

Course  
**Geometric Representations**  
**MTH-P104-4**

Presecondary





“Nothing is easier to learn than geometry, however useless it may be.”

Sacha Guitry

## Presentation of the Course *Geometric Representations*

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The course *Geometric Representations* is designed to help adult learners deal competently with real-life situations in which they must solve problems that involve representing the physical environment.

The course prepares adult learners to use basic geometry, measurements and ratios in real-life situations that require them to represent shapes and quantities.

This course continues to build on the knowledge learners have acquired in previous courses or in their daily lives. They already use measurements of time and length and understand space-related concepts. They are also familiar with using fractional notation in certain contexts and with representing simple geometric shapes. In this course, they will explore other measurements such as those related to surface area, capacity, mass and angles. They will also strengthen their understanding of fractional notation by using them to represent parts of objects (simple fractions) as well as the relationship between quantities of objects. The emphasis will be on using such notation to provide a clearer representation of the

physical environment rather than on applying calculation techniques, which will be covered in more depth in other courses in the *Mathematics* program. Adults will study geometry in greater detail by using the properties of figures, the calculation of perimeters, angles and certain significant segments in everyday situations.

By the end of the course, adult learners will be able to accurately employ basic geometric language and use deductive and inductive reasoning with respect to the various ratios, arithmetic operations and properties of figures. As well, they will have improved their understanding of shapes and quantities in their physical environment and will be able to describe and illustrate them appropriately. They will also determine the measurements and ratios required to deal with real-life situations. Their ability to represent the ratios between two quantities of objects and to measure mass and temperature will also be useful for representing the physical environment. Although these representations are not geometric in nature, they are part of this course.

## Dealing With the Real-Life Situations

Dealing effectively with real-life situations is based on actions. These actions are grouped into categories and make use of a set of resources that include operational competencies and essential knowledge. During the learning process, adults are expected to construct knowledge related to these resources in order to be able to deal appropriately with their real-life situations.

The class of situations, categories of actions, operational competencies and essential knowledge constitute the compulsory elements of the course. These elements are explained in detail under their respective headings.



## Class of Situations Addressed by the Course

This course addresses a single class of situations: *Representing the physical environment*.

Representing the physical environment is an important part of the real-life situations in this class. Adults perceive shapes and quantities in their physical environment through direct observation or by interpreting written descriptions or illustrations of this environment. In both cases, their mental representations must be based on geometric models. Often, adults are also called on to produce representations of the physical environment that consist of shapes and quantities and that may take the form of an oral or written description or of an illustration. The real-life situations in this course involve representations of the physical environment that are part of the daily lives of adults. In order to be able to deal with such situations, adults are required to perform some calculations, to use relatively simple geometric figures and to work with the most common types of measurements from the International System of Units.

In situations involving renovations or construction, adults will be able to explain, for instance, that they want a rectangular table, a swimming pool with a certain capacity or wood planks of specific dimensions. They must also be able to take the necessary measurements to carry out the tasks related to these types of situations. Certain real-life situations associated with the arts or literature will also involve some of the elements covered in this course. For example, adults will be better able to visualize a written description of a setting or to illustrate objects in recreational artistic activities. Lastly, other very common real-life situations involve representations of the physical environment. This is the case, for instance, when adults describe an object or a place to someone else or measure quantities of food for a meal.

Class of Situations	Examples of Real-Life Situations
Representing the physical environment	<ul style="list-style-type: none"> <li>▪ Reading a description</li> <li>▪ Describing a place or an object to a friend</li> <li>▪ Assembling a piece of furniture</li> <li>▪ Preparing a meal</li> <li>▪ Producing a work of art</li> <li>▪ Renovating a plumbing system</li> <li>▪ Building a patio</li> <li>▪ Making a garment</li> <li>▪ Controlling body weight</li> <li>▪ Furnishing a room</li> <li>▪ Landscaping</li> </ul>

## Categories of Actions

The *categories of actions* are groups of actions that are appropriate for dealing with the real-life situations addressed in the course. *Examples of actions* are provided to illustrate the scope of the category in a variety of contexts.

Categories of Actions	Examples of Actions
<ul style="list-style-type: none"> <li>▪ Perceiving shapes and quantities in the physical environment</li> </ul>	<ul style="list-style-type: none"> <li>▪ Perceives shapes and quantities from a written description of a setting</li> <li>▪ Identifies an object described by someone else</li> <li>▪ Determines where a tree is to be planted based on a diagram</li> <li>▪ Visualizes the quantity of food indicated in a recipe in order to choose the right-sized container or the appropriate measuring instruments</li> <li>▪ Compares the dimensions of two houses</li> <li>▪ Matches the various parts of a piece of furniture with the figures shown in the installation guide</li> <li>▪ Matches shapes and measurements with objects observed</li> <li>▪ Visualizes the known length of an object</li> <li>▪ Visualizes the surface area that will be covered by a new carpet given the surface's dimensions</li> </ul>
<ul style="list-style-type: none"> <li>▪ Producing representations of the physical environment</li> </ul>	<ul style="list-style-type: none"> <li>▪ Writes a description of a room</li> <li>▪ Describes his/her house to a friend</li> <li>▪ Draws a sketch of a patio to be built</li> <li>▪ Draws a diagram of a mechanical part</li> <li>▪ Represents an object in a painting</li> </ul>

Categories of Actions	Examples of Actions
<ul style="list-style-type: none"> <li>▪ Determining measurements and ratios</li> </ul>	<ul style="list-style-type: none"> <li>▪ Estimates the daily nutritional value of a food portion</li> <li>▪ Measures a person's mass</li> <li>▪ Measures the ingredient amounts for a recipe</li> <li>▪ Derives the measure of an angle in a mechanical part</li> <li>▪ Divides a cake into several equal parts</li> <li>▪ Prunes the recommended portion of a tree or bush</li> <li>▪ Calculates the perimeter of a fenced-in area</li> <li>▪ Calculates the amount of fabric needed to make a garment</li> </ul>

## Compulsory Elements and End-of-Course Outcomes

The compulsory elements are those that the teacher must absolutely take into account when designing learning situations.

### Class of Situations

Representing the physical environment

### Categories of Actions

- Perceiving the physical environment
- Producing representations of the physical environment
- Determining measurements and ratios

### Operational Competencies

Think logically

- Infers the properties of simple geometric figures
- Makes connections between figures, measurements, ratios and the objects they represent
- Deduces information that is implicit in representations of the physical environment
- Selects the most appropriate instrument for taking precise measurements
- Makes sure his/her conclusions are realistic and coherent

Communicates

- Accurately decodes symbols, notations and terms associated with arithmetic and geometric language
- Recognizes shapes and quantities
- Checks his/her interpretation with other people
- Structures his/her message appropriately using mathematical models
- Accurately uses symbols, notations and terms associated with arithmetic and geometric language
- Makes sure the message is clear

### Essential Knowledge

- Plane figures
- Measurements
- Decimals and ratios
- Proportional relationships

The end-of-course outcomes describe how adults make use of the compulsory elements to deal with the real-life situations addressed in the course.

### End-of-Course Outcomes

In order to deal with the situations in the class *Representing the physical environment*, adults perceive the physical environment and produce geometric representations of them. They also determine the measurements and ratios needed to deal with the real-life situation.

Adults see the physical environment directly or it is presented to them in a description or an illustration. They are able to analyze a diagram or a sketch, understand the description of a setting, form a precise image of the objects they observe, follow the directions for assembling a piece of furniture. To do this, they accurately decode the symbols, notations and terms of arithmetic and geometric language. Adults make connections among the figures, measurements, ratios and objects they represent in order to form more accurate mental representations. They use their inferences with respect to the properties of simple geometric figures in order to deduce implicit information in the representations of the physical environment (measurements of angles or segments that are omitted or geometric figures that are partially represented). When representations of the physical environment are conveyed to them, adults identify their shapes and quantities (measurements and ratios). In cases where fractional notation is used, they determine whether it represent a fraction of the object or the ratio between the two quantities of objects. When in doubt, they check their interpretation with others. Lastly, they make sure their conclusions are plausible and coherent so that the information they deduce is consistent with reality.

Adults produce representations of the physical environment when they describe a park, make a sketch of a patio to be built, sketch a part, etc. They select the geometric shapes that most closely resemble the objects they want to describe or illustrate and construct them using the appropriate techniques. If necessary, they indicate measurements in accordance with SI (International System of Units) notation and correctly use fractional notation. When they wish to convey their representations, they structure their message appropriately by using the correct mathematical models. They make sure their descriptions and illustrations are clear so that others will be able to understand the physical environment.

Adults accurately determine measurements and ratios when they produce representations, try to understand the physical environment or acquire a better understanding of the real-life situation in question. For instance, this may involve performing operations on ratios and decimals in order to calculate length, determine a portion or calculate the approximate total mass of a set of objects. A good sense of the units of measure enable adults to estimate the measurement of objects, regardless the type of the measurement involved (e.g. mass, length, capacity, angle). Adults also select the required instrument according to the order of magnitude of the measurement to be taken. They use the instrument with precision and make a note of the measurements by rigorously adhering to the International System of Units. They may also be required to determine ratios or measurements by deducing them directly from a given representation. In all cases, they make sure their results are plausible.

## Evaluation Criteria

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- Forms an appropriate perception of the physical environment
- Produces clear and appropriate representations of the physical environment
- Accurately determines measurements and ratios

## Operational Competencies

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The contribution of each operational competency is described in terms of the actions that are appropriate for dealing with the real-life situations in this course. These operational competencies are addressed in other courses and therefore all of the courses taken together contribute to their development.

In this course, only the following operational competencies are addressed: *Thinks logically* and *Communicates*.

### Contribution of the Operational Competency *Thinks logically*

The operational competency *Thinks logically* allows adult learners to make connections and draw conclusions when dealing with real-life situations in the class *Representing the physical environment*. This competency involves deducing and inferring information from ratios, arithmetic operations and the properties of geometric figures.

Adult learners think logically when they infer the properties of simple geometric figures by observing them in different contexts. For example, they infer that the sum of the interior angles of any triangle is 180 degrees. They look for examples to check their conjectures with respect to a property and for counterexamples to clarify, adjust or refute their conjectures. In this way, learners make connections between figures and classify and organize these figures according to their properties.

Adult learners select the geometric figures that are the most suited to the object they wish to describe or illustrate. They deduce certain types of information that are implicit in the representations of the physical environment they analyze. For example, when they study a drawing, a diagram or a sketch, they make connections between plane figures, ratios and measurements and the objects they represent. Learners are therefore able to deduce the angle or segment measurements that have been omitted or the geometric shapes that are partially represented. When using fractional notation, they deduce, according to the context, whether a ratio represents part of a whole or a ratio of quantities of objects. Because they have a good grasp of units of measure, they are able to estimate certain measurements pertaining to the physical environment and select the instrument they need to take a specific measurement. Adult learners check that their conclusions (e.g. estimates, conjectures, calculations) are plausible and consistent by referring to their previous observations.

### Contribution of the Operational Competency *Communicates*

The operational competency *Communicates* allows learners to interpret and produce simple messages consisting of geometric representations when they deal with real-life situations in the class *Representing the physical environment*. This competency involves decoding and making rigorous use of the mathematical language associated with these representations.

When interpreting a message, adult learners accurately decode the symbols, notations and terms associated with decimal numbers, ratios, the most common measurements and plane figures. For example, this allows them to identify the shapes shown in a diagram and the quantities in a recipe, or to better understand the description of a setting or the instructions for assembling a piece of furniture. Regardless of whether the message is written or spoken, learners are able to clearly perceive the object or environment being represented. When in doubt, they check with others to verify their interpretation of the geometric representation of the physical environment.

Adult Learners produce a message in order to communicate their mental representations of the physical environment. They structure their message appropriately by using the correct mathematical models (e.g. geometric figures, arithmetic expressions). They make accurate use of the symbols, notations and terms of arithmetic and geometric language, the most common measurements, plane figures and the related terms. Thus, they are able to correctly match the symbols and notations with the information they wish to convey in their representations of the physical environment. Adult learners are therefore able to describe an object, communicate measurements or sketch the layout of a room, for instance. They make sure their message is clear and appropriate to the situation or to their audience.

## Essential Knowledge

All of the knowledge shown in the table below is compulsory since it is essential for dealing with many of the situations in the class *Representing the physical environment*.

The left-hand column shows the essential knowledge that was not covered in previous courses. Where necessary, its scope is shown in parentheses. The right-hand column shows the essential knowledge that was covered in previous courses. Since previously acquired knowledge is also needed to deal with the situations in this course, adult learners must deepen their understanding of this knowledge by adapting it to situations that involve representations of the physical environment. In some cases, the knowledge outlined in this column is included with more general knowledge in the left-hand column. It is nonetheless listed in italics to make it easier to identify adult learners' previously acquired knowledge.

The various types of ratios (simple fractions, mixed numbers, improper fractions and ratios of quantities of objects) are not dealt with exhaustively, since they are used only in a context involving representations of the physical environment. In order that every facet of this essential knowledge may be addressed in a greater range of contexts, it has been made compulsory in other mathematics courses in this program that examine other types of situations.

New compulsory knowledge	Compulsory knowledge acquired in previous courses
<p><b>Plane figures</b></p> <ul style="list-style-type: none"> <li>• Regular convex polygons</li> <li>• Classifying triangles (scalene, equilateral, right and isosceles)</li> <li>• Classifying quadrilaterals</li> <li>• Properties of simple figures (regular convex polygons and various types of triangles and quadrilaterals)</li> <li>• Vertically opposite, adjacent, complementary and supplementary angles</li> <li>• Significant segments (side, base, diagonal, radius and diameter)</li> <li>• Perimeter and circumference</li> <li>• Area</li> <li>• Surface area</li> </ul>	<p><b>Plane figures</b></p> <ul style="list-style-type: none"> <li>• <i>Simple geometric figures (circles, squares, rectangles and triangles)</i></li> <li>• <i>Properties of squares and rectangles</i></li> <li>• Significant segments (length, width, secants, parallel and perpendicular lines)</li> </ul>

New compulsory knowledge	Compulsory knowledge acquired in previous courses
<p><b>Plane figures (cont'd)</b></p> <ul style="list-style-type: none"> <li>• Constructing angles from 0 to 180 degrees (to the nearest two degrees)</li> <li>• Constructing polygons (squares, rectangles, various types of triangles)</li> <li>• Constructing a circle</li> <li>• Calculating the perimeter or the length of the sides of a convex polygon</li> <li>• Decomposing a complex figure into simpler figures</li> </ul> <p><b>Measurements</b> (International System of Units only)</p> <ul style="list-style-type: none"> <li>• Prefixes used in the International System (milli, centi, deci, deca, hecto, kilo)</li> <li>• Units of measure for area, capacity, temperature and mass</li> <li>• Measuring and estimating length</li> <li>• Measuring and estimating capacity</li> <li>• Measuring and estimating the size of an angle</li> <li>• Measuring and estimating area using the tile method</li> <li>• Converting a measurement into another within the SI system (except for area measurements)</li> </ul> <p><b>Ratios</b></p> <ul style="list-style-type: none"> <li>• Improper fractions</li> <li>• Equivalent fractions</li> <li>• Simplifying fractions</li> <li>• Common denominator</li> </ul>	<p><b>Plane figures (cont'd)</b></p> <ul style="list-style-type: none"> <li>• Acute, obtuse and right angles</li> </ul> <p><b>Measurements</b></p> <ul style="list-style-type: none"> <li>• <i>Measuring and estimating length (mm, cm, m and km)</i></li> <li>• <i>Measuring and estimating capacity (mL and L)</i></li> <li>• Measuring and estimating mass (mg, g and kg)</li> <li>• Measuring and estimating temperature (degrees Celsius)</li> <li>• <i>Converting a length measurement into another within the SI system (mm, cm, m and km)</i></li> </ul> <p><b>Decimals and ratios</b></p> <ul style="list-style-type: none"> <li>• Mixed numbers</li> <li>• Ratios</li> <li>• Everyday vocabulary associated with fractions (half, one half, one quarter, one third, two thirds, etc.)</li> <li>• Positioning decimals on the number line (including negative numbers)</li> </ul>

New compulsory knowledge	Compulsory knowledge acquired in previous courses
<p><b>Ratios (cont'd)</b></p> <ul style="list-style-type: none"> <li>• Comparing fractions, improper fractions and mixed numbers (fractional parts with the same denominator, where the denominator of one fraction is a multiple of the denominator of the other, or whose denominators are less than or equal to four)</li> <li>• Representing improper fractions (using the base 10 number system and visual aids: block sets, illustrations, etc.)</li> <li>• Converting a mixed number into a improper fraction and vice versa</li> <li>• Adding and subtracting ratios of quantities of objects</li> <li>• Adding and subtracting positive fractions, improper fractions and mixed numbers using a calculator, visual aids and written calculation algorithms (fractional parts with the same denominator, where the denominator of one fraction is a multiple of the denominator of the other, or whose denominators are less than or equal to four)</li> <li>• Multiplication and division involving a natural number and a positive mixed number (using a calculator, visual aids and written calculation algorithms)</li> <li>• Translating relations into arithmetic models using mixed numbers, improper fractions, positive mixed numbers and ratios of quantities of objects</li> </ul>	<p><b>Decimals and ratios (cont'd)</b></p> <ul style="list-style-type: none"> <li>• Comparing decimals up to three places (including negative numbers)</li> <li>• Representing mixed numbers and ratios of quantities of objects (using the base 10 number system and visual aids, such as block sets, illustrations, etc.)</li> <li>• Calculations involving the four operations on decimals (in the case of negative numbers, the operations are carried out by using visual aids only: timelines, illustrations, etc.)</li> <li>• Solving sequences of arithmetic operations on positive decimals (with no more than one set of parentheses and four operations)</li> <li>• Making a mental approximation of the results of operations or sequences of operations on positive decimals</li> <li>• <i>Calculating a fraction of a natural number</i></li> <li>• <i>Calculating the fraction that corresponds to the part of a whole</i></li> <li>• Translating relations into arithmetic models using positive decimals</li> </ul> <p><b>Proportional relationships</b></p> <ul style="list-style-type: none"> <li>• Directly proportional relationships</li> <li>• Unit-rate method</li> </ul>

## Attitudes

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The following attitudes are provided as suggestions only. The development of these attitudes can help adults to become more competent in dealing with the real-life situations in this course.

Rigour	Curiosity
This attitude helps adult learners to be precise when they take measurements or produce representations of the physical environment. It allows them to estimate measurements, perform accurate calculations and check that they are plausible.	This attitude makes adult learners more inclined to carefully observe the physical environment or its representations so that they are better able to identify plane figures and find the information that will help them improve their representation of the environment.

## Complementary Resources

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The following resources are provided as suggestions only and consist of references that may be consulted in learning situations.

Social Resources	Material Resources
<ul style="list-style-type: none"><li>▪ Various types of companies (e.g. landscaping, construction, interior decoration)</li><li>▪ Museums</li></ul>	<ul style="list-style-type: none"><li>▪ Calculator</li><li>▪ Geometry instruments</li><li>▪ Sewing patterns</li><li>▪ Scale</li><li>▪ Instruments for measuring capacity</li><li>▪ Block sets for representing fractions</li><li>▪ Home renovation and interior decoration magazines</li><li>▪ Instructions for assembling a piece of furniture</li><li>▪ Descriptive texts</li><li>▪ Dynamic geometry software</li><li>▪ Cookbooks</li></ul>

## Contribution of the Subject Areas

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The contribution of other subject areas, in particular knowledge related to the Social Sciences, Personal Development, Languages and Mathematics, Science and Technology is also useful for dealing with the real-life situations in this course. The elements identified for each subject area are not compulsory and do not constitute prerequisites.

### Subject Area: Social Sciences

#### Program of Study: *Consumer Habits*

- When adults purchase building materials or describe an object to a salesperson, they may have to use their knowledge of consumerism (e.g. finding information, assessing possible choices).

### Subject Area: Personal Development

#### Program of Study: *Health*

- Since some of the real-life situations in this course may involve planning a meal, adult learners may be required to use their knowledge of some of the basic principles pertaining to healthy nutrition (e.g. nutritional value of foods, recommended portions).

### Subject Area: Languages

#### Program of Study: *English, Language of Instruction*

- A number of the real-life situations in the *Geometric Representations* course may require adult learners to produce and interpret written or oral descriptions. Consequently, the language of instruction will be used throughout the course.

## Subject Area: Mathematics, Science and Technology

### Program of Study: *Computer Science*

- Some of the real-life situations in this course may involve a knowledge of computers. For example, this is the case when adults use dynamic geometry software to visualize the layout of a room or the Internet to look for building materials or recipes.

### Program of Study: *Technology*

- Some of the real-life situations in this course may make reference to construction, renovation or design and therefore may require adult learners to use their knowledge of measuring instruments, various types of materials, measuring, tracing and cutting techniques, safety measures, etc.

### Program of Study: *Relationship With the Environment*

- In order to develop a landscape design, adult learners may need to study climatic factors, survival conditions, plant species, etc. As well, when they describe their surroundings, they may have to refer to the various characteristics of the natural environment.

### Program of Study: *Mathematics*

- In addition to a knowledge of the content prescribed in the *Geometric Representations* course, dealing with some of the real-life situations in this course may require the use of mathematical knowledge from the other Common Core Basic Education courses. This will be the case, for instance, when adult learners draw up or consult plans, measure or estimate volumes or calculate the area of certain figures. Adult learners may also be required to use their knowledge of sets to classify various plane figures.

## Andragogical Context

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The *Geometric Representations* course allows adult learners to deal with numerous everyday situations that range from providing a simple description of an object to illustrating the precise layout of a room. They will realize that what they learn will allow them to improve their understanding of the physical environment and to produce much more accurate representations of it.

Although the focus of the course is to help adults learn about geometry, it is also aimed at helping them to continue to construct the knowledge of arithmetic they have acquired in previous courses or in everyday life. If adult learners do not have the appropriate prerequisite knowledge (right-hand column in the table of essential knowledge), the teacher will have to set aside time and assign simpler learning situations to allow them to construct this knowledge. It should be noted that decimals will be especially useful for dealing with measures in the International System of Units and, conversely, learning about this system will help adult learners better understand decimals.

In this course, the emphasis is on the use of ratios (fractions, mixed numbers, improper fractions and ratios between quantities of objects) to help adult learners produce a better representation of the physical environment. In fact, fraction notation is more appropriate than decimal notation for illustrating or describing parts of objects or ratios between quantities of objects. Conversely, the use of objects or geometric representations to illustrate ratios sheds light on the related concepts.

The development of logical reasoning is at the heart of this course. The teacher will ask the adult learners to infer the properties of figures and to classify these figures. Learners will be better able to make the required deductions in the case of unknown

measurements in figures or objects if they themselves have inferred the properties of these figures, which serve as the basis for finding these measurements.

The teacher draws on the real-life experiences of learners in order to present them with plausible learning situations. The closer the learning situations are to actual everyday situations, the more meaningful they are and the more knowledge the students will retain. This course also provides an opportunity to make adult learners aware of the fact that mathematics may help them better appreciate artistic and literary activities. The interest that many adults have in these types of activities adds to the motivation needed to learn about mathematics.

The course content will be useful in many everyday situations; however, given that the scope of this content is often limited (e.g. describing the shape of a table to a friend), the teacher could suggest learning situations with a theme that is common to a variety of everyday contexts. For example, a learning situation could involve taking precise measurements. This ability is useful in different real-life situations such as preparing recipes, using household products or purchasing materials for a renovation project. Such a learning situation would be aimed at constructing knowledge related to the number line, measurement techniques or notation rules. To make learning meaningful, learners will be asked to give examples of everyday situations in which each measuring instrument is essential. Another learning situation could involve representing the parts of a whole or the ratio between quantities of objects, tasks that are encountered in many everyday situations.

## Learning Situation

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The learning situation that follows is provided as an example to show teachers how the principles of the education reform can be applied in the classroom.

It is authentic in the sense that it addresses a real-life situation (taken from the class of situations in the course) that adults may find themselves in. It is sufficiently open and comprehensive to allow adult learners to explore several important aspects related to dealing with this real-life situation.

The examples of actions presented in the course help the teacher to identify those actions that an adult would take to deal with the real-life situation. The teacher can then refer to these examples in order to develop pertinent learning activities.

The learning situation is organized in terms of the three steps of the teaching-learning process, which are as follows:

- planning learning
- actual learning
- integrating and reinvesting learning

These steps highlight the principles of the education reform insofar as they encourage adults to be active, to reflect on their learning and to interact with their peers when the learning context is suitable. They include learning activities and may also include evaluation activities intended to support adults in the learning process.

These activities help learners to construct knowledge related to the compulsory elements of the course that are targeted by the learning situation concerned: one or more categories of actions, essential knowledge and the actions of the operational competencies associated with the categories of actions.

The example provided also refers to certain teaching strategies—pedagogical methods and techniques—that can be selected according to the learners, the context and the learning environment. Certain learning strategies may also be suggested, as well as a variety of material and social resources.

## Example of a Learning Situation

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### Perception of Portions of Objects

This learning situation applies to several real-life situations in the class *Representing the physical environment*. It deals with the perception of shapes and portions of objects in the physical environment (e.g. one quarter of a round pie, two and a half cups of liquid, two fifths of a rectangular vegetable garden). The learning situation requires adult learners to represent fractions of figures and to associate them with everyday objects.

This learning situation could be assigned at the beginning of the course. The teacher asks the class as a whole to find everyday objects that can be represented by a circle, a square, a rectangle or a triangle. This will allow adult learners to reactivate prior learning, since they are already familiar with these simple geometric figures. The teacher then asks the class to describe an object that is not whole (e.g. three-quarters of a pie), thus making the learners aware of the fact that they need a code to represent such situations. Although adult learners already have some knowledge of simple fractions, the teacher may not want to take anything for granted in conducting this learning situation.

Using an object suggested by the class (e.g. a rectangular cake), the teacher asks learners to represent it (in two dimensions) by drawing it and shading in the part that corresponds to half the cake. The adult learners do this part of the activity in pairs so that they can share their ideas. The teacher then explains the rules for writing simple fractions by introducing the concepts of numerator and denominator, and then discusses other everyday objects by making reference to thirds, quarters, etc. The examples used become

increasingly complex but are always related to everyday situations: cutting off one third of a rectangular plank, spreading peat moss over one quarter of a square piece of land, pouring water in a glass until it is two-thirds full, etc. As the activity progresses and by asking questions, the teacher checks the learners' representations and use of fraction notation, and corrects them if necessary. The teacher gets adult learners to define the role of the denominator (number of equal parts that make up a whole) and the numerator (the numbers of parts considered). A number of carefully chosen examples will allow learners to observe the equivalences between various fractions. Throughout the activity, the adult learners are asked to provide other examples of equivalences.

Adult learners master these concepts and techniques through simple problems and exercises. Some of the exercises deal with the representation of ordinary fractions using objects whose shapes are associated with plane figures, while others deal with the equivalence between different fractions.

The teacher introduces mixed numbers and improper fractions by using illustrations and by making connections with everyday objects. Adult learners become familiar with the representation of these mixed numbers and improper fractions by using simple figures. They also learn the rules for writing fractions. They study the equivalence between mixed numbers and the corresponding improper fraction by using figures that represent everyday objects. Through questions, the teacher gets the learners (who work in pairs) to infer the calculation techniques for converting mixed numbers to improper

fractions and vice versa. During a discussion on the techniques identified, the teacher verifies their inferences and demonstrates these techniques.

Once again, learners master these concepts and techniques through simple problems and exercises. Some of these exercises involve representing improper fractions and mixed numbers using geometric figures, while others deal with converting from one notation to another by using calculation techniques. Adult learners can verify their calculations by using figures to represent the resulting mixed numbers and improper fractions.

In order to prepare the adult learners to reapply what they have learned, the teacher has them identify the real-life situations in which they must use simple fractions, mixed numbers or improper fractions. Using a real-life situation of their choice, each adult learner draws up a simple problem in which the use of fractions is necessary and has a peer solve the problem. Adult learners work in pairs to solve the different problems, and the teacher provides feedback to regulate learning.

Some of the exercises completed earlier involve figures that the adult learners do not yet recognize. These include the parallelogram, the rhombus, the hexagon, etc. Since many everyday objects have more complex shapes, it may be useful to continue this learning situation by incorporating these new figures as well as complex figures (composed of two or three simple figures). This is how the adult learners will be able to better integrate what they have learned about their perception of ratios in the physical environment in addition to constructing new knowledge pertaining to the simple figures that must be studied in this course.

## Elements of the Course Addressed by the Learning Situation

Class of Situations	
Representing the physical environment	
Learning Situation	
Perception of Portions of Objects	
Categories of Actions	
<ul style="list-style-type: none"> <li>Perceiving shapes and quantities in the physical environment</li> <li>Producing representations of the physical environment that involve shapes and quantities</li> <li>Determining measurements and ratios</li> </ul>	
Operational Competencies	Essential Knowledge
<ul style="list-style-type: none"> <li>Thinks logically</li> <li>Communicates</li> </ul>	<ul style="list-style-type: none"> <li>Simple geometric figures</li> <li>Ratios</li> <li>Improper fractions</li> <li>Mixed numbers</li> <li>Equivalent fractions</li> <li>Everyday vocabulary associated with fractions</li> <li>Representing mixed numbers and ratios of quantities of objects</li> <li>Representing improper fractions</li> <li>Converting a mixed number into improper fraction and vice versa</li> <li>Translating relations into arithmetic models using positive mixed numbers</li> </ul>
Complementary Resources	
<ul style="list-style-type: none"> <li>Geometry set</li> </ul>	

