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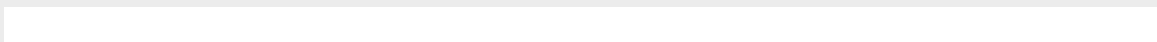


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ALLIANCE  
TO MONITOR  
LEARNING



# Monitoring Progress towards SDG 4.1: Initial Analysis of National Assessment Frameworks for Mathematics

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## Summary

### Background

4.1: By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes.

4.1.1 Proportion of children and young people: (a) in grades 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex.

The UNESCO Institute for Statistics and the UNESCO International Bureau of Education (IBE-UNESCO) worked collaboratively to support national strategies for measuring learning and to enable international reporting in SDG 4.1 within the Education 2030 Framework for Action. The two institutions understand learning outcomes in terms of specific skills, knowledge, and competencies that students are required to demonstrate, and which are oftentimes visible within National Assessment Frameworks (NAFs). For this purpose, NAFs in Mathematics were collected, mapped, and analysed in order to produce cross-nationally comparable indicators, at the three points of measurement of indicator 4.1.1: grades 2/3, end of primary, and end of lower secondary education. Only NAFs available in English, French, and Spanish were coded, whereas the remaining NAFs in other languages were saved for future, potential use. In order to provide an up-to-date picture of assessment within Member States, only NAFs developed after 2000 were used. The study focused solely on national low-stakes assessments, and thus excluded frameworks developed for high-stakes examinations. Lastly, NAFs related to upper secondary education, were also not mapped and analysed, as they did not fall within the three aforementioned points of measurement of Indicator 4.1.1.

Following the strict screening of all NAFs collected through the aforementioned filters and restrictions, 115 NAFs for Mathematics were finally used for mapping and analysis. These were available in either English, French, or Spanish, ranged from grades 1 to 8, and came from 53 Member States and 7 out of the 8 regions of the world<sup>1</sup>.

### Findings of the study

- An overall analysis showed that the domain with the higher coverage across the 115 NAFs was the *Number Knowledge* domain (113 NAFs, or 98%), followed by *Geometry* (103 NAFs, or 90%), *Measurement* (101 NAFs, or 88%), *Statistics and Probability* (97 NAFs, or 79%), *Algebra* (80 NAFs, or 70%), and *Math Proficiency* (30 NAFs, or 26%).
- *Math Proficiency* was the domain, whose coverage was drastically lower than all other domains, a fact that remained consistent across all levels of analysis. A possible explanation is that NAFs typically treat proficiency as an area that should be taught within each domain. Mathematical Proficiency is critically important to teach, yet extremely hard to assess, especially in the context of a national assessment.
- The presence of trends between education levels was clear between Lower Primary and Upper Primary, with the highest correlation between these two levels. Such a trend indicates a close articulation of learning objectives and assessments in the Primary education level. Noteworthy was the lack of articulation between Upper Primary and

<sup>1</sup> Central Asia is the only region of the world not represented in this study, due to language limitations.

Lower Secondary, which signifies a need for attention by Member States to close this gap in the scope and sequence of their education policies and documents.

- The presence of trends between Member States of different income classification levels is prevalent regarding the extensiveness of content areas covered within NAFs. In the majority of analyses, Member States classified as High-Income contained better coverage of both domains and sub-domains. The likely explanation for this income classification trend, is that Member States of higher income levels have the ability to teach a broader set of skills per content category and thereby typically include more objectives per domain and sub-domain, mapping to the respective categories. This could be a result of these Member States allocating more resources to the development of their NAFs or due to the existence of critical mass, which is an advantage of theirs against Member States of lower income levels. Furthermore, a hypothesis that would need to be further investigated, is the possibility of alignment of curriculum and assessment and better correlation between curriculum frameworks and NAFs. This would allow Member States not only to develop competency-related indicators within their curriculum frameworks, but also to effectively reflect them within their NAFs.

## Recommendations

- The development of a UNESCO Global Content Framework of Reference for Mathematics would allow Member States to utilise it as a preliminary guide in the development of assessment policies and as an evaluation tool. The Framework could then be used for, and by, those Member States which are in the process of developing or would like to develop an NAF or a self-assessment tool of their national assessment model and frameworks.
- Translation of NAFs provided in languages other than English, French, and Spanish could help to shed light in regions of the world that are misrepresented in comparison to others in this study.
- Ways of assessing quality of learning objectives, in addition to quantity of them, should be explored for a better representation of rigor of assessment objectives.
- The possibility of the progressive nature of education, assessment systems, and NAFs needs to be taken into consideration and reflected within the final Global Content Framework of Reference.
- Cross-national (regional and international) assessments, both in terms of content and performance levels, will also inform this Framework and contribute in making it more comprehensive and an adequate, to the best possible extent, representation of information from the various levels (national, regional, and international).

The Framework has the potential to ultimately allow Member States to improve the quality of education not only within their national assessments, but as a whole, while at the same time allowing UNESCO to monitor progress towards SDGs - Education 2030, and SDG 4.1 in particular.



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In-Progress Reflection No. 15 on  
*Current and Critical Issues in Curriculum, Learning and Assessment*

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## Monitoring Progress towards SDG 4.1: Initial Analysis of National Assessment Frameworks for Mathematics



With support of:



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## Open Note of the IBE

The IBE has launched the series In-Progress Reflections on *Current and Critical Issues in Curriculum, Learning and Assessment* to open a communal space for a global conversation, collective production and discussion on those issues of high concern for Member States. It intends to support country efforts in mainstreaming challenging issues within the processes of curriculum renewal and development across different levels, settings and provisions of the education system.

Initially, the focus areas of the In-Progress Reflections series encompass, among others,: (i) Early Childhood Care and Education (ECCE) as a foundation of holistic child development and learning; (ii) Reading and writing in early grades to support the development of essential competencies; (iii) Youth Culture and competencies for Youth in the early 21st century (covering formal, non-formal and informal education); (iv) ICT curricula and inclusive pedagogy contributing to relevant and effective learning outcomes; (v) STEM (Science, Technology, Engineering and Mathematics) curricula to foster sustainable development; (vi) Curriculum for Global Citizenship Education (peace, human rights, sustainable development, values, ethics, multiculturalism, etc.); (vii) Assessment to enhance and support learning opportunities; and (viii) Inclusive education as an over guiding principle of education systems.

The series of reflections covers a wide array of knowledge products, among them: discussion papers, policy briefs, frameworks, guidelines, prototypes, resource packs, learning tools and multimedia resources. These materials are discussed, refined, used and disseminated engaging education and curriculum agencies / institutes, and in particular curriculum developers and specialists, development experts, policy makers, teacher trainers, supervisors, principals, teachers, researchers and other educational stakeholders. In addition, they serve as reference materials for the IBE menu of capacity-development training on curriculum, learning and quality education – namely masters, diplomas, certificates and workshops – to forge policy and technical dialogue involving a diversity of stakeholders and to support sustainable country fieldwork.

Through blogs and e-forums, we encourage the audience to actively interact and bring in diverse perspectives. Effectively, the online space for reflection allows us to stay connected, facilitates exchange between experts from different regions of the world, and truly fosters continuous reflection on the issues concerned. The blog is structured to gather diverse resources, which include tools and documents (as previously mentioned) under specific themes to provide a complex and rich set of materials targeted to the specific needs of Member States. The In-Progress Reflections will capture relevant visions, views and comments shared by the audience, and serve as a key resource to support Member States' efforts in mainstreaming relevant findings and effective practices in national policies, curriculum frameworks and developments and in professional practices.

**Dr. Mmantsetsa Marope: Director, International Bureau of Education**



# Monitoring Progress towards SDG 4.1: Initial Analysis of National Assessment Frameworks for Mathematics

## **Abstract:**

Sustainable Development Goal (SDG) Target 4.1

*“By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes.”*

The UNESCO Institute for Statistics and the UNESCO International Bureau of Education (IBE-UNESCO) worked collaboratively to support national strategies for measuring learning and to enable international reporting in SDG 4.1 within the Education 2030 Framework for Action. The two institutions understand learning outcomes in terms of specific skills, knowledge, and competencies that students are required to demonstrate, and which are oftentimes visible within National Assessment Frameworks (NAFs). For this purpose, a content and skills Coding Scheme for Mathematics was developed, into which 115 English-, French-, and Spanish-language NAFs were mapped, in order to find ways to link different assessment results and to report them in a globally comparable way. The mapping exercise provided a clear picture of the prevalence of mathematical content and competencies in NAFs, and revealed trends, differences, and commonalities among regions of the world, income classification levels, education levels, and languages. The paper concludes with a set of recommendations that focus on ways for moving forward in monitoring SDG 4.1, and in developing the Coding Scheme into a UNESCO Content Framework of Reference that could be used by Member States to assess and improve the content coverage of their national assessment systems.

**Keywords:** Assessment – Education 2030 – mathematics – national assessment framework (NAF) – SDG 4.1

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## Introduction

Education has the power to transform lives. As an agent of change towards empowerment of individuals and societies and a main driver of development, education facilitates towards the realisation of the Education 2030 Framework for Action (UNESCO, 2015; United Nations [UN], 2015) and Sustainable Development Goal 4 (UN, 2015). These new education agendas focus on ensuring provision of quality education for all and improving learning outcomes: ‘Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.’

Quality education has been linked to curriculum (UNESCO-IBE, 2013), in terms of curriculum laying the foundations for comprehensive educational reforms, as well as to evaluation and assessment (Schiefelbein and McGinn, 2017) as they indicate both the extent to which students have learned what is prescribed in the curriculum and the effectiveness of education systems in applying the curriculum. UNESCO, as the United Nation’s (UN) specialized agency for education, and its institutions undertook the role of leading and coordinating the Education 2030 agenda, through monitoring progress towards the education targets, supporting national strategies for measuring learning, and enabling international reporting.

The UNESCO Institute for Statistics (UIS) has the mandate to ‘work with partners to develop new indicators, statistical approaches and monitoring tools to better assess progress across the targets related to UNESCO’s mandate, working in coordination with the Education 2030 Steering Committee’ (UIS, 2017). In particular, as the custodian agency for SDG 4.1.1, the UIS is coordinating the development of methodologies, indicators, and data reporting to achieve the objectives of these agendas. This implies, among others, finding ways to link different assessment results and to report them in a globally comparable way, in order to help Member States to measure progress towards their development goals and the education agendas.

The UNESCO International Bureau of Education (IBE-UNESCO), as UNESCO’s Centre of Excellence in curriculum, learning, assessment and related matters, supports Member States to enhance the effectiveness of student learning by promoting excellence in curriculum design, learning, teaching, and assessment processes. Its overarching aim is to strengthen the capacities of Member States to design, develop, implement and assess curricula that ensure the equity, quality, development-relevance, and resource efficiency of education and learning systems.

In this study, UIS and IBE-UNESCO worked collaboratively to support the monitoring of learning outcomes with regard to SDG 4.1, by finding ways to link them globally in a comparable way. As a first step, the two institutions focused on the skills and content coverage of learning assessment, which ‘...refers to a wide range of methods and tools used to evaluate, measure and document learning outcomes, learning progress and learning needs and conditions’ (UNESCO, 2017). These outcomes, which are understood in terms of specific skills, knowledge, and competencies that students are required to demonstrate, are oftentimes visible within National Assessment Frameworks (NAFs). NAFs are designed and used as ‘outlines of desirable item types’ (Cunningham, 2017) that include the content and skills assessed by a Member State.

UIS and IBE-UNESCO worked together towards mapping the content of NAFs, in order to produce cross-nationally comparable indicators for SDG 4.1 for Literacy and Mathematics:

*‘Target 4.1: By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes*

- *Indicator 4.1.1: Proportion of children and young people: (a) in grades 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex’ (UN, 2015).*

A content and skills framework for Mathematics was developed from cognitive theory and various national curricula, which was then followed by the development of a Coding Scheme (Cunningham, 2017). The Coding Scheme allowed the two institutions to map various NAFs onto the framework. This mapping exercise provided important information about the mathematical content and skills assessed globally at the national level. This information and the Coding Scheme set the basis for a UNESCO Content Framework of Reference, which will be combined with information on regional and international assessments and performance levels (which is a work in-progress by the two institutions). The strength of the future Framework lies in the balanced representation of national, regional, and international standards, upon which it is developed. Member States will benefit directly from the Framework as they will be able to use it to map and evaluate the content and performance levels described in their NAFs. This exercise will also allow them, if they wish, to compare their standards, content, skills, and performance levels to those set by the Framework and improve upon them.

This report focuses on English-, French-, and Spanish-language Mathematics NAFs, ranging from Primary education to Lower Secondary education (from grade 1 to grade 8) and presents the study in the following order. A description of the methodology used in this study comes first, focusing on the Coding Scheme and Content Reference List, as well as the Quantitative Database developed to facilitate towards quantitative analysis. The study's findings are then presented, in what constitutes the largest section of the report. This section is based on five levels of analysis on the domain and sub-domain levels: (1) Overall analysis of NAFs; (2) Analysis by region of the world; (3) Analysis by income classification levels; (4) Analysis by education level; and (5) Analysis by language. Commonalities and differences identified among NAFs and Member States from these five levels of analysis are highlighted throughout this section. The last section of the report identifies the limitations of the Coding Scheme and Content Reference List in particular, as well as of the study in general. It also includes a series of recommendations that focus on ways for moving forward in monitoring progress towards SDG 4.1 - Education 2030, through the improvement of the existing Coding Scheme and Content Reference List, in light of its development into a UNESCO Content Framework of Reference that will be used by Member States.

# I. Methodology

This study's analyses focus on 115 English-, French, and Spanish-language National Assessment Frameworks (NAFs) for Mathematics from 53 Member States (25% of 210<sup>1</sup> Member States). It is important to note that the number of NAFs collected is larger from the number of Member States from which NAFs have been collected, as this is oftentimes the result of a Member State conducting national assessment in more than one grade levels. The NAFs were mapped onto the Content Reference List with the use of a Coding Scheme, both developed by a consultant appointed by UIS. The mapping of NAFs onto the Content Reference List allowed for the identification of differences and commonalities in the content assessed among regions, income classification levels, levels of education, and languages.

## 1. National Assessment Frameworks used for coding

This study aims to support the monitoring of learning outcomes for SDG 4.1 - Education 2030. Specifically, it focuses on national, low-stakes assessments, conducted with the purpose of evaluating and improving the quality of education within Member States. For this purpose, NAFs in Mathematics were collected, mapped, and analysed, in order to produce cross-nationally comparable indicators, at the three points of measurement of indicator 4.1.1: grades 2/3, end of primary, and end of lower secondary education. Only NAFs available in English, French, and Spanish were coded for this study, whereas the remaining NAFs in other languages were saved for future, potential use. In order to provide an up-to-date picture of assessment within Member States, only NAFs developed after 2000 were used.

The study focused solely on national low-stakes assessments, and thus excluded frameworks developed for high-stakes examinations. Lastly, NAFs related to upper secondary education, were also not mapped and analysed, as they did not fall within the three aforementioned points of measurement of indicator 4.1.1. Following the strict screening of all NAFs collected through the aforementioned filters and restrictions, 115 NAFs for Mathematics were finally used for mapping and analysis. These were available in either English, French, or Spanish, ranged from grades 1 to 8, and came from 53 Member States and 7 out of the 8 regions of the world<sup>2</sup>.

## 2. Coding Scheme

The initial structure of the Coding Scheme derived from a small number of comprehensive curriculum frameworks of three languages (English, French, and Spanish)<sup>3</sup>. A research team from IBE-UNESCO mapped the content of 115 NAFs, with the aim of improving its structure, and breadth and detail of content. Prior to this, three NAFs (USA grade 4, Sri Lanka grade 8, and the Gambia grade 5) were used to test the Coding Scheme for consistency and accuracy, so as to provide recommendations for its improvement. In order to ensure internal consistency, each member of the research team coded, individually, all English-language NAFs for all countries in Western Europe and North America. These 15 NAFs were sufficient for establishing internal consistency and working out other small issues, regarding interpretation, with the application of the Coding Scheme.

The Coding Scheme is comprised of six domains, which are then broken down into 17 sub-domains. The six domains and subsequent sub-domains are presented in *Figure 1* below.

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<sup>1</sup> This number includes Members and Associate Members of UNESCO, as well as administrative regions, countries, and provinces. The full list of UNESCO Member States and UNESCO Associate Members may be found here: [http://www.unesco.org/eri/cp/ListeMS\\_Indicators.asp](http://www.unesco.org/eri/cp/ListeMS_Indicators.asp) (Accessed 15 June 2017.)

<sup>2</sup> Central Asia is the only region of the world not represented in this study, due to language limitations.

<sup>3</sup> For a description of the method followed for developing the Coding Scheme and Content Reference List, see: Cunningham, M. 2017. *Method for Developing an International Curriculum and Assessment Framework for Mathematics*.

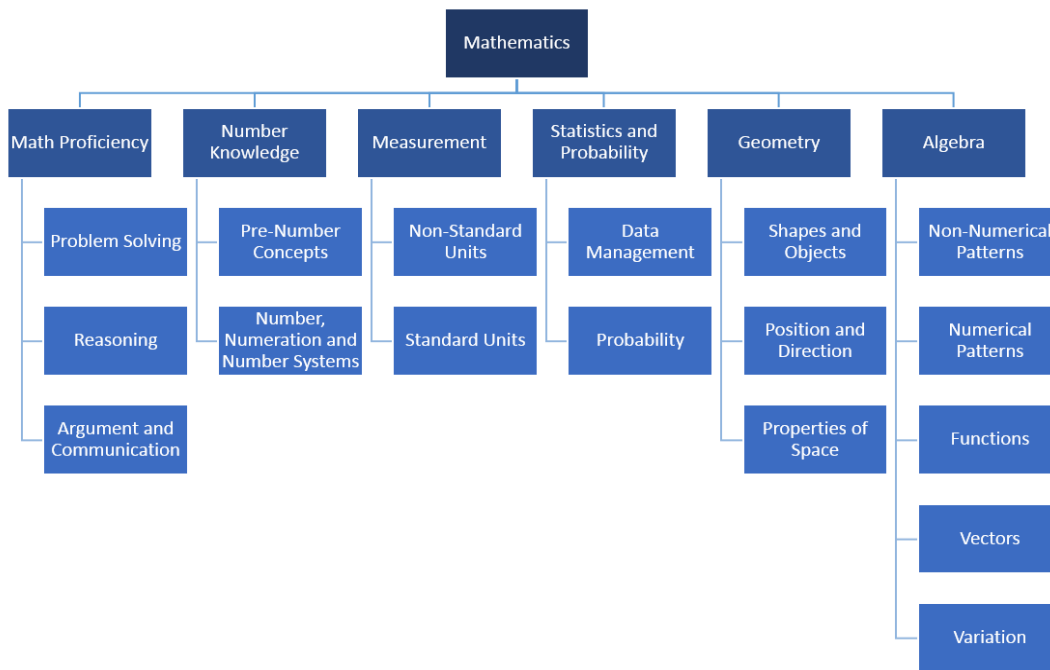


Figure 1: Coding Scheme - Domains and sub-domains<sup>4</sup>

Following the categorisation into domains and sub-domains, the Coding Scheme is then broken down into constructs and their descriptions. Finally, in what is clearly the most detailed portion of the Coding Scheme, each construct is further divided into sub-constructs with explicit descriptions of what should be included in an objective in order to be mapped properly onto the Content Reference List. Each domain is presented in [Figures 2.1-2.6 \(Annex 2\)](#), with its corresponding sub-domains, constructs (if any), and sub-constructs. It is worth noting that an “Other” category was included among the sub-constructs of all constructs. This allowed the research team to place there any objectives found in the NAFs mapped that did not fit into the Coding Scheme as it was. The information within the “Other” sub-constructs formed the basis of the recommendations provided for the improvement of the Coding Scheme and Content Reference List.

The content of the NAFs was mapped onto two different Excel databases, each serving different purposes. The Content Reference List database presents detailed information of the content of the NAFs coded (specific objectives and subsequent broader categories in which an NAF categorizes its objectives). This information may be used for qualitative analyses to improve and to further populate the initial Content Reference List. The second database is quantitative in nature, and it denotes the presence or absence of a certain sub-construct, construct, sub-domain, or domain in each NAF mapped. The information of this database may be used for quantitative analysis to inform about the commonalities and differences among NAFs of different Member States worldwide. The different methods used for mapping information in each database are presented in more detail in the following sections.

### 3. Content Reference List

The Content Reference List was developed to map individual objectives from Mathematics NAFs onto a single template. Paired with the Coding Scheme, the Content Reference List contains information that provides a rich and detailed comparison of Mathematics NAFs from Member States. All individual items and objectives from the different NAFs were copy-pasted under the corresponding categories (domains, sub-domains, constructs, sub-constructs) of the Content Reference List. This database includes therefore the domains, sub-domains, constructs, and sub-constructs as they appeared in the NAFs that were coded.

<sup>4</sup> Source: IBE-UNESCO, 2017.

In the cases where it was possible, the research team followed strictly the layout of the Coding Scheme (domains, sub-domains, constructs, and sub-constructs). In many instances, however, the NAFs did not categorize their items into four categories. In the case of Pakistan (grade 4), for instance, the NAF included distinct domains (i.e. *Numbers and Arithmetic Operations, Factors and Multiples, Fractions*, etc.) but was then only further broken down into two categories. For example, a domain such as *Fractions* would be broken down into “Addition and Subtraction of Fractions” and then further explained with specific objectives such as (i) “Add fractions with unlike denominators,” (ii) “Verify the commutative property of addition of fraction with the same denominators,” (iii) “Verify the associative property of addition of fraction with the same denominator,” and (iv) “Subtract fractions with unlike denominators.” Because this information could not align directly with four separate designations on the Content Reference List, the research team made the determination to “merge” “Addition and Subtraction of Fractions” across both the sub-domain and construct levels. While no two Member States or NAFs are alike, this process was consistent in mapping the various NAFs onto this database.

A considerable number of NAFs, from a variety of regions, income classification levels, education levels, and languages were structured and anchored in competency-based and cross-disciplinary approaches rather than subject-based ones. For example, France’s NAFs were not structured like other. Rather, France, emphasising functionality and skills rather than encyclopaedic knowledge, followed a competency-based and cross-subject approach to its NAFs, using and defining their domains as “Les langages pour penser et communiquer.” This broad scope of a domain reached across multiple subjects in its NAFs and clearly exceeded the descriptive language and scope of the Content Reference List – primarily structured as subject-based. Another example was found in Argentina, whose NAFs were structured and developed from and encompassing a competency-based approach: “Capacidad cognitiva general” and “Capacidad cognitiva específica.” Argentina organized its NAFs to ensure that these competencies and “Capacidades cognitivas” were woven throughout all content areas in Mathematics. Considering these varying approaches, among others, the research team decided to map such NAFs into the Content Reference List as best as possible with a focus on respecting the integrity and educational approach of each Member State. In summary, when viewing the analyses in the below sections, it is key to keep in mind that Member States’ interpretations, approaches, and educational philosophies do vary.

#### 4. Quantitative Database

It must be noted that the Content Reference List was designed, developed, and mapped to within a qualitative data methodology. Upon the introduction of the need for the qualitative data to be quantified, an additional database (quantitative in nature) was created.

Within the Quantitative Database, in order to denote the presence or absence of a certain sub-construct, construct, sub-domain, or domain a value of “0” was assigned for absence and a value of “1” for presence of such categories. In addition to these two values, two other values were used to notate issues that would only be visible in the Content Reference List, but could be of interest to the person using the Quantitative Database. Therefore, “1\*” was used for the cases where only a sub-construct from the “Other” category of a construct was present. The value “n.a.” was used to indicate the absence of an entire category from that specific NAF. For example, if an NAF included domains, sub-domains and/or constructs, but no sub-constructs, “n.a.” would be used in the “Mapping sub-constructs” sheet for that specific NAF.

Understanding the ways in which to view the Content Reference List and the Quantitative Database, in light of decisions made by the research team, can provide the reader with a more robust, and contextually accurate, understanding of the analyses provided below. The following section seeks to analyse data with the aim of identifying differences and commonalities on the content assessed in Mathematics among (1) All NAFs mapped; (2) Regions of the world; (3) Income classification levels; (4) Levels of education; and (5) Languages, based on domain and sub-domain content areas, as mapped on the Content Reference List.

## II. Findings of the Study

The detailed information mapped onto the Content Reference List, once quantified, provides several different, yet rich, analyses. The comparisons that can be drawn from an analysis of the data solely by looking at the domain and sub-domain levels show an interesting distribution of assessment content. No English-, French, or Spanish-language NAFs were collected from Central Asia, thus comparisons should be done with caution of this limitation.

More importantly, perhaps, is the necessary understanding that whether or not a category, in this case domain and sub-domain, was considered present in any particular NAF, depended on whether or not subsequent categories were found in an NAF. For example, if a construct was considered “present” in an NAF, it means that at least one sub-construct was identified within that NAF. Furthermore, if at least one construct was included in the NAF of a particular Member State, then the corresponding sub-domain was considered “present.” Finally, following suit, if a domain is included in an NAF, it only means that at least one sub-domain is considered “present.” This decision was made by the research team to simplify the information gathered, while still providing enough of a distinction to illicit useful data. The information, specifically that of domain and sub-domain levels, was analysed for quantity of objectives, not quality, and therefore does not necessarily represent rigor of assessment objectives or a way to standardize information across content areas. It is important, when interpreting the results of these analyses that careful consideration is taken of this limitation.

### 1. Analysis of NAFs: An Overall Look

In order to gain a better understanding of the data that has been collected, it is important to first better understand the distribution of data across all 115 NAFs, regardless of region, income-classification level, education level, or language.

#### Domain level

Figure 2, below, shows a breakdown, by percent of the domains covered in the 115 NAFs analysed.

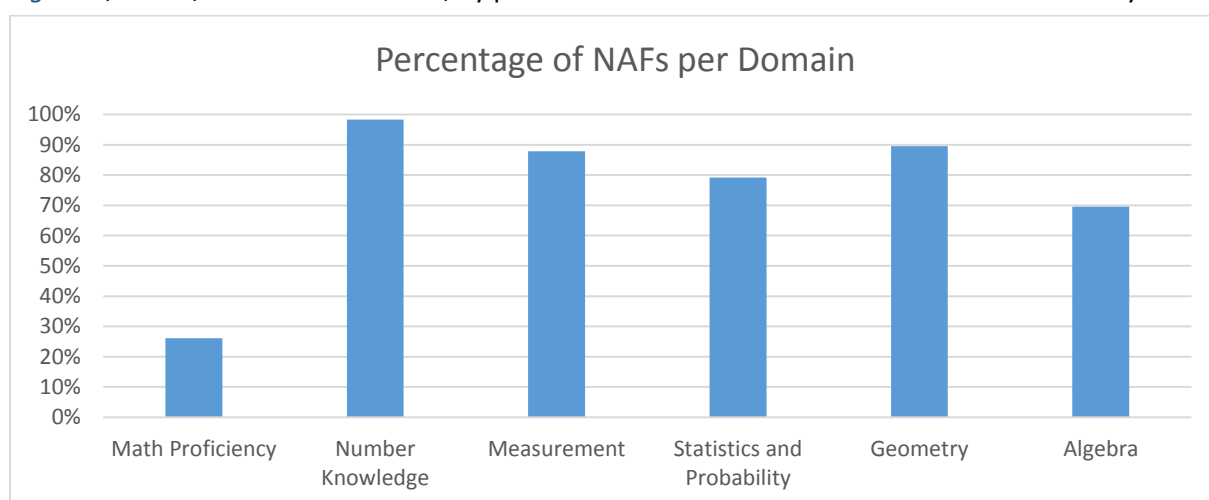


Figure 2: Percentage of NAFs per domain

An overall analysis showed that the domain with the higher coverage across the 115 NAFs was the *Number Knowledge* domain (113 NAFs, or 98%), followed by *Geometry* (103 NAFs, or 90%), *Measurement* (101 NAFs, or 88%), *Statistics and Probability* (97 NAFs, or 79%), *Algebra* (80 NAFs, or 70%), and *Math Proficiency* (30 NAFs, or 26%).

*Math Proficiency* was the domain, whose coverage was drastically lower than all other domains, a fact that remained consistent across all levels of analysis. A possible explanation is that NAFs typically treat proficiency as an area that should be taught within each domain. Mathematical Proficiency is critically



important to teach, yet extremely hard to assess, especially in the context of a national assessment. Additionally, a conversation between the research team and the consultant who developed the Coding Scheme and Content Reference List suggested that this domain served ‘as a guidepost for future NAFs. As more online items replace traditional paper-and-pencil items, opportunities will arise to ask and to assess things very differently (in ways that up to now we simply could not ask or test).’ Therefore, the research team along with the consultant made the decision to only consider this domain present, if Member States dedicated an individual domain or sub-domain to Mathematical Proficiency, as this would show the importance certain Member States prescribe to these skills. Therefore, although it appears that very few NAFs contain objectives that fall within the *Math Proficiency* domain, the more likely explanation is that these items are actually contained within the other content domains instead.

### Sub-domain level

Figure 3, below, shows a breakdown, by percent of the sub-domains covered in the 115 NAFs analysed.

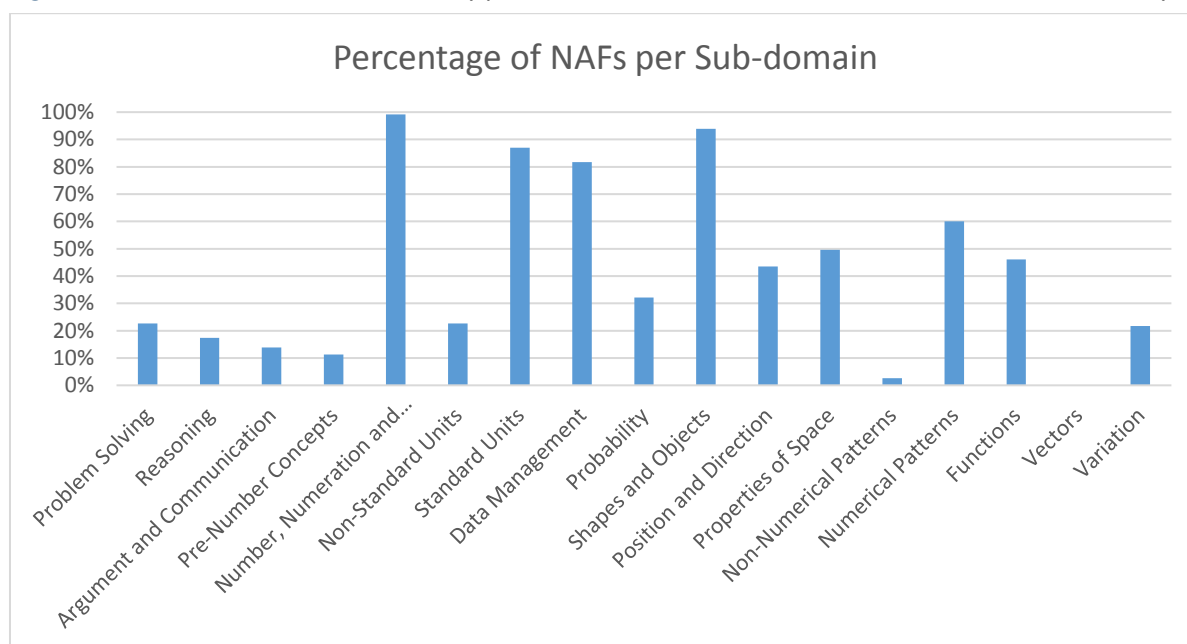


Figure 3: Percentage of NAFs per sub-domain

Regarding sub-domains, an overall analysis showed that all NAFs but one<sup>5</sup> (114 NAFs, or 99%) cover the “Number, Numeration and Number Systems” sub-domain, a trend that remained consistent across all levels of analysis in this report. The presence of this sub-domain in nearly all 115 NAFs reveals the importance Member States worldwide place in assessing knowledge and skills pertaining to this content area.

The following sub-domains are also highly covered by the 115 NAFs analysed (from highest to lowest): “Shapes and Objects” (108 NAFs, or 94%), “Standard Units” (100 NAFs, or 87%), and “Data Management” (94 NAFs, or 82%). Following those, but with significantly lowered coverage, are “Numerical Patterns” (69 NAFs, or 60%), “Properties of Space” (57 NAFs, or 50%), “Position and Direction” (50 NAFs, or 43%), “Chance and Probability” (37 NAFs, or 32%), followed by “Non-Standard Units” and “Problem Solving” (which are equally covered by 26 NAFs, or 23%), and “Variation” (25 NAFs, or 22%). With a coverage of below 20% are the following sub-domains: “Reasoning” (20 NAFs, or 17%), “Argument and Communication” (16 NAFs, or 14%), “Pre-Number Concepts” (13 NAFs, or 11%), and “Non-Numerical Patterns” (3 NAFs, or 3%).

<sup>5</sup> Only El Salvador, in Latin America and the Caribbean, did not contain an assessment objective of this kind.

The low presence of the sub-domains of “Pre-Number Concepts” and “Non-Standard Units” could be justified by the fact that objectives contained in the subsequent sub-domains within each domain (i.e. “Number, Numeration, and Number Systems” and “Standard Units”) assume that students have the knowledge from these simpler sub-domains already mastered. One may assume that the “Pre-Number Concepts” and “Non-Standard Units” are taught in Lower Primary grades, and might therefore only be present within those grades. Analysis of sub-domains coverage by level of education ([II.4 Analysis of NAFs: Classification by Education Level](#)) reinforces this hypothesis (presence of these two sub-domains within Lower Primary education, and absence of them from Upper Primary and Lower Secondary education) and provides a potential explanation of their small coverage within the NAFs used in this study.

Lastly, the sub-domain “Vectors” is the only one that is absent from all NAFs analysed in this study. A possible explanation would be that this sub-domain is assessed at a higher grade in education and, considering the extent of the Content Reference List to Lower Secondary education (grade 8), its absence from the NAFs used in this study is logical. This trend remained consistent across all levels of analysis and will therefore not be repeated again.

## 2. Analysis of NAFs: A Regional Comparison

Aside from the results of the analysis of NAFs overall, a more nuanced understanding of the results can be garnered when looking at a breakdown of the data by region of the world. Out of the 53 Member States, 11 (21%) were from North America and Western Europe, 8 (15%) from East Asia and the Pacific, 4 (8%) from South and West Asia, 14 (26%) from Latin America and the Caribbean, 4 (8%) from the Arab States, 2 (4%) from Central and Eastern Europe, and 10 (19%) from Sub-Saharan Africa. There were no NAFs in English, French, or Spanish collected from Central Asia, and therefore, any information regarding this region has been left out.

Considering that many Member States had multiple NAFs developed for different grades, for this part of the analysis all data collected from one Member State’s NAFs was combined so that each Member State would only appear once within a region. This was determined to be necessary in order to avoid the data being skewed by having the data of one Member State represented multiple times within one region (due to that Member State having multiple NAFs).

### Domain level

The information displayed in [Figure 4](#), below, shows a breakdown, by percent of domains covered in each region.

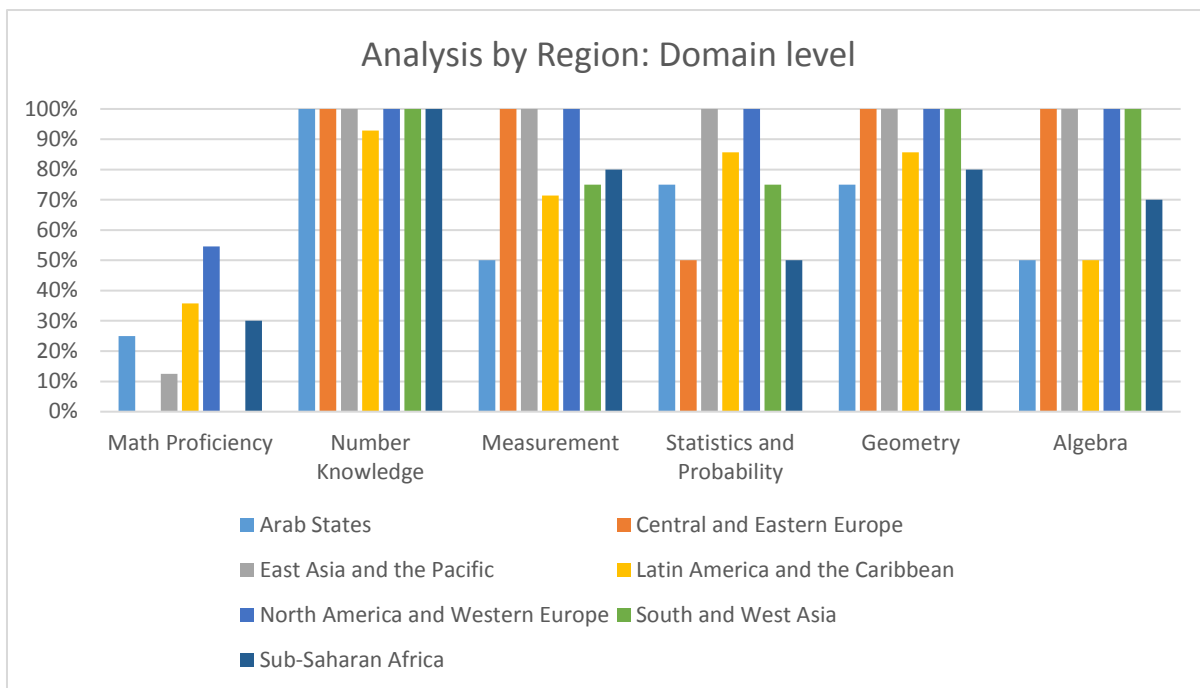


Figure 4: Analysis by region: domain level

52 out of the 53 Member States, regardless of region, covered at least one assessment objective in the *Number Knowledge* domain, reaching 98% of coverage. Interestingly, both North America and Western Europe and East Asia and the Pacific had 100% of their respective NAFs cover the *Number Knowledge*, *Measurement*, *Statistics and Probability*, *Geometry*, and *Algebra* domains. The least emphasis was placed, again, on *Math Proficiency* across all 7 regions, following suit with similar explanations as to why that domain is underrepresented.

There were significant disparities seen in three out of the six domains: *Measurement*, *Statistics and Probability*, and *Algebra*. The Arab States, Latin America and the Caribbean, and South and West Asia seem to be placing less emphasis on *Measurement* objectives. The Arab States and Latin America and the Caribbean also seem to be placing less emphasis on *Geometry*, in comparison to Member States in the four remaining regions, in which 100% coverage of the *Geometry* domain was observed. Less emphasis on objectives regarding *Statistics and Probability* seems to be placed by Member States in Central and Eastern Europe and Sub-Saharan Africa, whereas less emphasis on *Algebra* is placed by Member States in Latin America and the Caribbean and the Arab States.

#### Sub-domain level

An even more nuanced understanding of the results can be seen when looking at a breakdown of the data by sub-domains for each region of the world. The information displayed in *Figure 5*, below, shows a breakdown, by percent, of sub-domains covered in each region.

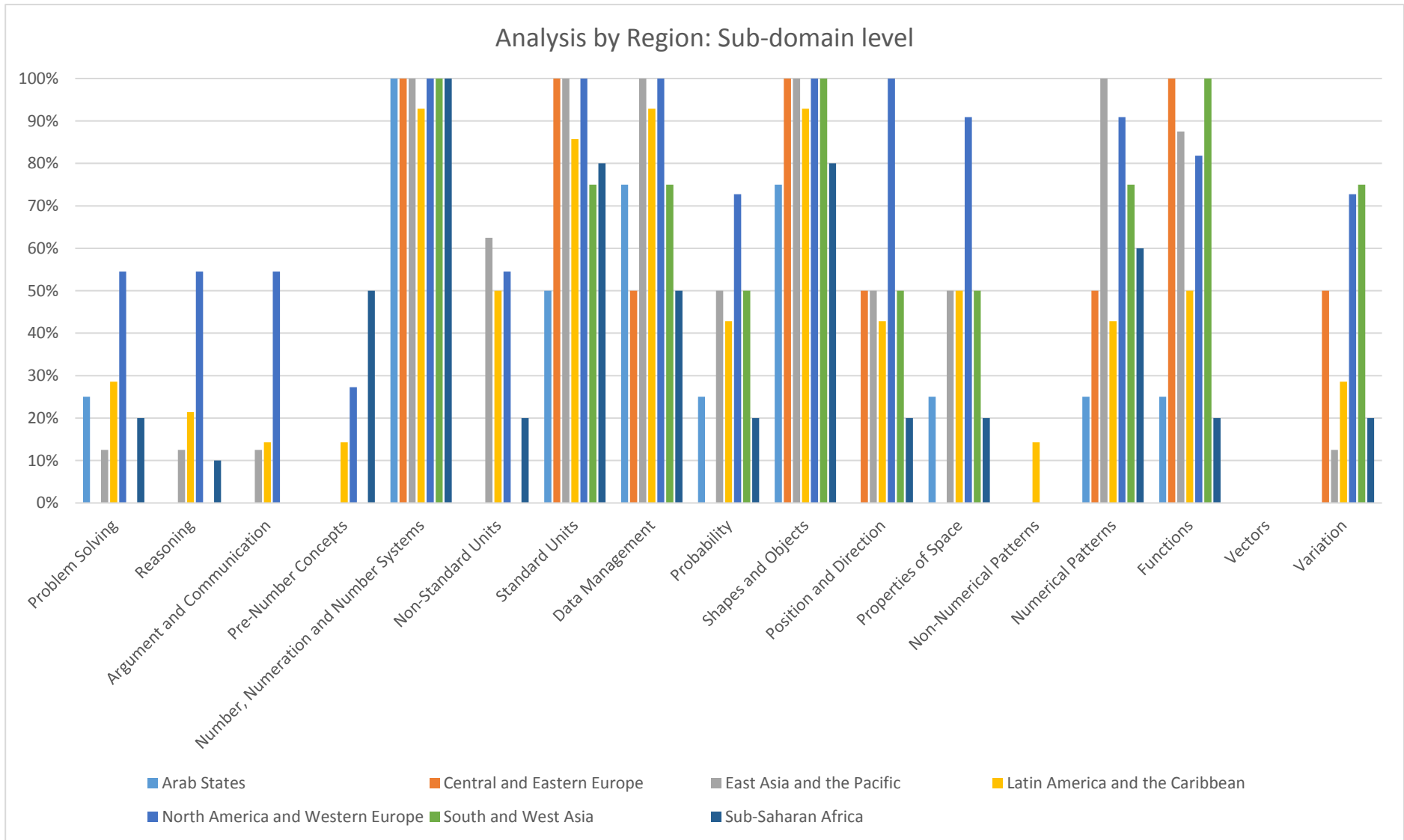


Figure 5: Analysis by region: Sub-domain level

The greatest disparities in coverage of sub-domains among regions can be observed in the “Problem Solving,” “Reasoning,” and “Argument and Communication” sub-domains within the *Math Proficiency* domain. North America and Western Europe seems to have significantly higher coverage of these sub-domains than other regions, whilst, consistent with the domain level analysis, Central and Eastern Europe and South and West Asia do not cover these sub-domains at all.

North America and Western Europe also seems to be diverting from other regions regarding the “Position and Direction” and “Properties of Space” sub-domains within *Geometry*. Specifically, there is a 40% - 50% difference in the coverage of these sub-domains by North America and Western Europe, in comparison to other regions, which shows the great importance given by this region to these aspects of *Geometry*.

Also diverting from other regions is the high presence of the “Pre-Number Concepts” sub-domain (*Number Knowledge* domain) in NAFs of Sub-Saharan Africa. A hypothesis stated earlier, and verified in section [II.4 \(Analysis of NAFs: Classification by Education Level\)](#), considers this sub-domain to be absent from higher levels of education, as its concepts are often covered in lower education levels. A closer look at the NAFs of Member States from Sub-Saharan Africa shows that the vast majority of them (8 out of 11 NAFs, or 73%) are for the Lower Primary education level, which explains the high coverage of the “Pre-Number Concepts” sub-domain by this region.

In sum, while the regional analysis does provide some interesting information regarding content area coverage, it appears that the region of the world does not play a significant role in determining coverage of domain or sub-domain content areas of NAFs. Analysis based on income classification levels could perhaps help to shed more light in regards to commonalities and differences among the coverage of domains and sub-domains within NAFs.

### 3. Analysis of NAFs: Classification by Income

The classification of the 53 Member States by income, in *Low-Income*, *Lower-Middle-Income*, *Higher-Middle-Income*, and *High-Income* countries (World Bank, 2017)<sup>6</sup> was used for this part of the analysis: 17 High-Income (37%), 15 Upper-Middle-Income (29%), 15 Lower-Middle-Income (29%), and 5 Low-Income (10%). Palestine does not fall into one of these categories as denoted by the World Bank (2017) and, therefore, is listed as *Uncategorized*. Any information regarding this Member State has been left out of these analyses.

Similar to the previous section, the data collected from one Member State’s NAFs was combined so that each Member State would only appear once within an income level. This decision was made considering that many Member States had multiple NAFs developed for different grades. This was determined to be necessary in order to avoid the data being skewed by having the data of one Member State represented multiple times within one income classification level (due to that Member State having multiple NAFs). As a result, the total number of Member States for this analysis is that of 52.

#### Domain level

The information displayed in [Figure 6](#), below, shows a breakdown, by percent, of domains covered by Member States in each income classification level.

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<sup>6</sup> This classification was preferred over the separation between developed and developing countries, which are terms that are no longer used by the World Bank (Fantom, 2016). Instead, the classification was made between Low-Income, Lower-Middle-Income, Upper-Middle-Income, and High-Income Member States. This classification was used to provide a precise description and facilitate a richer analysis of the data collected.

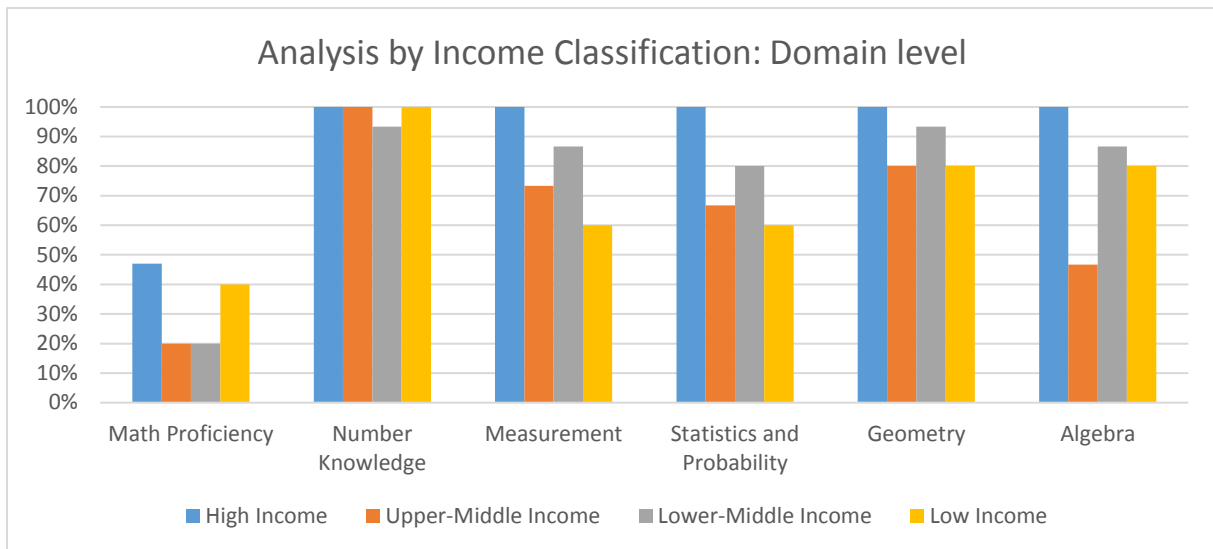


Figure 6: Analysis by income classification: Domain level

All High-Income Member States cover five of the six domains completely, with the exception of *Math Proficiency*, which is the least represented across the board, regardless of income levels. High-Income, Upper-Middle-Income, and Low-Income Member States achieved 100% of coverage in the *Number Knowledge* domain, while Lower-Middle-Income Member States achieved 93% coverage (14 out of 15 Member States).

The most striking data revolves around Member States classified as Low-Income. This observation should however be read with caution of the number of Low-Income Member States (5) in comparison to Lower-Middle and Upper-Middle Income (15 for each income level). Member States classified as Low-Income cover a larger percentage of *Math Proficiency* (2 out of 5, or 40%) and *Algebra* (4 out of 5, or 80%) than Member States classified as Upper-Middle-Income (3 out of 15, or 20% for *Math Proficiency*; 7 out of 15, or 47% for *Algebra*). Upper-Middle-Income Member States only surpass the percentages of Low-Income Member States in two domains: *Measurement* and *Statistics and Probability* (Note: There is 80% coverage for these two classification levels in the *Geometry* domain). Lower-Middle-Income Member States also trend in this direction, surpassing Upper-Middle-Income Member States in every domain except *Math Proficiency* and *Number Knowledge*.

### Sub-domain level

As with the analysis by region of the world, an even more nuanced understanding of the results can be seen when looking at a breakdown of the data by sub-domains for each income classification level. The information displayed in [Figure 7](#), below, shows a breakdown, by percent, of sub-domains covered by each of the income classification levels.



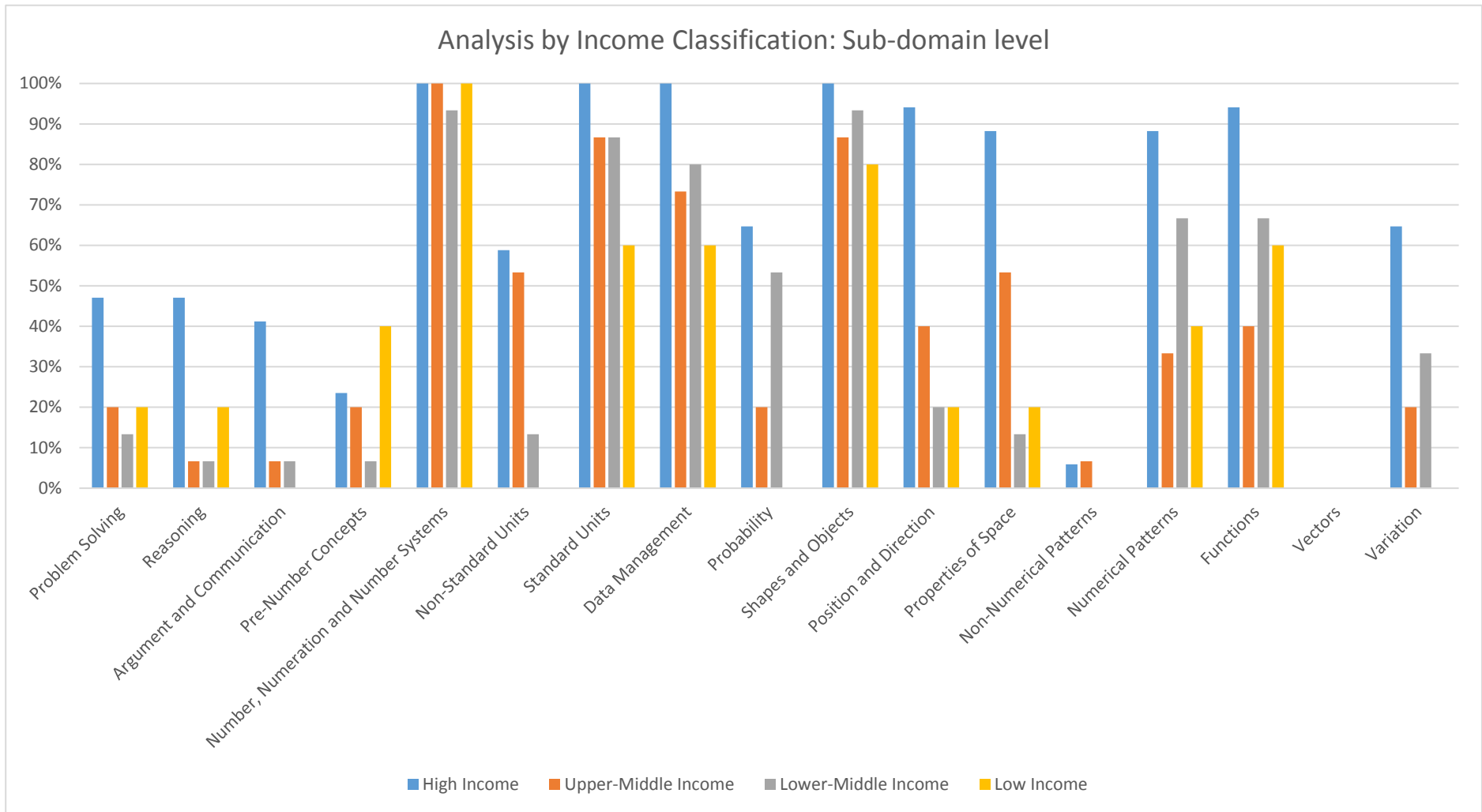


Figure 7: Analysis by income classification: Sub-domain level

Following suit with the domain level analysis, sub-domain level analysis revealed that there was generally more coverage across all sub-domains within High-Income Member States. This was most prevalent in the sub-domains within the *Math Proficiency*, *Geometry*, and *Algebra* domains. In addition, this level of analysis revealed that there does not appear to be any relationship between Upper-Middle-Income, Lower-Middle-Income, and Low-Income Member States regarding sub-domain coverage.

It is interesting to note that most sub-domains are covered by Member States of all income levels<sup>7</sup>. An exception to this are Lower-Middle-Income Member States that do not include any objectives regarding “Non-Numerical Patterns” in their NAFs. Most notable, however, is the observation that Low-Income Member States is the income category that does not cover the most sub-domains, namely “Argument and Communication,” “Non-Standard Units,” “Probability,” “Non-Numerical Patterns,” “Vectors,” and “Variation.” The absence of these sub-domains and the low coverage of others from the NAFs of Low-Income Member States could potentially signify relatively simpler or narrower curricula and, subsequently, NAFs within these Member States.

“Shapes and Objects” is the most represented sub-domain (within *Geometry*) in NAFs of Member States of all income levels. Consistent with regional analysis, is a decrease in the coverage of the other two sub-domains by Member States of all income levels, albeit to different degrees. The decrease in the coverage of the other two sub-domains is slightly over 10% for High-Income Member States, but ranges from 30% to 80% for Member States of other income levels. A similar trend is observed regarding the sub-domains within the *Math Proficiency* and *Algebra* domains, albeit to a lesser degree.

There are trends noticed throughout the analyses of income classification levels. Generally, there is more coverage across all domains and sub-domains within the High-Income Member States. Several possible explanations could be given for this observation. A possible reason is that High-Income Member States allocate more resources to education overall and the development of thorough, complete NAFs. An additional factor that contributes to higher coverage of domains and sub-domains within NAFs of High-Income Member States is critical mass, which is an advantage of theirs against Member States of lower income levels. Critical mass could potentially lead to a better alignment between curriculum frameworks and NAFs, a hypothesis that would need to be further investigated. Higher coverage of the different sub-domains within NAFs of High-Income Member States would eventually allow the students of these Member States to develop skills and knowledge that students of Member States of other income levels do not.

#### 4. Analysis of NAFs: Classification by Education Level

The classification of all NAFs by education level, based on the three points of measurement of SDG 4.1.1 (grades 2/3; end of primary; end of lower secondary), was used for the analysis of the domain and sub-domain levels. Therefore, the 117 NAFs were organized in the following categories: Lower Primary<sup>8</sup> (47 NAFs, or 40%), Upper Primary (47 NAFs, or 40%), and Lower Secondary (23 NAFs, or 20%). In respecting the integrity of each Member State’s NAF(s), the research team grouped education levels according to what was mentioned in the NAF. For example, if a Member State stated grade 6 as Upper Primary, this grouping was respected and the research team classified that NAF as part of the Upper Primary level. On the contrary, if another Member State stated grade 6 as part of Lower Secondary, then this was respected and included in the Lower Secondary level data.

Moreover, it is crucial to note that in this analysis the total number of NAFs was 117, rather than 115, as otherwise noted in this report. The reason for this was that during the grouping of grade levels into education levels, two Member States’ NAFs (Bangladesh and Senegal) included overlapping grade levels; and separating them was determined as the best way to respect the Member States’ NAFs. In

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<sup>7</sup> This is not the case for the “Vectors” sub-domain within the *Algebra* domain, which is the only sub-domain that was not covered by any NAF.

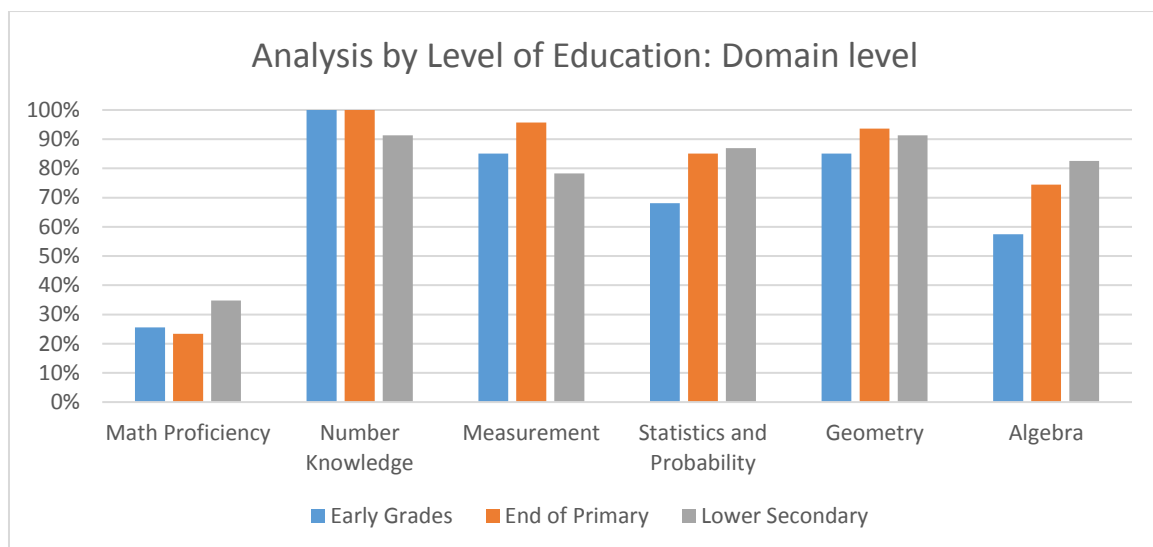
<sup>8</sup> Even though the first point of measurement of indicator 4.1.1 focuses only on grades 2 and 3, data from grade 1 was also mapped and analysed, in an attempt to expand the scope of this report and analysis.

Bangladesh, an NAF included data for grades 1 and 4, which overlapped between Lower Primary and Upper Primary. In Senegal, an NAF included data from grades 3 and 5, which overlapped between Lower Primary and Upper Primary. The research team made the decision to separate these overlapping datasets for each Member State in order to best represent the presence of data for each education level; therefore, the total number of NAFs for this analysis is that of 117.

The number of NAFs in each education level should be kept in mind when interpreting the data. It must be clearly stated that the quantity of NAFs in the Lower Secondary level is only 23 out of 117 (20%), which may mislead initial interpretation of the percentile representation in the graphs in this section. In light of this information, a thorough interpretation of the graphs and their values are represented below.

### Domain level

The information displayed in *Figure 8*, below, shows a breakdown, by percent, of domains covered by all 117 NAFs per education level.



*Figure 8: Analysis by level of education: Domain level*

Analysis on this level revealed a consistently (for the most part) increased coverage of all domains and sub-domains in Upper Primary NAFs in comparison to Lower Primary NAFs. This higher coverage is logical, considering the coverage of more mathematical concepts within higher grades of education. The commonalities between Lower Primary and Upper Primary for all domain levels, represents a linkage between each category in all NAFs. Such a linkage indicates that learning objectives and assessments are closely tied and well-articulated throughout the Primary education levels. Even though one would expect that this trend would continue in Lower Secondary NAFs, this was not always the case. The only domains with increased coverage at the Secondary level of education were those of *Math Proficiency*, *Algebra*, and *Statistics and Probability*, whereas the coverage of other domains decreased. This could be attributed to a lower number of NAFs in Lower Secondary (23) in comparison to Lower and Upper Primary (47 in each category). Furthermore, the difference between Upper Primary and Lower Secondary calls for further research and analysis into the root causes and an examination of the transition from levels and articulation of learning objectives is needed by all Member States, with the aim of strengthening the curricula and assessments whilst ensuring a smooth transition for learners.

### Sub-domain level

The information displayed in *Figure 9*, below, shows a breakdown, by percent, of the sub-domains covered by 117 NAFs per education level.

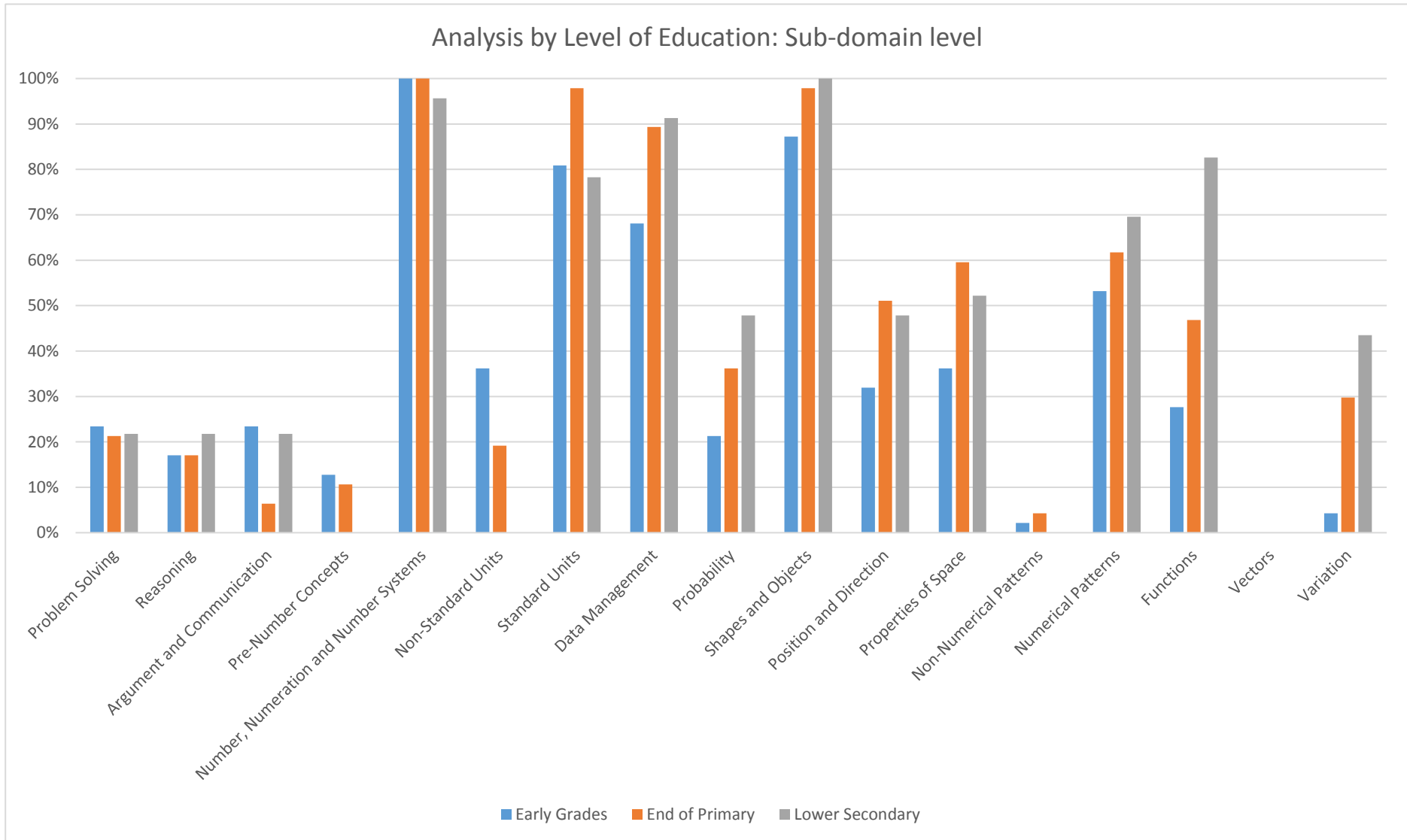


Figure 9: Analysis by level of education: Sub-domain level

Analysis on the sub-domain level was consistent with analysis on the domain level. Again, it revealed a consistently (for the most part) increased coverage of most sub-domains in Upper Primary NAFs in comparison to Lower Primary NAFs. An exception to this rule were the “Pre-Number Concepts” and “Non-Standard Units” sub-domains, regarding which an increase was noted from Lower to Upper Primary NAFs and a noticeable 0% of NAFs in Lower Secondary. A zero representation of these two sub-domains reaffirms the hypothesis stated in sections [II.1 \(Analysis of NAFs: An Overall Look\)](#) and [II.2 \(Analysis of NAFs: A Regional Comparison\)](#), when looking at their low coverage across all NAFs, as such sub-domains are a prerequisite to more complex mathematical concepts and thus need not be included in Lower Secondary NAFs.

The sub-domains “Number, Numeration and Number Systems,” “Standard Units,” “Position and Direction,” and “Properties of Space” present a decrease in their presence within Lower Secondary NAFs, which appears inconsistent with the general observation. This could be attributed to a lower number of NAFs in Lower Secondary (23) in comparison to Lower and Upper Primary (47 in each category). However, this could also be an indicator of learning objectives and assessments not being closely tied and well-articulated between Upper Primary and Lower Secondary education levels. Therefore, the difference between these two education levels calls for further research and analysis into the root causes and an examination of the transition from levels and articulation of learning objectives is needed by all Member States, with the aim of strengthening the curricula and assessments whilst ensuring a smooth transition for learners.

## 5. Analysis of NAFs: Classification by Language

Given the fact that this report includes the collection of 115 NAFs of different languages from Member States, it was determined that an analysis by language was necessary. A linguistic analysis could shed light on commonalities, differences and trends among the three languages. A disproportionately higher number of English-language NAFs were collected for this project; therefore, this must be kept in mind when viewing this data and report.

Similarly to previous sections, the data collected from one Member State’s NAFs was combined so that each Member State would only appear once within a language. This decision was made taking into consideration the fact that many Member States had multiple NAFs developed for different grades as it has been said. This was determined to be necessary in order to avoid the data being skewed by having the data of one Member State represented multiple times within each language (due to that Member State having multiple NAFs).

In total, 37 out of 54 Member States (69%) had their NAF(s) in English, 5 out of 54 (9%) had their NAF(s) in French, and 12 out of 54 (22%) had their NAF(s) in Spanish. It is also important to note that the majority of Member States with Spanish-language NAFs belonged in the Latin America and the Caribbean region (11 out of 12 Member States, or 92%). Member States with French-language NAFs came from North America and Western Europe (3 out of 5 Member States, or 60%) and Sub-Saharan Africa (2 out of 5 Member States, or 40%), whereas Member States with English-language NAFs came from all regions of the world that are present in this report.

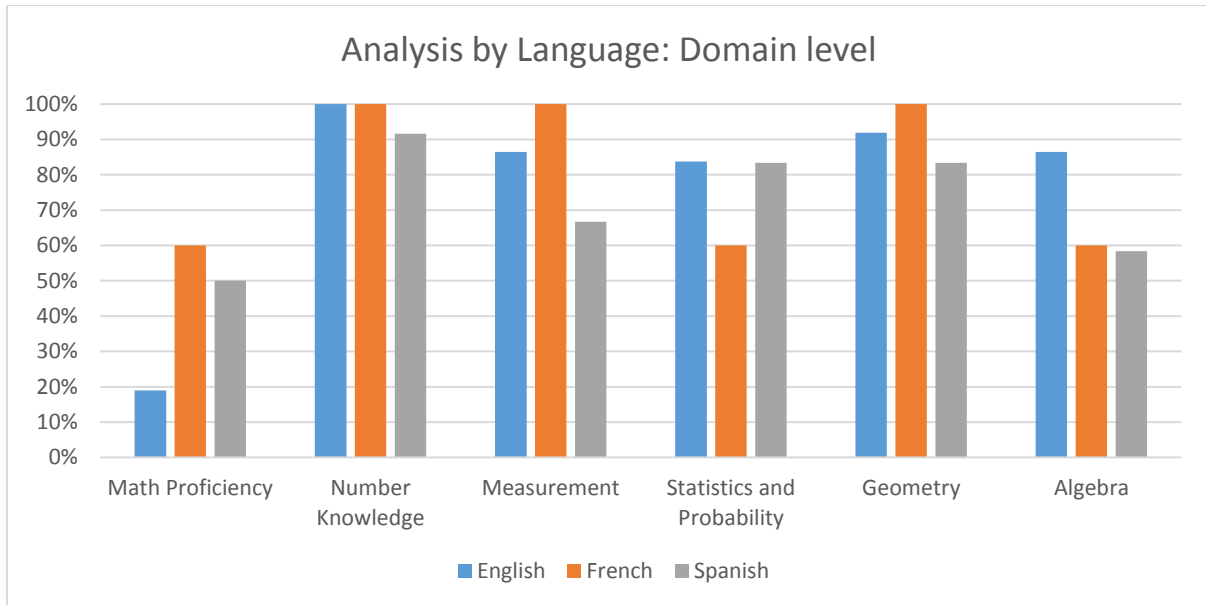
Moreover, it is crucial to note that in this analysis the total number of Member States was 54, rather than 53, as otherwise noted in this report. The reason for this was due to the fact that in the case of Canada, Quebec, both a French- and an English-language NAF was available, each corresponding to the Francophone and Anglophone sector of the province.<sup>9</sup> Determinations were thus made by the research team to consider Canada, Quebec as part of both the French- and English-language NAFs; therefore, the total number of Member States for this analysis is that of 54.

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<sup>9</sup> Even though ‘French is the first language of 80% of the population of Québec [...] [and] the language of instruction, [...] the Charter does provide for certain special cases where children are permitted to pursue their preschool, elementary and secondary school education in English at English-language public schools or subsidized private schools’ (Ministère de l’Éducation et de l’Enseignement supérieur, Québec, 2017).

### Domain level

The information displayed in *Figure 10*, below, shows a breakdown, by percent, of domains covered by 54 Member States in each language.



*Figure 10: Analysis by language: Domain level*

Commonalities seem to appear in terms of coverage of domains across Member States with NAFs in the three languages, as they all cover most domains to a similar degree. Differences were mainly apparent between Member States with French-language NAFs, and English- and Spanish-language NAFs. A surprisingly low coverage of the domain of *Statistics and Probability* was noticed among Member States with French-language NAFs in comparison to other domains. On the other hand, high coverage of the *Math Proficiency* domain was noticed in Member States with French- and Spanish-language NAFs in comparison to Member States with English-language NAFs. This could be attributed to the NAFs of these Member States being structured, designed, and developed following a competency-based approach.

### Sub-domain level

The information displayed in *Figure 11*, below, shows a breakdown, by percent, of the sub-domains covered by the 54 Member States per language of NAF.



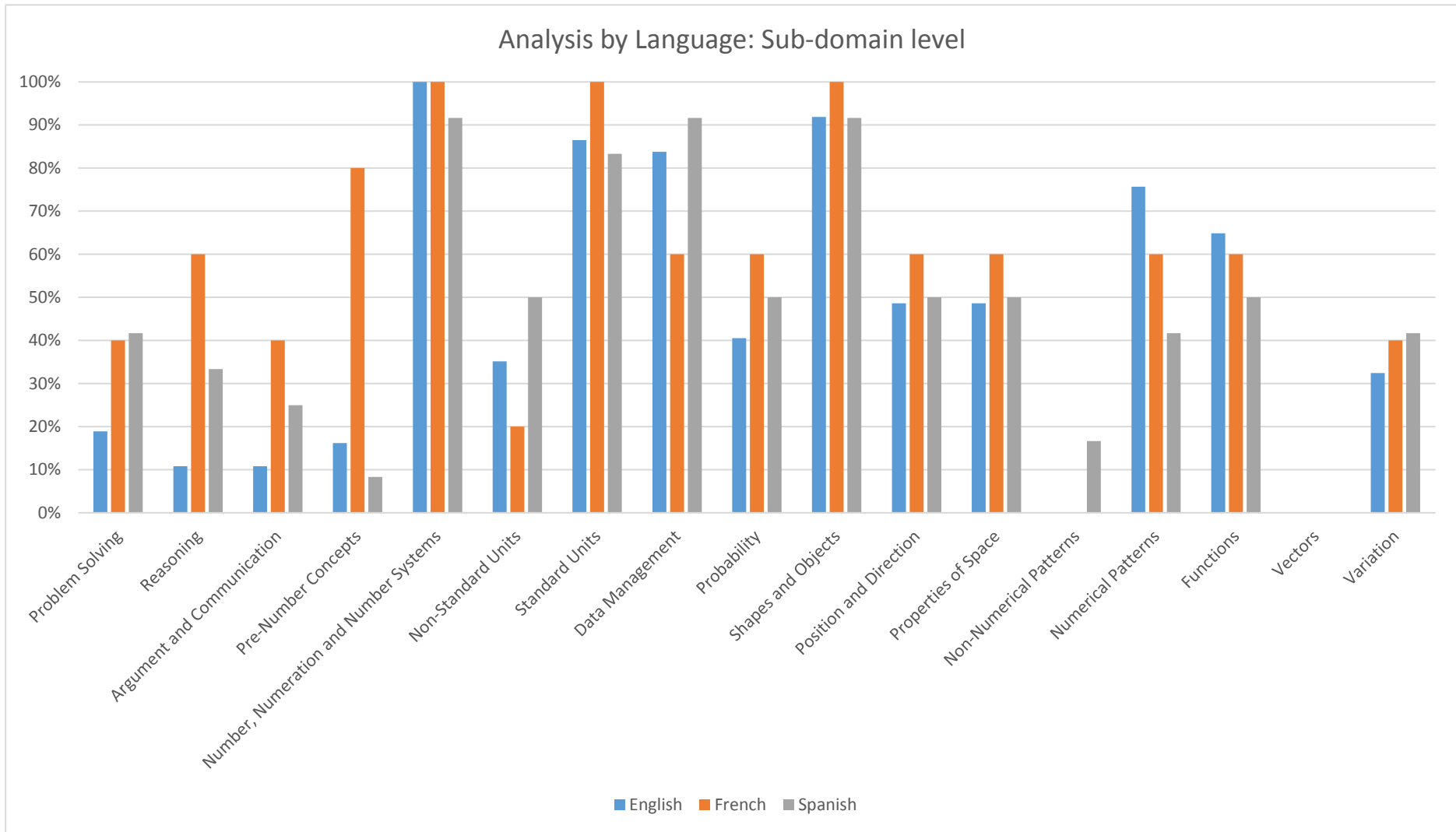


Figure 11: Analysis by language: Sub-domain level

An even more nuanced understanding of the results can be garnered when looking at a breakdown of the sub-domains by language. Consistent with the domain level analysis, differences were mainly apparent between French-language NAFs, and English- and Spanish-language NAFs.

Most striking is the high representation of the sub-domains within the *Math Proficiency* domain, mainly those of “Reasoning” and “Argument and Communication,” within Member States with French-language NAFs. The source of the high representation in *Math Proficiency* in general, and the two aforementioned sub-domains in particular, in Member States with French-language NAFs came primarily from France and Belgium (2 out of 5 Member States with French-language NAFs, or 40%), whose NAFs were structured, designed, and developed with a competency-based framework. Such an approach facilitates a cross-cutting emphasis on proficiency, cross-disciplinary skills and comprehensive learning objectives, which focused on learners’ proficiency in problem-solving, reasoning, and argument and communication rather than uniquely computations.

Another difference that could only be highlighted through a breakdown of the sub-domains by language is the presence of the “Non-Numerical Patterns” sub-domain solely within Member States with Spanish-language NAFs (2 out of 12 Member States, or 17%). A closer look at both the curriculum frameworks and NAFs of these countries would be required to help to shed light to this observation. Finally, a high presence of the “Pre-Number Concepts” sub-domain within Member States with French-language NAFs, in comparison to those with English- and Spanish-language NAFs is observed. Analyses by education level revealed that this sub-domain is linked to lower grades of education, and as such it is more commonly found within NAFs of Lower Primary education. Taking into consideration that 3 out of the 6 (50%) of French-language NAFs concerned the Lower Primary level, the high presence of this sub-domain within Member States of this language is logical.

### III. Limitations and the Way Forward

In providing an initial global picture of Mathematics content assessed worldwide at the national level, this study has highlighted some interesting trends. However, several factors must be considered when reviewing its findings. The data analysed and the methods used here have inevitable limitations; these have been highlighted throughout the report and are discussed here. The research team's recommendations are also included here; these focus on ways for moving forward in monitoring SDG 4.1 - Education 2030 and in developing the Coding Scheme into a UNESCO Content Framework of Reference to be used by Member States to assess and improve the content coverage of their national assessment systems and frameworks.

#### 1. Dataset

The research team sought to collect NAFs from, and thus include in this analysis, as many Member States and regions of the world as possible. However, difficulties in communication with Member States, differences in the content of national assessment documents globally, as well as potential absence of low-stakes, national assessment practices in some Member States hindered this effort. As a result, NAFs were collected from 83 out of 210 (40%) Member States, out of which only NAFs from 53 out of the 210 (25%) Member States were used in this study.

This was due to, firstly, the scope of the study and, secondly, and most importantly, language limitations. The extent of the study to Lower Secondary education (according to the three points of measurement of SDG 4.1) meant that any NAFs regarding Upper Secondary education could not be included in it. In addition, given time and resource restrictions, NAFs written in languages other than English, French, and Spanish could not be utilized. As a result, there are regions of the world that are either not represented (i.e. Central Asia) or represented to a lesser degree than others in this study (i.e. Central and Eastern Europe, Arab States, Sub-Saharan Africa), as their official languages are not part of this study. While the information analysed was shown in percentages in order to standardize the data across regions, it still falls short of providing the most robust analysis. Evidently, there will continue to be limitations until NAFs of all the official languages of UNESCO can be mapped into the Coding Scheme.

#### 2. Quantity vs Quality

The Coding Scheme allowed the research team to place all objectives from NAFs into respective categories on the Content Reference list. The strongest aspects of it were its extensiveness and detail, as it provided for an unequivocally objective mapping of the NAFs, regardless of who was coding or the region of the world from which the NAF came. However, when transferring the qualitative data mapped onto the Content Reference List, to the quantitative database for analysis, the research team made the decision to consider a category (i.e. domain, sub-domain) "present," if at least one subsequent category was found in an NAF. For example, if a construct was considered "present" in an NAF, it means that at least one sub-construct was identified within that NAF, and so on and so forth. Even though this determination provided enough of a distinction to illicit useful data, it is crucial to understand that the information, specifically that of domain and sub-domain levels, was analysed for quantity of objectives, not quality, and therefore does not necessarily represent rigor of assessment objectives or a way to standardize information across content areas. This limitation should thus be borne in mind, when interpreting the results of these analyses. It is also imperative that consideration is taken of this limitation, when further developing the Content Reference List and Coding Scheme into a UNESCO Content Framework of Reference that could be used by Member States.

#### 3. Progressive nature of assessment

The extensive content coverage of the Coding Scheme, as highlighted earlier, was one of the strongest aspects of it, allowing NAFs for grades 1 to 8 to be mapped into it. Despite its breadth of detail, the Coding Scheme did not follow the progressive nature of NAFs and national assessment systems and

policies in general. Even though this limitation did not affect this study and analysis, it should be taken into consideration when efforts are made to develop it into a tool that could be used by Member States.

The analysis of data by education levels in this study revealed a strong linkage between content categories in NAFs from Lower to Upper Primary. Such a linkage indicates that learning objectives and assessments are closely tied and well-articulated throughout the Primary education levels. Even though one would expect that this trend would continue in Lower Secondary NAFs, this was not always the case. A possible explanation for this could be the poor transition between the Upper Primary and Lower Secondary levels and articulation of learning objectives. Breaking down the information by either grades, education levels, or performance levels could provide Member States with an understanding of the levels of learning around the globe, and at the same time enable them to strengthen their curricula and assessments whilst ensuring a smooth transition for learners.

The UNESCO Content Framework of Reference should be broken down into a more granular level with either grade level data, data classified by the three points of measurement of SDG 4.1 (grades 2/3, end of primary, lower secondary), or performance levels. Data gathered by each level will allow each Member State to visualize and take note of the scope and sequence of their curriculum and assessments, identifying possible gaps between grades or levels of education. A separate report focusing on content coverage of cross-national assessments (regional and international assessments) as well as performance levels of national, regional, and international assessment frameworks is currently in-progress by UIS and IBE-UNESCO. That report could help to shed light in the progressive nature of assessment, by defining the minimum level of proficiency as well as progression of learning. Its findings, when combined with the findings of the present study on NAFs, would form the basis for the development of the UNESCO Content Framework of Reference.

## Conclusion

Monitoring of learning outcomes with regard to SDG 4.1 - Education 2030 is among the main areas of focus of both UIS and IBE-UNESCO. The collaborative project towards mapping the content of NAFs for Target 4.1 for Literacy and Mathematics, in order to produce cross-nationally comparable indicators, is an initial attempt towards this objective. Following this initial development of a Coding Scheme for Mathematics and subsequent mapping of content of NAFs, the development of a UNESCO Content Framework of Reference that could be used by Member States would be the next step in this effort.

As noted in this report, most notable trends were among education levels and income classification levels. The presence of trends between education levels is clear between Lower Primary and Upper Primary, with the highest correlation between these two levels. As mentioned in the above sections of the report, such a trend indicates a close articulation of learning objectives and assessments in the Primary education level. Noteworthy was the lack of articulation between Upper Primary and Lower Secondary, which signifies a need for attention by Member States to close this gap in the scope and sequence of their education policies and documents. The presence of trends between Member States of different income classification levels is prevalent regarding the extensiveness of content areas covered within NAFs. In the majority of analyses, Member States classified as High-Income contained better coverage of both domains and sub-domains.

The likely explanation for this income classification trend, is that Member States of higher income levels have the ability to teach a broader set of skills per content category and thereby typically include more objectives per domain and sub-domain, mapping to the respective categories. This could be a result of these Member States allocating more resources to the development of their NAFs or due to the existence of critical mass, which is an advantage of theirs against Member States of lower income levels. Furthermore, a hypothesis that would need to be further investigated, is the possibility of alignment of curriculum and assessment and better correlation between curriculum frameworks and NAFs. This would allow Member States not only to develop competency-related indicators within their curriculum frameworks, but also to effectively reflect them within their NAFs. The lack of information on assessment and the inexistence of NAFs within Low-Income Member States, could be interpreted either as an issue of developing such policies within Member States or as an issue of communication between the Member States and UNESCO.

The development of a UNESCO Content Framework of Reference could assist Member States in this regard, as it would allow them to utilise it as a preliminary guide in the development of such policies and as an evaluation tool. The Framework could then be used for, and by, those Member States which are in the process of developing or would like to develop an NAF or a self-assessment tool of their national assessment model and frameworks. The Coding Scheme and Content Reference List form a strong basis for the development of such a model, due to their extensiveness and detail. The areas for improvement identified and mentioned above should be taken into consideration during the development phase. Translation of NAFs provided in languages other than English, French, and Spanish could help to shed light in regions of the world that are misrepresented in comparison to others in this study. In addition, ways of assessing quality of learning objectives, in addition to quantity of them should be explored for a better representation of rigor of assessment objectives. Finally, the possibility of the progressive nature of education, assessment systems, and NAFs needs to be taken into consideration and reflected within the final Content Framework of Reference. Cross-national (regional and international) assessments, both in terms of content and performance levels, will also inform this Framework and contribute in making it more comprehensive and an adequate, to the best possible extent, representation of information from the various levels (national, regional, and international). The Framework has the potential to ultimately allow Member States to improve the quality of education not only within their national assessments, but as a whole, while at the same time allowing UNESCO to monitor progress towards SDGs - Education 2030, and SDG 4.1 in particular.

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## Annex 1: NAFs analysed in this study

### Regions of the world:

- 1: North America and Western Europe
- 2: East Asia and the Pacific
- 3: South and West Asia
- 4: Latin America and the Caribbean
- 5: Arab States
- 6: Central and Eastern Europe
- 7: Sub-Saharan Africa
- 8: Central Asia

### Income classification levels:

- HI: High-Income  
 UMI: Upper-Middle-Income  
 LMI: Lower-Middle-Income  
 LI: Low-Income  
 UC: Uncategorized

Region	Member State	Grade Level	Income Level	Language	Document
1	Belgium	2	HI	French	Fédération Wallonie-Bruxelles, Enseignement et Recherche Scientifique. n.d. <i>Socles de Compétences – Enseignement Fondamental et Premier Degré de l’Enseignement Secondaire.</i>
1	Belgium	6	HI	French	Fédération Wallonie-Bruxelles, Enseignement et Recherche Scientifique. n.d. <i>Socles de Compétences – Enseignement Fondamental et Premier Degré de l’Enseignement Secondaire.</i>
1	Belgium	8	HI	French	Fédération Wallonie-Bruxelles, Enseignement et Recherche Scientifique. n.d. <i>Socles de Compétences – Enseignement Fondamental et Premier Degré de l’Enseignement Secondaire.</i>
1	Canada - Alberta	3	HI	English	Ministry of Education, Alberta Education. 2016. <i>Alberta Provincial Student Learning Assessment – Information Bulletin 2016-2017 Grade 3: Literacy and Numeracy.</i>
1	Canada - Alberta	6	HI	English	Ministry of Education, Alberta Education. 2016. <i>Alberta Provincial Achievement Testing – Subject Bulletin 2016-2017 Grade 6 – Mathematics.</i>
1	Canada - Ontario	3	HI	English	Education Quality and Accountability Office. 2007. <i>Framework – Assessment of Reading, Writing and Mathematics, Primary Division (Grades 1-3).</i>
1	Canada - Ontario	6	HI	English	Education Quality and Accountability Office. 2007. <i>Framework – Assessment of Reading, Writing and Mathematics, Junior Division (Grades 4-6).</i>
1	Canada - Ontario	8	HI	English	Council of Ministers of Education, Canada (CMEC). 2016. <i>Pan-Canadian Assessment Program – PCAP 2016 – Assessment Framework.</i>
1	Canada - Quebec	2	HI	English	Éducation, Loisir et Sport, Québec. 2009. <i>Progression of Learning – Mathematics.</i>
1	Canada - Quebec	4	HI	English	Éducation, Loisir et Sport, Québec. 2009. <i>Progression of Learning – Mathematics.</i>



1	Canada - Quebec	6	HI	English	Éducation, Loisir et Sport, Québec. 2009. <i>Progression of Learning – Mathematics</i> .
1	Canada - Quebec	8	HI	English	Ministère de l'Éducation et de l'Enseignement supérieur, Québec. 2016. <i>Progression of Learning in Secondary School – Mathematics</i> .
1	France	3	HI	French	Ministère de l'Éducation nationale, de l'Enseignement supérieur et de la Recherche. 2016. <i>Compétences du Socle – Document d'Accompagnement pour l'Évaluation des Acquis du Socle Commun de Connaissances, de Compétences et de Culture. Éléments pour l'Appréciation du Niveau de Maîtrise Satisfaisant en Fin de Cycle 2</i> .
1	France	6	HI	French	Ministère de l'Éducation nationale, de l'Enseignement supérieur et de la Recherche. 2016. <i>Compétences du Socle – Document d'Accompagnement pour l'Évaluation des Acquis du Socle Commun de Connaissances, de Compétences et de Culture. Éléments pour l'Appréciation du Niveau de Maîtrise Satisfaisant en Fin de Cycle 3</i> .
1	France	8	HI	French	Ministère de l'Éducation nationale, de l'Enseignement supérieur et de la Recherche. 2016. <i>Compétences du Socle – Document d'Accompagnement pour l'Évaluation des Acquis du Socle Commun de Connaissances, de Compétences et de Culture. Éléments pour l'Appréciation du Niveau de Maîtrise Satisfaisant en Fin de Cycle 4</i> .
1	Iceland	4	HI	English	Ministry of Education, Science and Culture. 2014. <i>The Iceland National Curriculum Guide for Compulsory Schools – with Subject Areas</i> .
1	Iceland	7	HI	English	Ministry of Education, Science and Culture. 2014. <i>The Iceland National Curriculum Guide for Compulsory Schools – with Subject Areas</i> .
1	Ireland	2	HI	English	Educational Research Centre. 2014. <i>The 2014 National Assessments of English Reading and Mathematics. Volume 1: Performance Report</i> .
1	Ireland	6	HI	English	Educational Research Centre. 2014. <i>The 2014 National Assessments of English Reading and Mathematics. Volume 1: Performance Report</i> .
1	Malta	6	HI	English	Department of Curriculum Management, Malta. 2014. <i>Mathematics – A Revised Syllabus for Primary Schools</i> .
1	Spain	3	HI	Spanish	Ministerio de Educación, Cultura y Deporte. 2015. <i>Marco General de la Evaluación de 3er Curso de Educación Primaria</i> .
1	Spain	6	HI	Spanish	Ministerio de Educación, Cultura y Deporte. 2015. <i>Marco General de la Evaluación Final de Educación Primaria</i> .
1	UK - England	2	HI	English	Standards and Testing Agency. 2015. <i>Key Stage 1 – Mathematics Test Framework – National Curriculum Tests from 2016 – For Test Developers</i> .
1	UK - England	6	HI	English	Standards and Testing Agency. 2015. <i>Key Stage 2 – Mathematics Test Framework – National Curriculum Tests from 2016 – For Test Developers</i> .
1	USA	4	HI	English	National Assessment Governing Board, U.S. Department of Education. 2014. <i>Mathematics Framework for the 2015 National Assessment of Educational Progress</i> .
1	USA	8	HI	English	National Assessment Governing Board, U.S. Department of Education. 2014. <i>Mathematics Framework for the 2015 National Assessment of Educational Progress</i> .
2	Australia	3	HI	English	NAPLAN and ACARA. 2016. <i>Minimum standards – numeracy (Year 3)</i> .
2	Australia	5	HI	English	NAPLAN and ACARA. 2016. <i>Minimum standards – numeracy (Year 5)</i> .
2	Australia	7	HI	English	NAPLAN and ACARA. 2016. <i>Minimum standards – numeracy (Year 7)</i> .
2	Cambodia	3	LMI	English	Ministry of Education, Youth and Sport Cambodia (MoEYS) and Education Quality Assurance Department (EQAD). 2016. <i>Results of Grade Three Student Achievement from the National Assessment in 2015</i> .
2	Cambodia	6	LMI	English	Ministry of Education, Youth and Sport Cambodia (MoEYS) and Education Quality Assurance Department (EQAD). 2015. <i>Results of Grade Six Student Achievement from the National Assessment in 2013</i> .
2	Cambodia	8	LMI	English	Ministry of Education, Youth and Sport Cambodia (MoEYS) and Education Quality Assurance Department (EQAD). 2016. <i>Results of Grade Eight Student Achievement from the National Assessment in 2014</i> .
2	Fiji	4	UMI	English	Ministry of Education, Heritage and Arts. 2016. <i>Year 4 Numeracy Outcomes</i> .
2	Fiji	6	UMI	English	Ministry of Education, Heritage and Arts. 2016. <i>Year 6 Numeracy Outcomes</i> .
2	Fiji	8	UMI	English	Ministry of Education, Heritage and Arts. 2016. <i>Year 8 Numeracy Outcomes</i> .
2	Hong Kong	3	HI	English	Hong Kong Examinations and Assessment Authority. n.d. <i>Mathematics Curriculum – The Basic Competency at the end of KS1 (Trial Version)</i> .

2	Hong Kong	6	HI	English	Hong Kong Examinations and Assessment Authority. n.d. <i>Mathematics Curriculum – The Basic Competency at the end of KS2 (Trial Version)</i> .
2	Laos	3	LMI	English	Ministry of Education and Sports Research Institute for Educational Sciences. 2014. <i>Report – National Assessment of Student Learning Outcome (ASLO III) Grade 3</i> .
2	Micronesia	4	LMI	English	Department of Education, Division of Basic Education. 2015. <i>FSM National Minimum Competency Standard-Based Test (NMCT) 2015</i>
2	Micronesia	6	LMI	English	Department of Education, Division of Basic Education. 2015. <i>FSM National Minimum Competency Standard-Based Test (NMCT) 2015</i>
2	Micronesia	8	LMI	English	Department of Education, Division of Basic Education. 2015. <i>FSM National Minimum Competency Standard-Based Test (NMCT) 2015</i>
2	New Zealand	1	HI	English	Ministry of Education. 2009. <i>Mathematics Standards for years 1-8</i> .
2	New Zealand	2	HI	English	Ministry of Education. 2009. <i>Mathematics Standards for years 1-8</i> .
2	New Zealand	3	HI	English	Ministry of Education. 2009. <i>Mathematics Standards for years 1-8</i> .
2	New Zealand	4	HI	English	Ministry of Education. 2009. <i>Mathematics Standards for years 1-8</i> .
2	New Zealand	5	HI	English	Ministry of Education. 2009. <i>Mathematics Standards for years 1-8</i> .
2	New Zealand	6	HI	English	Ministry of Education. 2009. <i>Mathematics Standards for years 1-8</i> .
2	New Zealand	7	HI	English	Ministry of Education. 2009. <i>Mathematics Standards for years 1-8</i> .
2	New Zealand	8	HI	English	Ministry of Education. 2009. <i>Mathematics Standards for years 1-8</i> .
2	Philippines	3	LMI	English	Department of Education, Republic of the Philippines. 2015. <i>Utilization of the Early Grade Reading Assessment (EGRA) and Early Grade Math Assessment (EGMA) Tools for System Assessment</i> .
3	Bangladesh	3,5	LMI	English	Monitoring and Evaluation Division. 2012. <i>2011 National Student Assessment for Grades 3 and 5 - National Report</i> .
3	India	3	LMI	English	National Council of Education Research and Training. 2014. <i>National Achievement Survey (Cycle 3) Class III – Achievement Highlights 2014</i> .
3	India	5	LMI	English	National Council of Education Research and Training. 2014. <i>National Achievement Survey Class V (Cycle 3) – National – Subject wise Report – Learning Gaps in Language, Mathematics and Environmental Studies</i> .
3	India	8	LMI	English	National Council of Education Research and Training. 2014. <i>National Achievement Survey Class VIII (Cycle-3) – 2014</i> .
3	Nepal	8	LI	English	Government of Nepal Ministry of Education, Education Review Office. 2016. <i>Assessment Framework – National Assessment of Student Achievement for Grade 8</i> .
3	Sri Lanka	4	LMI	English	National Education Research and Evaluation Centre (NEREC). 2015. <i>Chapter Six – Patterns and Trends in Achievement: Mathematics 2015</i> .
3	Sri Lanka	8	LMI	English	National Education Research and Evaluation Centre (NEREC). 2014. <i>Chapter Three – Patterns in Achievement – Mathematics 2014</i>
4	Argentina	3	UMI	Spanish	Ministerio de Educación. 2016. <i>Operativo Nacional de Evaluación de Calidad Educativa – Aprender 2016 – Primaria</i> .
4	Argentina	6	UMI	Spanish	Ministerio de Educación. 2016. <i>Operativo Nacional de Evaluación de Calidad Educativa – Aprender 2016 – Primaria</i> .
4	Chile	3	HI	Spanish	Agencia de Calidad de la Educación, Gobierno de Chile. 2015. <i>Informe Técnico Simce 2013</i> .
4	Chile	6	HI	Spanish	Agencia de Calidad de la Educación, Gobierno de Chile. 2015. <i>Informe Técnico Simce 2013</i> .
4	Colombia	8	UMI	Spanish	Ministerio de Educación Nacional. 2014. <i>Dirección de Calidad para la Educación Preescolar, Básica y Media – Subdirección de Referentes y Evaluación de la Calidad Educativa</i> .
4	Costa Rica	6	UMI	Spanish	Ministerio de Educación Pública, Dirección de Gestión y Evaluación de la Calidad, Departamento de Evaluación Académica y Certificación. 2017. <i>Matemáticas – Tabla de Especificaciones de Habilidades y Conocimientos que se Medirán en las Pruebas de Certificación de los Programas: I y II Ciclo de la Educación General Básica Abierta</i> .

4	Dominica	6	UMI	English	Ministry of Education and Human Resource Development, Dominica. 2014. <i>Report on Candidate's Performance at the 2014 Grade Six National Assessments (G6NA)</i> .
4	Dominican Republic	4	UMI	Spanish	Ministerio de Educación, Republica Dominicana. 2010. <i>Evaluación Diagnostica de Inicio del 4<sup>to</sup> Grado de la Educación Básica – Informe de Resultados 2010</i> .
4	Ecuador	3	UMI	Spanish	Ministro de Educación. 2008. <i>Informe Técnico – Aprendo 2007 – Logros Académicos y Factores Asociados</i> .
4	El Salvador	7	LMI	Spanish	Ministerio de Educación, El Salvador. 2016. <i>Documento Informativo de PAES para directores, docentes y estudiantes de Educación Media – Prueba de Aprendizajes y Aptitudes para Egresados de Educación Media</i> .
4	Guatemala	3	LMI	Spanish	Ministerio de Educación. 2016. <i>¿Qué Debo Saber para Realizar la Prueba de Matemática?</i>
4	Guyana	2	UMI	English	Ministry of Education, Guyana. n.d. <i>Guidelines for Assessment of Literacy and Numeracy Standards. Grade Two Teachers' Copy</i> .
4	Honduras	1	LMI	Spanish	República de Honduras, Secretaria de Educación. n.d. <i>Estándares Educativos Nacionales Español y Matemáticas – Básica 1<sup>o</sup> a 6<sup>o</sup> Grados</i> .
4	Honduras	2	LMI	Spanish	República de Honduras, Secretaria de Educación. n.d. <i>Estándares Educativos Nacionales Español y Matemáticas – Básica 1<sup>o</sup> a 6<sup>o</sup> Grados</i> .
4	Honduras	3	LMI	Spanish	República de Honduras, Secretaria de Educación. n.d. <i>Estándares Educativos Nacionales Español y Matemáticas – Básica 1<sup>o</sup> a 6<sup>o</sup> Grados</i> .
4	Honduras	4	LMI	Spanish	República de Honduras, Secretaria de Educación. n.d. <i>Estándares Educativos Nacionales Español y Matemáticas – Básica 1<sup>o</sup> a 6<sup>o</sup> Grados</i> .
4	Honduras	5	LMI	Spanish	República de Honduras, Secretaria de Educación. n.d. <i>Estándares Educativos Nacionales Español y Matemáticas – Básica 1<sup>o</sup> a 6<sup>o</sup> Grados</i> .
4	Honduras	6	LMI	Spanish	República de Honduras, Secretaria de Educación. n.d. <i>Estándares Educativos Nacionales Español y Matemáticas – Básica 1<sup>o</sup> a 6<sup>o</sup> Grados</i> .
4	Honduras	7	LMI	Spanish	República de Honduras, Secretaria de Educación. n.d. <i>Estándares Educativos Nacionales Español y Matemáticas – Básica 7<sup>o</sup> a 9<sup>o</sup> Grados</i> .
4	Honduras	8	LMI	Spanish	República de Honduras, Secretaria de Educación. n.d. <i>Estándares Educativos Nacionales Español y Matemáticas – Básica 7<sup>o</sup> a 9<sup>o</sup> Grados</i> .
4	Mexico	3	UMI	Spanish	Secretaria de Educación Pública, Subsecretaria de Planeación y Evaluación de Políticas Educativas. 2013. <i>Evaluación Nacional del Logro Académico en Centros Escolares – Educación Básica: Manual Técnico 2013</i> .
4	Mexico	4	UMI	Spanish	Secretaria de Educación Pública, Subsecretaria de Planeación y Evaluación de Políticas Educativas. 2013. <i>Evaluación Nacional del Logro Académico en Centros Escolares – Educación Básica: Manual Técnico 2013</i> .
4	Mexico	5	UMI	Spanish	Secretaria de Educación Pública, Subsecretaria de Planeación y Evaluación de Políticas Educativas. 2013. <i>Evaluación Nacional del Logro Académico en Centros Escolares – Educación Básica: Manual Técnico 2013</i> .
4	Mexico	6	UMI	Spanish	Secretaria de Educación Pública, Subsecretaria de Planeación y Evaluación de Políticas Educativas. 2013. <i>Evaluación Nacional del Logro Académico en Centros Escolares – Educación Básica: Manual Técnico 2013</i> .
4	Mexico	7	UMI	Spanish	Secretaria de Educación Pública, Subsecretaria de Planeación y Evaluación de Políticas Educativas. 2013. <i>Evaluación Nacional del Logro Académico en Centros Escolares – Educación Básica: Manual Técnico 2013</i> .
4	Mexico	8	UMI	Spanish	Secretaria de Educación Pública, Subsecretaria de Planeación y Evaluación de Políticas Educativas. 2013. <i>Evaluación Nacional del Logro Académico en Centros Escolares – Educación Básica: Manual Técnico 2013</i> .
4	Peru	2	UMI	Spanish	Ministerio de Educación del Perú. 2009. <i>Evaluación Censal de Estudiantes (ECE) – Segundo grado de primaria – Cuarto grado de primaria de IE EIB – Marco de Trabajo</i> .
4	Peru	4	UMI	Spanish	Ministerio de Educación del Perú. 2009. <i>Evaluación Censal de Estudiantes (ECE) – Segundo grado de primaria – Cuarto grado de primaria de IE EIB – Marco de Trabajo</i> .
4	Saint Vincent and the Grenalides	2	UMI	English	Ministry of Education, Curriculum Development Unit. n.d. <i>Chapter 4 – Grade 2 – Annual Plan</i> .
4	Saint Vincent and the Grenalides	4	UMI	English	Ministry of Education, Curriculum Development Unit. n.d. <i>Chapter 6 – Grade 4 – Annual Plan</i> .

5	Jordan	2	UMI	English	RTI International. 2012. <i>Student Performance in Reading and Mathematics, Pedagogic Practice, and School Management in Jordan.</i>
5	Egypt	4	LMI	English	Szucs, E. and Hassan-Wassef, H. 2010. <i>Evaluation of Community Schools in Egypt.</i>
5	Pakistan	4	LMI	English	Ministry of Federal Education and Professional Training, Pakistan. 2008. <i>Mathematics Framework – National Education Assessment System.</i>
5	Pakistan	8	LMI	English	Ministry of Federal Education and Professional Training, Pakistan. 2008. <i>Mathematics Framework – National Education Assessment System.</i>
5	Palestine	4	UC	English	Assessment and Evaluation Department. 2016. <i>National Assessment (NAT) 2016 – Main Content Domains and sub competencies.</i>
6	Albania	3	UMI	English	Ministria e Arsimit dhe Sportit, National Examination Agency. 2015. <i>Assessment of Students' Achievements in 3<sup>rd</sup> and 5<sup>th</sup> Grade.</i>
6	Albania	5	UMI	English	Ministria e Arsimit dhe Sportit, National Examination Agency. 2015. <i>Assessment of Students' Achievements in 3<sup>rd</sup> and 5<sup>th</sup> Grade.</i>
6	Estonia	3	HI	English	National Curriculum for Basic Schools. 2014. <i>Appendix 3 of Regulation No1 of the Government of the Republic of 6 January 2011 National Curriculum for Basic Schools (Last amendment 29 August 2014) - Subject Field: Mathematics.</i>
6	Estonia	6	HI	English	National Curriculum for Basic Schools. 2014. <i>Appendix 3 of Regulation No1 of the Government of the Republic of 6 January 2011 National Curriculum for Basic Schools (Last amendment 29 August 2014) - Subject Field: Mathematics.</i>
7	Gambia	3	LI	English	Ministry of Basic and Secondary Education. n.d. <i>Introduction to the Learning Achievement Targets (LATs) Handbook – Mathematics Grade 3.</i>
7	Gambia	5	LI	English	Ministry of Basic and Secondary Education. n.d. <i>Introduction to the Learning Achievement Targets (LATs) Handbook – Mathematics Grade 5.</i>
7	Ghana	3	LMI	English	Ministry of Education, Ghana Education Service, and Assessment Services Unit. 2014. <i>Ghana National Education Assessment.</i>
7	Ghana	6	LMI	English	Ministry of Education, Ghana Education Service, and Assessment Services Unit. 2014. <i>Ghana National Education Assessment.</i>
7	Ivory Coast	3	LMI	French	Ministère de l'Éducation Nationale. 2016. <i>Evaluations des Compétences des Élevés de CE1 en Lecture et en Mathématiques – Côte d'Ivoire - mai 2016.</i>
7	Mauritius	3	UMI	English	Mauritius Institute of Education. 2015. <i>Diagnostic Assessment at Standard III.</i>
7	Senegal	1,4	LI	French	Ministère de l'Éducation Nationale. n.d. <i>Cadre du Système National d'Évaluation des Rendements Scolaires.</i>
7	Seychelles	2	HI	English	Ministry of Education. 2015. <i>Primary National Curriculum – Attainment Targets.</i>
7	Seychelles	4	HI	English	Ministry of Education. 2015. <i>Primary National Curriculum – Attainment Targets.</i>
7	Seychelles	6	HI	English	Ministry of Education. 2015. <i>Secondary National Curriculum – Attainment Targets.</i>
7	South Africa	2	UMI	English	Department of Basic Education. 2014. <i>The Annual National Assessment of 2014 – Diagnostic Report – Foundation Phase – Mathematics and Home Language.</i>
7	South Africa	3	UMI	English	Department of Basic Education. 2014. <i>The Annual National Assessment of 2014 – Diagnostic Report – Foundation Phase – Mathematics and Home Language</i>
7	South Africa	4	UMI	English	Department of Basic Education. 2014. <i>The Annual National Assessment of 2014 – Diagnostic Report – Intermediate and Senior Phases – Mathematics and Home Language</i>
7	South Africa	5	UMI	English	Department of Basic Education. 2014. <i>The Annual National Assessment of 2014 – Diagnostic Report – Intermediate and Senior Phases – Mathematics and Home Language</i>
7	South Africa	6	UMI	English	Department of Basic Education. 2014. <i>The Annual National Assessment of 2014 – Diagnostic Report – Intermediate and Senior Phases – Mathematics and Home Language</i>
7	South Sudan	2	LI	English	Ministry of Education, Science and Technology. 2016. <i>South Sudan Early Grade Reading and Mathematics Assessment Report.</i>
7	Uganda	3	LI	English	Uganda National Examinations Board – Government. 2015. <i>Uganda – National Assessment of Progress in Education.</i>
7	Uganda	6	LI	English	Uganda National Examinations Board – Government. 2015. <i>Uganda – National Assessment of Progress in Education.</i>
7	Zambia	2	LMI	English	RTI International. 2015. <i>National Assessment Survey of Learning Achievement at Grade 2 – Results for Early Grade Reading and Mathematics in Zambia.</i>

# Annex 2: Coding Scheme – Domains, sub-domains, constructs, and sub-constructs

Figure 2.1: Math Proficiency domain

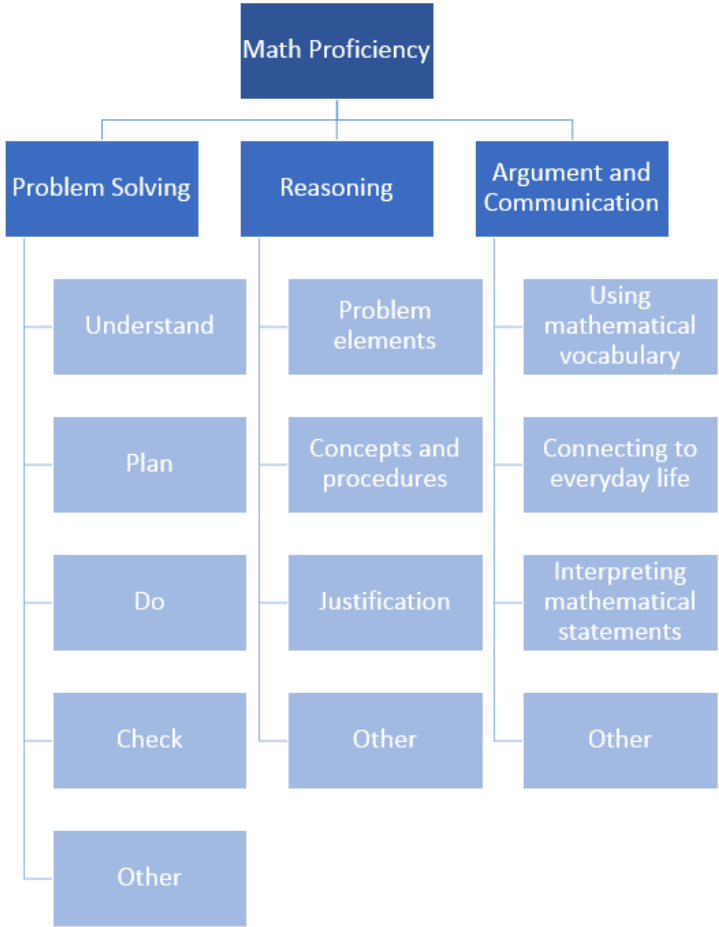


Figure 2.2: Number Knowledge domain

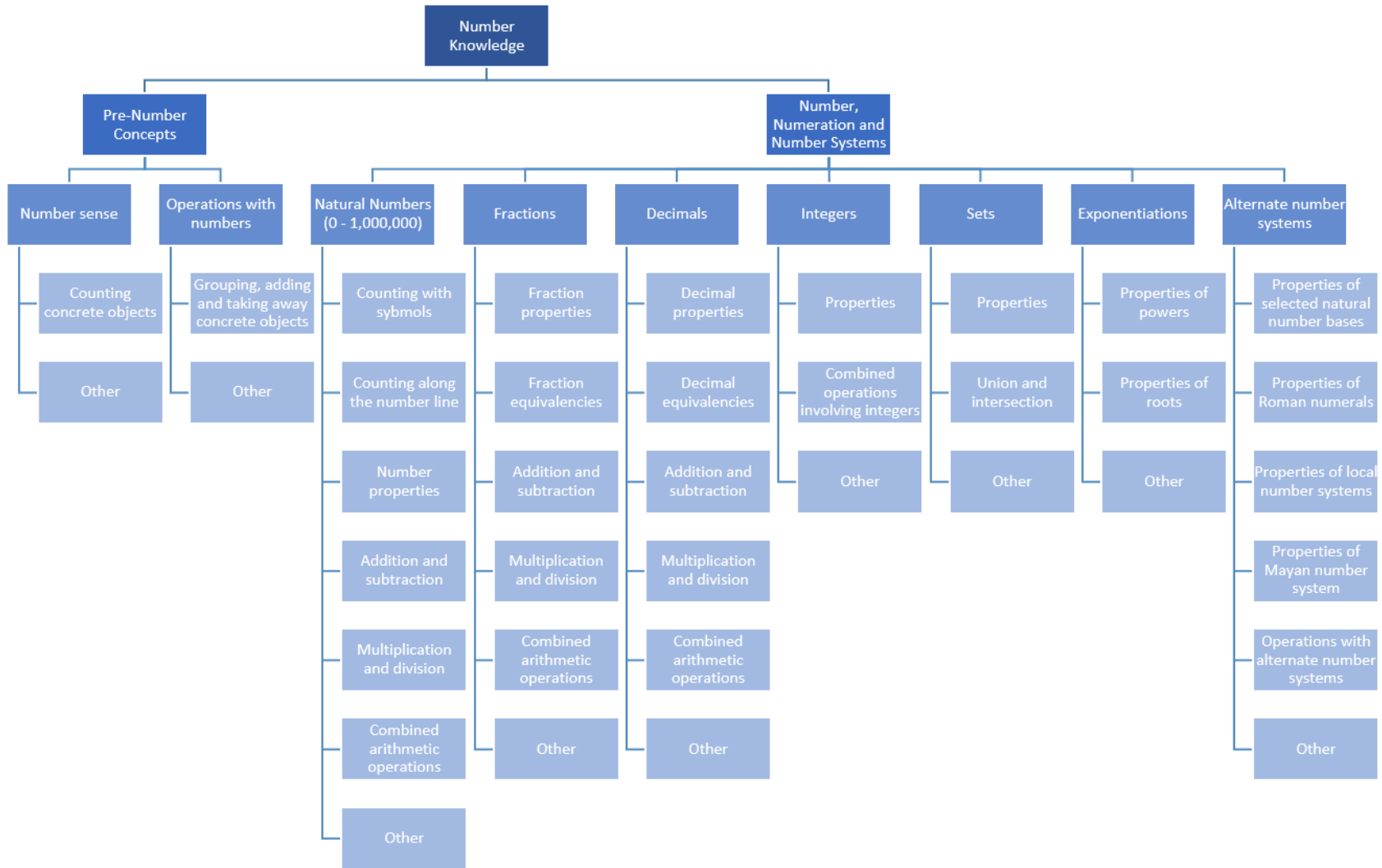


Figure 2.3: Measurement domain

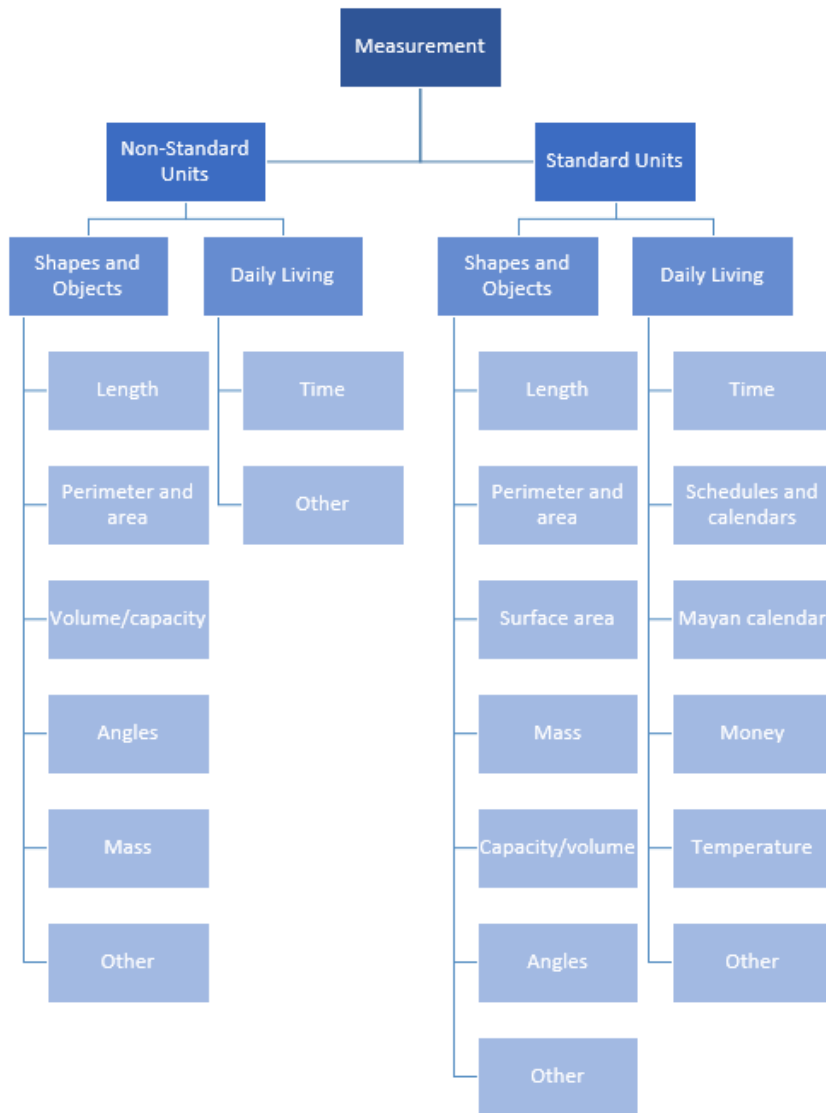




Figure 2.4: Statistics and Probability domain

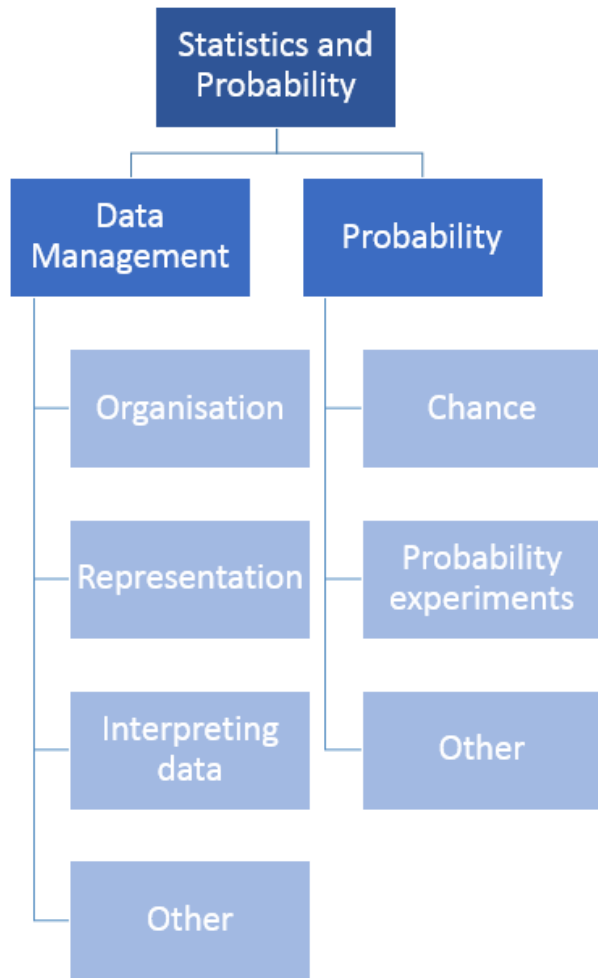


Figure 2.5: Geometry domain

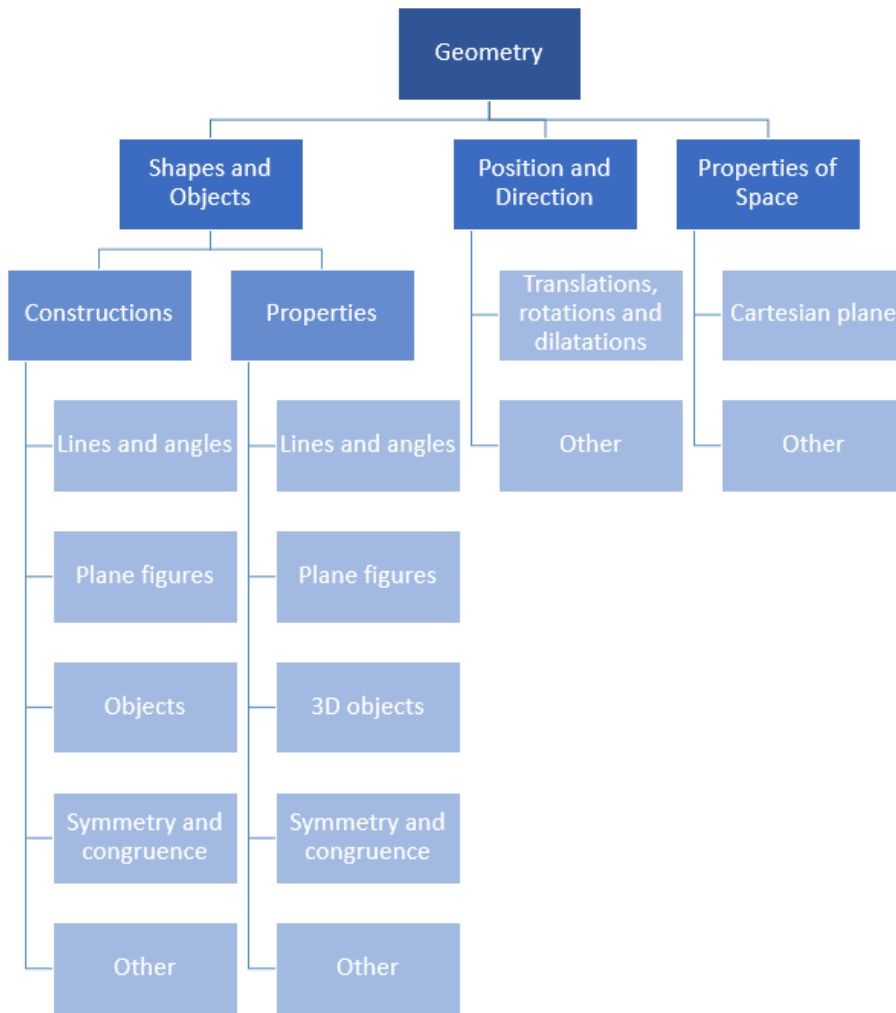


Figure 2.6: Algebra domain

