

ALGEBRAIC AND GRAPHICAL MODELLING IN A FUNDAMENTAL CONTEXT 2



SOFAD



ALGEBRAIC AND GRAPHICAL MODELLING IN A FUNDAMENTAL CONTEXT 2



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Legend: r = right c = centre I = leftt = top b = bottom

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IV

HOW THE LEARNING GUIDE IS STRUCTURED

Welcome to the learning guide for the *Algebraic and Graphical Modelling in a Fundamental Context 2* course. The aim of this course, which is the second in the **Secondary V Science** sequence, is to develop your ability to handle situations that require an algebraic or graphical model to express a relationship between quantities. To achieve this, you will study eight new real functions:

- exponential;
- logarithmic;
- rational;
- square root;
- sinusoidal;
- tangent;
- piecewise;
- absolute value.

You will complete your learning by expanding your knowledge of:

- operations on functions;
- · determining the type of dependency relationship using the curve of best fit;
- solving one-variable equations and inequalities.

You will be required to use various solution strategies to understand and model situational problems. You will need to use your mathematical reasoning skills. You will also have to describe how you solved these problems clearly and thoroughly using mathematical language.

You are now invited to complete the learning activities found in the six chapters of the two guides for this course and enrich your knowledge of algebra.

Portailsofad.com

Go to portailsofad.com for videos, ICT activities and printable versions of resources that are complementary to the SOLUTIONS series, which you can use throughout your learning journey.



CHAPTER COMPONENTS

The learning process followed in each chapter enables students to progress by building on what they have learned from one section to the next. The following diagrams illustrate this approach and specify the pedagogical intent of each section.

CHAPTER INTRODUCTION

The first page describes the context and theme that will serve as a backdrop for the acquisition of the new knowledge discussed in the chapter.



A table of contents accompanies this first page. The knowledge to be acquired is described for each of the *Situations*, as well as the theme of the situational problems.



SITUATIONS

In general, there are two learning Situations per chapter. The approach taken in these situations makes it possible to acquire new knowledge and develop mathematical skills in real, realistic or purely mathematical contexts.

PHASES OF EACH SITUATION



SITUATIONAL PROBLEM

- Linked to the main theme of the chapter, this page briefly describes the context of the situational problem, as well as the information required to solve it.
- A box describes the task you will have to perform later in the *Solution* section. This task is the starting point for acquiring new knowledge to solve the situational problem.

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EXPLORATION

This section invites you to analyze the data of a situational problem, and then to identify the knowledge that you possess and the knowledge you need to acquire in order to perform the task.

 The questions posed will guide you toward a problem-solving strategy.

		 representation a preventation 	
	1. Piecewise Functions		
	In this section, you will discover harwise represent this new type of function, which is defined differently on different totacion of its design.		
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1	Abitude of the Assessition of Tene Depart (mate		
1			

ACQUISITION A

This is where the knowledge needed to solve the situational problem is assimilated. Each *Acquisition* encourages reflection before presenting new mathematical knowledge.

	as are now adde to solve 'Ethantional Phoblem 1.1.	Ar Autonomous Braking System
1	Determine at what distance between the two can the systems chaddinatize beating if it does that has been a people to this example, estimate what the difference between the system if the solution of the solution distance separating these is only 21 m.	
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1.1	parameter in commencements (in = 1.24). In the graph to the right, the sandalast Q and L, respectively reported the beginning and end of builting	
	slation	
	slutice	
5	shation	
	shution	
5		

- SOLUTION

By the time you reach this section, you should have acquired all the knowledge and strategies that are essential to solving the situational problem described at the beginning of the situation.

1. Properties	s of a Piecewise Function and how to detensive and interpret the properties	Preservice day Preservice Integration Integration and American	
will allow you to refer	this branchedge.	(prevented handown	
EXMINING		RIVE DES CONCERN	
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To define the main p	reperters of a function, 7	t	
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	_7	the second	
Reports	Delation	Inangle	
Domain Ensure Interferencial	Let all others the independent variable can take.	Let al real numbers, R.	
Zeros of the function	The reference of a first which first a state	1.00	
(a intercept)			
y intercept (mild value)	the south of typ, When the domain of the function is limited to the interval (0,), the y-interceptics also called the initial value.	14	
	A function is positive over part of its skewain if $ f_{\rm P} >0$ for all the values of z in this part.	Peaker at 0 (-1, 1)	
	A function is regular over part of its domain (15) < 2 for all the values of a in this part.	#E)*n,*EU(3,*n)	
	A function is consistent more an interval of the elements if, for all values a, and a, in this interval, if a) = Eq. :		
Comp	The function is increasing over the interval if, for all values	Increasing (~n, 1)	
	The function is decremented over the interval of the all values	Desensing [1, *s]	
	a_1 and a_2 in this interval, $a_1 \leq a_2$ results in $\{a_2\} > \{a_2\}.$		
Incomum at maximum	The minimum is the unabest of the calars, of the dependent variable. The maximum is the largest value.	Maximum 2	
		· · · · · · · · · · · · · · · · · · ·	
			- 61

- ACQUISITION B

In this second acquisition, you will acquire new knowledge prescribed by the program linked to the knowledge encountered in *Acquisition A.*

$\left\{ dx + 1d \text{if } x \in [-n,-1] \right\}$	Densin al I.
Real Provide and a second	Range of F
	y intercept.
$\begin{bmatrix} -\frac{\pi}{2} + \frac{\pi}{2} & \text{if } x \in \{0, +n\} \end{bmatrix}$	Maximum of the harviory
	Minimum of the function
(TTTT TTTT	Zenn of the functions
	Instantion interval
	Dramating Interval
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	pestivel
	pained region
All Write the function rule g expresented by D HOTE their 2.2 is the arrive of a second day	pentori regatori Na gagh.
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CONSOLIDATION

This section will allow you to consolidate the mathematical knowledge acquired in *Acquisitions A* and *B*. As in the *Integration* section, this *Consolidation* also contributes to the development of mathematical skills.

AT THE END OF A CHAPTER...

KNOWLEDGE SUMMARY

This section summarizes all the knowledge to *Remember* in the form of fill-in-the-blank questions. We invite you to fill in the missing information.

INTEGRATION

In this section, which includes exercises and complex situations, you will have to apply the knowledge seen in this chapter.

LES

The *LES* is a complex task developed according to the certification evaluation model. It is accompanied by a competency evaluation grid.

COMPLEMENTS



SELF-EVALUATION

A Self-Evaluation section is presented in the first part of the Complements section in Volume 2. It allows you to evaluate your acquired knowledge and the mathematical skills you have developed throughout the course. In this way, you will be able to identify the knowledge that you have mastered and that for which a revision is necessary before moving on to the Summary Scored Activity.

•	REFRESHER		These requester questions cover knowledge
			Anderstand the new knowledge.
	REMINISCR, PRIES		
	Polynomial Functions of Degree Les	s than 3	
	Solve the following equations.		
	a) 12x + 5 = 8	b) $\frac{4}{3} = \frac{x-6}{5}$	
	c) $5(x-2)^2 + 4 = 49$	d) B = "2x ² +"	12x - 2
	a) $3(x + 4)^2 - 8 = -11$	f) (2x - 5)(-2)	(c + 6) = 0
	Graph the following functions.		
	a) f(x) = 12	b) $g(x) = -\frac{3}{4}x$	- 4
	c) $h(x) = 4(x + 1)^2 + 3$	d) $i(s) = s^{2} + 1$	0x + 25
	A child drops a pebble into a deep dry w The pebble starts off at the edge of the starting position. It is known that the dis square of the elapsed time (if air resistar	ell. After 2.5 s, the pebble tos well. After 1 s, it has fallen to a tance travelled by an object ce is not taken into account)	when the bottom of the well, a depth of "5 m in relation to its in freefail is proportional to the
	 a) Determine the rule that describes the during its fall. 	e position of the pebble as a l	function of the time elapsed
	b) After how long is the pebble at a dep	ith of 15 m?	
	c) Estimate the depth of the well.		
	d) Graph this function, taking into acco	unt its domain.	
	() a) Given that a parabola has a vertex lo determine the function rule.	cated at ("3, 2) and that it par	ses through point (1, "6),
1	b) What are the zeros of this function?		
a ris public minimum	<) What is the value of f[3]?		
0 1004			
	AND WERKEY PRESS 215		

REFRESHER

Throughout the *Situations*, you will come across headings entitled *Reminders*. These sections present concepts seen in a previous course that are necessary to understand the new knowledge or to solve the current situation.

The *Refresher* section allows you to use exercises to review the mathematical rules and concepts that are the subject of a *Reminder*.

	CHAPLER 1 Piccewise Functions A piccewise Functions A piccewise function is abaction for which the rule dflirst depending on the internal where the independent which is thread to be advant of the internance such the transmission succession network of the internance	
	are called official values. Example: An object is thrown into a shallow roost The following function describes this situation.	
	$\begin{array}{ c }\hline & \hline &$	0 00000 figure and the second se
384		

KNOWLEDGE SUMMARY

The full version of the *Knowledge Summary* is found in this section. A printable version is also available online.

Mathemat	ical Symbols		
Symbol	Reasing	Symbol	Weating
	equals	1.1	Positive infinity
~	approximately equal to	14	Negative infinity
	not equal to	N	Set of natural numbers
Ξ	Plus or minus.		Set of real numbers
	less than	z	Set of integers
	greater than	12	Inverse of the function f
	less than or equal to	•	composed of
	greater than or equal to	dom f	Domain of the function f
υ,	Square root	an/	Range of the function f
10	Cube root of a	Δx	Change in x
1/2	ethnoct of a	Δy	Orange in y
[a]	Absolute value of a	- 10	Sippe
∠ A	Angle A	log	Logarithm
m∠A	Measure of angle A	in	Napierian or natural logarithm
n R	Length of segment BC	P.	Range of a point P, which moves by rutation on a circle after a time t
d(A, II)	Distance between points A and B	sint	Sine of the angle t
A.,	Area of the triangle	6947	Cosine of the angle t
[a, b]	Internal of a to b inclusive	tant	Tangent of the angle r
[4, 8]	Internal including a, but excluding b	arc sin or sin ⁻¹	Inverse of the sine function
[a, b]	internal excluding a, but including b	arc cos or cos ⁻¹	inverse of the cosine function
]4,8[internal of a to b-exclusive	arctan ortan 1	inverse of the tangent function
6	belongs to	Number	
U	Union of sets		kater number: e ~ 271928
0	Intersection of sets		Sunctions.
G	Is included in		Pinamber ~ 2.1416
A'B	Set A minus set B		
1	Such that		
	If and only if		
-	infinity	1	

MATHEMATICAL REFERENCE

In this section, we present mathematical symbols used in the guide and some abbreviations of units of measurement. Reminders of mathematical formulas are also provided.

	Absolute value (of a number)	Amplitude	
Verter nutrient, 4000 a	and rate and a data and ata and	December of each out of a cut	of coster
			2222

Words and expressions written in blue in the current text are defined in the *Glossary*.



ANSWER KEY

Toward the end of the guide, you will find the *Answer Key*. It is designed not only for checking your answers, but also to complement your learning process. It contains the answers to questions and detailed explanations of the approach to be taken or the reasoning to be used.



EVALUATION GRID

A competency *Evaluation Grid* is available at the end of the guide. After solving an *LES*, you are asked to evaluate yourself using this grid. You can then complete the abbreviated version at the bottom of each *LES*.

	QUICK REFERENCE
	Name of learner:
- QR	
8	
	* The spick reference must have a maximum length of one page (front) E1, s 11, he handwritten or electronically control by the barrow (reinimum

QUICK REFERENCE

You can create your own quick reference guide. A detachable sheet is provided for this purpose at the end of the guide in Volume 2. You may use this quick reference during the final test.

HEADINGS AND PICTOGRAMS



ASK

Invites the student to watch a video clip on the situational problem.

Determine the distance between the two cars when...

Presents the task to be performed as part of your Situational Problem.

REMINDER

PAGE 138, QUESTIONS 1 TO 3

REFRESHER EXERCISES

Functions...

The functions including...

Example:

An object starting from a standstill...

Refers to knowledge you have acquired in previous courses and refresher exercises related to this *Reminder*.

REMEMBER

The functions defined...

To calculate the image of a...

Example:

To calculate the value of *f*(9), ...

Presents the mathematical knowledge you will be required to master. This is the knowledge prescribed by the study program.

STRATEGY Representing a...

Representing a situation with a diagram allows you to visualize the variables...

Presents problem-solving strategies that can be applied to a variety of situations.

All commercial aircraft operate in control mode.

Allows you to discover historical and cultural information related to the mathematical concepts being studied.

TIP

When studying piecewise functions in depth, a convention is imposed: the intervals that define the parts... Provides a tip that simplifies the task, or offers a different way of dealing with the problem or of applying the concept being studied.

CAUTION!

This is a single function, because it relates the same variables in the same situation, and this even...

Warns of traps to avoid or exceptions that may apply to the concept being studied.

ICT

ICT activity 2.2.1 allows you to use a graphing calculator to validate the graph of your sketches. This activity is accessible...

Prompts you to complete an online activity (GeoGebra or graphing calculator) that will encourage you to explore the concept studied using technological tools.

SCORED ACTIVITY

You must now complete Scored Activity 1. It can be found on the course website... Indicates that you are ready to complete the Scored Activity designed to assess your comprehension as you learn. The Summary Scored Activity is completed at the very end of the course. These activities are presented in separate booklets of the guide. You will have to submit each completed activity to your teacher or tutor who will provide you with feedback following correction.

SOLUTIONS

The **SOLUTIONS** series covers all the courses in the Diversified Basic Education Program, including the Secondary V *Cultural, Social and Technical* (CST) and *Science* (Sci) options.



SOFAD

The **SOLUTIONS** learning approach is based on the acquisition of all the prescribed mathematical knowledge in a problem-solving context. The learning sequence that supports this approach is as follows:



Inductive and deductive questions give meaning to the knowledge and strategies to be acquired. The learning guides offer a multitude of simple exercises and more complex tasks to meet the needs expressed by learners and teachers. Additional resources are also available on <u>portailsofad.com</u>.

Components of the SOLUTIONS series:

- · Learning guide: print and PDF versions;
- Teaching guide (PDF);
- · Videos on situational problems;
- · ICT activities: GeoGebra, graphing calculator;
- Scored activities;
- · Answer keys.



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