**Subject : Geometry**

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| **UNIT ONE** | | | |
| **TOPIC** | **PARALLELL LINES AND PLANES (Three weeks)** | | |
| **ESSENTIAL QUESTIONS** | What vocabulary is essential to performing transformations?  How do we know lines or planes are parallel?  How do we use parallel lines to prove related concepts? | | |
| **CONTENT** | | **SKILLS:** | **COMMON CORE STANDARDS** |
| **Understanding Spatial Relations and When Lines and Planes are Parallell** | | Prove theorems about lines and angles.  Theorems include: when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent.  Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°. | **G-CO.1** Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.    **G-CO.9** Prove34 theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment’s endpoints.  **G-CO.10** Prove27 theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point*.*  **G.G.1, G.G.2, G.G.3, G.G.4, G.G.5, G.G.6, G.G.7, G.G.8, G.G.9, G.G.10. G.G.35** |
| **Mathematical Practices :**  Model with mathematics. Use appropriate tools strategically. Attend to precision.  Look for and make use of structure. Look for and express regularity in repeated reasoning Reason abstractly and quantitatively  Make sense of problems and persevere in solving them Construct viable arguments and critique the reasoning of others | | | |
| **ASSESSMENTS**  ConferencingPre and Post Tests  Open-ended problems that involve a discovery approach to collaborative learning Lead up problem solving tasks  Performance Based Assessment Daily student work  Student/group presentations | | | |
| **MATERIALS & RESOURCES** | Text book : Meaningful Mathematics – Geometry Prentice Hall Mathematics Algebra I  Graphing calculators Algebra Tiles and other manipulatives  Smart Board Demonstrations Problem solving materials created by teachers  “Reality In Mathematics Education” Lesson Pack <http://nrich.maths.org/frontpage>  [www.Jmap.org](http://www.Jmap.org) | | |

**Subject : Geometry**

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| **UNIT TWO** | | | |
| **TOPIC** | **Proofs & Congruence (Three weeks)** | | |
| **ESSENTIAL QUESTIONS** | How do we use deductive reasoning to reason and justify statements?  Why is it important to be able to prove the statements that we make?  How do we apply postulates to prove triangles congruent?  How do we use S.S.S., SAS, ASA postulates to prove triangles congruent?  Where to we see congruent triangles in the real world and why are they important?  How do we form hypothesis and reason logically to reach conclusions ? | | |
| **CONTENT** | | **SKILLS:** | **COMMON CORE STANDARDS** |
| **Understand Proofs and the Properties of Congruence** | | Define congruent triangles.  State that if two triangles agree in S.S.S. & S.S.S., that the corresponding pairs of angles are congruent.  Explain why A.A.A. Ε A.A.A. does not necessarily produce a pair of congruent triangles.  State that if two triangles agree in S.A.S. Ε S.A.S., all of the pairs of corresponding parts are congruent.  State that if two triangles agree in A.S.A Ε A.S.A, all of the other pairs of corresponding parts are congruent.  Decide if two triangles are congruent based on the S.S.S. criteria.  Solve arithmetic and algebraic problems involving corresponding sides of congruent triangles.  define Reflexive Postulate  review addition and subtraction postulates applied to line segments and angles in a triangle  mark diagrams appropriately based on given information and determine which postulate (SSS, SAS or ASA should be used to prove triangles congruent use a flow chart diagram to indicate a plan for a formal proof  apply postulates and theorems from previous lessons to proving triangles congruent  indicate, next to the reasons in the proofs, which previous steps are used to reach particular conclusions | **G-CO.6** Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.  **G-CO.7** Use the definition of congruence in terms of rigid motions to show that two triangles are  congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.  **G-CO.8** Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. |
| **Experiment with**  **Transformations in the plane.**  **Prove Geometric Theorems**. | | define altitude, median and angle bisector  identify altitudes, medians and angle bisectors of triangles in diagrams  identify congruent angles, congruent line segments and right angles in diagrams in which altitudes, medians and angle bisectors are given  Solve numeric and algebraic problems involving altitudes, medians and angle bisectors  Define parallel lines  Define transversal  Define alternate interior angles, corresponding angles and interior angles on the same side of the transversal  Derive postulate that "If two lines are parallel, then the corresponding angles are congruent"  Informally derive the theorems: "If two lines are parallel, then the alternate interior angles are congruent  Solve numerical and algebraic problems involving the postulates in 4 and 5  explain what is meant by a translation  find the coordinates of a point under a translation  given its horizontal and vertical translation | **G-CO.1** Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.  **G-CO.2** Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).  **G-CO.3** Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.  **G-CO.4** Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.  **G-CO.5** Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. |
| **Proving Geometric Theorems for Lines, Triangles and Quadrilaterals** | | Review the definition of a median of a triangle  Define centroid and concurrence  Investigate and apply 2:1 relationship between the segments of the median formed by the position of the centroid.  prove and apply the following theorems in formal proofs to show line segments are in proportion: If a line segment joins the midpoints of two sides of a triangle, then it is parallel to the third side and has length equal to one-half the length of the third side.  write proofs involving line segments that are in proportion  State and prove informally using problems in arithmetic and algebra "If a line is parallel to one side of a triangle and intersects the other two sides, the line divides the segments proportionally."  How can we apply the properties of quadrilaterals in formal proofs? | **G-CO.9** Prove34 theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment’s endpoints.  **G-CO.10** Prove27 theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.  **G-CO.11** Prove27 theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.  **G.G.24, G.G.25, G.G.26, G.G.27, G.G.28, G.G.29, G.G.30, G.G.31, G.G.32, G.G.33, G.G.34 , G.G.42, G.G.43, G.G.44, G.G.45, G.G.46, G.G.47** |
| **Mathematical Practices :**  Model with mathematics. Use appropriate tools strategically. Attend to precision.  Look for and make use of structure. Look for and express regularity in repeated reasoning Reason abstractly and quantitatively  Make sense of problems and persevere in solving them Construct viable arguments and critique the reasoning of others | | | |
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**Subject : Geometry**

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| **UNIT THREE** | | | |
| **TOPIC** | **SIMILAR TRIANGLES & POLYGONS (Three weeks)** | | |
| **ESSENTIAL QUESTIONS** | How do we use dilation to understand similarity?  How do we know two figures are similar?  How do we use similarity to prove theorems? | | |
| **CONTENT** | | **SKILLS:** | **COMMON CORE STANDARDS** |
| **Understand similarity in terms of transformations in the plane.**  **Prove theorems involving similarity**  **Use similar polygon properties to solve real world problems** | | Given two figures, use the definition of similarity in  terms of similarity transformations to decide if  they are similar;  Explain using similarity transformations and the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding parts of sides.  Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.  Prove theorems about triangles. Theorems include:  a line parallel to one side of a  triangle divides the other two  proportionally, and conversely;  the Pythagorean Theorem proved using triangle similarity.  Verify experimentally the properties of dilations given by a center and a scale factor.  Solve corresponding parts of polygons using proportionality. | **G-SRT.1** Verify experimentally the properties of dilations given by a center and a scale factor:  a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.  b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.  **G-SRT.2** Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.  **G-SRT.3** Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.  **Prove theorems involving similarity**  **G-SRT.4** Prove35 theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity*.  **G.G.36, G.G.37, G.G.38, G.G.39, G.G.40, G.G.41, G.G.48, G.G.49** |
| **Mathematical Practices :**  Model with mathematics. Use appropriate tools strategically. Attend to precision.  Look for and make use of structure. Look for and express regularity in repeated reasoning Reason abstractly and quantitatively  Make sense of problems and persevere in solving them Construct viable arguments and critique the reasoning of others | | | |
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**Subject : Geometry**

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| **UNIT FOUR** | | | |
| **TOPIC** | **QUADRILATERALS (Three weeks)** | | |
| **ESSENTIAL QUESTIONS** | When do we call a quadrilateral a parallelogram?  What are the types of parallelograms and how do we distinguish them?  What types of polygons to we see regularly in everyday life?  What is the relationship between sides and internal angles of regular polygons? | | |
| **CONTENT** | | **SKILLS:** | **COMMON CORE STANDARDS** |
| **Properties of parallelograms**  **Properties of all quadrilaterals**  **Properties of regular polygons** | | Proving theorems about parallelograms.  a. Opposite sides are congruent,  b. Opposite angles are congruent,  c. the diagonals of a parallelogram bisect each  other,  d. rectangles are parallelograms with congruent  diagonals.  Prove theorems about triangles. the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length | **G-CO.10** Prove27 theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.  **G-CO.11** Prove27 theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals. |
| **Mathematical Practices :**  Model with mathematics. Use appropriate tools strategically. Attend to precision.  Look for and make use of structure. Look for and express regularity in repeated reasoning Reason abstractly and quantitatively  Make sense of problems and persevere in solving them Construct viable arguments and critique the reasoning of others | | | |
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| **UNIT FIVE** | | | |
| **TOPIC** | **Coordinate Geometry ( 3 weeks)** | | |
| **ESSENTIAL QUESTIONS** | How is Coordinate Geometry connecting Algebra to Geometric concepts?  How can I represent real life information on a two dimensional plane?  How can geometrical design be modeled using the coordinate plane? | | |
| **CONTENT** | | **SKILLS:** | **COMMON CORE STANDARDS** |
| **Coordinate Geometry**  **Connecting Algebra and Geometry through Coordinates** | | Students will be able to:  Investigate and conjecture the relationship between the slopes of parallel lines (review) and the slopes of perpendicular lines  Analyze the equations of given pairs of lines to determine if the lines are parallel, perpendicular or neither  Determine the slope of a line parallel or  perpendicular to a line whose equation is given  Prove lines parallel or perpendicular using their slopes. | **G-GPE.5** Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). |
|  | | Students will be able to:  State the relationship between the slopes of parallel lines  State the relationship between the slopes of perpendicular lines  Write the equation of a line through a given point  Parallel to a line whose equation is given  Perpendicular to a line whose equation is given  Prove, given the coordinates of the vertices of a parallelogram or rectangle, that the diagonals bisect each other and/or are congruent and justify their  conclusion. | **G-GPE.4** Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle |
|  | | Students will be able to:  Explore, conjecture, and apply the formula for the distance between two points having the same ordinate or abscissa  Investigate, conjecture, discover, and apply the formula for the distance between any two points in the plane  Apply the distance formula to numeric problems involving finding the length of a line segment  Apply the distance formula to show that two line segments have equal lengths  Students will be able to  Find the perimeter of figures drawn on a coordinate plane having sides parallel to the axes  Find the area of figures having one or more sides parallel to the axes using the distance formula | **G-GPE.6** Find the point on a directed line segment between two given points that partitions the segment in a given ratio.  **G-GPE.7** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula  **G.G.62, G.G.63, G.G.64, G.G.65, G.G.66, G.G.67, G.G.68, G.G. 69, G.G.70** |
| **Standards of Mathematical Practices :**  Model with mathematics. Use appropriate tools strategically. Attend to precision.  Look for and make use of structure. Look for and express regularity in repeated reasoning Reason abstractly and quantitatively  Make sense of problems and persevere in solving them Construct viable arguments and critique the reasoning of others | | | |
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**Subject : Geometry**

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| **UNIT SIX** | | | |
| **TOPIC** | **TRANSFORMATIONS (Three weeks)** | | |
| **ESSENTIAL QUESTIONS** | Under what conditions do various transformations preserve geometric properties?  How can I determine how a series of transformations can produce a given image from an initial object? | | |
| **CONTENT** | | **SKILLS:** | **COMMON CORE STANDARDS** |
| **Experiment with**  **Transformations in the plane.**  **Understand similarity in**  **terms of transformations**  **Understand the different types of transformations and their properties.** | | Represent transformations in the plane using, e.g.,  transparencies and geometry software;  Describe transformations as  functions that take points in the plane as inputs and give other points as outputs.  Compare transformations that  preserve distance and angle to those that do not.  Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments  and various geometric figures.  Verify the properties of a dilation  **G.G.54, G.G.55, G.G.56, G.G.57, G.G.58, G.G.59, G.G.60, G.G.61** | **G-CO.2** Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).  **G-SRT.1** Verify experimentally the properties of dilations given by a center and a scale factor:  A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.  **G-SRT.2** Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.  **G-SRT.3** Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. |
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| **UNIT SEVEN** | | | |
| **TOPIC** | **CIRCLES (Four weeks)** | | |
| **ESSENTIAL QUESTIONS** | Why is knowledge of properties of the circle important to high school students?  What is the relationship between pi and the circumference of a circle?  Where do we use our knowledge of circles to solve real world problems? | | |
| **CONTENT** | | **SKILLS:** | **COMMON CORE STANDARDS** |
| **Experiment with transformations**  **in the plane.**  **Understand and apply theorems about circles.**  **Apply geometric concepts in**  **Modeling situations.** | | Know precise definitions circle and distance around a circular arc.  Prove that all circles are similar.  Identify and describe relationships among inscribed angles, radii, and chords.  Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles  The radius of a circle is perpendicular to the tangent where the radius intersects the circle.  Prove properties of angles for a  Quadrilateral inscribed in a circle. | **G-C.1** Prove that all circles are similar.  **G-C.2** Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects  the circle.  **G-C.3** Construct the inscribed and circumscribed circles of a triangle, and prove37 properties of angles for a quadrilateral inscribed in a circle.  **G.G.49, G.G.50, G.G.51, G.G.52, G.G.53, G.G.70, G.G.71, G.G.72, G.G.73, G.G.74** |
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| **UNIT EIGHT** | | | |
| **TOPIC** | **CONSTRUCTIONS & LOCUS (Two weeks)** | | |
| **ESSENTIAL QUESTIONS** | How are concepts of loci applied to solve problems?  What is the importance of geometrical constructions in design?  Where to we see examples of constructions used in architecture? | | |
| **CONTENT** | | **SKILLS:** | **COMMON CORE STANDARDS** |
| **Understand five major loci.**  **Understand compound loci.**  **Make Geometric constructions using understanding of loci.** | | Make formal geometric constructions with a variety of tools and methods (compass and straight edge, string, reflective devices, paper folding, dynamic geometric software, etc.).  Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing  perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line  parallel to a given line through a point not on the line.  Construct the inscribed and circumscribed circles of a triangle.  Apply knowledge of loci to perform construction needed to find points satisfying given conditions of the locus | **G-CO.12** Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.  **G-CO.13** Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.  **G-C.3** Construct the inscribed and circumscribed circles of a triangle, and prove37 properties of angles for a quadrilateral inscribed in a circle.  **G-C.4** (+) Construct a tangent line from a point outside a given circle to the circle.  **G.G.16, G.G.17, G.G.18, G.G.19, G.G.20, G.G.22, G.G.23** |
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| **UNIT NINE** | | | |
| **TOPIC** | **POLYGONS, AREAS AND VOLUMES (Four weeks)** | | |
| **ESSENTIAL QUESTIONS** | How do we use the area formulas to solve problems in design and construction?  Why do the area formulas work?  How do we use the volume formulas to solve problems in design and construction?  Why do the volume formulas work? | | |
| **CONTENT** | | **SKILLS:** | **COMMON CORE STANDARDS** |
| **Apply area formulas in**  **Modeling situations.**  **Find areas of sectors of circles.**  **Apply geometric**  **concepts in modeling situations.**  **Explain volume formulas and use them to solve problems.**  **Visualize the relation**  **between two dimensional**  **and three dimensional objects.** | | Give an informal argument for the formulas for the circumference of a circle, area of a circle and areas of plane figures.  Derive the formula for the area of a sector.  Apply Geometric concepts and area formulas to solve design problems.  Use geometric shapes, their measures, and their properties to describe objects  Use geometric shapes, their measures, and their properties to describe objects  Give an informal argument for the formulas for the volume of a cylinder, pyramid, and cone.  Identify the shapes of two dimensional cross- sections of three dimensional objects, and identify three dimensional objects generated by rotations of two dimensional objects. | **G-MG.1** Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).  **G-MG.2** Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).  **G-MG.3** Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).  **G-GMD.3** Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.  **Visualize relationships between two-dimensional and three-dimensional objects**  **G-GMD.4** Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.  **G.G.11, GG.12, G.G.13, G.G.14, G.G.15,** |
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| **UNIT TEN** | | | |
| **TOPIC** | **RIGHT ANGLED TRIANGLES AND TRIGONOMETRY (Three weeks)** | | |
| **ESSENTIAL QUESTIONS** | How can we use the properties of right triangles to solve problems in construction, business and navigation?  How can we find distances to inaccessible objects using trigonometry? | | |
| **CONTENT** | | **SKILLS:** | **COMMON CORE STANDARDS** |
| **Define trigonometric ratios and solve problems involving right triangles.**  **Using trigonometry to model and solve real world problems** | | Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles!  Explain and use the relationship between the sine and cosine of complementary angles.  Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems | **G-SRT.6** Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.  **G-SRT.7** Explain and use the relationship between the sine and cosine of complementary angles.  **G-SRT.8** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. |
| **Mathematical Practices :**  Model with mathematics. Use appropriate tools strategically. Attend to precision.  Look for and make use of structure. Look for and express regularity in repeated reasoning Reason abstractly and quantitatively  Make sense of problems and persevere in solving them Construct viable arguments and critique the reasoning of others | | | |
| **ASSESSMENTS**  ConferencingPre and Post Tests  Open-ended problems that involve a discovery approach to collaborative learning Lead up problem solving tasks  Performance Based Assessment Daily student work  Student/group presentations | | | |
| **MATERIALS & RESOURCES** | Text book : Meaningful Mathematics – Geometry Prentice Hall Mathematics Algebra I  Graphing calculators Algebra Tiles and other manipulatives  Smart Board Demonstrations Problem solving materials created by teachers  “Reality In Mathematics Education” Lesson Pack <http://nrich.maths.org/frontpage>  [www.Jmap.org](http://www.Jmap.org) | | |