DEFINITION OF THE EVALUATION DOMAIN

Adult General Education

Diversified Basic Education Program

Mathematics

GEOMETRIC REPRESENTATION IN A FUNDAMENTAL CONTEXT 2 MTH-5173-2

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Québec

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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.[1]

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.[2] The DEDs and the criterion-referenced rubrics are recommended for this purpose.

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

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Proficiency in subject-specific knowledge presupposes its acquisition, understanding, application and mobilization, and is therefore linked with the evaluation criteria for the competencies.</td></tr>
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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 seven of the nine 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 loci	• Describing, representing and constructing geometric loci
	  ○ conics studied:
	  ▪ parabola (centred at the origin and translated)
	  ▪ circle (centred at the origin)
	  ▪ ellipse (centred at the origin)
	  ▪ hyperbola (centred at the origin)
	• Solving a system of second-degree equations with respect to conics
	• Determining the coordinates of points of intersection of a straight line and a conic or of a parabola and another conic

Standard unit circle	• Finding measurements: ○ arcs or angles (radians) • Finding the coordinates of points associated with important angles
Trigonometric identities	• Manipulating simple trigonometric expressions using definitions
Vectors	• Resultant and projection • Operations on vectors • Determining the coordinates of a point of division

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.[4] 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.

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	$A_{rectangle} = lw$	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.

- Consider $\vec{u}$, $\vec{v}$ and $\vec{w}$, which are vectors in the plane, as well as scalars $\mathbf{r}$ and $\mathbf{s}$.

P22. Vector $\mathbf{r}\vec{u} = \vec{0}$ if, and only if, $\mathbf{r} = 0$ or $\vec{u} = \vec{0}$.

$$(\mathbf{r}\vec{u} = \vec{0}) \Leftrightarrow (r = 0 \vee \vec{u} = \vec{0})$$

P23. If vectors $\vec{u}$ and $\vec{v}$ are non-collinear, then $\mathbf{r}\vec{u} = \mathbf{s}\vec{v}$ if, and only if, $\mathbf{r} = 0$ and $\mathbf{s} = 0$.

If $\vec{u}$ and $\vec{v}$ are non-collinear vectors, then $(\mathbf{r}\vec{u} = \mathbf{s}\vec{v}) \Leftrightarrow (\mathbf{r} = \mathbf{s} = 0)$.

P24. Vectors $\vec{u}$ and $\vec{w}$ are collinear if, and only if, there is a real number $\mathbf{r}$ that is not equal to zero such that $\vec{w} = \mathbf{r}\vec{u}$.

$$(\vec{w} \text{ is collinear with } \vec{u}) \Leftrightarrow (\exists!\, \mathbf{r} \in \mathbb{R} : \vec{w} = \mathbf{r}\vec{u})$$

P25. Vectors $\vec{u}$ and $\vec{v}$ are non-collinear if, and only if, for any vector $\vec{w}$, there are two real numbers $\mathbf{r}$ and $\mathbf{s}$ such that $\vec{w} = \mathbf{r}\vec{u} + \mathbf{s}\vec{v}$.

$$(\vec{u} \text{ and } \vec{v} \text{ are non-collinear}) \Leftrightarrow (\forall \vec{w},\ \exists!\, \mathbf{r} \in \mathbb{R},\ \exists!\, \mathbf{s} \in \mathbb{R} : \vec{w} = \mathbf{r}\vec{u} + \mathbf{s}\vec{v})$$

P26. Vectors $\vec{u}$ and $\vec{v}$ are orthogonal if, and only if, their scalar product is equal to zero.

$$(\vec{u} \perp \vec{v}) \Leftrightarrow (\vec{u} \bullet \vec{v}) = 0$$

APPENDIX II – CRITERION-REFERENCED RUBRICS

Adult General Education

EVALUATION

Criterion-Referenced Rubrics

_____
Adult learner's name

_____
Teacher's name

_____
Date

Diversified Basic Education Program
Mathematics

Course
Geometric Representation in a Fundamental Context 2
MTH-5173-2

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.

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

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.

Rating scale / **Evaluation criteria**	**Advanced** competency development	**Thorough** competency development	**Acceptable** competency development	**Partial** competency development	**Minimal** competency development	**Mark**
2.2 Proper implementation of mathematical reasoning suited to the situation	Always presents coherent procedures; identifies the different steps in the solution and carries them out by drawing on appropriate knowledge and skills. **20**	Usually presents coherent procedures; generally identifies the different steps in the solution and carries them out by drawing on appropriate knowledge and skills. **16**	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. **12**	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. **8**	Has difficulty developing procedures. **4**	**__/20**
2.1 Correct use of appropriate mathematical concepts and processes	Always applies the appropriate mathematical knowledge correctly. **15**	Usually applies the appropriate mathematical knowledge correctly. **12**	Sometimes applies the appropriate mathematical knowledge correctly. **9**	Rarely applies the appropriate mathematical knowledge correctly. **6**	Very rarely applies the appropriate mathematical knowledge correctly. **3**	**__/15**
	Always obtains the correct results. **5**	Usually obtains the correct results. **4**	Sometimes obtains the correct results. **3**	Rarely obtains the correct results. **2**	Very rarely obtains the correct results. **1**	**__/5**

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.

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

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