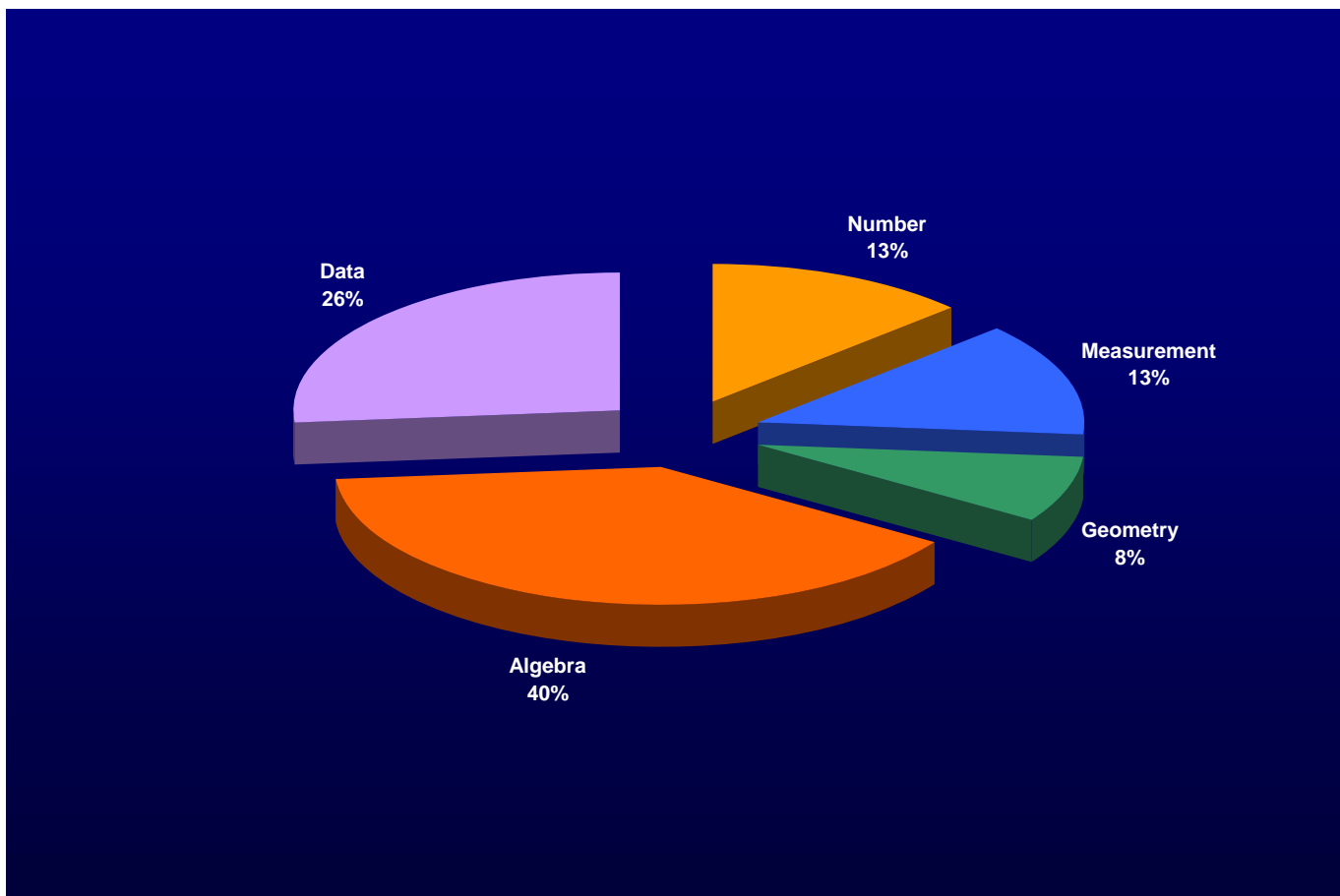


**Essential Focus Elements – Mathematics
GRADE 9**

Grade Nine – Mathematics Essential Focus Elements



Essential Focus Elements – Mathematics GRADE 9

| STANDARD | CONCEPTS <i>(What Students Need to KNOW)</i> | SKILLS <i>(What Students Need to be Able to DO)</i> |
|---|--|---|
| Number, Number Sense, and Operations | <p>Number and Number Systems</p> <ul style="list-style-type: none"> • Properties • Equivalent forms for rational and irrational numbers <p>Meaning of Operations</p> <ul style="list-style-type: none"> • Effects of operations <p>Computation and Estimation</p> <ul style="list-style-type: none"> • Fluency in computation • Solutions for problem situations | <ol style="list-style-type: none"> 1. Identify and justify properties. 2. Compare, order, and determine equivalent forms for rational numbers. 3. Explain the effects of operations, include the use of powers and roots. 4. Demonstrate fluency in computation. 5. Estimate solutions for problems involving square roots and cube roots. |
| Measurement | <p>Measurement Units</p> <ul style="list-style-type: none"> • Rates within the same measurement system <p>Use Measurement Techniques and Tools</p> <ul style="list-style-type: none"> • Ratios of areas and ratio of volumes • Right triangle trigonometry • Scale drawing | <ol style="list-style-type: none"> 1. Convert rates within the same system. 2. Compute the ratio of lengths to determine ratio of areas and volumes in similar figures. 3. Solve problems involving unknown distances and angle measure using right triangle geometry and scale drawing. |
| Geometry and Spatial Sense | <p>Characteristics and Properties</p> <ul style="list-style-type: none"> • Trigonometric ratios <p>Visualization and Geometric Models</p> <ul style="list-style-type: none"> • Two-dimensional figures in the coordinate plane | <ol style="list-style-type: none"> 1. Define trigonometric ratios in a right triangle. 2. Analyze properties of figures in coordinate plane. |

Essential Focus Elements – Mathematics GRADE 9

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|--|---|---|
| <p>Patterns, Functions, and Algebra</p> | <p>Use Patterns, Relations, and Functions</p> <ul style="list-style-type: none"> • Functions and relations • Zeroes, roots, and solutions • Families of functions <p>Use Algebraic Representations</p> <ul style="list-style-type: none"> • Equivalent forms of equations and inequalities • Linear equations satisfying given conditions • 2 by 2 systems of linear equations • Monomials and polynomials • Rational expressions <p>Analyze Change</p> <ul style="list-style-type: none"> • Direct and inverse variation | <ol style="list-style-type: none"> 1. Generalize patterns, functions, and relations. 2. Translate among tabular, graphical, and symbolic representations of functions and relations. 3. Demonstrate the relationship between zero, roots, and solutions. 4. Describe characteristics of families of functions. 5. Compare characteristics of families of functions. 6. Write and use equivalent forms of equations and inequalities. 7. Solve and interpret 2 by 2 systems of linear equations. 8. Add, subtract, multiply, and divide monomials and polynomials. 9. Simplify and eliminate common factors in rational expressions. 10. Simplify rational expressions by applying properties of exponents. 11. Model and solve problems of direct and inverse variation. |
|--|---|---|

Essential Focus Elements – Mathematics GRADE 9

| | | |
|---|---|--|
| <p>Data Analysis and Probability</p> | <p>Data Collection</p> <ul style="list-style-type: none"> • Scatterplot for a set of bivariate data <p>Statistical Methods</p> <ul style="list-style-type: none"> • Frequency distributions • Relationships in bivariate data <p>Probability</p> <ul style="list-style-type: none"> • Fundamental counting principle • Theoretical and experimental probability | <ol style="list-style-type: none"> 1. Create a scatterplot. 2. Sketch a line of best fit in a scatterplot. 3. Interpret slope of a line of best fit for a scatterplot. 4. Analyze and interpret frequency distributions. 5. Make inferences about relationships in bivariate data. 6. Use the fundamental counting principle to determine probability. 7. Use theoretical and experimental probability. |
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Essential Focus Elements – Mathematics

GRADE 9

TIPS AND LESSON PLANS

TIPS

Number, Number Sense, and Operations

| Skill # | |
|---------|--|
| 1 | Develop rules of the various properties by examining specific examples and formulating ideas. Write in own words. |
| 1 | Develop the rules of the Commutative (addition/multiplication) property, Associative (addition/multiplication) Property, Additive Identity, Multiplicative Identity and the Distributive Property by examining specific examples and formulating idea to allow students to experiment with numbers and write the properties in their own words. |
| 2 | Use a deck of cards for games; with black cards, negative, red cards, positive. |
| 2 | Use a deck of cards (large size are more fun) for each pair of players, with face cards removed, indicate black cards are positive number and red cards are negative. Many games can be played including comparing or ordering integers, as well as performing various operations. |
| 3 | Use calculator to write powers in decimal form. Use both positive and negative powers. |
| 3 | Investigate different patterns associated with “square numbers” and “triangular numbers” using counters, tiles, etc. to complete a sequence. |
| 3 | Use a calculator to write powers in decimal form, for example: start with 10 to the 4 th power and go to 10 to the -4 th power then ask students to discover a pattern. |
| 4 | Practice computing mentally - divide class into 2 teams. Have a student from each team go to the chalkboard. When the teacher states the problem, the students write the problem on the board with the answer. The first student to correctly write and solve the problem wins a point for their team. The competition is over after every student has participated. The team with the greatest number of points wins. |
| 5 | WHICH CUBE WOULD YOU CHOOSE? There are three large cubes - yellow, red, and blue. The yellow is 3X3X3 where each small cube contains a \$20 bill; the red cube is 4X4X4 where each small cube contains a \$10 bill; and the blue cube is 5X5X5 where each small cube contains a \$5 bill. Which one would you choose to keep? |

Measurement

| Skill # | |
|---------|--|
| 1 | Increase a recipe large enough for the entire class. Convert where possible. |
| 1 | Using classroom as model, determine amount of wallpaper needed; calculate the cost of papering the entire classroom. |
| 2 | Use proportions to solve real-life problems, such as finding the dimensions(wingspan) of an airplane from a scale model (1-to-250 scale) |
| 3 | Use GeoBoards to make similar right triangles; Find/ compare areas. |
| 3 | Explore more about right triangles and area, using “tangrams.” |
| 3 | Measure real world to estimate other measurements, using trigonometry and similar figures. |

Essential Focus Elements – Mathematics GRADE 9

Geometry and Spatial Sense

| Skill # | |
|---------|---|
| 1 | Use GeoBoard to make triangles, then find the tangent, sine and cosine of the acute angles in each triangle. |
| 2 | Have pairs of students do a "describe & draw", where one communicates direction and the other makes the design using GeoBoard or dot paper. |

Patterns, Functions and Algebra

| Skill # | |
|---------|---|
| 1-2 | Use authentic situations, as students buying DVDs and their cost. Have them graph line, determine y-intercept, slope, equation. Use graphing calculator |
| 2 | Use activities such as those in OMAP or NCTM navigating series. |
| 6, 8, 9 | Use algebra tiles to solve equalities and inequalities. |
| 7 | Use graphing calculators to explore relationships of graphs and intercepts. |

Data Analysis and Probability

| Skill # | |
|---------|--|
| 1-3 | Have class work together to create scatter, as measuring arm span and height. Use graphing calculator to plot scattergram. |
| 4 | Students can design/conduct surveys or other investigations to model. |

Essential Focus Elements – Mathematics

GRADE 9

LESSON PLANS

Number, Number Sense, and Operations

| Skill No. | Lesson No. | Lesson Title | Description |
|-----------|------------|--------------|-------------|
| | | | |

Measurement

| Skill No. | Lesson No. | Lesson Title | Description |
|-----------|------------|--------------|-------------|
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Geometry and Spatial Sense

| Skill No. | Lesson No. | Lesson Title | Description |
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Patterns, Functions, and Algebra

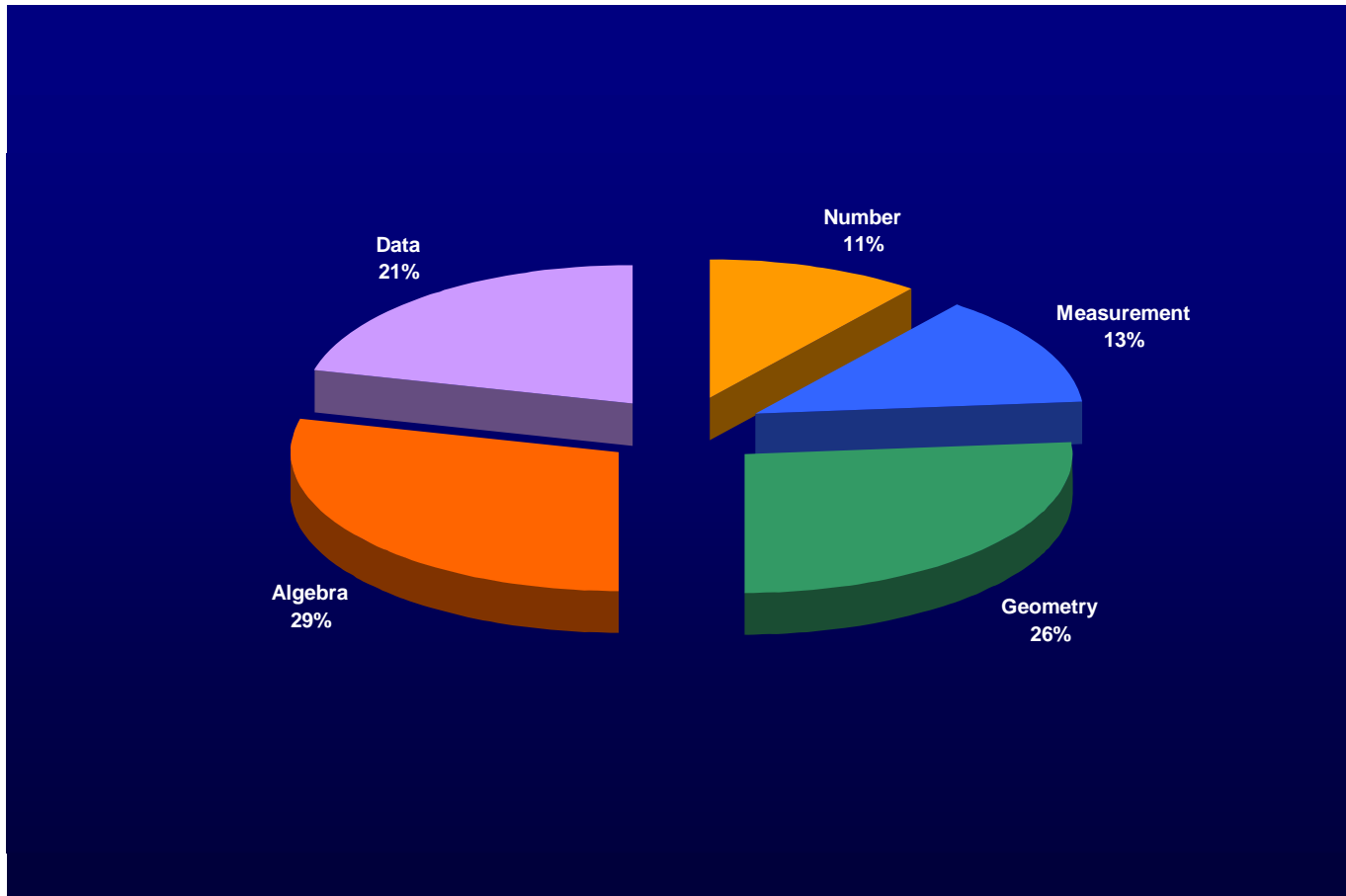
| Skill No. | Lesson No. | Lesson Title | Description |
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Data Analysis and Probability

| Skill No. | Lesson No. | Lesson Title | Description |
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**Essential Focus Elements – Mathematics
GRADE 10**

Grade Ten – Mathematics Essential Focus Elements



Essential Focus Elements – Mathematics GRADE 10

| STANDARD | CONCEPTS <i>(What Students Need to KNOW)</i> | SKILLS <i>(What Students Need to be Able to DO)</i> |
|---|---|---|
| Number, Number Sense, and Operations | Meaning of Operations <ul style="list-style-type: none"> • Nth root Computation and Estimation <ul style="list-style-type: none"> • Factorials | <ol style="list-style-type: none"> 1. Explain the Nth root. 2. Approximate the Nth root between consecutive integers. 3. Compute factorials. |
| Measurement | Use Measurement Techniques and Tools <ul style="list-style-type: none"> • Central and inscribed angles and their associated arcs | <ol style="list-style-type: none"> 1. Determine the measures of central and inscribed angles. |

Essential Focus Elements – Mathematics GRADE 10

| | | |
|-----------------------------------|---|---|
| Geometry and Spatial Sense | <p>Characteristics and Properties</p> <ul style="list-style-type: none"> • Key aspects of geometric figures <ul style="list-style-type: none"> ○ Interior and exterior angles of polygons ○ Triangles (mean, altitude, mid-segment, points of concurrency) ○ Circles (radius, diameter, chord, circumference, arcs, sector, segment, and inscribed angle) • Validity of conjectures <ul style="list-style-type: none"> ○ Prove (verify, illustrate) the Pythagorean Theorem ○ Prove theorems involving triangle similarity and congruence ○ Prove theorems involving properties of lines, angles, triangles, and quadrilaterals <p>Spatial Relationships</p> <ul style="list-style-type: none"> • Congruent figures and similar figures <p>Transformation and Symmetry</p> <ul style="list-style-type: none"> • Reflection and rotation symmetries • Coordinate rules for translations, reflections, and rotations <p>Visualization and Geometric Models</p> <ul style="list-style-type: none"> • Chords, radii, and arcs | <ol style="list-style-type: none"> 1. Define and explain aspects of geometric figures. 2. Create, test, and establish the validity of conjectures. 3. Construct congruent and similar figures. 4. Construct similar figures. 5. Identify reflection and rotation symmetries. 6. Derive coordinate rules. 7. Solve problems involving chords, radii, and arcs of the same circle. |
|-----------------------------------|---|---|

Essential Focus Elements – Mathematics GRADE 10

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|--|---|--|
| <p>Patterns, Functions, and Algebra</p> | <p>Use Patterns, Relations, and Functions</p> <ul style="list-style-type: none"> • Characteristics of square root, cubic root, absolute value, and basic trigonometric functions <p>Use Algebraic Representation</p> <ul style="list-style-type: none"> • Variables in equations and formulas • Linear and nonlinear equations and inequalities with square roots and rational expressions as coefficients and solutions • Systems of linear inequalities | <ol style="list-style-type: none"> 1. Describe and compare the characteristics of the functions listed. 2. Solve for a specific variable in equations and formulas. 3. Solve equations and inequalities with square roots, etc. 4. Solve systems of linear inequalities. |
| <p>Data Analysis and Probability</p> | <p>Data Collection</p> <ul style="list-style-type: none"> • Bivariate data <p>Statistical Methods</p> <ul style="list-style-type: none"> • Relationship between two variables | <ol style="list-style-type: none"> 1. Represent and analyze bivariate data. 2. Use multiple graphical displays and statistical measures to interpret the relationship between two variables. |

Essential Focus Elements – Mathematics

GRADE 10

TIPS AND LESSON PLANS

TIPS

Number, Number Sense, and Operations

| Skill # | |
|---------|--|
| 1 | Emphasize multiple representations for same graphic relation between matrices, vectors, and complex numbers. |
| 1-2 | Calculate any root using logarithms - root = antilog (log (number)/n); Newton's formulas may also be used |
| 3 | Have calculators available for student use with this skill |

Measurement

| Skill # | |
|---------|---|
| 1 | Use construction tools and measuring instruments. |
| 1 | Try using internet for interactive tutorials such as those found on: (www.analyzemath.com) |
| 3 | Use manipulatives for students to investigate surface area (e.g., paper wrapped around a cone). |

Geometry and Spatial Sense

| Skill # | |
|---------|---|
| 1 | Add excitement to this topic by making use of the internet (Ex. www.enchantedmind.com and http://nlvm.usu.edu (National Library of Virtual Manipulatives), or use tangrams and pentominoes |
| 1 | Use protractors and other tools to explore angles in polygons. |
| 1 | Use polar navigation. |
| 3 | Use GeoBoards to construct similar and congruent triangles |
| 4 | Find words, letters and figures that have symmetric patterns; site examples of translation, rotation and reflection in real-life situations |
| 5 | Use practical problems involving triangles. |
| 6 | Bring out the compass, ruler & protractor for this one |

Essential Focus Elements – Mathematics GRADE 10

Patterns, Functions and Algebra

| Skill # | |
|---------|---|
| 1 | Use graphing calculators for investigation. |
| 4 | First solve & graph using number line; then use graphing calculators. |
| 1 | Conduct investigations with graphing calculators and/or other technologies. |
| 2-3 | Use algebra tiles to solve equations and inequalities |

Data Analysis and Probability

| Skill # | |
|---------|--------------------------------|
| 2 | Use interactive graphing tool. |

Essential Focus Elements – Mathematics

GRADE 10

LESSON PLANS

Number, Number Sense, and Operations

| Skill No. | Lesson No. | Lesson Title | Description |
|-----------|------------|--------------|-------------|
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Measurement

| Skill No. | Lesson No. | Lesson Title | Description |
|-----------|------------|--------------|-------------|
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Geometry and Spatial Sense

| Skill No. | Lesson No. | Lesson Title | Description |
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Patterns, Functions, and Algebra

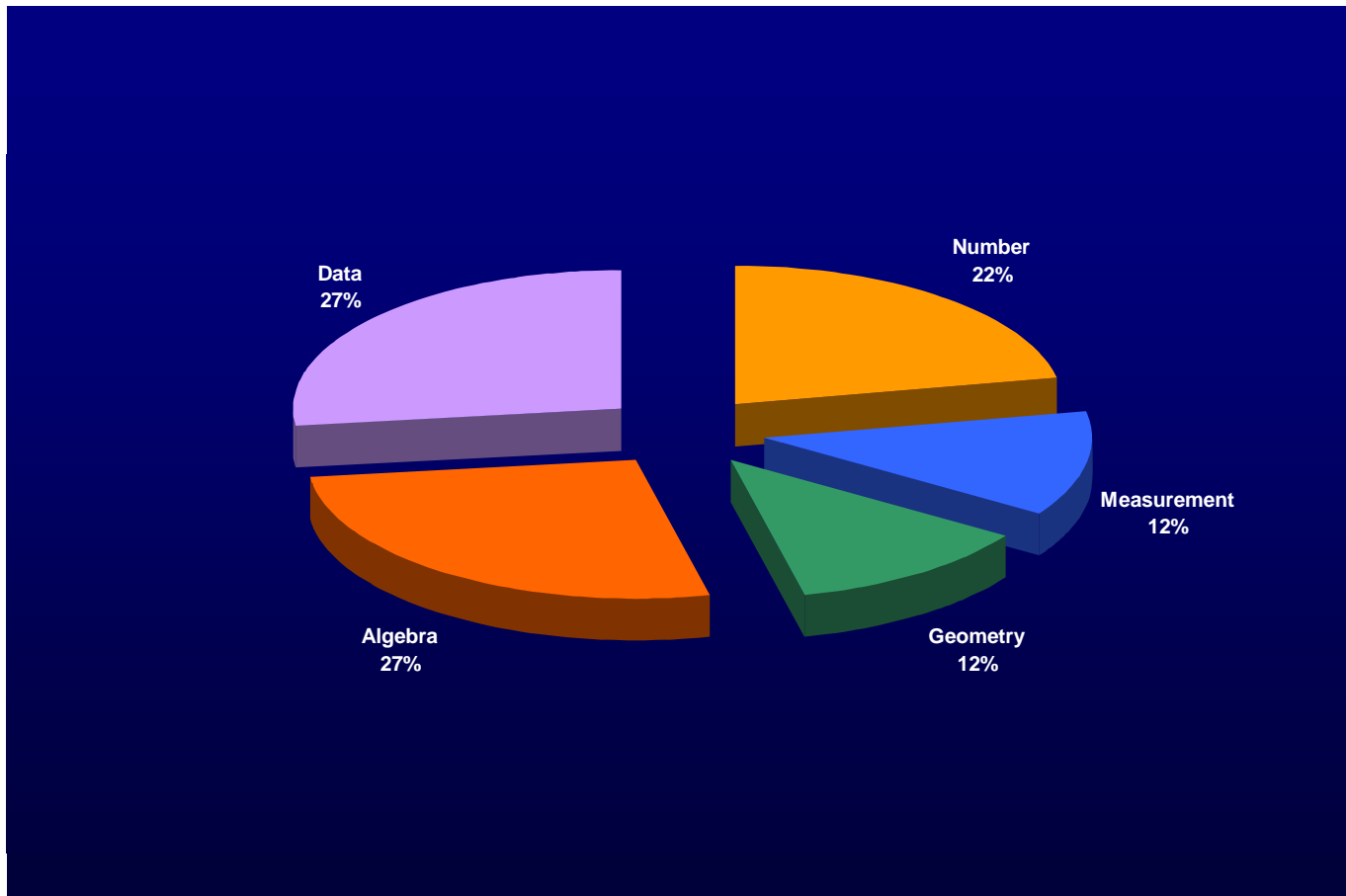
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Data Analysis and Probability

| Skill No. | Lesson No. | Lesson Title | Description |
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**Essential Focus Elements – Mathematics
GRADE 11**

Grade Eleven – Mathematics Essential Focus Elements



Essential Focus Elements – Mathematics GRADE 11

| STANDARD | CONCEPTS <i>(What Students Need to KNOW)</i> | SKILLS <i>(What Students Need to be Able to DO)</i> |
|---|---|--|
| Number, Number Sense, and Operations | <p>Number and Number Systems</p> <ul style="list-style-type: none"> • Matrices • Operations with matrices and vectors • Complex numbers <p>Computation and Estimation</p> <ul style="list-style-type: none"> • With matrices • With complex numbers • Fractional and negative exponents | <ol style="list-style-type: none"> 1. Determine properties of operations with matrices and vectors. 2. Represent complex numbers. 3. Compute with matrices. 4. Compute with complex numbers. 5. Use fractional and negative exponents in computation. |
| Measurement | <p>Measurement Units</p> <ul style="list-style-type: none"> • Radian and degree measure • Significant digits <p>Use Measurement Techniques and Tools</p> <ul style="list-style-type: none"> • Formula for surface area of a cone | <ol style="list-style-type: none"> 1. Use radians and degrees to measure and to solve problems. 2. Determine the number of significant digits. 3. Derive the formula for the surface area of a cone or section. |

Essential Focus Elements – Mathematics GRADE 11

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|--|--|---|
| <p>Geometry and Spatial Sense</p> | <p>Spatial Relationships</p> <ul style="list-style-type: none"> • Polar coordinates <p>Transformations and Symmetry</p> <ul style="list-style-type: none"> • Translations using vectors • Scalar multiplication <ul style="list-style-type: none"> • Law of Sines and Cosines | <ol style="list-style-type: none"> 1. Use polar coordinates in the coordinate plane. 2. Represent translations using vectors. 3. Understand and utilize scalar multiplication. 4. Describe scalar multiplication graphically and algebraically. 5. Determine lengths and angle measure using the Law of Sines and the Law of Cosines. |
| <p>Patterns, Functions, and Algebra</p> | <p>Use Patterns, Relations, and Functions</p> <ul style="list-style-type: none"> • Characteristics (shape, number of roots, domain, range, asymptotic behavior) of: <ul style="list-style-type: none"> ○ Quadratic functions with complex roots ○ Polynomial functions of any degree ○ Logarithmic functions ○ Rational functions • Maximum and minimum values <p>Use Algebraic Representations</p> <ul style="list-style-type: none"> • Inverse of a function • Equations with radical expressions <ul style="list-style-type: none"> • 3 by 3 systems of equations • Characteristics of conic sections | <ol style="list-style-type: none"> 1. Describe and compare characteristics of various types of functions. 2. Represent the inverse of a function. 3. Identify maximum and minimum values of a function. 4. Solve equations with radical expressions. 5. Solve equations with complex roots. 6. Solve 3 by 3 systems of equations. 7. Describe characteristics of conic sections. |

Essential Focus Elements – Mathematics GRADE 11

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| <p>Data Analysis and Probability</p> | <p>Data Collection</p> <ul style="list-style-type: none"> • Statistical experiment, survey or study <p>Statistical Methods</p> <ul style="list-style-type: none"> • Scatterplot of bivariate data <ul style="list-style-type: none"> • Standard deviation • Normal curve • Validity of results <p>Probability</p> <ul style="list-style-type: none"> • Random variable | <ol style="list-style-type: none"> 1. Design a statistical experiment, survey, or study. 2. Interpret data results of a statistical experiment, study, or survey. 3. Create a scatterplot of bivariate data. 4. Identify trends of a scatterplot of bivariate data. 5. Find a function to model the data of a scatterplot of bivariate data. 6. Compute the standard deviation of a set of data. 7. Evaluate the validity of results. 8. Understand and use random variables. |
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Essential Focus Elements – Mathematics GRADE 11

TIPS AND LESSON PLANS

TIPS

Number, Number Sense, and Operations

| Skill # | |
|---------|--|
| | |

Measurement

| Skill # | |
|---------|--|
| | |

Geometry and Spatial Sense

| Skill # | |
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Patterns, Functions and Algebra

| Skill # | |
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| | |

Data Analysis and Probability

| Skill # | |
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Essential Focus Elements – Mathematics

GRADE 11

LESSON PLANS

Number, Number Sense, and Operations

| Skill No. | Lesson No. | Lesson Title | Description |
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Measurement

| Skill No. | Lesson No. | Lesson Title | Description |
|-----------|------------|--------------|-------------|
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Geometry and Spatial Sense

| Skill No. | Lesson No. | Lesson Title | Description |
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Patterns, Functions, and Algebra

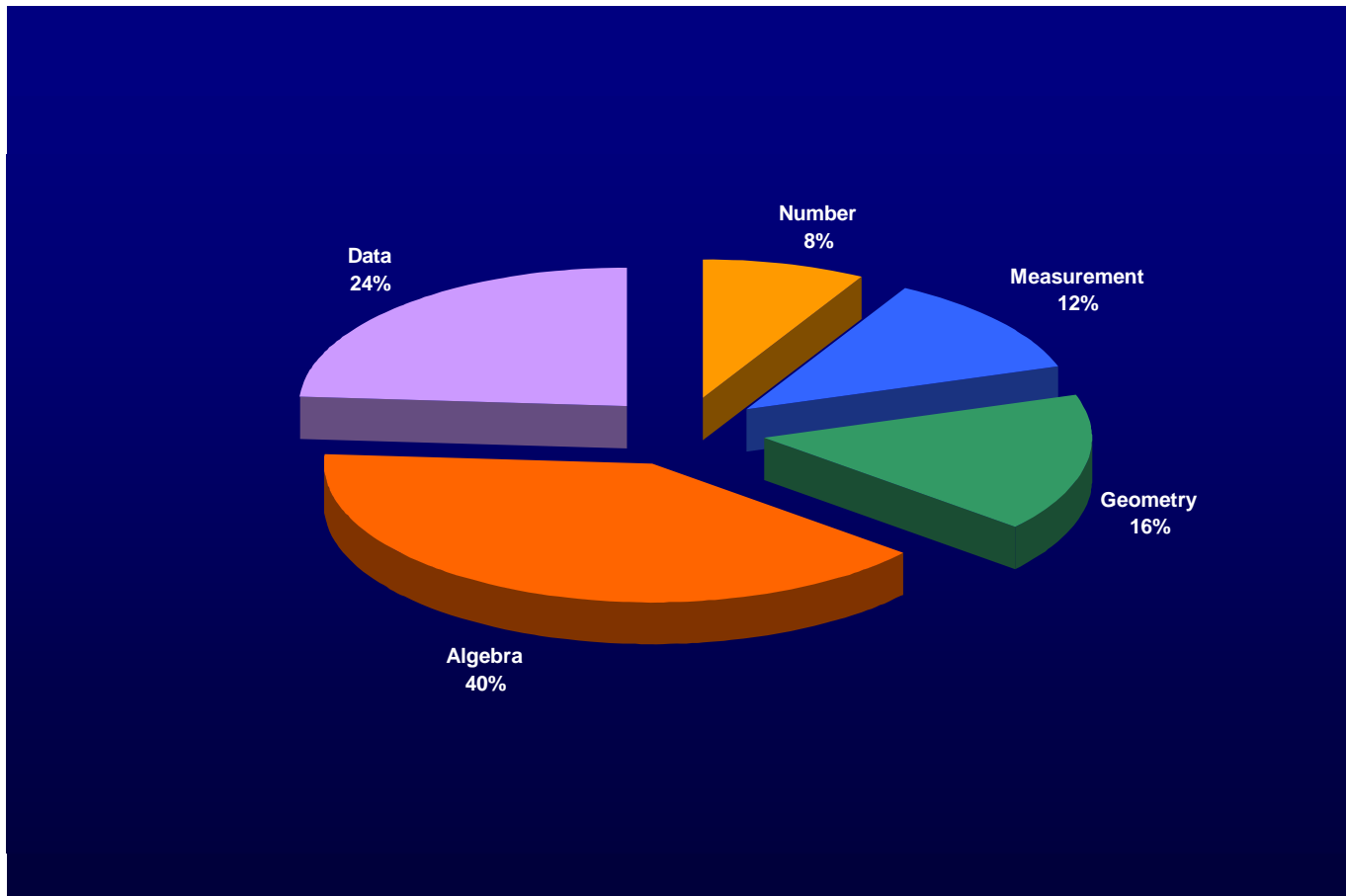
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Data Analysis and Probability

| Skill No. | Lesson No. | Lesson Title | Description |
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**Essential Focus Elements – Mathematics
GRADE 12**

Grade Twelve – Mathematics Essential Focuses



Essential Focus Elements – Mathematics GRADE 12

| STANDARD | CONCEPTS <i>(What Students Need to KNOW)</i> | SKILLS <i>(What Students Need to be Able to DO)</i> |
|---|---|--|
| Number, Number Sense, and Operations | Number and Number Systems <ul style="list-style-type: none"> • Properties | <ol style="list-style-type: none"> 1. Determine properties of operations with complex numbers. |
| Measurement | Use Measurement Techniques and Tools <ul style="list-style-type: none"> • Derive measurements; e.g., acceleration and pressure • Angular velocity • Upper and lower bounds • Successive approximations • Limits | <ol style="list-style-type: none"> 1. Solve problems involving derived measurements. 2. Use radian measure to solve problems involving angular velocity. 3. Apply informal concepts of successive approximations, upper and lower bounds, and limits. |
| Geometry and Spatial Sense | Transformations and Symmetry <ul style="list-style-type: none"> • Matrices • Trigonometric identities (angle addition, subtraction, double) Visualization and Geometric Models <ul style="list-style-type: none"> • Curves • Conic sections | <ol style="list-style-type: none"> 1. Understand, work through and use matrices. 2. Derive trigonometric identities. 3. Apply trigonometric identities 4. Relate graphical and algebraic representations of curves and conic sections. |

Essential Focus Elements – Mathematics GRADE 12

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|--|---|---|
| <p>Patterns, Functions, and Algebra</p> | <p>Use Patterns, Relations, and Functions</p> <ul style="list-style-type: none"> • Arithmetic and geometric sequences and series • Characteristics of transcendental and periodic functions <p>Use Algebraic Representations</p> <ul style="list-style-type: none"> • Matrices • Limits • Area under a curve <p>Analyze Change</p> <ul style="list-style-type: none"> • Instantaneous rate of change | <ol style="list-style-type: none"> 1. Analyze and describe the behavior of sequences and series. 2. Describe and compare the characteristics of identified functions. 3. Set up and solve systems using matrices. 4. Analyze successive estimates using progressively smaller rectangles (area under a curve). 5. Use the concept of limit to find the instantaneous rate of change. |
| <p>Data Analysis and Probability</p> | <p>Data Collection</p> <ul style="list-style-type: none"> • Various sampling methods <p>Statistical Methods</p> <ul style="list-style-type: none"> • Bivariate data modeled by a function • Summary statistics for univariate data <p>Probability</p> <ul style="list-style-type: none"> • Theoretical and experimental probability in real world problem situations | <ol style="list-style-type: none"> 1. Identify various sampling methods. 2. Use various sampling methods. 3. Transform bivariate data so it can be modeled by a function. 4. Find the summary statistics for a set of univariate data. 5. Use theoretical and experimental probabilities to determine probabilities in real world problem situations. |

Essential Focus Elements – Mathematics GRADE 12

TIPS AND LESSON PLANS

TIPS

Number, Number Sense, and Operations

| Skill # | |
|---------|--|
| | |

Measurement

| Skill # | |
|---------|--|
| | |

Geometry and Spatial Sense

| Skill # | |
|---------|---------------------------------------|
| 4 | Create/model cone and related curves. |

Patterns, Functions and Algebra

| Skill # | |
|---------|-----------------|
| 2 | Use technology. |

Data Analysis and Probability

| Skill # | |
|---------|--|
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Essential Focus Elements – Mathematics

GRADE 12

LESSON PLANS

Number, Number Sense, and Operations

| Skill No. | Lesson No. | Lesson Title | Description |
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Measurement

| Skill No. | Lesson No. | Lesson Title | Description |
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Geometry and Spatial Sense

| Skill No. | Lesson No. | Lesson Title | Description |
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Patterns, Functions, and Algebra

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Data Analysis and Probability

| Skill No. | Lesson No. | Lesson Title | Description |
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