MATH M010 Course Outline

• **Course Title:** Foundation Math 1
• **Course Number:** FND M010
• **Course Credit Units:** 4.00
• **Total Contact Periods Per Week:** 5 – 6
• **Degree Level:** New Foundations

**Course Description:**
This course is the first of two math courses in the Foundations Program. Foundation Math 1 (FND M010) focuses on introducing and developing basic mathematical knowledge and skills and proficiency in preparing the students for Math M020 to have an exposure to transferring their skills to simple practical life examples. The main resource for this course is an internet based course called ALEKS characterized by its ability to:
- provide individually targeted instruction
- provide Adaptive learning at students’ own pace
- check retention of knowledge and skills with regular individualized assessment

**Additional Information:**
Students who complete the Foundation Math 1 course will have the conceptual understanding and application knowledge in basics of numbers, measurement, geometry, algebra, data analysis, statistics and probability. Students are expected to develop:
- Their awareness and understanding of the language of mathematics in English
- Apply the concepts to simple real life situations
- Acquire the necessary foundation in mathematics to be successful in Foundation Math 2, FND M020

**Grading Mode:** N - Normal Grading Mode

**Prerequisite Course(s):**
**Corequisite Course(s):**
**Equivalent Course(s):**
**Transfer Credit (TR), with reference to LP228**

**Course Learning Outcomes:**
- LO1: Understand and Apply basic concepts of **Whole Numbers**
- LO2: Understand and Apply basic concepts of **Fractions**
- LO3: Understand and Apply basic concepts of **Decimal Numbers**
- LO4: Understand and Apply basic concepts of **Real Numbers**
- LO5: Understand and Apply basic concepts of **Ratio, Proportion & Percentage**
- LO6: Understand and Apply basic concepts of **Measurement**
- LO7: Identify, Understand and Apply basic concepts of **2D and 3D Geometry**
- LO8: Understand and Apply basic concepts of **Data Analysis and Statistics**
- LO9: Understand and Apply basic concepts in **Algebra**
- LO10: Understand basic concepts of **Graphing**

**Teaching and Learning Strategies:**
This course requires independent practice and exercise, computer based learning and structures blended with regular standard classroom delivery on a need basis. Students must have an internet connection at home as ALEKS is the key resource. 

**Assessment and Learning in Knowledge Spaces (ALEKS)** is a web-based, artificially intelligent assessment and learning system. ALEKS uses adaptive questioning to quickly and accurately determine exactly what a student knows and doesn’t know in a course. ALEKS then instructs the student on the topics he/she is most ready to learn. As a student works...
through a course, ALEKS periodically reassesses the student to ensure that topics learned are also retained. ([http://www.aleks.com/about_aleks](http://www.aleks.com/about_aleks)).

### Key Strategies

- **Active learning** in class (during the 5 contact hours) by engaging the students in Learn By Doing activities, both hands on and using technology.
- A minimum of 5 hours of **independent learning** by students per week outside the regular contact hours.
- **Collaboration** and sharing best practices among teachers.
- Regular and **prompt individualized feedback** on student progress using the reports available for generation on ALEKS.
- **Technology** will be used to enhance the teaching and learning process. It is mandatory for all students to have an iPad. In addition to the classroom interaction, all comprehensive assessments are to be conducted on these iPads using a secure platform.
- Unless an early exit, all students are expected to complete at least 5 comprehensive assessments to be eligible to take the final comprehensive exam.

### Assessment Strategies:

#### Coursework - Pie: COVERING OUTCOMES 1 – 10 BASED ON STUDENT LEARNING PACE: 40%

This part of coursework is based on a comprehensive test taken under exam conditions. If a student meets a certain benchmark (refer to EARLY EXIT BELOW), the student becomes eligible to take an exit exam under exam conditions in the college. The comprehensive assessment assesses the successful mastery of a range of skills and mathematical concepts.

**Unless a student is an early exit, all students are expected to complete the initial assessment and at least 5 comprehensive assessments and early exits to be eligible to take the final Exit Exam.**

*Outcomes: 1-12*

#### Coursework – MIDTERM EXAM: COVERING OUTCOMES 1 TO 4 - 20%

All students who are still registered in the course at the time of the midterm assessment must take it under exam conditions. The midterm will cover LO1 - LO4 to ensure the basic and pre-requisite skills for the more complex learning outcomes are learnt and assessed.

#### Coursework – Quick Tables: 10%

The ALEKS course will generate the quick table assessments to ensure students acquire the necessary mental mathematical abilities over addition, subtraction, multiplication and division.

**The quick table assessments must be administered at the college under exam conditions.** QT must be officially started with the start of the ALEKS course. Initial QT average for the first 4 weeks will be adopted for the final grade but students are strongly encouraged to continue improving their QT scores up to the point of exit.

#### Final Exam (important to pass) – Early Exit Exams: COVERING OUTCOMES 1 – 10 - 30%

Once a student has met the eligibility criteria in the comprehensive test, the student can take an early exit exam under exam conditions at the college and can exit the course if he/she can meet the exit criteria (refer to EARLY EXIT BELOW).

**Total Weight: 100%**

### Required Educational Resources:


### Additional Educational Resources:

- Gen Ed Share Point Math 1 (FND-M010) HCT Foundations Math 1 e-book Black Board Vista e-learning materials and exercises
- Formula Sheet Gen Ed Share Point Learning Outcomes Gen Ed Share Point Assessment Guidelines

### Attachments:

- Appendix A- formula sheet & appendix B ALEKS & HCT conversion table.

### Special Comment:
### Early exit:

#### FND M010

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<tr>
<th>EXIT</th>
<th>No. of Topics (PIE %)</th>
<th>HCT %</th>
<th>Quick Table</th>
<th>MID TERM EXAM</th>
<th>EXIT EXAM SCORE</th>
<th>HCT Final Grade</th>
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<td><em>INITIAL ASSESSMENT</em></td>
<td>&gt;=200 (&gt;=91%)</td>
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<td>100% INITIAL ASSESSMENT SCORE</td>
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<td><em>EARLY EXIT 1 –</em></td>
<td>&gt;=200 (&gt;=91%)</td>
<td>&gt;=90%</td>
<td>NA</td>
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<td>&gt;=85%</td>
<td>40% ALEKS SCORE +30% EXIT EXAM (&gt;=85%) converted to 100%</td>
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<td><em>EARLY EXIT 2 –</em></td>
<td>&gt;=200 (&gt;=91%)</td>
<td>&gt;=90%</td>
<td>Average of QT scores at the point of exit MUST PASS AVERAGE 60%</td>
<td>MIDTERM SCORE IN %</td>
<td>CONDITION &gt;=85%</td>
<td>40% ALEKS SCORE + 10% QT + 20% MID TERM + 30% EXIT EXAM (&gt;=85%)</td>
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<td><em>FINAL EXAM ATTEMPTS</em></td>
<td>&gt;=156 (&gt;=71%)</td>
<td>&gt;=60%</td>
<td>Average of QT scores at the point of exit MUST PASS AVERAGE 60%</td>
<td>MIDTERM SCORE IN %</td>
<td>PASS MARK &gt;=60%</td>
<td>40% ALEKS SCORE + 10% QT + 20% MID TERM + 30% EXIT EXAM (&gt;=85%)</td>
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<td>Final Average &gt;= 60% No submission should be allowed if final average is below 60%</td>
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Appendix A –
FORMULA SHEET

Geometry - (Use $\pi = 3.14$)

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<tr>
<th>Geometry</th>
<th>Formula</th>
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<tr>
<td><strong>Perimeter</strong></td>
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<tr>
<td>Perimeter of a square</td>
<td>$P = 4s$</td>
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<tr>
<td>Perimeter of a triangle</td>
<td>$P = s_1 + s_2 + s_3$</td>
</tr>
<tr>
<td>Perimeter of a rectangle</td>
<td>$P = 2l + 2w$</td>
</tr>
<tr>
<td>Circumference of a circle</td>
<td>$C = 2\pi r$</td>
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<td>$C = \pi d$</td>
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<th><strong>Area</strong></th>
<th>Formula</th>
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<tbody>
<tr>
<td>Area of a square</td>
<td>$A = s^2$</td>
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<tr>
<td>Area of a rectangle</td>
<td>$A = lw$</td>
</tr>
<tr>
<td>Area of a triangle</td>
<td>$A = \frac{1}{2} bh$</td>
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<tr>
<td>Area of a parallelogram</td>
<td>$A = bh$</td>
</tr>
<tr>
<td>Area of a trapezoid</td>
<td>$A = \frac{1}{2} (a + b)h$</td>
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<thead>
<tr>
<th><strong>Volume</strong></th>
<th>Formula</th>
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<tbody>
<tr>
<td>Volume of a cube</td>
<td>$V = s^3$</td>
</tr>
<tr>
<td>Volume of a rectangular prism/cuboid</td>
<td>$V = lwh$</td>
</tr>
<tr>
<td>Volume of a cylinder</td>
<td>$V = \pi r^2 h$</td>
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<tr>
<td>Volume of a sphere</td>
<td>$V = \frac{4}{3} \pi r^3$</td>
</tr>
<tr>
<td>Volume of a cone</td>
<td>$V = \frac{1}{3} \pi r^2 h$</td>
</tr>
<tr>
<td>Volume of a triangular prism</td>
<td>$V = \frac{1}{2} lwh$</td>
</tr>
<tr>
<td>The general formula for the Volume of a pyramid</td>
<td>$V = \frac{1}{3}$ Area of the base × Height</td>
</tr>
<tr>
<td>The volume of a pyramid with a rectangular base</td>
<td>$V = \frac{1}{3}$ Length of base × Width of base × Height</td>
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<tr>
<th><strong>Surface Area</strong></th>
<th>Formula</th>
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<tbody>
<tr>
<td>Surface Area of a cube</td>
<td>$SA = 6 s^2$</td>
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<tr>
<td>Surface Area of a sphere</td>
<td>$SA = 4\pi r^2$</td>
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<tr>
<td>Surface area of the cone</td>
<td>$SA = \pi r^2 + \pi rs$</td>
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<tr>
<td>Surface area of a cylinder</td>
<td>$SA = 2\pi r^2 + 2\pi rh$</td>
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<tr>
<td>Surface area of a rectangular prism</td>
<td>$SA = 2(lw + lh + lh)$</td>
</tr>
<tr>
<td>Surface area of a triangular prism</td>
<td>$SA = wh + lw + lh + ls$</td>
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| **Pythagorean Theorem:** | $a^2 + b^2 = c^2$                                                      |

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<tr>
<th><strong>Linear Equations</strong></th>
<th>Equation of a straight line: $y = mx + c$</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>$m = \frac{y_2-y_1}{x_2-x_1}$</td>
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<tr>
<td></td>
<td>$m$ : slope, $c$ : $y$-intercept</td>
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</table>
**Rules of Exponents**

Rule 1 of Exponents: \[ a^m \times a^n = a^{m+n} \]

Rule 2 of Exponents: \[ \frac{a^m}{a^n} = a^{m-n}, \quad a \neq 0 \]

Rule 3 of Exponents: \[ (a^m)^n = a^{mn} \]

Rule 4 of Exponents: \[ (ab)^n = a^n b^n \]

Rule 5 of Exponents: \[ \left( \frac{a}{b} \right)^n = \frac{a^n}{b^n}, \quad b \neq 0 \]

Rule 6 of Exponents: \[ a^0 = 1, \quad a \neq 0 \]

Rule 7 of Exponents: \[ a^{-n} = \frac{1}{a^n} \quad r \quad \frac{1}{a^{-n}} = a^n ; a \neq 0 \]

The square of a binomial \((a \pm b)^2 = a^2 \pm 2ab + b^2\)

**Sequences**

**Arithmetic Sequence**
\[ a_n = a_1 + (n - 1)d \]

**Geometric Sequence**
\[ a_n = a_1 r^{n-1} \]

**Percentages**

**Amount of Change**
\[ A = RB \]

**New Amount**
\[ N = B \pm A \]
\[ N = B(1 \pm R) \]

**Temperature**

**Fahrenheit to Celsius:**
\[ C = \frac{5}{9}(F - 32) \]

**Celsius to Fahrenheit:**
\[ F = \frac{9}{5}C + 32 \]

**Speed**
\[ s = \frac{d}{t} \]

**Simple and Compound Interest**

\[ P: \text{principal (your first deposit)} \]
\[ r: \text{annual interest rate} \]
\[ n: \text{number of times interest is compounded each year} \]
\[ t: \text{total time in years} \]
\[ A: \text{accumulated amount after n years, including interest} \]

1. **Simple interest**
   \[ I = Prt \]

2. **If interest is compounded once a year**
   \[ A = P(1 + r)^t \]

3. **If interest is compounded n times a year**
   \[ A = P(1 + r/n)^nt \]
<table>
<thead>
<tr>
<th>PIE Score</th>
<th>ALEKS %</th>
<th>HCT %</th>
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**FND M010**
COURSE OUTCOMES

Whole Numbers (46 topics)

Place Value, Expanded Form, and Numeral Translation (6 topics)
- Whole number place value: Problem type 1
- Whole number place value: Problem type 2
- Expanded form
- Expanded form with zeros
- Numeral translation: Problem type 1
- Numeral translation: Problem type 2

Addition and Subtraction (1 topic)
- Word problem with addition or subtraction of whole numbers

Multiplication and Division (15 topics)
- Multiplication as repeated addition
- Multiplication by 10, 100, and 1000
- Multiplication with trailing zeros: Problem type 1
- Multiplication with trailing zeros: Problem type 2
- Multiplication of large numbers
- Multiples: Problem type 1
- Multiples: Problem type 2
- Introduction to properties of multiplication
- Division facts
- Word problem with multiplication or division of whole numbers
- Word problem with multiplication and addition or subtraction of whole numbers
- Division of whole numbers given in fractional form
- Quotient and remainder: Problem type 1
- Word problem on quotient and remainder
- Word problem with division of whole numbers and rounding

Ordering, Rounding, and Estimating (7 topics)
- Introduction to inequalities
- Ordering large numbers
- Rounding to tens or hundreds
- Rounding to hundreds or thousands
- Estimating a sum of whole numbers
- Estimating a difference of whole numbers
- Estimating a product or quotient of whole numbers

Exponents and Order of Operations (3 topics)
- Introduction to parentheses
- Introduction to order of operations
- Order of operations with whole numbers

Prime Numbers, Factors, and Multiples (10 topics)
- Even and odd numbers
- Divisibility rules for 2, 5, and 10
- Divisibility rules for 3 and 9
• Factors
• Prime numbers
• Prime factorization
• Greatest common factor of 2 numbers
• Least common multiple of 2 numbers
• Least common multiple of 3 numbers
• Word problem with common multiples

**Introduction to Expressions and Equations (4 topics)**
• Evaluating an algebraic expression: Whole number addition or subtraction
• Evaluating an algebraic expression: Whole number multiplication or division
• Evaluating an algebraic expression: Whole numbers with two operations
• Using two steps to solve an equation with whole numbers

**Fractions (35 topics)**

**Equivalent Fractions (5 topics)**
• Introduction to fractions
• Understanding equivalent fractions
• Equivalent fractions
• Introduction to simplifying a fraction
• Simplifying a fraction

**Plotting and Ordering (5 topics)**
• Fractional position on a number line
• Plotting fractions on a number line
• Ordering fractions with the same denominator
• Ordering fractions with the same numerator
• Using a common denominator to order fractions

**Multiplication and Division (11 topics)**
• Product of a unit fraction and a whole number
• Product of a fraction and a whole number: Problem type 1
• Fraction multiplication
• Product of a fraction and a whole number: Problem type 2
• Multiplication of 3 fractions
• Word problem involving fractions and multiplication
• Multi-step word problem involving fractions and multiplication
• The reciprocal of a number
• Division involving a whole number and a fraction
• Fraction division
• Word problem involving fractions and division

**Addition and Subtraction (6 topics)**
• Addition or subtraction of fractions with the same denominator and simplification
• Finding the LCD of two fractions
• Addition or subtraction of unit fractions
• Addition and subtraction of 3 fractions with different denominators
• Word problem involving addition or subtraction of fractions with different denominators
• Fractional part of a circle

**Mixed Numbers (7 topics)**
• Writing an improper fraction as a mixed number
• Writing a mixed number as an improper fraction
• Addition and subtraction of 3 mixed numbers with different denominators
• Word problem involving addition or subtraction of mixed numbers with different denominators
• Multiplication of a mixed number and a whole
• Division with a mixed number and a whole number
• Word problem involving multiplication or division with mixed numbers

**Exponents and Order of Operations (1 topic)**
• Exponents and fractions

**Decimals (55 topics)**

**Place Value, Ordering, and Rounding (10 topics)**
• Decimal place value: Tenths and hundredths
• Decimal place value: Hundreds to ten thousandths
• Writing a decimal number less than 1 given its name
• Writing a decimal number greater than 1 given its name
• Writing a decimal number given its name: Advanced
• Reading decimal position on a number line: Tenths
• Reading decimal position on a number line: Hundredths
• Introduction to ordering decimals
• Ordering decimals
• Rounding decimals

**Converting Decimals to Fractions (7 topics)**
• Converting a decimal to a proper fraction without simplifying: Basic
• Converting a decimal to a proper fraction without simplifying: Advanced
• Converting a decimal to a proper fraction in simplest form: Basic
• Converting a decimal to a proper fraction in simplest form: Advanced
• Converting a decimal to a mixed number and an improper fraction without simplifying
• Converting a decimal to a mixed number and an improper fraction in simplest form: Basic
• Converting a decimal to a mixed number and an improper fraction in simplest form: Advanced

**Addition and Subtraction (8 topics)**
• Decimal addition with 3 numbers
• Decimal subtraction: Basic
• Decimal subtraction: Advanced
• Decimal addition and subtraction with 3 or more numbers
• Estimating a decimal sum or difference
• Word problem with addition or subtraction of 2 decimals
• Word problem with addition of 3 or 4 decimals and whole numbers
• Word problem with subtraction of a whole number and a decimal: Regrouping with zeros

**Multiplication (11 topics)**
• Introduction to decimal multiplication
• Multiplication of a decimal by a whole number
• Decimal multiplication: Problem type 1
• Decimal multiplication: Problem type 2
• Multiplication of a decimal by a power of ten
• Multiplication of a decimal by a power of 0.1
• Multiplication of decimals that have a product less than 0.1
• Estimating a product of decimals
• Word problem with multiplication of a decimal and a whole number
• Word problem with multiplication of two decimals
• Word problem with decimal addition and multiplication

Division (10 topics)
• Whole number division with decimal answers
• Division of a decimal by a whole number
• Division of a decimal by a 1-digit decimal
• Division of a decimal by a 2-digit decimal
• Division of a decimal by a power of ten
• Division of a decimal by a power of 0.1
• Decimal division with rounding
• Word problem with division of a decimal and a whole number
• Word problem with division of two decimals
• Word problem with decimal subtraction and division

Converting Fractions to Decimals (9 topics)
• Converting a fraction with a denominator of 10 or 100 to a decimal
• Converting a fraction with a denominator of 100 or 1000 to a decimal
• Ordering fractions and decimals
• Converting a fraction to a terminating decimal: Basic
• Converting a fraction to a terminating decimal: Advanced
• Converting a fraction to a repeating decimal: Basic
• Converting a fraction to a repeating decimal: Advanced
• Using a calculator to convert a fraction to a rounded decimal
• Converting a mixed number to a terminating decimal: Advanced

Ratios, Proportions, and Percents (33 topics)

Ratios and Unit Rates (8 topics)
• Writing ratios using different notations
• Writing ratios for real-world situations
• Simplifying a ratio of whole numbers: Problem type 1
• Simplifying a ratio of decimals
• Finding a unit price
• Computing unit prices to find the better buy
• Solving a word problem on proportions using a unit rate
• Finding unit rates
Proportions (2 topics)
- Solving a proportion of the form $x/a = b/c$
- Word problem on proportions: Problem type 1

Converting Between Fractions, Decimals, and Percentages (14 topics)
- Converting a fraction with a denominator of 100 to a percentage
- Converting a percentage to a fraction with a denominator of 100
- Finding the percentage of a grid that is shaded
- Introduction to converting a percentage to a decimal
- Introduction to converting a decimal to a percentage
- Converting between percentages and decimals
- Converting a mixed number percentage to a decimal
- Converting between percentages and decimals in a real-world situation
- Converting a percentage to a fraction in simplest form
- Converting a decimal percentage to a fraction
- Converting a fraction to a percentage: Denominator of 4, 5, or 10
- Converting a fraction to a percentage: Denominator of 20, 25, or 50
- Using a calculator to convert a fraction to a rounded percentage
- Converting a fraction to a percentage in a real-world situation

Applications Involving Percentages (9 topics)
- Finding a percentage of a whole number
- Finding a percentage of a whole number without a calculator: Basic
- Finding a percentage of a whole number without a calculator: Advanced
- Applying the percent equation: Problem type 1
- Applying the percent equation: Problem type 2
- Finding a percentage of a total amount: Real-world situations
- Finding a percentage of a total amount without a calculator: Sales tax, commission, discount
- Estimating a tip without a calculator
- Computing a percentage from a table of values

Geometry (27 topics, no due date)
Perimeter (5 topics)
- Perimeter of a polygon
- Perimeter of a square or a rectangle
- Sides of polygons having the same perimeter

Lines, Angles, and Triangles (9 topics)
- Identifying parallel and perpendicular lines
- Naming segments, rays, and lines
- Drawing an angle with the protractor
- Acute, obtuse, and right angles
- Supplementary and complementary angles
• Acute, obtuse, and right triangles
• Scalene, isosceles, and equilateral triangles
• Finding an angle measure of a triangle given two angles
• Finding an angle measure for a triangle with an extended side

Polygons and Quadrilaterals (3 topics)
• Naming polygons
• Identifying parallelograms, rectangles, and squares
• Classifying quadrilaterals

Area of Polygons (4 topics)
• Area of a square or a rectangle
• Perimeter and area on a grid
• Distinguishing between area and perimeter
• Area of a triangle

Circumference and Area of Circles (3 topics)
• Introduction to a circle: Diameter, radius, and chord
• Circumference of a circle
• Circumference and area of a circle

Volumes (2 topics)
• Vertices, edges, and faces of a solid
• Counting the cubes in a solid made of cubes

Square Roots and the Pythagorean Theorem (1 topic)
• Square root of a perfect square

Measurement (3 topics)

Metric Units of Measurement (2 topics)
• Choosing metric measurement units
• Metric distance conversion with whole number values

Time and Temperature (1 topic)
• Time unit conversion with whole number values

Data Analysis and Statistics (6 topics)
Tables and Graphs of Data (4 topics)
• Interpreting a tally table
• Constructing a line plot
• Interpreting a bar graph
• Interpreting a line graph

Probability (2 topics)
• Introduction to the probability of an event
• Probability of an event

Real Numbers (7 topics)
Plotting and Ordering (6 topics)
• Plotting integers on a number line
• Plotting rational numbers on a number line
• Reading the temperature from a thermometer
• Writing a signed number for a real-world situation
• Ordering integers
• Ordering real numbers

Exponents and Order of Operations (1 topic)
• Exponents and integers: Problem type 1

Algebraic Expressions and Equations (6 topics)
One-Step Linear Equations (6 topics)
• Additive property of equality with fractions and mixed numbers
• Additive property of equality with decimals
• Additive property of equality with integers
• Additive property of equality with signed fractions
• Solving for a variable in terms of other variables using addition or subtraction: Basic
• Multiplicative property of equality with fractions

Graphs of Linear Equations (2 topics)
Ordered Pairs (2 topics)
• Reading a point in the coordinate plane
• Plotting a point in the coordinate plane