## Essential Understanding

Algebraic reasoning includes identifying and analyzing patterns, which allows for the generalization and expression of relationships in a variety of contexts.

### Guiding Questions

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<tbody>
<tr>
<td>How can quantities be compared?</td>
<td>How can quantities be considered equal?</td>
<td>How can equal and non-equal quantities be represented?</td>
<td>How can the process of solving simple linear equations be formalized?</td>
<td>How can linear equations be manipulated to preserve equality?</td>
<td>How can linear equations model diverse contexts?</td>
<td>How can linear equations and inequalities model diverse contexts?</td>
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<tr>
<td>How can non-numerical patterns be identified, described, extended and created?</td>
<td>How can patterns be identified, described, extended and created?</td>
<td>How can the generalization of patterns be represented and applied?</td>
<td>How can linear relations reflect meaningful contexts?</td>
<td>How can linear relations be modelled in diverse contexts?</td>
<td>How can linear relations be used as a model to analyze and generalize information in diverse contexts?</td>
<td>How can functions be used as a model to analyze and generalize information in diverse contexts?</td>
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### Possible Concepts and Procedures

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<tbody>
<tr>
<td>Same and not same</td>
<td>Same and not same</td>
<td>Equal and not equal</td>
<td>Modelling a context</td>
<td>Modelling a context</td>
<td>Preservation of equality</td>
<td>Preservation of equality</td>
<td>Distribution</td>
<td>Variables on both sides</td>
<td>Linear systems</td>
<td>Radicals</td>
<td>Trigonometric equations</td>
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<td>More and less</td>
<td>More and less</td>
<td>One-step equation</td>
<td>One-step equation</td>
<td>Variables</td>
<td>Two-step linear equations</td>
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<td>Order of operations</td>
<td>Rational equations</td>
<td>Exponential equations</td>
<td>Logarithmic equations</td>
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<td>Equality</td>
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<td>Computational thinking (supports coding)</td>
<td>Operations (including squares, cubes and parentheses)</td>
<td>Operations (including squares, cubes and parentheses)</td>
<td>Operations (including squares, cubes and parentheses)</td>
<td>Algebra for order of operations</td>
<td>Linear inequalities</td>
<td>Trigonometric identities</td>
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<td>Concrete and pictorial patterns</td>
<td>Concrete and pictorial patterns</td>
<td>Patterns involving addition or subtraction</td>
<td>Patterns involving addition or subtraction</td>
<td>Operations (including squares, cubes and parentheses)</td>
<td>Operations (including squares, cubes and parentheses)</td>
<td>Operations (including squares, cubes and parentheses)</td>
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<td>Quadratic equations</td>
<td>Exponential equations</td>
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<td>Computational thinking (supports coding)</td>
<td>Functions</td>
<td>Polynomial functions</td>
<td>Absolute value functions</td>
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<td>Computational thinking (supports coding)</td>
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<td>Tables</td>
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<td>Graphs</td>
<td>Slope</td>
<td>Linear functions</td>
<td>Radical functions</td>
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<td>Increasing patterns</td>
<td>Decreasing patterns</td>
<td>Relationships</td>
<td>Pattern rules</td>
<td>Variables</td>
<td>Equations</td>
<td>Intercepts</td>
<td>Quadratic functions</td>
<td>Reciprocal functions</td>
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<td>Translating patterns</td>
<td>Translating patterns</td>
<td>Pattern rules</td>
<td>Predicting terms</td>
<td>Predicting terms</td>
<td>Table of values</td>
<td>Parallel and perpendicular lines</td>
<td>Linear functions</td>
<td>Rational functions</td>
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<td>Computational thinking (supports coding)</td>
<td>Function notation</td>
<td>Domain and range</td>
<td>Operations</td>
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<td>Radical functions</td>
<td>Composition of functions</td>
<td>Inverse functions</td>
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<td>Radical functions</td>
<td>Trigonometric functions</td>
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## DRAFT Kindergarten to Grade 12 Mathematics Scope and Sequence

### Guiding Questions

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</table>
| **Possible Concepts and Procedures**
- one-to-one correspondence
- conservation of number
- counting to 10
- subitizing to 6
- cardinality
- hierarchical inclusion
- composing and decomposing numbers
- logical reasoning through puzzles or games
- skip counting by 2, 5, 10 and 100
- decomposition of number
- counting backwards from 20
- cardinality
- hierarchical inclusion
- one-to-one correspondence
- place value estimation
- logical reasoning through puzzles or games
- skip counting by 15
- part to whole
- comparing fractions with common denominators
- composing and decomposing numbers
- place value to 1000
- rounding
- estimation
- logical reasoning through puzzles or games
- counting by simple fractions
- comparing and ordering fractions
- composing and decomposing numbers
- place value from 0.01 to 0.1
- rounding
- logical reasoning through puzzles or games
- fractions, decimals and percentages
- improper fractions
- mixed numbers ratios
- place value from 0.01 to
- rounding
- logical reasoning through puzzles or games
- integers
- positive and negative numbers
- ratio equivalence
- part to part
- and part to whole
- percentages from 1 to 100
- place value from 0.001 to 1,000
- rounding
- logical reasoning through puzzles or games
- rates
- fractions, decimals and percentages
- percentages from 0 and beyond 100
- logical reasoning through puzzles or games
- real number system
- logical reasoning through puzzles or games
- domain and range
- discrete and continuous data
- logical reasoning through puzzles or games
- set builder notation
- interval notation
- logical reasoning through puzzles or games
- set theory
- logical reasoning through puzzles or games |

### Essential Understanding

Number sense includes organizing and representing quantitative information to make meaningful connections and to develop curiosity and flexibility with numbers.

- How are numbers represented in everyday life?
- How are numbers used to represent and interpret quantity?
- How are numbers represented, interpreted and compared to make meaningful connections?
- How can numbers be represented as parts and wholes?
- How can numbers communicate proportional relationships?
- How can percentages be applied in diverse contexts?
- How are the subsets of the real number system applied in mathematical and everyday contexts?
- How are different number sets used?
- How are different number sets used?
## DRAFT Kindergarten to Grade 12 Mathematics Scope and Sequence

### Guiding Questions

- How can familiar objects and shapes in the environment be described, represented, and compared?
- How can familiar 3-D objects and 2-D shapes be composed, decomposed, measured, and described?
- How can 3-D objects and 2-D shapes be decomposed, measured, and described?
- How can complex 3-D objects and 2-D shapes be composed, decomposed, measured, and described?
- How are linear measures used to develop formulae for 2-D shapes?
- a. How are linear measures and 2-D measures used to develop formulae for describing 3-D objects?
- b. How can geometric properties be used to classify angles and triangles?
- How are relationships between linear measures of a 2-D shape be described?
- How can geometric formulae be used flexibly to solve problems?
- How are angles and sides of right triangles related?
- a. How are angles and sides of oblique triangles related?
- b. How can properties of a circle be used to solve problems?
- c. How can different systems be used for indirect and direct measurements?
- a. How is measurement affected by the limitations of instruments?
- b. How are trigonometric ratios applied to the unit circle?

### Possible Concepts and Procedures

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<tbody>
<tr>
<td><strong>Essential Understanding</strong></td>
<td>Spatial reasoning includes visualizing and describing relationships to create concrete and abstract representations within culturally based experiences, cycles, patterns and place.</td>
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<tr>
<td><strong>Possible Concepts and Procedures</strong></td>
<td>2-D shapes as parts of 3-D objects, sorting by 2-D attributes, composing and decomposing 2-D shapes, congruence (superimposing with concrete objects), estimating and measuring perimeter using standard units, standard units (cm, m), rectangle, square, parallelogram, increasing dimensionality, height, base, linear measurement with standard units (mm), identifying 90° angles, volume of right rectangular prisms, circumference, area and diameter of circles, area of triangles, area of composite shapes, including regular polygons, surface area of prisms and pyramids, Pythagorean theorem, surface area and volume of a cylinder, cone and sphere, volume of prisms and pyramids, formula manipulation, primary trigonometric ratios, congruent triangles, similar triangles, sine law, cosine law, ambiguous case, primary and reciprocal trigonometric ratios 0° to 360°, angles in standard position, angle conversions between degrees and radians, trigonometric ratios of all angles (degrees and radians).</td>
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DRAFT Kindergarten to Grade 12 Mathematics Scope and Sequence
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<tbody>
<tr>
<td>• positional vocabulary</td>
<td>• computational thinking (supports coding)</td>
<td>• logical reasoning through puzzles or games</td>
<td>• flips, turns and slides</td>
<td>• directions and locations</td>
<td>• position relative to other objects</td>
<td>• computational thinking (supports coding)</td>
<td>• logical reasoning through puzzles or games</td>
<td>• diagonal slides and flips</td>
<td>• half and quarter turns</td>
<td>• grid, map and position of key features</td>
<td>• computational thinking (supporting coding)</td>
<td>• logical reasoning through puzzles or games</td>
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<tr>
<td>• half and quarter turns</td>
<td>• diagonal slides and flips</td>
<td>• conservation of composition</td>
<td>• single transformation</td>
<td>• distance</td>
<td>• rotational symmetry</td>
<td>• line and rotational symmetry</td>
<td>• combinations of transformations of 2-D shapes</td>
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<tr>
<td>• diagonal slides and flips</td>
<td>• flips, slides and turns of 2-D shapes and 3-D objects</td>
<td>• communicating spatial relationships and place</td>
<td>• patterns in arrays</td>
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### Guiding Questions

- How can the position of an object in space be described?
- How can the position of an object in space be described and represented?
- How can visualization be used to predict and describe changes in position?
- How can change in position be analyzed and described from different viewpoints?
- How can position and transformation be described and represented pictorially?
- How can position and transformation be described and represented in a Cartesian plane?
- How can transformations be described and represented in a Cartesian plane?
- How can transformations contribute to design?
- How can scale be applied to shape and place?
- How can different views be used to analyze and describe 3-D objects?
- How are characteristics of a quadratic function affected by transformations?
## Guiding Questions

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<tbody>
<tr>
<td>How can time be used to describe cycles of change in the environment?</td>
<td>How can time be used to measure cycles of change in a variety of contexts?</td>
<td>How can time be measured and communicated?</td>
<td>How can the passage of time be measured?</td>
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## Possible Concepts and Procedures

- passage of time in a variety of contexts
- non-standard time
- seasons, months, days of the week and relative time of the day
- days to weeks
- months to years
- half-hour and hour calendar
- standard measures
telling time to hour, half-hour and quarter-hour
- passage of time in variety of contexts
- 24-hour clock
- passage of time in a variety of contexts

## Essential Understanding

Data are ethically managed, represented and analyzed using diverse methods and holistic understandings to make predictions and inform decisions.

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<tbody>
<tr>
<td>How can questions be posed to explore personal interests?</td>
<td>How can questions be formulated to identify and gather data about personal interests and experiences?</td>
<td>How can questions be formulated to compare data about personal interests and experiences?</td>
<td>How can questions be formulated to gather and compare data that address relevant community issues?</td>
<td>How can reflecting upon the original question lead to further investigation?</td>
<td>How can reflecting upon the original question and data collected lead to further investigation?</td>
<td>How might questions introduce bias or other problems?</td>
<td>How can questions be evaluated for validity and the data they generate for reliability?</td>
<td>How can questions be evaluated for validity and the data they generate for reliability?</td>
<td>How can questions be evaluated for validity and the data they generate for reliability?</td>
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## Possible Concepts and Procedures

- formulating questions
- formulating questions
- formulating purposeful questions
- clarifying the problem
- formulating questions
- clarifying the problem
- formulating questions
- numerical and categorical data
- identifying problems
- formulating questions
- formulating further questions
- formulating questions from the collection of data
- formulating questions from the interpretation of data
- bias
- validity
- reliability
- validity
- reliability
- validity
- reliability

## Guiding Questions

- How can observable data be collected, represented and interpreted? | How can observable data be collected, represented and interpreted? | How can observable data be collected, represented and interpreted? | How can data be interpreted and communicated in meaningful ways? | How can the type of data influence representation? | How can the organization of data support analysis? | How can data be represented in an effective and ethical way? | How can data be collected and represented in an effective and ethical way? | How can data be collected and represented in an effective and ethical way? | How can data be collected and represented in an effective and ethical way? |

## Possible Concepts and Procedures

- data collection
- concrete graphs
- representing data
- one to one
- recording first-hand data
- symbolic graphs
- first-hand and second-hand data
- many to one
- constructing
- distinguishing first-hand from second-hand data
- categorizing
- methods of collecting data
- different representations for the
- misleading data
- interpreting and critiquing graphs
- misleading data
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- misleading data
- interpreting and critiquing graphs
### Guiding Questions

- How can the likelihood of an experience be communicated?
- How can the likelihood of an event be communicated?
- How can the possible outcomes of an experiment be identified?
- How can information be used to predict probability?
- How can probability be predicted without an experiment?
- How can one event influence the probability of another event?
- How can potential outcomes of multiple theoretical events be determined?
- How can probability be determined for multiple events?
- How can probability be determined for multiple events?
- How can combinatorics be applied to probability?
- How can events be predicted using analysis of data?

### Possible Concepts and Procedures

- never
- always
- sometimes
- never always likely unlikely
- possible impossible often rarely probable improbable
- possible outcomes
- experimental probability chance of something occurring randomness
- single-event theoretical probability
- dependent versus independent events
- sample space computational thinking (supports coding)
- independent events and dependent events fundamental counting principle
- probability with “and/or” mutually inclusive and exclusive events
- permutations combinations computational thinking (supports coding)
- confidence intervals 95% box plot normal distribution z-scores standard deviation binomial distribution

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### Essential Understanding

Additive and multiplicative thinking are developed through diverse strategies shaped by cultures, identities and experiences to solve problems involving quantitative information.
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<td><strong>Guiding Questions</strong></td>
<td>How can joining and separating be used to describe familiar situations?</td>
<td>How can joining and separating be used to explain and solve problems in familiar contexts?</td>
<td>How can composing and decomposing be used to solve number problems?</td>
<td>How can additive thinking be used to flexibly solve number problems?</td>
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<tr>
<td><strong>Possible Concepts and Procedures</strong></td>
<td>• recognizing joining and separating situations</td>
<td>• addition and subtraction of 0 to 100</td>
<td>• addition and subtraction of numbers to 100</td>
<td>• computational estimation</td>
<td>• mental mathematics strategies for 2-digit numbers</td>
<td>• computational thinking (supports coding)</td>
<td>• composing and decomposing numbers to 100</td>
<td>• addition and subtraction of numbers to 100</td>
<td>• computational estimation</td>
<td>• decimals to tenths</td>
<td>• computational thinking (supports coding)</td>
<td>• composing and decomposing numbers to 100</td>
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### Guiding Questions

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**Possible Concepts and Procedures**

- recognizing money
- distinguishing attributes from values of coins and bills
- sorting money into groups
- counting money using skip counting
- different values in multiple ways
- planning a simple budget
- adding and subtracting coins and bills
- recording amounts
- making change
- saving
- purchasing
- sales tax
- discount
- tips
- unit cost
- best buy
- simple interest
- budgeting
- simple banking
- income with deductions
- profit versus loss
- compound interest (graphically)
- savings and loans
- credit
- leasing versus buying
- investments
- compound interest (algebraically)

- rates
- square
- algorithm for multiplication or division
- computational thinking (supports coding)

- a polynomial expression