

# DEFINITION OF THE EVALUATION DOMAIN

Adult General Education

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Diversified Basic Education Program

Mathematics

GEOMETRIC REPRESENTATION IN AN APPLIED CONTEXT 2

MTH-5163-2

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## Introduction

The Definition of the Evaluation Domain (DED) ensures consistency between a course and the related evaluation instruments. The DED is used to select, organize and describe the essential and representative elements of the course. The DED is based on the program of study and the course, but should by no means replace them in the planning of instructional activities.

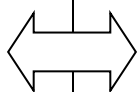
All the DEDs produced after June 30, 2014, by the Ministère de l'Éducation (MEQ) are prescriptive. Consequently, they are the reference documents to be used in the development of all examinations, be they ministerial examinations or those developed by adult education centres or by Société GRICS (BIM). The DEDs thus serve as a model for preparing multiple equivalent versions of examinations that are valid across the province.<sup>1</sup>

Furthermore, as set out in the *Policy on the Evaluation of Learning*, adult learners must know what they will be evaluated on and what is expected of them.<sup>2</sup> The DEDs and the criterion-referenced rubrics are recommended for this purpose.

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1. Québec, Ministère de l'Éducation du Québec, *Policy on the Evaluation of Learning* (Québec: Gouvernement du Québec, 2003), 47.
  2. Ibid., 9.

## Evaluation Content

<b>General Information</b>	
<p><b>Broad Areas of Learning<sup>3</sup></b></p> <ul style="list-style-type: none"> <li>• Citizenship and Community Life</li> <li>• Media Literacy</li> </ul> <p><b>Subject Area</b></p> <ul style="list-style-type: none"> <li>• Mathematics, Science and Technology</li> </ul> <p><b>Family of Learning Situations</b></p> <ul style="list-style-type: none"> <li>• Measurement and spatial representation</li> </ul>	<p><b>Program of Study</b></p> <ul style="list-style-type: none"> <li>• Mathematics</li> </ul> <p><b>Course</b></p> <ul style="list-style-type: none"> <li>• Geometric Representation in an Applied Context 2</li> </ul>
<b>Essential Elements Targeted by the Evaluation</b>	
<p><b>Subject-Specific Competencies</b></p> <ol style="list-style-type: none"> <li>1. Uses strategies to solve situational problems</li> <li>2. Uses mathematical reasoning</li> <li>3. Communicates by using mathematical language</li> </ol>	<p><b>Categories of Knowledge</b></p> <ul style="list-style-type: none"> <li>• Geometric transformations</li> <li>• Trigonometric relations in triangles</li> <li>• Equivalent figures (plane figures or solids)</li> <li>• Metric relations in circles</li> <li>• Standard unit circle</li> <li>• Trigonometric identities</li> <li>• Geometric loci and relative positions</li> <li>• Vectors</li> </ul>
<b>Evaluation Criteria</b>	
<p><b>Evaluation Criteria for Competency 1</b></p> <ol style="list-style-type: none"> <li>1.1 Indication (oral or written) that the situational problem has been understood</li> <li>1.2 Application of strategies and appropriate mathematical knowledge</li> </ol> <p><b>Evaluation Criteria for Competency 2</b></p> <ol style="list-style-type: none"> <li>2.1 Correct use of appropriate mathematical concepts and processes</li> <li>2.2 Proper implementation of mathematical reasoning suited to the situation</li> <li>2.3 Proper organization of the steps in an appropriate procedure</li> </ol>	<p><b>Proficiency in Subject-Specific Knowledge</b></p> <p>Proficiency in subject-specific knowledge presupposes its acquisition, understanding, application and mobilization, and is therefore linked with the evaluation criteria for the competencies.</p>




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3. The broad areas of learning are stated exactly as in the course. However, the person who designs the evaluation instrument may choose other broad areas of learning.

## Explanation of the Evaluation Content

### Evaluation Criteria

The evaluation criteria are stated exactly as in the course.

Not all the evaluation criteria for the course are used in the examination. Nevertheless, the adult learner must receive feedback on all of them during the learning process.

The evaluation criteria used in the examination are presented below. They are associated with Competency 1, *Uses strategies to solve situational problems* and Competency 2, *Uses mathematical reasoning*.

Competency 3, *Communicates by using mathematical language*, is not specifically evaluated for the purpose of certification and recognition. However, as it is an essential part of all mathematical activities, this competency has been taken into account in the assessment tools provided to help teachers come to a judgment.

### Information Clarifying the Evaluation Criteria

#### **1.1 Indication (oral or written) that the situational problem has been understood**

This criterion evaluates the adult learner's ability to identify what is required in accordance with the wording of the problem and to extract relevant information, taking into account the constraints involved in the mathematical processing of the situation.

#### **1.2 Application of strategies and appropriate mathematical knowledge**

This criterion evaluates the adult learner's ability to use relevant strategies to select appropriate knowledge in order to solve the problem.

#### **2.1 Correct use of appropriate mathematical concepts and processes**

This criterion evaluates the adult learner's ability to properly apply the mathematical knowledge and skills required to solve the problem.

#### **2.2 Proper implementation of mathematical reasoning suited to the situation**

This criterion evaluates the adult learner's ability to use logical reasoning by drawing upon the appropriate knowledge and skills.

#### **2.3 Proper organization of the steps in an appropriate procedure**

This criterion evaluates the adult learner's ability to present a structured procedure that complies with mathematical notation and conventions. The answer is consistent with the adult learner's procedure and the context of the situational problem.

## Proficiency in Subject-Specific Knowledge

Proficiency in subject-specific knowledge is assessed through the evaluation of the competencies, using tasks related to the evaluation criteria.

For this course, certain knowledge is explicitly evaluated.

## Weighting

The weighting for the evaluation of the competencies is determined in accordance with the *Framework for the Evaluation of Learning* in general education in the youth sector.

Competency 1, *Uses strategies to solve situational problems*: 30%

Competency 2, *Uses mathematical reasoning*: 50%

The weighting corresponding to the knowledge that is explicitly evaluated is 20%.

The weighting of the evaluation criteria appears in the assessment tools provided in the *Marking Guide*. Adult learners must be made aware of the evaluation criteria used to evaluate them and the corresponding weighting of each criterion.

## Knowledge

All the categories of knowledge and at least eight of the ten items of prescribed knowledge are covered in the examination. However, for a given item of prescribed knowledge, it is not necessary to include all of the items listed in the *Restrictions and Clarifications* column of the table of prescribed knowledge for the course.

### Subject-Specific Content

Categories of Knowledge	Prescribed Knowledge
Geometric transformations	<ul style="list-style-type: none"> <li>• Describing and representing geometric transformations</li> </ul>
Trigonometric relations in triangles	<ul style="list-style-type: none"> <li>• Representing and interpreting situations using triangles</li> </ul>
Equivalent figures (plane figures or solids)	<ul style="list-style-type: none"> <li>• Finding measurements:               <ul style="list-style-type: none"> <li>○ lengths of segments</li> <li>○ areas</li> <li>○ volumes</li> <li>○ capacities</li> </ul> </li> </ul>
Metric relations in circles	<ul style="list-style-type: none"> <li>• Finding measurements:               <ul style="list-style-type: none"> <li>○ arcs or angles (degrees or radians)</li> <li>○ lengths (segments, chords)</li> </ul> </li> </ul>
Standard unit circle	<ul style="list-style-type: none"> <li>• Finding measurements:               <ul style="list-style-type: none"> <li>○ arcs or angles (radians)</li> </ul> </li> <li>• Finding the coordinates of points associated with important angles</li> </ul>
Trigonometric identities	<ul style="list-style-type: none"> <li>• Manipulating simple trigonometric expressions using definitions</li> </ul>
Geometric loci and relative positions	<ul style="list-style-type: none"> <li>• Describing, representing and constructing geometric loci               <ul style="list-style-type: none"> <li>○ plane loci</li> <li>○ the conics studied are:</li> </ul> </li> </ul>

Categories of Knowledge	Prescribed Knowledge
	<ul style="list-style-type: none"><li>▪ parabola (centred at the origin and translated)</li><li>▪ circle (centred at the origin and translated)</li><li>▪ ellipse (centred at the origin and translated)</li><li>▪ hyperbola (centred at the origin and translated)</li></ul>
Vectors	<ul style="list-style-type: none"><li>• Resultant and projection</li><li>• Operations on vectors</li></ul>

## Specifications for the Evaluation Instruments

### Examination: Number of Parts, Sections, Procedure and Duration

The examination is divided into two sections. These sections are included in a single booklet and must be administered during the same evaluation session, barring exceptional circumstances.

Duration: 180 minutes

### Examination Content

The two sections are:

1. The “Explicit Evaluation of Knowledge” section

In this section, the adult learner must answer four application questions.

2. The “Evaluation of Competencies” section

This section consists of three tasks that the adult learner must complete based on realistic situations.

### Information-Gathering Tools

Explicit Evaluation of Knowledge

- Short- and long-answer questions in the *Adult’s Booklet*

Evaluation of Competencies

- Problem-solving tasks in the *Adult’s Booklet*

*Note: A list of mathematical formulas and a list of geometry principles are included in the appendix I as well as in the Adult’s Booklet.*



### Authorized Materials

- A scientific or graphic display calculator without a computer algebra system (CAS)

Information about the calculator and its use:

- The calculator must not be able to perform algebraic calculations, factor algebraic expressions or solve equations.
- The data and programs stored in the calculator's memory must be erased before and after the examination. Before the day of the examination, adult learners must have been given the opportunity to learn how to reset the calculator's memory to zero.

- A ruler, a set square, a compass, a protractor, blank rough paper and blank graph paper

- A memory aid

Information about the memory aid:

- The adult learner may prepare a memory aid consisting of no more than one 8½ x 11 inch sheet of paper, with information on one side only. It may be handwritten or typed (minimum 12-point font; single-spaced) and must be approved by the teacher.
- Examples prepared by the adult learner and mathematical formulas may be included in the memory aid.

### Assessment Tools

For the "Explicit Evaluation of Knowledge" section, examples of appropriate solutions are provided in the *Marking Guide*.

For the "Evaluation of Competencies" section, the criterion-referenced rubrics are the assessment tools that the teacher must use to come to a judgment. This judgment must be based on a minimum of two completed tasks. An adult learner who completes only one of the three tasks in the examination must be given a failing grade. Feedback should nonetheless be provided in order to prepare the adult learner to retake the examination.

In criterion-referenced interpretation, the information gathered is compared with the outcomes expected of the adult learner.<sup>4</sup> The rubrics are compulsory and include the following rating scale:

Competency development:

- Advanced
- Thorough
- Acceptable
- Partial
- Minimal

The *Information-Gathering Tool* is also provided in the *Marking Guide* to facilitate the marker's task.

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4. Ibid., 28-29.

**Pass Mark**

The pass mark is 60%.

**Retakes**

The adult learner must retake the entire examination.

### APPENDIX I – FORMULAS AND GEOMETRY PRINCIPLES

Plane Figure	Formula for the Area	
Square	$A_{square} = s^2$	s: length of a side
Circle	$A_{circle} = \pi r^2$	r: radius
Rhombus	$A_{rhombus} = \frac{D d}{2}$	D: length of the long diagonal d: length of the short diagonal
Parallelogram	$A_{parallelogram} = b h$	b: length of the base h: height
Regular Polygon	$A_{regular\ polygon} = \frac{s a n}{2}$	s: length of a side a: length of the apothem n: number of sides
Rectangle	$A_{rectangle} = l w$	l: length w: width
Trapezoid	$A_{trapezoid} = \frac{(B + b) h}{2}$	B: length of the long base b: length of the short base h: height
Triangle	$A_{triangle} = \frac{b h}{2}$	b: length of the base h: height

Solid	Formula for the Area	Formula for the Volume	
Cone	$A_L = \pi r s$ $A_T = A_L + A_b$	$V_{cone} = \frac{A_b h}{3}$	r: radius s: slant height h: height
Cube	$A_L = 4 s^2$ $A_T = 6 s^2$	$V_{cube} = s^3$	s: length of a side
Cylinder	$A_L = 2 \pi r h$ $A_T = A_L + 2 A_b$	$V_{cylinder} = A_b h$	r: radius h: height
Right Prism	$A_L = P_b h$ $A_T = A_L + 2 A_b$	$V_{prism} = A_b h$	h: height
Pyramid	$A_L = \frac{P_b s}{2}$ $A_T = A_L + A_b$	$V_{pyramid} = \frac{A_b h}{3}$	s: slant height h: height
Sphere	$A_L = 4 \pi r^2$ $A_T = 4 \pi r^2$	$V_{sphere} = \frac{4 \pi r^3}{3}$	r: radius

Legend:       $A$ : area                       $A_b$ : area of the base                       $A_L$ : lateral area  
                   $A_T$ : total area                       $P_b$ : perimeter of the base                       $V$ : volume

## Geometry Principles

You can use the following principles to develop your procedure when presenting a proof or a justification. Simply indicate the number of the principle when referring to it.

- P13.** The medians of a triangle determine six equivalent triangles.
- P14.** The midpoint of the hypotenuse of a right triangle is equidistant from the three vertices.
- P15.** The lengths of the sides of any triangle are proportional to the sines of the angles opposite these sides (sine law).
- P16.** The square of the length of a side of any triangle is equal to the sum of the squares of the lengths of the other two sides, minus twice the product of the lengths of the other two sides multiplied by the cosine of the contained angle (cosine law).
- P17.** Regular polygons have the smallest perimeter of all equivalent polygons with  $n$  sides.
- P18.** Of two regular convex polygons that are equivalent, the polygon with the most sides will have the smaller perimeter. (Ultimately, an equivalent circle will have the smaller perimeter.)
- P19.** Cubes have the largest volume of all rectangular prisms with the same total surface area.
- P20.** Spheres have the largest volume of all solids with the same total surface area.
- P21.** Cubes have the smallest total surface area of all rectangular prisms with the same volume.
- P22.** Any diameter perpendicular to a chord divides that chord and each of the arcs that it subtends into two congruent parts.

**Geometry Principles (cont.)**

- P23.** The measure of an inscribed angle is one-half the measure of its intercepted arc.
- P24.** If a line is perpendicular to a radius of a circle at the endpoint of the radius in the circle, the line is tangent to the circle. The converse is also true.
- P25.** In a circle or in congruent circles, two congruent chords are equidistant from the centre and vice versa.
- P26.** Two parallel lines, be they secants or tangents, intercept two congruent arcs of a circle.
- P27.** If point P is located outside circle O, and if segments PA and PB are tangents to that circle at points A and B respectively, then segment OP bisects angle APB and the length of segment PA is equal to the length of segment PB.
- P28.** The measure of an angle located between the circumference and the centre of a circle is one-half the sum of the measures of the arcs intercepted by the angle and its vertical angle.
- P29.** The measure of an angle located outside a circle is one-half the difference of the measures of the intercepted arcs.
- P30.** If two chords of a circle intersect in its interior, the product of the lengths of the segments of one chord is equal to the product of the lengths of the segments of the other chord.
- P31.** If secants PAB and PCD of a circle have the same external endpoint P, then,  
 $m\overline{PA} \times m\overline{PB} = m\overline{PC} \times m\overline{PD}$ .



## **APPENDIX II – CRITERION-REFERENCED RUBRICS**





Adult General Education

<p style="text-align: center;"><b>EVALUATION</b></p> <p style="text-align: center;"><b>Criterion-Referenced Rubrics</b></p> <hr/> <p style="text-align: center;">Adult learner's name</p> <hr/> <p style="text-align: center;">Teacher's name</p> <hr/> <p style="text-align: center;">Date</p>
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Diversified Basic Education Program  
*Mathematics*

Course  
*Geometric Representation in an Applied Context 2*  
MTH-5163-2

**Competency 1: Uses strategies to solve situational problems (30%)**

**Instructions:**

- For each criterion, circle the statement(s) that correspond(s) to the adult learner’s performance level.
- In the last column, enter the mark from the rubric that most closely corresponds to your assessment of the adult learner’s performance level.
- Assign a mark of 0 when the adult learner’s performance does not correspond to any of the statements in the rubric.

<b>Rating scale</b> <b>Evaluation criteria</b>	<b>Advanced</b> competency development	<b>Thorough</b> competency development	<b>Acceptable</b> competency development	<b>Partial</b> competency development	<b>Minimal</b> competency development	<b>Mark</b>
<b>1.1</b> <b>Indication (oral or written) that the situational problem has been understood</b>	Accurately identifies the relevant information and the required elements.  <b>10</b>	Identifies, with a fair amount of accuracy, the relevant information and the required elements.  <b>8</b>	Identifies some of the relevant information and required elements.  <b>6</b>	Rarely identifies the relevant information and the required elements.  <b>4</b>	Very rarely identifies the relevant information and the required elements.  <b>2</b>	<b>___/10</b>
<b>1.2</b> <b>Application of strategies and appropriate mathematical knowledge</b>	Always uses relevant strategies to select appropriate knowledge.  <b>20</b>	Usually uses relevant strategies to select appropriate knowledge.  <b>16</b>	Sometimes uses relevant strategies to select appropriate knowledge.  <b>12</b>	Rarely uses relevant strategies to select appropriate knowledge.  <b>8</b>	Very rarely uses strategies to select appropriate knowledge.  <b>4</b>	<b>___/20</b>
<b>Mark for Competency 1:</b>						<b>___/30</b>

**Competency 2: Uses mathematical reasoning (50%)**

**Instructions:**

- For each criterion, circle the statement(s) that correspond(s) to the adult learner’s performance level.
- In the last column, enter the mark from the rubric that most closely corresponds to your assessment of the adult learner’s performance level.
- Assign a mark of 0 when the adult learner’s performance does not correspond to any of the statements in the rubric.

<b>Rating scale</b> <b>Evaluation criteria</b>	<b>Advanced</b> competency development	<b>Thorough</b> competency development	<b>Acceptable</b> competency development	<b>Partial</b> competency development	<b>Minimal</b> competency development	<b>Mark</b>
<b>2.2</b> <b>Proper</b> <b>implementation of</b> <b>mathematical</b> <b>reasoning suited to</b> <b>the situation</b>	Always presents coherent procedures; identifies the different steps in the solution and carries them out by drawing on appropriate knowledge and skills.  <b>20</b>	Usually presents coherent procedures; generally identifies the different steps in the solution and carries them out by drawing on appropriate knowledge and skills.  <b>16</b>	Presents procedures that are somewhat coherent; usually identifies the main steps in the solution and carries them out by drawing on knowledge and skills that are generally appropriate.  <b>12</b>	Presents procedures that are not very coherent; identifies few of the steps in the solution and carries them out by drawing on knowledge and skills that are rarely appropriate.  <b>8</b>	Has difficulty developing procedures.  <b>4</b>	<b>__/20</b>
<b>2.1</b> <b>Correct use of</b> <b>appropriate</b> <b>mathematical</b> <b>concepts and</b> <b>processes</b>	Always applies the appropriate mathematical knowledge correctly.  <b>15</b>	Usually applies the appropriate mathematical knowledge correctly.  <b>12</b>	Sometimes applies the appropriate mathematical knowledge correctly.  <b>9</b>	Rarely applies the appropriate mathematical knowledge correctly.  <b>6</b>	Very rarely applies the appropriate mathematical knowledge correctly.  <b>3</b>	<b>__/15</b>
	Always obtains the correct results.  <b>5</b>	Usually obtains the correct results.  <b>4</b>	Sometimes obtains the correct results.  <b>3</b>	Rarely obtains the correct results.  <b>2</b>	Very rarely obtains the correct results.  <b>1</b>	<b>__/5</b>

**Competency 2: Uses mathematical reasoning (50%) (cont.)**

**Instructions:**

- For each criterion, circle the statement(s) that correspond(s) to the adult learner’s performance level.
- In the last column, enter the mark from the rubric that most closely corresponds to your assessment of the adult learner’s performance level.
- Assign a mark of 0 when the adult learner’s performance does not correspond to any of the statements in the rubric.

<b>Rating scale</b> <b>Evaluation criteria</b>	<b>Advanced</b> competency development	<b>Thorough</b> competency development	<b>Acceptable</b> competency development	<b>Partial</b> competency development	<b>Minimal</b> competency development	<b>Mark</b>
<b>2.3</b> <b>Proper organization of the steps in an appropriate procedure</b>	Always presents clear and structured procedures that follow the conventions of mathematics.  <b>5</b>	Usually presents clear and structured procedures that follow the conventions of mathematics.  <b>4</b>	Presents procedures that are somewhat structured or that do not always follow the conventions of mathematics.  <b>3</b>	Presents procedures that are not very structured or that seldom follow the conventions of mathematics. The steps in the solution are implicit.  <b>2</b>	Presents procedures that are largely unstructured and does not follow the conventions of mathematics.  <b>1</b>	<b>___/5</b>
	Always gives answers consistent with the procedure used and the context.  <b>5</b>	Usually gives answers consistent with the procedure used and the context.  <b>4</b>	Gives answers that are not completely consistent with the procedure used and the context.  <b>3</b>	Rarely gives answers that are consistent with the procedure used and the context.  <b>2</b>	Very rarely gives answers that are consistent with the procedure used and the context.  <b>1</b>	<b>___/5</b>
<b>Mark for Competency 2:</b>						<b>___/50</b>



