Numeracy Progressions

Purpose of Numeracy Progressions in Current Curriculum

The numeracy progressions are a resource that teachers can use to support students in meeting the learning outcomes in the current provincial curriculum (programs of study). They are not intended to be an add-on or a separate program of studies. They should not be used to teach or to formally evaluate and report numeracy separately from subject learning outcomes.

The progressions are a tool that can be used to support numeracy development in meaningful ways as students engage with subject content. When numeracy is explicit in each subject:
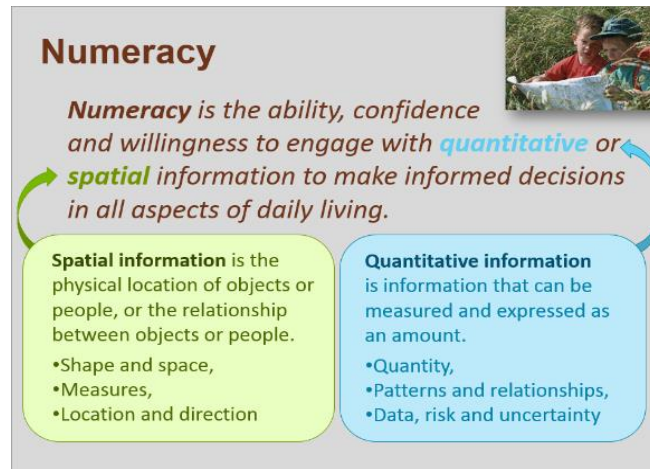
- a meaningful context is created where students learn and apply numeracy skills; and
- students' ability to understand subject content is enhanced.

Importance of Numeracy

Strong numeracy skills are essential in today's society. Alberta Education recognizes the importance of these skills in the *Ministerial Order on Student Learning*[1], which states that all students "will employ literacy and numeracy to construct and communicate meaning."

Definition of Numeracy

Alberta Education defines numeracy as follows.

Numeracy

Numeracy is the ability, confidence and willingness to engage with *quantitative* or *spatial* information to make informed decisions in all aspects of daily living.

Spatial information is the physical location of objects or people, or the relationship between objects or people.
- Shape and space,
- Measures,
- Location and direction

Quantitative information is information that can be measured and expressed as an amount.
- Quantity,
- Patterns and relationships,
- Data, risk and uncertainty

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[1]*Ministerial Order on Student Learning: Goals and Standards Applicable to the Provision of Education in Alberta* (#001/2013)

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Organization of the Progressions – Components, Elements, and Descriptors

Numeracy progressions identify the aspects of numeracy that apply across subjects in each division level. The progressions provide educators with a common reference for numeracy development within certain age ranges or divisions.

The following chart shows how the progressions are organized.

The progressions are organized by two **components**—Awareness, and Knowledge and Understanding.

Component: NUMERACY KNOWLEDGE AND UNDERSTANDING (NKU)					
Numeracy Knowledge and Understanding Descriptors The descriptors identify what students are typically able to demonstrate as their numeracy knowledge and understanding increases. This is a cumulative process. It is expected that learning experiences, while developmentally appropriate, will become increasingly complex.					
	Kindergarten (typically ages 4–5)	**Division I (typically ages 6–8)**	**Division II (typically ages 9–11)**	**Division III (typically ages 12–14)**	**Division IV (typically ages 15–18+)**
NKU2 SPATIAL INFORMATION *Students apply knowledge of spatial* information to make an informed decision.* *Spatial information* refers to the physical location of objects or people, or the relationship between objects or people.	**Measurement** Children compare two familiar objects according to measurement attributes to complete a task (e.g., taller, shorter, heavier, smaller).	**Measurement** Students select and use basic measuring instruments to complete a task (e.g., ruler, calendar, stopwatch, thermometer).	**Measurement** Students identify and use appropriate measuring instruments and read simple meters, dials and weigh scales in their environment.	**Measurement** Students identify, select and use suitable instruments to take measurements at an appropriate level of precision.	**Measurement** Students identify, select and use precise instruments or methods to take accurate measurements.

Elements assist in exploring the breadth and depth of each literacy or numeracy component.

The **descriptors** explain what students can typically demonstrate by the end of their particular age/division grouping.

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How can the numeracy progressions be used by teachers?

Teachers can use the progressions in the following ways:
- as a reference tool, providing an overview of key aspects of numeracy that apply across the subjects from Kindergarten to Grade 12;
  - when viewed horizontally, across an element, the descriptors provide an overview of how numeracy is developed throughout a student's schooling.
  - when viewed vertically, within an age range or division, the descriptors in each element provide a profile of the numeracy developed within the subjects throughout that age range or division.

- to plan effective learning experiences that foster the development of numeracy;
  - consider what numeracy skills will assist students in understanding the learning outcomes in the subject.
  - identify numeracy components, elements, and descriptors that represent what the students will use and/or develop in this learning experience.

- as a reference point when gathering information about students' numeracy strengths, needs, and growth; and

- to assist in determining when a student may require numeracy support to facilitate understanding of subject content.

Do teachers assess the numeracy progressions?

Numeracy development can be observed within the context of learning experiences across the subjects. Teachers are not required to formally evaluate and report on the progressions separately from learning outcomes.

The numeracy progressions are not intended to be a formal diagnostic tool. They may be used by educators to inform the selection of assessment strategies, activities, and tools that are appropriate for their students.

Purpose of Numeracy Progressions in Future Curriculum

In future provincial curriculum
- the progressions will provide curriculum developers with a consistent reference tool that describes numeracy milestones;

- the connections between learning outcomes and relevant numeracy progressions that are developed and applied in a given subject will be shown; and

- the progressions will be identified by Alberta Education to indicate the numeracy that students will use, develop and enhance through the learning outcomes, and for ease of use by teachers.

Numeracy Progressions

Numeracy is the ability, confidence and willingness to engage with quantitative* or spatial** information to make informed decisions in all aspects of daily living.

***Quantitative information** is information that can be measured and expressed as an amount.   ****Spatial information** is the physical location of objects or people, or the relationship between objects or people.

Component: NUMERACY AWARENESS (NA)					
	Numeracy Awareness Descriptors The descriptors identify what students are typically able to demonstrate as their numeracy awareness increases. This is a cumulative process. It is expected that learning experiences, while developmentally appropriate, will become increasingly complex.				
Division / **Element**	**Kindergarten** **(typically ages 4–5)**	**Division I** **(typically ages 6–8)**	**Division II** **(typically ages 9–11)**	**Division III** **(typically ages 12–14)**	**Division IV** **(typically ages 15–18+)**
NA1 **IMPORTANCE OF NUMERACY** *Students recognize that numeracy enables people to make informed decisions in all aspects of daily living.*	**Purpose** Children recognize that quantitative and spatial information is all around them.	**Purpose** Students recognize everyday situations where numeracy is used to make decisions.	**Purpose** Students recognize that numeracy helps people make informed decisions.	**Purpose** Students recognize how numeracy helps people to achieve personal and community goals, and make informed decisions.	**Purpose** Students recognize how numeracy enables people to be effective in everyday life and in society.
NA2 **LEARNER AWARENESS** *Students identify what they know, are able to do and need to learn when engaging in tasks that involve numeracy.* ***Regulate** refers to students managing their own learning (e.g., goal setting, monitoring progress throughout a task, self-evaluation). Personal initiative, perseverance and adaptation are characteristics of a self-regulated learner. (Zimmerman, 2002).	**Personal Insight** Children participate in guided activities that model how to think about their numeracy strengths and the strategies they can use to regulate* their learning.	**Personal Insight** With guidance, students recognize their numeracy strengths and the strategies they can use to regulate* their learning.	**Personal Insight** Students recognize and describe their numeracy strengths and challenges. With some guidance, they choose appropriate strategies to regulate* their learning.	**Personal Insight** Students recognize, reflect on and describe their numeracy strengths and challenges. They choose appropriate strategies to regulate* their learning.	**Personal Insight** Students recognize, reflect on, analyze and describe their numeracy strengths and challenges. They choose appropriate strategies to regulate* their learning.

NA3 TASK AWARENESS **Students are aware of the numeracy demands within a task.**	**Task Analysis** Children participate in guided activities that model how to complete a task that involves numeracy.	**Task Analysis** Students identify tasks that involve numeracy and determine which information may be used to complete a task.	**Task Analysis** Students analyze situations that involve numeracy to identify relevant and irrelevant information.	**Task Analysis** Students analyze situations that involve numeracy to identify relevant, irrelevant and unknown information and make appropriate assumptions when required.	**Task Analysis** Students examine situations that involve numeracy and transfer their understanding from other contexts to assist them.

Component: NUMERACY KNOWLEDGE AND UNDERSTANDING (NKU)					
	Numeracy Knowledge and Understanding Descriptors The descriptors identify what students are typically able to demonstrate as their numeracy knowledge and understanding increases. This is a cumulative process. It is expected that learning experiences, while developmentally appropriate, will become increasingly complex.				
Division Element	**Kindergarten** **(typically ages 4–5)**	**Division I** **(typically ages 6–8)**	**Division II** **(typically ages 9–11)**	**Division III** **(typically ages 12–14)**	**Division IV** **(typically ages 15–18+)**
NKU1 QUANTITATIVE INFORMATION **Students apply knowledge of quantitative* information to make an informed decision.** ***Quantitative information** refers to information that can be measured and expressed as an amount.	**Magnitude** Children describe the quantity of objects within a group(s) as being more, less, enough, too many or too few for a variety of purposes (e.g., to share cookies, make teams).	**Magnitude** Students interpret and compare quantities expressed as whole numbers in their environment.	**Magnitude** Students interpret, compare and use quantities expressed as whole numbers, and as percentages, fractions and decimals that are commonly used in real-life situations.	**Magnitude** Students interpret, compare and use quantities expressed as small and large numbers, fractions, decimals, rates, percentages, scales and ratios in real-life situations.	**Magnitude** Students interpret, compare and use the magnitude of small and large numbers, fractions, decimals, rates, percentages, scales and ratios in real-life situations.
	Using Numbers Children use numbers to count and label in their environment (e.g., board games, phone number, counting rhymes).	**Using Numbers** Students use numbers to indicate position or value in their environment (e.g., first, second, third, currency, music notes).	**Using Numbers** Students use negative numbers in real-life situations (e.g., temperature, golf scores, hockey statistics).	**Using Numbers** Students interpret and use negative numbers in real-life situations (e.g., account balances, sports statistics economic indicators).	**Using Numbers** Students recognize how numbers can be used to inform or shape attitudes and beliefs in real-life situations (e.g., interpreting percentages).
	Calculations Children solve basic counting problems informally in familiar situations.	**Calculations** Students use basic addition and subtraction in familiar situations.	**Calculations** Students calculate using whole numbers and decimals in real-life situations.	**Calculations** Students calculate using whole numbers, decimals, fractions and percentages in real-life situations.	**Calculations** Students calculate using whole numbers, fractions, decimals, rates, percentages, scales and ratios in real-life situations.
	Patterns and Relationships Children recognize non-numerical patterns in their environment and daily routines (e.g., days of the week, rhythms).	**Patterns and Relationships** Students recognize patterns in their environment and daily routines (e.g., calendar, seasons).	**Patterns and Relationships** Students analyze and use patterns, including increasing or decreasing patterns, to make simple predictions in real-life situations.	**Patterns and Relationships** Students take multiple factors into consideration when identifying and describing relationships and trends encountered in real-life situations.	**Patterns and Relationships** Students make predictions based on relationships and trends in real-life situations.

	Numeracy Knowledge and Understanding Descriptors				
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NKU1 (cont'd) QUANTITATIVE INFORMATION ***Students apply knowledge of quantitative* information to make an informed decision.*** *Quantitative information refers to information that can be measured and expressed as an amount.	**Organization of Data** Children organize familiar items by sorting according to shared characteristics.	**Organization of Data** Students organize objects, ideas or information using a classification system.	**Organization of Data** Students organize objects, ideas or information using a variety of classification systems.	**Organization of Data** Students devise and interpret classification systems.	**Organization of Data** Students devise and interpret multi-tiered classification systems.
	Collection of Data Children participate in data collection and recording for a specified purpose.	**Collection of Data** Students formulate questions for a specific investigation and collect, record and discuss the data using charts and graphs.	**Collection of Data** Students use an effective method to collect, organize, analyze and represent data.	**Collection of Data** Students design a plan to collect, display and analyze data in an effective manner to test a hypothesis or explore a question.	**Collection of Data** Students select effective data collection and display methods to make informed decisions.
	Interpretation of Data Children extract specific data from a basic graph or chart.	**Interpretation of Data** Students extract specific data from a graph or chart to make comparisons or inferences.	**Interpretation of Data** Students interpret data from a graph or chart to make inferences and draw conclusions.	**Interpretation of Data** Students identify how information from a chart or graph could be misinterpreted or misleading (e.g., bias and sample size, misleading claims).	**Interpretation of Data** Students critically assess claims or arguments based on data or statistics to make an informed decision.
	Probability Children use simple probability language to describe familiar events (e.g., will happen, will not happen, might happen, always, never, impossible).	**Probability** Students describe the likelihood of an event occurring using probability vocabulary (e.g., possible, impossible, probable, likely, unlikely).	**Probability** Students describe the possible outcomes of events along a continuum from impossible to certain.	**Probability** Students use and interpret probability to make informed decisions in real-life situations.	**Probability** Students use their knowledge of probability to evaluate claims and predictions to make informed decisions in real-life situations (e.g., health benefits or risks).

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NKU2 SPATIAL INFORMATION *Students apply knowledge of spatial* information to make an informed decision.* **Spatial information refers to the physical location of objects or people, or the relationship between objects or people.* ***Sketch refers to a drawing which represents key features.* ****Referent refers to a known measurement that is used as a reference to help judge other measurements (e.g., the width of the tip of the little finger is a common referent for one centimetre).*	**Spatial Visualization** Children participate in activities that develop spatial thinking (e.g., puzzles, building with blocks, drawing).	**Spatial Visualization** Students physically manipulate objects to describe and sketch** them in a variety of orientations and sizes.	**Spatial Visualization** Students visualize and sketch** familiar objects in their environment from different viewpoints.	**Spatial Visualization** Students visualize familiar and unfamiliar objects from different viewpoints by mentally manipulating them in space. They represent the objects through sketching** or other methods.	**Spatial Visualization** Students visualize, analyze and represent the relationship between two or more objects.
	Management of Space Children judge the space between themselves and others or objects in their environment.	**Management of Space** Students judge and use the space around or between bodies, objects or shapes in their environment.	**Management of Space** Students judge and refine the use of the space around or between bodies, objects or shapes with fluency. (e.g., positive/negative space)	**Management of Space** Students intentionally judge and manage the space around or between bodies, objects or shapes with fluency (e.g., sports' play strategies).	**Management of Space** Students intuitively judge and manage the space around or between bodies, objects or shapes with fluency and precision (e.g., choreography).
	Measurement Children compare two familiar objects according to measurement attributes to complete a task (e.g., taller, shorter, heavier, smaller).	**Measurement** Students select and use basic measuring instruments to complete a task (e.g., ruler, calendar, stopwatch, thermometer).	**Measurement** Students identify and use appropriate measuring instruments and read simple meters, dials and weigh scales in their environment.	**Measurement** Students identify, select and use suitable instruments to take measurements at an appropriate level of precision.	**Measurement** Students identify, select and use precise instruments or methods to take accurate measurements.
		Units of Measurement Students identify basic units of measure and familiar referents*** for a given task (e.g., "A metre is used to measure length and a metre is about the height of a door knob from the floor").	**Units of Measurement** Students determine and use the type and unit of measurement, and familiar referent*** most useful for a task (e.g., "I need 200 mL of vinegar. The amount I measure out will be less than the amount in a small water bottle.")	**Units of Measurement** Students calculate measures using familiar referents*** and simple prescribed procedures, as appropriate for the task (e.g., Determine the amount of carpet needed by pacing out a room and calculating the area).	**Units of Measurement** Students calculate measures using multi-step procedures to the degree of precision required for the task and compare results to familiar referents***.
			Conversions Students convert units of measurement within the same system in real-life situations (e.g., hours to minutes, centimetres to metres).	**Conversions** Students apply common and practical conversions between different systems of measurement in real-life situations (e.g., 250 mL is approximately 1 cup).	**Conversions** Students apply practical conversions to determine implications for personal decision making (e.g., currency, time zones, distance).

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NKU2 (cont'd) SPATIAL INFORMATION *Students apply knowledge of spatial* information to make an informed decision.* *Spatial information refers to the physical location of objects or the relationship between objects.*	**Time** Children describe and sequence familiar activities using relative time vocabulary (e.g., before, after, first, then, next, a long time ago).	**Time** Students describe the duration of familiar events and the intervals between them using units of time (e.g., seconds, minutes, hours, days, weeks, months, year).	**Time** Students determine the chronology and duration of events encountered in real-life situations using time and elapsed time.	**Time** Students measure, represent and examine concepts of time used in different contexts (e.g., generations, decades, nanoseconds).	**Time** Students determine how time is measured, represented and perceived using different perspectives and in different contexts (e.g., cultural, geographical, historical, literary, scientific).
	Location and Direction Children follow and give directions using gestures and basic positional language (e.g., in front, beside).	**Location and Direction** Students navigate and create directions and geographic representations using basic techniques (e.g., oral directions, gestures, basic maps, story maps).	**Location and Direction** Students navigate, create and generate navigational aids using a variety of traditional, non-digital and digital techniques in familiar contexts (e.g., Inuksuit, position of sun or stars, maps with legends, basic map features, mental maps).	**Location and Direction** Students navigate, create and generate navigational aids using a variety of traditional, non-digital and digital techniques in familiar and unfamiliar contexts (e.g., landmarks, maps with legends, map features, GPS, mental maps).	**Location and Direction** Students select, use, create and generate navigational aids using a variety of traditional, non-digital and digital techniques in novel contexts (e.g., landmarks, maps with legends, map features, GPS, mental maps).

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NKU 3 INTERPRET, REPRESENT, COMMUNICATE *Students interpret, represent and communicate in a variety of digital and non-digital formats to support decisions in situations involving numeracy.* ***Labelled diagrams** include language or extra pictorial devices (arrows, lines, brackets or other symbols) that provide additional information about movement or sequencing as appropriate.	**Interpretation and Representation of Quantitative Information** Children recognize and create basic representations of quantitative information (e.g., numbers, drawings).	**Interpretation and Representation of Quantitative Information** Students create and interpret basic representations of quantitative information (e.g., numbers, drawings, equations, words, basic tables, musical notation).	**Interpretation and Representation of Quantitative Information** Students create and interpret different representations of quantitative information.	**Interpretation and Representation of Quantitative Information** Students interpret, create and integrate different representations of quantitative information.	**Interpretation and Representation of Quantitative Information** Students shift with ease and flexibility when working with different representations of quantitative information.
	Interpretation and Representation of Spatial Information Children interpret simple diagrams that represent spatial information (e.g., identify the real object a drawing represents).	**Interpretation and Representation of Spatial Information** Students interpret and create simple models and labelled diagrams* to represent spatial information (e.g., number line, diagrams of life cycles).	**Interpretation and Representation of Spatial Information** Students interpret and create models and labelled diagrams* to represent spatial concepts (e.g., mind maps, topographical maps, timelines).	**Interpretation and Representation of Spatial Information** Students interpret and create labelled diagrams* and physical or digital models to represent movement, concepts or processes (e.g., atomic models, sport's play diagrams).	**Interpretation and Representation of Spatial Information** Students interpret and create labelled diagrams* and physical or digital models to represent complex phenomena (e.g., cellular respiration processes, influence of geography on political events).
	Communication Children use basic vocabulary, gestures, objects or symbols when communicating about quantitative or spatial information.	**Communication** Students use basic vocabulary, gestures, objects, symbols and analogies when communicating ideas in situations involving numeracy (e.g., 'round like a wheel').	**Communication** Students identify and use meaningful terminology, gestures, symbols, objects and analogies to explain quantitative and spatial concepts encountered in real-life situations.	**Communication** Students identify and use precise terminology, gestures, symbols, objects and analogies to support decisions in real-life situations involving numeracy (e.g., 'the structure of an atom is like a solar system').	**Communication** Students construct arguments supported by a variety of appropriate formats to justify assumptions, techniques, results and decisions in real-life situations involving numeracy.

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NKU4 STRATEGIES, METHODS OR TOOLS *Students use efficient and effective strategies, methods or tools to manage quantitative or spatial information.*	**Strategies** Children use a non-symbolic strategy in a task involving numeracy (e.g., act it out, draw it).	**Strategies** Students identify different strategies that may be used to complete a task involving numeracy.	**Strategies** Students assess alternate strategies and recognize that the choice of strategy impacts the end result.	**Strategies** Students determine how the variables within a context may influence the choice of strategy and impact the end result (e.g., considering options when selecting a cellphone plan).	**Strategies** Students analyze variables within a context to select strategies that result in an informed decision.
	Estimation Children estimate the quantities of small sets of objects in familiar situations.	**Estimation** Students use estimation to check the reasonableness of results in familiar situations.	**Estimation** Students apply overestimating or underestimating when a precise answer is not required in real-life situations.	**Estimation** Students apply approximations, overestimating or underestimating when a precise answer is not required in real-life situations.	**Estimation** Students apply approximations, overestimating or underestimating when a precise answer is not required in real-life situations.
	Methods or Tools Children participate in activities that use non-digital basic methods or tools in a task involving numeracy (e.g., pencil and paper, counting with objects).	**Methods or Tools** Students use non-digital methods or tools in a task involving numeracy (e.g., pencil and paper, mental calculations, visualization, calendars, agendas).	**Methods or Tools** Students use effective non-digital methods or tools in a task involving numeracy (e.g., pencil and paper, mental calculations, visualization, schedules, timetables).	**Methods or Tools** Students use effective non-digital and digital methods or tools based on the demands of a task involving numeracy (e.g., pencil and paper, mental calculations, visualization, calculators, schedules, timetables, digital 3D modeling software).	**Methods or Tools** Students select and refine their use of efficient and effective non-digital and digital methods or tools based on the demands of a task involving numeracy (e.g., pencil and paper, mental calculations, visualization, calculators, schedules, timetables, spreadsheets, digital 3D modeling software).