Official Bulletin Cycle 3
CM1 - CM2 - 6e
Mathematics

In the continuity of previous cycles, Cycle 3 ensures the further development of the six major mathematical skills: to research, model, represent, calculate, reason and communicate. Problem solving is the main criterion for mastery of knowledge in all areas of mathematics, but it is also the means to ensure that it is appropriated. While algebraic modeling is primarily Cycle 4 and high school, problem solving already shows how mathematical concepts can be relevant tools for solving certain situations.

The situations on which the problems relate are, most often, derived from other teachings, from class life or from everyday life. Students also attend problems that arise from an internal context of mathematics. Putting some knowledge into historical perspective (position numeration, appearance of decimals, metric system, etc.) helps to enrich students' scientific culture. We also try to offer students problems to learn to look for that are not directly related to the concept being studied, which do not necessarily involve a single solution, that do not resolve only with one or more operations but by reasoning and research by trial and error.

Cycle 3 aims to deepen the mathematical concepts addressed in Cycle 2, to extend the field of study, to consolidate the automation of the written calculation techniques introduced previously (addition, subtraction and multiplication) as well as the results and calculation procedures. In the second cycle, it is also necessary to construct new written and mental calculation techniques, and finally to introduce new concepts such as decimals, proportionality or the study of new quantities (area, volume, angle, etc.).

The geometric activities practiced in cycle 3 are in continuity with those of cycle 2. They are distinguished by a greater share of reasoning and argumentation that complements the perception and use of instruments. They are also an opportunity to attend new representations of space (patterns, perspectives, views from the front, side, from above ...). In addition to the use of paper, pencil and the manipulation of concrete objects, digital tools are gradually being introduced. Thus, the use of computation and numeration software makes it possible to deepen the knowledge of the properties of the numbers and the operations like to increase the control of certain techniques of computations. Similarly, geometric activities can be an opportunity for students to use different work media: paper and pencil, but also dynamic geometry software, introduction to programming or visualization software maps, plans.

Skills	Areas of the base
Look for • Collect and organize the information needed to solve problems from a variety of media: texts, tables, diagrams, graphs, drawings, diagrams, etc. • Engage in an approach, observe, question, manipulate, experiment, hypothesize, using tools or mathematical procedures already encountered, by developing a reasoning adapted to a new situation. • Test, try several resolution tracks.	2, 4
modeling • Use mathematics to solve some problems from situations of everyday life. • Recognize and distinguish problems arising from additive, multiplicative, proportionality situations. • Recognize real situations that can be modeled by geometric relations (alignment, parallelism, perpendicularity, symmetry). • Use geometric properties to recognize objects.	1, 2, 4
Represent • Use tools to represent a problem: drawings, diagrams, diagrams, graphs, writings with parentheses, … • Produce and use various representations of simple fractions and decimals. • Analyze a plane figure in different aspects (surface, outline of it, lines and points).	1, 5

• Recognize and use the first coding elements of a plane figure or a solid. • Use and produce representations of solids and spatial situations.	
Reason • Solve problems that require the organization of multiple data or the construction of a process that combines reasoning steps. • In geometry, gradually move from perception to control by instruments to initiate reasoning based solely on the properties of figures and on relationships between objects. • Progress collectively in an investigation knowing how to take into account the point of view of others. • Justify their claims and look for the validity of the information available.	2, 3, 4
Calculate • Calculate with decimal numbers, accurately or approximatively, using appropriate strategies or techniques (mentally, online, or by doing the operations). • Check the likelihood of its results. • Use a calculator to find or verify a result.	4
Communicate • Gradually use an adequate vocabulary and / or appropriate notation to describe a situation, to explain an argument. • Explain one's approach or reasoning, understand another's explanations and argue in the exchange.	1, 3

Numbers and calculations

In Cycle 3, the study of large numbers makes it possible to enrich the comprehension of our numeral system (oral numeration and written numeration) and to mobilize its properties during calculations. Fractions and then decimals appear as new numbers introduced to overcome the insufficiency of integers, in particular to measure lengths, areas and mark points on a graduated half-line. The link to be established with the knowledge acquired about integers is essential. Having a good understanding of the relationships between the different units of integer numbers (units, tens, hundreds of each order) allows to extend them to tenths, hundredths ... The common characteristics between the numeral system and the metric system are highlighted. The comma writing is presented as a convention to write a decimal fraction or a sum of decimal fractions. This makes it possible to update the nature of the decimal numbers and to justify the comparison rules (which are different from those used for the integers) and calculation.

The mental calculation, the calculated calculation and the instrumented calculation are to be built in interaction. Thus, the mental calculation is mobilized in the calculated calculation and it can be used to provide an order of magnitude before an instrumented calculation. Reciprocally, the instrumented calculation can make it possible to verify a result obtained by the mental calculation or by the calculated calculation. Calculation, in all its modalities, contributes to the knowledge of numbers. Thus, even if mental arithmetic can produce useful results in different contexts of everyday life, its teaching nevertheless aims primarily at exploring the numbers and properties of operations. It is a question of bringing the students to adapt by adopting the most effective procedure according to their knowledge but also and especially according to the numbers and the operations put into play in the calculations. For this, it is essential that students can rely on enough memorized digital facts and automated elementary calculus modules.
Similarly, if the mastery of written operating techniques allows the student to obtain a calculation result, the construction of these techniques is an opportunity to rework the properties of the numeration and meet examples of complex algorithms.
The arithmetic problems proposed in Cycle 3 make it possible to enrich the meaning of the operations already discussed in Cycle 2 and to study new ones. The procedures for dealing with these problems can evolve according to the numbers involved and their structure. The calculation also contributes to the representation of the problems, it is a question of developing at the same time in the pupils the capacities of calculation and resolution of arithmetic problems (the work on the technique and on the meaning having to nourish each other) .

Expected end of cycle	
Use and represent large integers, simple fractions, decimals. Calculate with integers and decimals. Solve problems using simple fractions, decimals and calculation.	
Related knowledge and skills	**Examples of situations, activities and resources for the student**

<table>
<tr><td colspan="2">Use and represent large integers, simple fractions, decimals</td></tr>
<tr><td>Composing, breaking down large integers, using thousands of clusters.
- Numeration units (single units, tens, hundreds, thousands, millions, billions) and their relationships.

Understand and apply the rules of numeration to large numbers (up to 12 digits).

Compare, arrange, frame large integers, locate them and place them on a suitable graduated half-line.</td><td>Situations whose resolution mobilizes knowledge about numeration or conversions of units of numeration. Illustrate large numbers using examples of orders of magnitude (French population, world population, radius of the Earth, age of the solar system ...).
The work on some units of mass or length and on their relations (gram, kilogram, ton, centimeter, meter, kilometer, etc.) allows a return on the rules of numeration.</td></tr>
<tr><td>Understand and use the concept of simple fractions.
- Fractional writings.
- Various designations of fractions (oral, written and decompositions).

Locate and place fractions on a suitable graduated half-line.
- A first extension of the order relationship.

Framing a fraction by two consecutive integers.

Establish equalities between simple fractions.</td><td>Use fractions for:
- report size sharing or size measurement in simple cases;
- express a quotient.
Situation allowing to connect the formulations the half, the third, the quarter and 1/2 of, 1/3 of, 1/4 of, etc. (fractions seen as operators).
For example, using a graduated half-line, students establish that 5/10 = 1/2, 10/100 = 1/10, and so on.
Write a fraction as a sum of an integer and a fraction less than 1.</td></tr>
<tr><td>Understand and use the notion of decimal number.
- Specificities of decimal numbers.

Associate various designations of a decimal number (decimal fractions, commas and decompositions).
- Rules and operation of numbering systems in the field of decimal numbers, relations between number units (decimal point), number values according to their rank in the decimal point (point of view) positional).

Locate and place decimals on a suitable graduated half-line. Compare, arrange, frame, insert decimals.
- Order on decimal numbers.</td><td>Situations requiring:
- to use decimal numbers to account for size sharing or size measurement in simple cases;
- to use different representations: measurements of lengths and areas, one unit being chosen;
- to make the link between the units of measurement and the units of measurement (tenth / dm / dg / dl, hundredths / cm / cg / cL / cents, etc.).
The graduated digital half-line is an opportunity to highlight successive enlargements of the scale from 1/10 to 1/1000.</td></tr>
<tr><td colspan="2">Calculate with integers and decimals</td></tr>
<tr><td>Memorize numerical facts and basic calculation procedures. Develop or choose oral and written computing strategies. Check the likelihood of a result, in particular by estimating its order of magnitude.
- Addition, subtraction, multiplication, division.
- Properties of the operations: • 2 + 9 = 9 + 2 • 3 × 5 × 2 = 3 × 10 • 5 × 12 = 5 × 10 + 5 × 2
- Additive and multiplicative numerical facts and procedures.
- Multiple and divisors of numbers in common use.
- Criteria of divisibility (2, 3, 4, 5, 9, 10).</td><td rowspan="4">Examples of facts and numerical procedures:
- multiply or divide by 10, by 100, by 1000 a decimal number,
- look for the complement to the unit, the ten, the hundred superior,
- frame a number between two consecutive multiples,
- find a quotient, a rest,
- multiply by 5, by 25, by 50, by 100, by 0.1, by 0.5 ...
Use different presentations to communicate the calculations (oral formulations, posed calculations, online, in columns, etc.).
In connection with the calculator, introduce and work the priority of multiplication on addition and subtraction as well as the use of parentheses.</td></tr>
<tr><td>Mental calculation: to calculate mentally to obtain an exact result or to evaluate an order of magnitude.</td></tr>
<tr><td>Online calculation: use parentheses in very simple situations.
- Rules of use of parentheses.</td></tr>
<tr><td>Calculus: implement a calculation algorithm for addition, subtraction, multiplication, division.</td></tr>
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- Operating techniques of calculation (in the case of division, we limit ourselves to divide by an integer).	
Instrumented calculus: use a calculator to find or verify a result. - Basic functions of a calculator.	
Solve problems using simple fractions, decimals and calculation	
Solve problems involving all four operations. - Direction of operations. - Issues relating to: - additive structures; - multiplicative structures.	Enrich the repertoire of additive and multiplicative issues, including divisional issues.
Organization and data management Collect digital data from a variety of media. Produce tables, diagrams and graphs organizing digital data. Exploit and communicate measurement results. ¬ Usual representations: - tables (in two or more columns, double entry); - bar, circular or semicircular diagrams; - Cartesian graphs.	Extract or process data from newspaper articles. Organize data from other courses (science and technology, history and geography, physical education and sports ...) to treat them.
Proportionality Recognize and solve proportionality problems using a suitable procedure.	Situations allowing an encounter with scales, constant speeds, percentage rates, in connection with the study of decimal fractions. Mobilize the properties of linearity (additive and multiplicative), of proportionality, of passage to unity. Use examples of proportionality tables.

Progressivity benchmarks
It is possible, when solving problems, to go beyond the progressiveness markers identified for each level.

At the beginning of the cycle, the numbers are approached up to 1,000,000, then gradually up to one billion. This work will need to be maintained throughout cycle 3.
Fractions and decimals: Fractions are both object of study and support for the introduction and learning of decimals. For this reason, the study of simple fractions (such as 2 / 3,1 / 4,5 / 2) and decimal fractions is started as early as CM1. From CM1 to the 6th, we approach different possible conceptions of the fraction, from the division of quantities to the quotient of two integers, which will be studied in the 6th. For decimal numbers, activities can be limited to hundredths at the beginning of the cycle to extend to ten thousandths in the sixth.

Calculation: The practice of mental calculation gradually extends from integers to decimals, and the procedures to be mobilized become more complex.
The different operating techniques relate to integers and / or decimals:
addition and subtraction for decimal numbers from CM1;
multiplication of a decimal number by an integer in CM2, of two decimal numbers in 6th;
Euclidean division from the beginning of the cycle, division of two integers with a decimal quotient, division of a decimal number by an integer from the CM2.

Problem solving: Progressivity on problem solving, in addition to the mathematical structure of the problem, is based in particular on:
- the numbers involved: integers (throughout the cycle) then decimals;
- the number of stages of calculation and the determination or not of these stages by the students: according to the cases, at all the levels of the cycle 3, one passes from problems whose solution involves a step at one or more stages indicated in the 'stated to problems, in the 6th, requiring the organization of multiple data or the construction of an approach;
- the media envisaged for taking information: the collection of useful information can be done from a single medium in CM1 (text or table or graphic representation) then from two complementary supports to go to complex tasks mixing several supports in 6th.
The communication of the process and the results takes different forms and is enriched during the cycle.
From the beginning of the cycle, the proposed problems fall under the four operations, the objective is to automate the recognition of the operation at the end of the cycle 3.

Sizes and measures

In cycle 3, the knowledge of the q
uantities already attended in cycle 2 (length, mass, capacity, duration, price) are completed and structured, in particular through the mastery of the legal units of the International System of Units (decimal or sexagesimal number) and their relationships. One of the challenges is to enrich the notion of size by approaching the notion of area of a surface and distinguishing it clearly from that of perimeter. Students approach the concept of angle and become familiar with the concept of volume by linking it first to that of capacity.

The notion of measuring a quantity consists in associating, a unit being chosen, a number (integer or not) with the quantity considered. It is a question of determining how many units or splits of the unit are contained in the quantity to be measured. The operations on the quantities also make it possible to approach operations on their measurements. The notions of size and measure of greatness are dialectically constructed, solving problems involving different types of tasks (compare, estimate, measure). In the context of magnitudes, proportionality will be highlighted and summoned to solve problems in different contexts. In the continuity of cycle 2, the work on the estimation participates in the validation of results and makes it possible to give meaning to these quantities and their measurement (to estimate by building on references already built: lengths and area of a ground basketball, area of a stamp, mass of a trombone, mass and volume of a bottle of milk ...).

Expected end of cycle	
Compare, estimate, measure geometric quantities with integers and decimals: length (perimeter), area, volume, angle. Use the lexicon, the units, the specific measuring instruments of these quantities. Solve problems involving magnitudes (geometric, physical, economic) using integers and decimals.	
Related knowledge and skills	**Examples of situations, activities and resources for the student**
Compare, estimate, measure geometrical quantities with integers and decimals: length (perimeter), area, volume, angle Use the lexicon, the units, the specific measuring instruments of these quantities	
Compare perimeters with or without recourse to measurement. Measure perimeters by reporting units and fractions of units, or using a formula. - Length concept: special case of the perimeter. - Formula of the perimeter of a square, a rectangle. - Formula of the length of a circle. - Units relating to lengths: relationships between length units and number units (large numbers, decimals).	Use measuring instruments: decameter, caliper, laser sight (range finder), various digital applications. Adapt the choice of the unit, the instrument according to the object (order of magnitude) or according to the desired accuracy. Approach the notion of distance as the shortest way between two points, between a point and a line.
Compare, classify and store surfaces according to their area without using the measure. Differentiate area and perimeter of a surface. Determine the measurement of the area of a surface from a simple tiling or using a formula. Estimate the extent of an area by different procedures. - Usual area units: multiples and submultiples of m^2 and their relationships, are and hectare. - Formulas of the area of a square, a rectangle, a triangle, a disc.	Situations leading students to: - superimpose, cut, glue surfaces; - use tessellations to better understand the action of measuring an area. Adapt the choice of the unit according to the object (order of magnitude) or according to the desired precision or according to the digital domain considered.
Connect the units of volume and capacity. Estimate the measurement of a volume by different procedures. - Usual units of capacity (multiples and sub-multiples of the liter). - Usual units of volume (cm3, dm3, m3), relations between	Compare or measure contents (or interior volumes of a container) without the use of measurement or counting. For example, find the number of cubes of 1 cm edge needed to fill a right pad. Adapt the choice of unit according to the

the units. Determine the volume of a right-hand block by referring to a count of units or using a formula. - Formula of the volume of a cube, of a right block. Identify angles in a geometric figure.	object (order of magnitude) or according to the desired accuracy.
Compare angles. Reproduce a given angle using a template. Recognize that an angle is straight, acute or obtuse. Estimate the measure of an angle. Estimate and verify that an angle is straight, acute or obtuse. Use a measuring instrument (the protractor) and a unit of measure (the degree) to: - determine the degree of angle; - construct a given measurement angle in degrees. - Notion of angle. - Glossary associated with angles: right angle, acute, obtuse. - Measure in degree of an angle.	Before working on measurements, establish relations between angles (sums, shares, reference to the angles of the equilateral triangle, the isosceles right triangle). Compare angles without using their measure (by superposition, with a layer). Differentiate acute and obtuse angles Estimate the measurement of an angle, for example to 10 °, and check with the help of the protractor. Use angle templates, the square, the protractor. The rapporteur is a new measuring instrument that should be introduced during the construction and study of figures.
Solve problems involving magnitudes (geometric, physical, economic) using integers and decimals	
Solve problems of comparison with and without recourse to the measure. Solve problems whose resolution simultaneously mobilizes different units of measure and / or conversions.	Situations leading the students to complete the units of size (length, mass, capacity, duration) and to highlight the relations between them.
Calculate perimeters, areas or volumes, mobilizing or not, depending on the case, formulas. - Formulas giving - the perimeter of a square, a rectangle, the length of a circle; - the area of a square, a rectangle, a triangle, a disc; - the volume of a cube, of a right block.	
Calculate the time elapsed between two given instants. Determine a moment from the knowledge of a moment and a duration. - Usual measurement units: day, week, hour, minute, second, tenth of a second, month, year, century, millennium.	Use the units of measure of the durations and their relations. Exploit various resources: - schedules of schedules or reservation of transport, - timetables of tides, sports activities, - programs of cinema, theater, television programs. These different resources are used on paper or online digital media.
Proportionality To identify a situation of proportionality between two quantities. - Graphs representing variations between two quantities.	Compare distance traveled and elapsed time, amount of gasoline consumed and distance traveled, amount of fluid dispensed and time elapsed, etc.

Progressivity benchmarks

It is possible, when solving problems, to go with some students or with the whole class beyond the progressiveness markers identified for each level.

The study of a magnitude requires activities to define the magnitude (direct or indirect comparison, or use of the measure), to explore the units of the corresponding international system of units, to make use of measuring instruments of this magnitude, to calculate measurements with or without formula. However, depending on the size or the attendance of the latter during the previous cycle, direct or indirect comparisons of quantities (length, mass and duration) will not be systematically repeated.

The lengths: In 6th, the work on the lengths makes it possible in particular to consolidate the notion of

perimeter, and to establish the notion of distance between two points, between a point and a straight line. The use of the compass makes it possible to compare and report lengths, to understand the definition of the circle (as a set of points equidistant from the center). The construction and use of the formulas of the perimeter of the square and the rectangle intervene progressively during the cycle. The formula giving the length of a circle is used in the 6th.

The durations: A work of consolidation of the reading of the time, the use of the units of measurement of durations and their relations as well as instruments of measurement of the durations is carried out in CM1 and in CM2. Throughout the cycle, problem solving is organized around two types of tasks: calculating a duration from the data of the initial moment and the final moment, determining a moment from the knowledge of a moment and a duration. The mastery of units of measure of durations and their relations makes it possible to organize the progressivity of these problems.

Areas: Throughout the cycle, the appropriate procedure for comparing areas of two surfaces should be chosen to determine the extent of an area with or without recourse to formulas. As of CM1, we compare and classify surfaces according to their area. The measurement or estimation of the area of a surface using a reference surface or a grid network is then discussed. Once these notions are stabilized, we discover and use the units of usual area and their relations. We can then build and use formulas to calculate the area of a square, a rectangle, then in 6th, calculate the area of a right triangle, of any triangle whose height is known, of a disk.

Capacity and volume: In continuity with Cycle 2, the concept of volume will be seen first as a capacity. In the primary, the contents are compared without measuring them and the capacity of a container is measured by counting units, in particular using the usual units (L, dL, cL, mL) and their relationships. In college, this work is continued by determining the volume of a right pave. The units of volume and capacity are then connected (1 L = 1 dm3, 1 000 L = 1 m3).

Angles: In primary, it is a question of estimating and verifying, using the square if necessary, that an angle is straight, acute or obtuse, to compare the angles of a figure then to reproduce an angle, using a template. This work is continued in the college, where we introduce a unit of measurement of the angles and the use of a measuring tool (the protractor).

Space and geometry

At the articulation of primary school and college, Cycle 3 is an important step in the approach of geometric concepts. Extending the work started in Cycle 2, the activities allow students to progressively move from a geometry where objects (the square, the right, the cube, etc.) and their properties are controlled by perception to a geometry where they are by the use of instruments, by the explicitation of properties to go then towards a geometry whose validation is based only on the reasoning and the argumentation. Different characterizations of the same object or the same mutually enriching notion allow students to move from the ordinary view of a drawing to the geometrical look of a figure.

Situations involving different types of tasks (recognizing, naming, comparing, verifying, describing, reproducing, representing, building) on geometric objects are favored in order to bring out geometric concepts (characterizations and properties of objects, relations between objects) and to enrich them. A game on the constraints of the situation, on the supports and the instruments put at the disposal of the students, allows a evolution of the procedures of treatment of the problems and an enrichment of the knowledge

Teachers take care to use precise and appropriate language to describe the actions and gestures made by students (folding, freehand drawing or using templates and usual instruments or when using software). These are gradually encouraged to use this language.

The spatial and geometrical activities should be linked to the two other themes: to solve in another context problems relating to proportionality; use in situation the quantities (geometrical) and their measurement. Moreover, they constitute privileged moments for a first initiation to the programming especially through the programming of displacements or construction of figures.

Expected end of cycle

- identify and move through space using or developing representations.
- Recognize, name, describe, reproduce, represent, build common figures and solids.
- Recognize and use some geometric relations (notions of alignment, belonging, perpendicularity, parallelism, equality of lengths, equality of angle, distance between two points, symmetry, enlargement

and reduction).	
Related knowledge and skills	**Examples of situations, activities and resources for the student**
identify and move through space using or developing representations	
Identify, describe or execute movements on a map or on a map. Accomplish, describe, encode movements in familiar spaces. Program the movements of a robot or those of a character on a screen. - Vocabulary used to define positions and displacements. - Various ways of representing space.	Situations giving rise to spatial identifications or to the description, coding or decoding of movements. To work : - in workspaces of different sizes (paper sheet, playground, neighborhood, city, etc.); - from schematic plans (for example, looking for the shortest route or asking for the least connections on a subway or bus map); - with new resources such as geographical information systems, software for initiation to programming ...
Recognize, name, describe, reproduce, represent, build some solids and geometric figures	
Recognize, name, compare, verify, describe: - simple or complex figures (assemblies of simple figures); - simple solids or simple solid assemblies from some of their properties. - Flat and solid figures, first characterizations: - triangles including particular triangles (right triangle, isosceles triangle, equilateral triangle); - quadrilaterals whose particular quadrilaterals (square, rectangle, rhombus, first approach of the parallelogram); - circle (as the set of points situated at a given distance from a given point). - Vocabulary suitable for naming solids: right pave, cube, right prism, regular pyramid, cylinder, cone, ball.	Situations of reproduction or construction mobilizing elementary gestures of measurement and plotting and knowledge about the usual figures Reproduce (scale or not) a figure from a model and already drawn elements. Use flat representations of solids (patterns, perspectives, front, side, top views, ...) and represent plane figures by drawing freehand figures. The vocabulary elements associated with objects and their properties (solid, polyhedron, face, edge, polygon, side, vertex, angle, half line, segment, circle, radius, diameter, middle, mediator, height, etc.) are introduced. and used in context to clarify the meaning: portraiture game, message exchange, association games (figures, designations, properties, representations).
Reproduce, represent, build: - simple or complex figures (assemblies of simple figures) - simple solids or assemblages of simple solids in the form of models or drawings or from a pattern (given, in the case of a prism or a pyramid, or to be constructed in the case of a pavement law).	
Realize, complete and write a construction program. Make a simple figure or a figure composed of simple figures using a software.	
Recognize and use some geometric relationships	
Make plots corresponding to perpendicularity or parallelism relations of straight lines and segments. Determine the shortest path between two points (in connection with the notion of alignment). Determine the shortest path between a point and a straight line or between two parallel lines (in relation to perpendicularity). - Alignment, belonging. - Perpendicularity, parallelism (construction of parallel lines, link with the property connecting parallel and perpendicular lines). - Equal lengths. - Equal angles. - Distance between two points, between a point and a line.	Situations leading students to use techniques that evolve according to the supports and instruments chosen; for example, for axial symmetry, from folding or using tracing paper to constructing the symmetry of a point with respect to a straight line or a compass. Examples of instruments: ruler, square, compass, angle templates, paper strips, tracing paper. Examples of various media: geoboards, squared paper, pointed paper, plain paper. Examples of materials: paper / pencil, software of dynamic geometry, initiation to the programming, software of visualization of maps, plans.
Complete a figure by axial symmetry. To construct the symmetrical figure of a given figure with respect to a given axis, whether or not the axis of symmetry cuts the figure, to construct the symmetry of a	

line, a segment, a point with respect to a given axis . - Symmetrical figure, axis of symmetry of a figure, symmetrical figures with respect to an axis. - Preservation properties of axial symmetry. - Mediator of a segment.	
Proportionality Reproduce a figure respecting a scale. - Enlargement or reduction of a figure.	Reproduce a figure from a model (the scale can be given by already drawn elements).

Progressivity benchmarks

It is possible, when solving problems, to go with some students or with the whole class beyond the progressiveness markers identified for each level.

Spatial learning: In the continuity of cycle 2 and throughout the cycle, spatial learning is realized from problems of locating the movement of objects, the elaboration of representations in real, materialized spaces (maps, maps, etc.).) or digital.

Geometric learning: These learnings develop the knowledge of plane figures, solid but also of relations between objects and properties of objects. The parallelogram is only the subject of a first attendance in the 6th and is particularly the opportunity to return to the notion of parallelism. The choice of the objects considered and the relationships and properties to be taken into account, the constraints on the instruments to be used, the actions to be carried out, the justifications and means of validation accepted make it possible to organize the progressivity of learning and to enrich the procedures of student resolution. Thus, it is not only the tasks that evolve from one level to another but the procedures for carrying out these tasks.

Progressivity is organized by taking into account:

• geometry gestures: certain construction skills, such as drawing a segment of a given length or reporting the length of a segment (CM1-CM2) or reproducing an angle (6th), are conducted in conjunction with the " sizes and measures ",

• the evolution of the procedures and the quality of the knowledge mobilized: thus, the pupil must first know how to recognize a square by taking into account the perpendicularity and the equality of the measurements of the sides (CM1-CM2) then progressively of show that it is a square from the properties of its diagonals or its axes of symmetry (6th),

• geometric objects frequented,

• Mastery of new layout techniques (compared to Cycle 2).

The reasoning: From the CM2, students are taken to go beyond the perceptive and instrumental dimension to reason only about properties and relationships. For example, the use of the ruler and the compass to draw a triangle, knowing the length of its sides, mobilizes the knowledge of the properties of the triangle and the definition of the circle. It is a question of conducting simple reasoning without formalism, using the properties of the usual figures or axial symmetry. A specific vocabulary is used from the beginning of the cycle to designate objects, relationships and properties.

Vocabulary and Notations: At the elementary level, when the points will be designated by letters, the teachers will always make explicit the object of which it speaks: "the point A", "the segment [AB]", "the triangle ABC", etc. No mastery is expected of students in the usual coding (parentheses or square brackets) before the last year of the cycle. The vocabulary and the new notations (∈, [AB], (AB), [AB), AB, (AOB)) are introduced as and when they are useful, and not at the beginning of an apprenticeship.

Instruments: At the primary level, students will use various rules (graduated or not, various sizes), templates, squared, compass. They will start using the reporter at the college.

Axial symmetry: A preliminary work on the figures can illustrate the overall appearance of the symmetry rather than proceeding in detail (by the point, the segment, the line). To construct or complete plane shapes by symmetry, different procedures will be approached during the cycle. They evolve and enrich themselves by a play on the figures, on the instruments available and by the use of various supports.

Introduction to programming: An introduction to programming is done on the occasion of particular activities of locating or moving (programming the movements of a robot or those of a character on a screen), or geometric activities (construction of simple figures or figures composed of simple figures). At CM1, we reserve the use of dynamic geometry software for manipulative learning (through the

visualization of instrumented constructions) and validation of constructions of plane figures. Beginning in CM2, their progressive use to make constructions, familiarize the students with the representations in cavalier perspective and with the notion of conservation of the properties during certain transformations.

Progressivity benchmarks: the special case of proportionality

Proportionality must be dealt with in each of the three domains "numbers and calculations", "quantities and measures" and "space and geometry".

In CM1, the use of linearity properties (additive and multiplicative) is preferred in problems involving integers. These properties must be clarified; they can be institutionalized non-formally with the help of examples ("if I have twice, three times ... more guests, I will need twice, three times ... more ingredients"; pens cost 10 euros and 3 pens cost 5 euros, so 9 pens cost 15 euros "). Procedures such as passing through the unit or calculating the coefficient of proportionality are progressively mobilized on problems that require it and on the basis of the numbers (integers or decimals) chosen in the statement or involved in the calculations. From CM2, situations involving constant scales or speeds may be encountered. The meaning of the expression "...% of" appears in the middle of the cycle. It is a question of knowing how to use it in simple cases (50%, 25%, 75%, 10%) where no technique is necessary, in connection with the fractions of a quantity. At the end of the cycle, the application of a percentage rate is an expected.