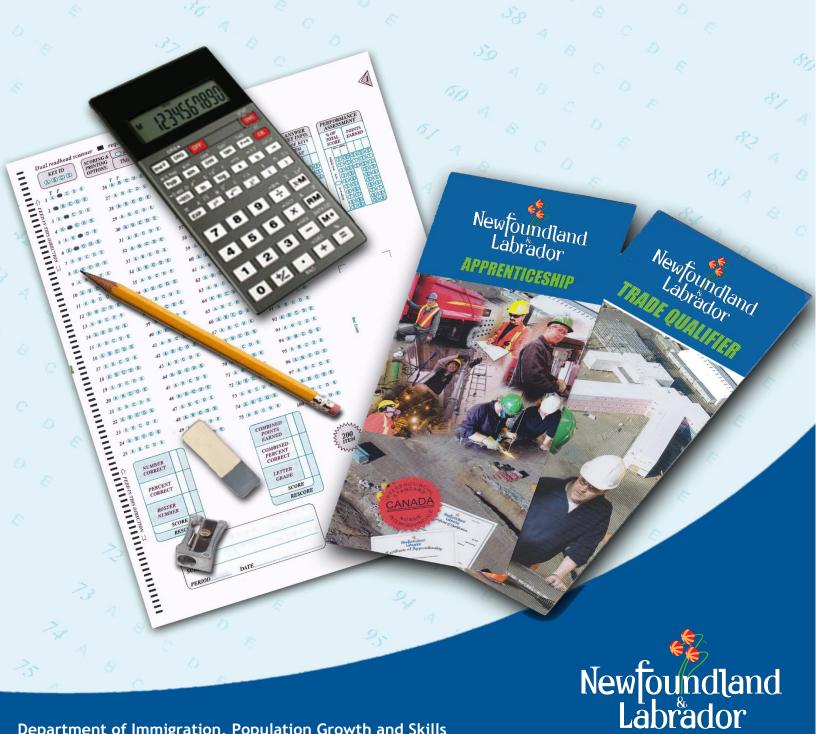
# APPRENTICESHIP & CERTIFICATION

**Study Guide Powerline Technician** 



## **Study Guide**

## Powerline Technician (Based on Red Seal Occupational Standard – RSOS 2019)

Government of Newfoundland and Labrador Department of Immigration, Population Growth and Skills Apprenticeship and Trades Certification Division

**Version 9** 

Revised November 2022

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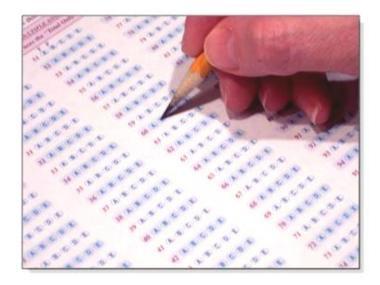
## Introduction

This Study Guide has been developed by the Newfoundland and Labrador Department of Immigration, Population Growth and Skills, Apprenticeship and Trades Certification Division, to assist apprentices and trade qualifiers as they prepare to write the Inter-provincial (IP) Red Seal Exam. IP Exams are available for all Red Seal trades. For a list of Inter-provincial trades please refer to the Department of Immigration, Population Growth and Skills website: https://www.gov.nl.ca/atcd/designated-trades/list-of-designated-trades/

#### 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
ring will be provided: a calculator (see Appendix B for calculator information)

#### **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.

☐ all other items required such as pencils, scrap paper, etc.

### **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.



- 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:

- 1. What is to be done during a tension stringing operation when the level wind will not move fully to the right or left?
  - A. Stop the pull and secure the pulling line.
  - B. Stop the pull and release tension from the pulling line.
  - C. Disengage the level wind and continue with pull.
  - D. Place the level wind in the center position and continue with pull.



- 2. What is considered when changing-out dampers on a transmission line?
  - A. Conductor weight, operating voltage and insulator rating.
  - B. Conductor sag, operating voltage and line current.
  - C. Conductor weight, structure height and hot stick capability.
  - D. Conductor weight, line current and hot stick capacity.



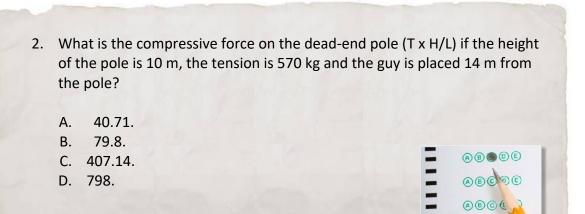
- 3. Which information is required when installing a fused disconnect switch?
  - A. kVA rating of the line, kVA load and feeder fault current.
  - B. kV rating of the line, line current and feeder fault current.
  - C. kV rating of the line and the load, and feeder fault current.
  - D. kV rating of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

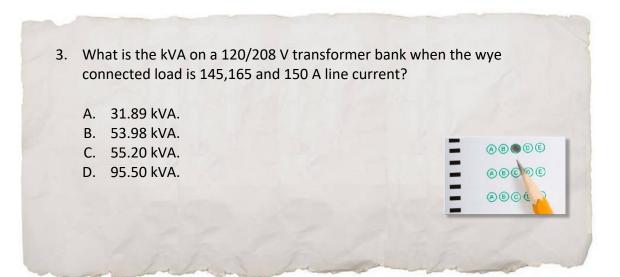


### **Level 3 Examples:**

- 1. An energy meter has a kW h factor of 7.2 and the disc rotates 40 times in 2 ½ minutes. What is the load being indicated by this meter?
  - A. 4147.2 watt.
  - B. 6912 watt.
  - C. 6912 volts-amp.
  - D. 7200 watt.







#### **Source of Questions:**

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

## **Exam Content**

## **Understanding the Red Seal Occupational Standard (RSOS)**

The Red Seal model has historically been based on the development of the National Occupational Analysis (NOA) which supports the development of multiple-choice format examinations.

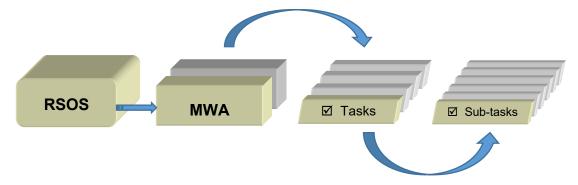
The RSOS was introduced in 2015 and is now taking the place of the NOA. Each RSOS or NOA sets the standard for a Red Seal trade. The Red Seal Inter-provincial Examination is based on the Red Seal Standard.

The new standards provide greater consistency in learning resources and allow for increased industry involvement in the development of these standards. This new model places increases emphasis on apprenticeship training and assessing skills with industry learning objectives, outcomes and performance criteria.

The RSOS for each trade describes the tasks and sub-tasks; skills and knowledge requirements; summary of essential skills; safety information; trends affecting the trade; technical terms; names of tools and equipment; acronyms; learning objectives and outcomes; industry expected performance and essential skills related to each sub-task.

The RSOS is an excellent tool to use as you study for the Red Seal exam. RSOSs can be found at http://www.red-seal.ca/resources/n.4.1-eng.html

RSOS material is organized into the following categories: **MWA** (*Major Working Activity*). The MWAs are further broken down into **TASKS** (*describes activities within an MWA*) and **SUB-TASKS** (*describe activities within a task* – *This is what the exam is based on*).

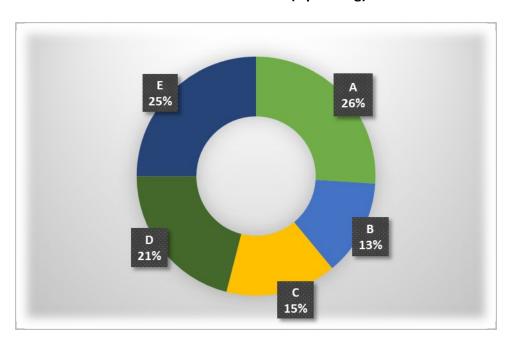


The NOA will continue to be used as the occupational standard for trades that do not yet have an RSOS developed.

## **RSOS Pie Chart**

The RSOS Pie Chart presents the MWA percentages in the form of a pie chart which tells you the approximate number of questions from each MWA. For example, 26% of the questions on the **Powerline Technician** Exam will be based on **MWA A**.

## **Powerline Technician (Operating)**



	BLOCK TITLES						
MWA A	Performs Common Occupational Skills	MWA D	Installs Auxiliary Equipment				
MWA B	Installs Structures	NAVA E	Performs Operation Maintenance and Rona				
MWA C	Installs Conductor Systems	MWA E	Performs 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 RSOS MWA. 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).

MWA A	Performs Common Occupational Skills	32		
Task 1	Performs safety related functions			
Task 2	Uses and maintains tools and equipment			
Task 3	Organizes work			
Task 4	Accesses work area			
Task 5	Uses live-line methods			
Task 6	Uses communication and mentoring techniques			
MWA B	Installs Structures	16		
Task 7	Installs pole structures			
Task 8	Installs steel lattice structures			
MWA C	C Installs Conductor Systems 1			
Task 9	Task 9 Installs overhead conductors and cables			
Task 10 Installs underground and underwater cable				
MWA D	D Installs Auxiliary Equipment			
Task 11	Installs lighting systems			
Task 12	Installs voltage control equipment			
Task 13	Installs protection equipment			
Task 14	Installs metering equipment			
Task 15	Installs communication devices			
MWA E	Performs Operation, Maintenance and Repair	32		
Task 16	Operates distribution and transmission systems			
Task 17	Maintains distribution and transmission systems			
Task 18	Repairs distribution systems			
Task 19	Repairs transmission systems			
	Total	125		

## **RSOS Sub-tasks**

The following RSOS Task Profile Checklist outlines the MWAs, 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 RSOS. 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 RSOS 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 RSOS for your trade.

## Task Profile Checklist Based on 2019 RSOS Powerline Technician

M۱	NA	VA A: Performs Common Occupational Skills						
		Task 1: Performs safety related functions						
		Sub-Tasks		Uses personal protective equipment (PPE) and safety equipment Controls power line hazards Controls environmental hazards Performs lock-out and tag-out procedures Performs temporary grounding and bonding procedures				
		Tas	k 2: Us	ses and maintains tools and equipment				
	П							
		Sub-Tasks		Uses hand, power and powder-actuated tools and equipment Uses electrical measuring and testing equipment Uses rigging, hoisting and lifting equipment				
		Tas	k 3: O	rganizes Work				
	П							
	ı	Sub-Tasks		Interprets plans, drawings and specifications Prepares worksite Plans job tasks and procedures				
		Tas	Task 4: Accesses work area					
	ı	Sub-Tasks		Climbs poles and steel lattice structures Uses access equipment Uses on and off road equipment				
		Tas	k 5: U	ses live-line methods				
		Sub-Tasks		Uses cover up Uses rubber gloves Uses bare-hand methods (NOT COMMON CORE) Uses fiberglass reinforced plastic (FRP) tools (hot sticks)				
		Tas	k 6: U	ses communication and mentoring techniques				
		Sub-Tasks	0	Uses communication techniques Uses mentoring techniques				

MV	NΑ	B:	Instal	ls Structures					
		☐ Task 7: Installs pole structures							
		S		Frames pole structures					
		Sub-Tasks		Sets pole structures					
		L-qr	Ц	Installs pole structure guys and anchors					
		S							
		Та	sk 8: I	nstalls steel lattice structures					
				Assembles steel lattice structures					
		ks		Erects steel lattice structures					
		Sub-Tasks		Installs steel lattice structure guy wires and anchors					
		-qn							
		Š							
MV	VΑ	C:	Instal	ls Conductor Systems					
	П	т.	als Os	Installs overhead conductors and cables					
	۲	Ia	SK 9:	installs overnead conductors and caples					
			_						
		ks		Strings overhead conductors and cables Sags overhead conductors and cables					
		Tas		Ties-in overhead conductors and cables					
		Sub-Tasks		Installs splices and connections to overhead conductors and cables					
		S							

☐ Task 10: Installs underground and underwater cable

□ Splices underground and underwater cable□ Terminates underground and underwater cable

Installs conduit and cablePlaces direct buried cable

M۱	WA D: Installs Auxiliary Equipment				
		Tas	sk 11:	Installs lighting systems	
	П				
		sks		Installs street lights	
		Sub-Tasks		Maintains street lights	
		Sul			
		Ta	sk 12:	Installs voltage control equipment	
				Installs transformers	
		sks		Installs capacitors	
		Sub-Tasks		Installs voltage regulators	
		Suk		Installs switches	
				Installs reactors (NOT COMMON CORE)	
		Ta	sk 13:	Installs protection equipment	
	П		_		
		S		Installs reclosers	
		Sub-Tasks		Installs sectionalizers	
		L-qn		Installs fuses	
		S		Installs lightning arrestors	
		Ta	sk 14:	Installs metering equipment	
		Tasks		Installs primary metering equipment	
				Installs secondary metering equipment	
		Sub			
		Ta	sk 15:	Installs communication devices	
		(4		Installe cellular automos	
		ask		Installs cellular antennas	
		Sub-Tasks		Transfers communication lines	
		S			

MV	VA	A E: Performs Operation, Maintenance and Repair					
		Та	sk 16:	Operates distribution and transmission systems			
			_				
		sks		Operates transmission systems			
		Sub-Tasks		Operates distribution systems			
		Sub		Performs station switching			
		Та	sk 17:	Maintains distribution and transmission systems			
				Inspects distribution and transmission systems			
		Ś		Maintains pole structures			
		Task		Maintains steel lattice structures			
		Sub-Tasks		Maintains system components			
		S		Trims trees			
	☐ Task 18: Repairs distribution systems						
				Troubleshoots overhead distribution systems			
		sks		Troubleshoots underground and underwater distribution systems			
		Sub-Tasks		Repairs overhead distribution systems			
		Su		Repairs underground and underwater distribution systems			
			1.40				
		ıa	SK 19:	Repairs transmission systems			
				Troubleshoots averboad transmission systems			
		S		Troubleshoots overhead transmission systems			
		Sub-Tasks		Troubleshoots underground and underwater transmission systems			
		l-qn		Repairs overhead transmission systems			
		S		Repairs underground and underwater 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 RSOS 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.						
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.

https://www.gov.nl.ca/atcd/apprentices-youth/self-study/study-guides/

#### 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 RSOS.

https://www.gov.nl.ca/atcd/designated-trades/pots-aacs/

#### **Red Seal Website**

**Red Seal** is a program that sets common standards to evaluate the skills of tradespeople across Canada. It is a partnership between the Federal Government and the provinces/territories.

The Red Seal model has been based on the National Occupational Analyses (NOA) which supports the development of multiple-choice examinations. A new Red Seal Occupational Standard (RSOS) was introduced in 2019 and is taking the place of the NOA.

https://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.

https://www.red-seal.ca/eng/s.1mpl.2.2x.1mQ.5.2st.3.4ns.shtml?tid=194

#### Red Seal Exam Self-Assessment Guide

Use this self-assessment tool to rate your own understanding and experience with the tasks of the trade that are on the Red Seal examination:

https://www.red-seal.ca/\_conf/assets/custom/docms/powerline-tech/self-assessment.pdf

#### **Glossary of Terms**

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

#### Acronyms

The Red Seal website lists Acronyms which will be helpful in preparing for your IP exam: http://www.red-seal.ca/trades/powerlinetech/2013n.4.1\_.1ppc\_.1cr.4nym-eng.html

#### List of Tools and Equipment

The Red Seal website shows a list of Tools and Equipment which will be helpful in preparing for your IP exam: http://www.red-seal.ca/trades/powerlinetech/2013n.4.1 .1pp.1 t.4.4ls-eng.html

## **Resources – Book List**

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	<b>√</b>	✓	✓	<b>√</b>	<b>✓</b>
The Guide Book for Lineman's and Cableman's Handbook	<b>√</b>	✓	✓	<b>√</b>	<b>✓</b>
Practical Problems in Mathematics for Electricians, 6 <sup>th</sup> edition	✓		✓	✓	
The Field Guide for Powerline Workers, 1 <sup>st</sup> edition	✓	✓	✓	✓	<b>✓</b>
Electrical Essentials for Powerline Workers, 2 <sup>nd</sup> edition	<b>√</b>	✓	✓	<b>√</b>	<b>✓</b>
Distribution Transformer Handbook, 4 <sup>th</sup> edition				<b>√</b>	<b>✓</b>
Hot Stick Manual	<b>√</b>				<b>✓</b>

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

Delmar's Standard Text of Electricity, 4th 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, 6th edition, Delmar Publishers, 2003
Herman, S., ISBN 978-0766838970
The Field Guide for Powerline Workers, 1st 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, 4th 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 Immigration, Population Growth and Skills, 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 Immigration, Population Growth and Skills 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.

## **Appendix A: Regional Offices**

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

Department of Immigration, Population Growth and Skills Apprenticeship and Trades Certification Division Toll Free: 1-877-771-3737

https://www.gov.nl.ca/atcd/contact-us/staff-listing-and-office-locations/

#### **Corner Brook**

1-3 Union Street Aylward Building, 2<sup>nd</sup> Floor Corner Brook, NL A2H 5M7

Telephone: (709) 637-2366 Facsimile: (709) 637-2519

#### **Grand Falls-Windsor**

42 Hardy Avenue Grand Falls-Windsor, NL A2A 2J9

Telephone: (709) 292-4215 Facsimile: (709) 292-4502

#### Clarenville

45 Tilley's Road Clarenville, NL A5A 1Z4

Telephone: (709) 466-3982 Facsimile: (709) 466-3987

#### St. John's

P.O. Box 8700 1170 Topsail Road Mount Pearl, NL A1B 4J6

Telephone: (709) 729-5688 Facsimile: (709) 729-5878

## Happy Valley – Goose Bay

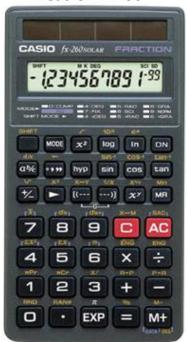
163 Hamilton River Road Bursey Building Happy Valley – Goose Bay, NL AOP 1E0

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

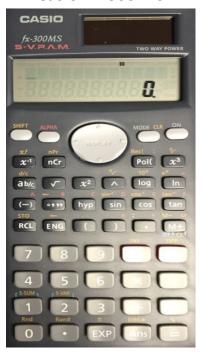
## Appendix B: Calculator Use

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.

Casio FX-260

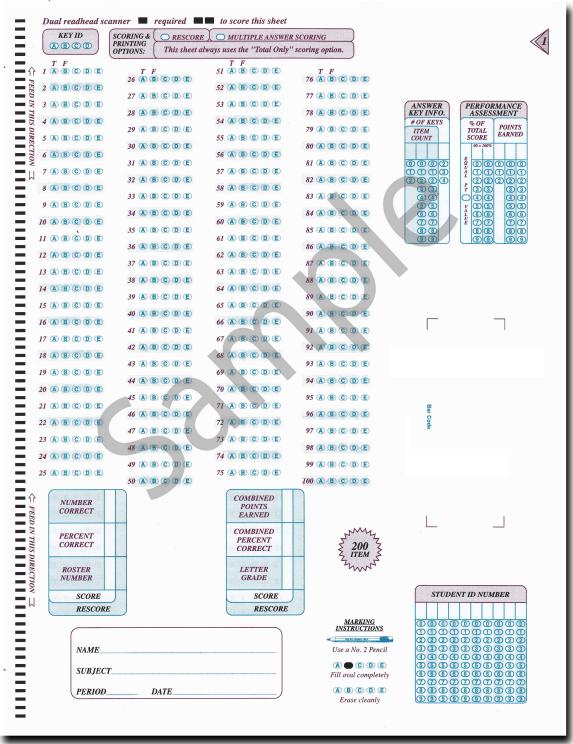


Casio FX-300 MS



## Appendix C: Answer Sheet Example

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 Immigration, Population Growth and Skills
Apprenticeship and Trades Certification Division
Standards and Curriculum Unit
45 Tilley's Road, Clarenville, NL A5A 1Z4
Fax: (709) 466-3987

