Close Encounters of the Quadratic Kind

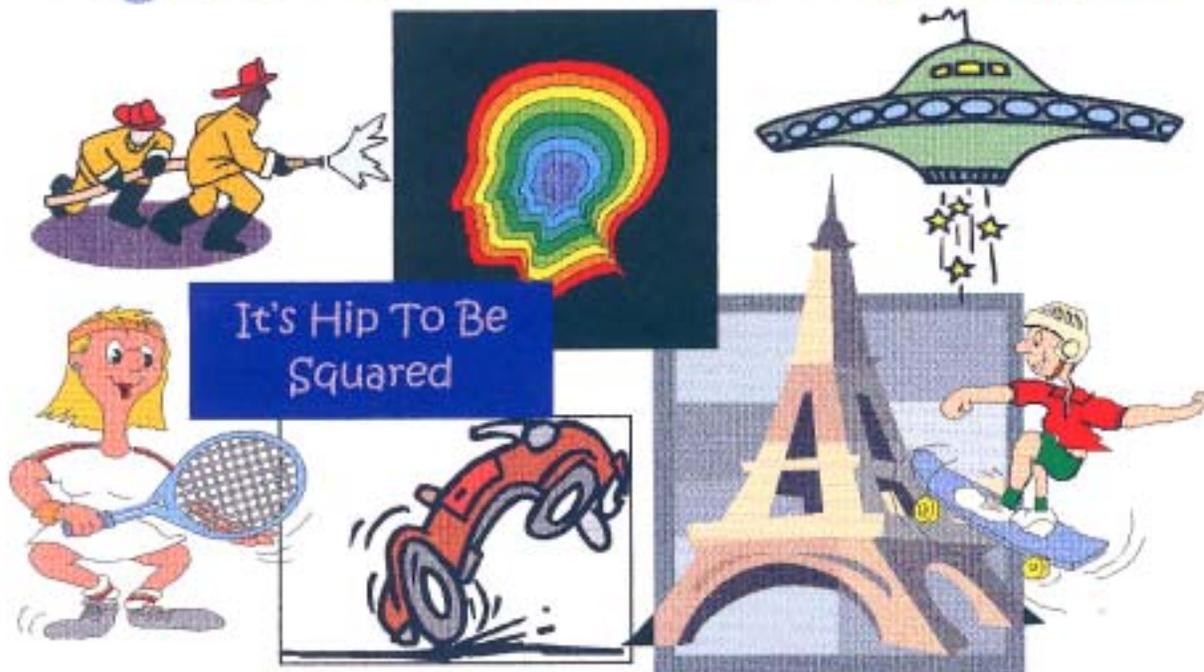It's Hip To Be Squared

An Integrated/Interdisciplinary Thematic Study of Quadratics
For Grades 9 - 10

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OVERVIEW

I. **CONTENT:**
Students will recognize, differentiate and graph linear and non-linear functions, specifically quadratics.
Students will learn applications of quadratic equations in physics, engineering, economics and sports.
Students will calculate maximum and minimum values and find the zeros of the equation.

Essential concepts:
Not all equations graph as lines.
Quadratics can have from zero to two roots.
The ways to solve quadratics: graph from a table of values, graphing calculator, and factor and use the zero product property, quadratic formula, completing the square.

I. **PROCESS:**
Students will intuitively grasp the concept of non-linear functions by observing/graphing equations and comparing/contrasting results. Labs/experiments will be used.

Students will skill-build by completing assignments involving multiplying/factoring polynomials, finding zeros, calculating maximum and minimum values, graphing.

Students will use/see real-world applications for quadratic equations. Students can also take an equation and by analyzing the equation, give specific information about critical points and sketch the graph.

II. **PRODUCT:**
Students will have specific techniques for solving quadratic equations. Students will tell the shape and direction of the graph, find maximum and minimum values, find places where the graph crosses the axes, and answer questions from real-world word problem situations.

Unit Overview: Alignment with
National/State/District Pupil Performance Standards

Benchmark 1: #A4.4.1 Students will be able to identify, graph and describe families of graphs including linear, absolute values and quadratics.

Benchmark 2: #E1.3.2 Students will be able to apply mathematical skills and processes to situations with peers and communities.

Benchmark 3: #C1.3.2 Students will be able to represent a problem numerically, graphically and symbolically translate among these alternative representations.

Benchmark 4: #E1.4.1 Students will be able to apply mathematical skills and processes to global issues.

Benchmark 5: #A4.4.2 Students will be able to create and solve linear and quadratic equations and inequalities.

Benchmark 6: #D1.4.1 Students will be able to follow and evaluate an argument, judging its validity using inductive or deductive reasoning and logic.

Benchmark 7: #C1.4.3 Students will be able to explain, justify and defend mathematical ideas, solutions and methods to various audiences.

Benchmark 8: #B1.4.3 Students will be able to verify the answer by using an alternative strategy.

I-SEARCH INDEPENDENT RESEARCH PROJECTS
FOR GIFTED AND TALENTED STUDENTS

1. PARADOXES:
Most students believe that a calculator always supplies a correct answer. Create a lesson teaching your peers the concepts that create incorrect answers and tricks to avoid common errors.

2. ATTRIBUTES:
Create a crossword puzzle where the "across" words are mathematical terms that apply to quadratics and the "down" words are applications of quadratics.

3. ANALOGIES:
Gravitational pull causes a projected object to fall. Centrifugal forces are created by spinning and cause separation. Compare centrifugal forces to gravitational pull.
Product: Create an experiment that will demonstrate these differences and similarities.

4. DISCREPANCIES:
There have been numerous documentations of U.F.O. sightings. Listen to "War of the Worlds" by Orson Wells, research a more recent U.F.O. sighting, and create a new radio program on this sighting.

5. PROVOCATIVE QUESTIONS:
You have discovered a method that allows you to harness the force of the gravity. Create a play that would demonstrate how you would use your powers.

6. EXAMPLES OF CHANGE:
Create a timeline displaying the creation of different counting devices/calculators. Include major events that could not have occurred without the most current technological advances in counting devices.

7. EXAMPLES OF HABIT:
Research modern architecture and locations that create an illusion of defying gravity.
Make a mobile of your examples with an explanation of the phenomenon.

8. ORGANIZED RANDOM SEARCH:
Research at least five different ball games, and using aspects from each, create a new game.

9. SKILLS OF SEARCH:
Find one of Galileo's experiments and reinvent the experiment using current technology.

10. TOLERANCE FOR AMBIGUITY:
How would a high school curriculum and education in general change if mathematics and language arts were not required for graduation?
Write a petition and a slogan for the removal of Math and English from the high school curriculum.

11. INTUITIVE EXPRESSION:
Write a poem, piece of music, or rap that expresses your feelings about calculator usage in schools.

12. ADJUSTMENT TO DEVELOPMENT:
Watch Nova's "Secrets of Lost Empires II - Medieval Stage" and create a project cube or pop-up book that describes the stages of development the creators went through and how a trebuchet construction would be different today.

13. STUDY CREATIVE PEOPLE AND PROCESS:
Research the accomplishments and life of Galileo, Newton, and Einstein. Role-play a day in the life of each of these men.

14. EVALUATE SITUATIONS:
You are a football kicker and have a chance to make the winning extra point in the Superbowl. You miss the kick. Prepare a mathematically based excuse to present to your team members.

15. CREATIVE READING SKILL:
Read the Right Stuff by Tom Wolfe and write a short children's picture book that illustrates the major events in the life of one of the astronauts.

16. CREATIVE LISTENING SKILL:
Research songs that include those ideas found in quadratics. (e.g. squares, highs, lows, and zeros) Create a mix of these songs and develop a dance to accompany the mix or create a new song for quadratics.

17. CREATIVE WRITING SKILL:
Write a dissertation for the derivation of the quadratic formula and its uses on another planet from the viewpoint of an alien.

18. VISUALIZATION SKILL:
Create a photo essay or collage of architecture with quadratic images from a specific historical period of at least fifty years.

CRITICAL THINKING SKILLS ACADEMIC
ANALYZING HUMAN ACTIVITIES! (AHA!)

STATE STANDARD #A.4.4.1   STUDENTS WILL BE ABLE TO identify, graphs, and describe families of graphs including linear, absolute values, and quadratics.

ESSENTIAL QUESTION: How does the Universal Theme of Producing, Exchanging and Distributing create mastery learning of essential concepts in this unit?

1. PRODUCING, EXCHANGING, AND DISTRIBUTING [ECONOMICS]
   (Algebra 1: Explorations and Applications by McDougal/Littel)

   KNOWLEDGE:
   Anticipatory Set: PowerPoint presentation on famous structures that include parabolas, absolute value graphs, and lines.
   Students will: Students will graph several linear, quadratic, and absolute value equations in the graphing calculator and explain which shapes are generated by each equation type.

   COMPREHENSION:
   Brainstorm with a partner and make a list of examples in the world where you see a line, absolute value graph, and parabola. Label each example with a possible equation.

   APPLICATION:
   Anticipatory Set: Graph a parabola that represents price versus net sales given an equation.
   (Example: Net sales = -100price2 + 300,000price)

   Students will: Write a justification for the best price to present to your boss.
   Class/team product: Invent a product that could sell for this price and create a media ad to market your product.
   Multicultural and/or ESL and/or Bilingual Link: Translate your written ads into another language.
   Mathematics/Science Link and/or Humanities Link: List the main characteristics of the price/sales graph. How did those characteristics influence your ad and price?

School-to-Career/Tech Prep Link: Interview the economics or vocational-ed teacher and find other factors that influence market price.

<u>HIGHER ORDER THINKING SKILLS (H.O.T.S.):</u>
Anticipatory Set: Students will present their advertisements to the class.
Students will: consider modifying their advertised price after being notified that the government has passed legislation that will increase the production cost of such products by 10%.
Class/team/individual product: Will you increase your price based on this information? By how much would you increase the product's price? Create a justification for this increase to an angry customer.

<u>INDIVIDUAL JOURNAL ASSIGNMENT:</u>
Pick one of the other ads and write how you would modify the ad or price to increase the marketability of the product.

<u>HOMELINK:</u>
With your family members discuss the shapes of familiar product logos.

STATE STANDARD #E.1.3.2 STUDENTS WILL BE ABLE TO apply mathematical skills and processes to situations with peers and communities.   .

ESSENTIAL QUESTION: How does the Universal Theme of Transportation create mastery learning of essential concepts in this unit?

2. TRANSPORTATION
    (Algebra 1: Explorations and Applications by McDougal/Littel)

    <u>KNOWLEDGE:</u>
    Anticipatory Set: Show clip of Speed or Bullitt
    Students will: Discuss the factors that affect the stopping distance of a moving object.

    <u>COMPREHENSION:</u>
    Give examples of the lengths of skid marks related to the speed of a vehicle.

    <u>APPLICATION:</u>
    Anticipatory Set: Investigating Speed Lab (p. 360-361)
    Students will: set up a ramp with a 10o angle using two meter sticks taped together, use a stopwatch to measure the time it takes the ball to reach the end of the ramp, record the time and distance for ten different trials.
    Class/team product: Create a scatterplot of time versus distance for your ten trials. Display all the graphs and as a group come to a consensus on the critical points of the graph.
    Multicultural and/or ESL and/or Bilingual Link: Create a bumper sticker that encourages safe speeds.
    Mathematics/Science Link and/or Humanities Link: Research scientists who worked with gravity (e.g. Galileo and Newton).
    School-to-Career/Tech Prep Link: Trip to the crime lab to explore statistics on accident investigations where speed was the primary cause.

    <u>HIGHER ORDER THINKING SKILLS (H.O.T.S.):</u>
    Anticipatory set: Play song the 59th Street Bridge Song by Simon and Garfunkel
    Students will: calculate a quadratic regression using a graphing calculator for a table of values relating a vehicle's stopping distance and its speed.
    Class/team/individual product: Create a jingle that tells people how to decide if they are far enough away from the car in front of them. Justify that this method will satisfy the regression result.

How has our discussion affected the way you will drive?

HOMELINK:
Discuss the expression "Stop on a dime" and it's meaning.

STATE STANDARD #C1.3.2   STUDENTS WILL BE ABLE TO REPRESENT A PROBLEM NUMERICALLY, GRAPHICALLY, AND SYMBOLICALLY; TRANSLATE AMONG THESE ALTERNATIVE REPRESENTATIONS.   .

ESSENTIAL QUESTION: How does the Universal Theme of Communications create mastery learning of essential concepts in this unit?

3. COMMUNICATIONS
(Algebra 1: Explorations and Applications by McDougal/Littel)

KNOWLEDGE:
Anticipatory Set: A clip from The Dish
Students will: list recent tele-communication advances.

COMPREHENSION:
Students will predict how the shape of a satellite dish will affect the distance and direction of the signal.

APPLICATION:
Anticipatory Set: PowerPoint presentation of different satellite dishes.
Students will: Match the graph with the picture of the dish and its equation. Discuss how the lead coefficient correlates with the shape of the graph (e.g. wide or narrow).
Class/team product: Create a 3-D model of a radio telescope.
Multicultural and/or ESL and/or Bilingual Link: List the ways that bush communities rely on radio telescopes.
Mathematics/Science Link and/or Humanities Link: Research radio telescopes in Brazil, Australia, and South Africa.
School-to-Career/Tech Prep Link: Visit from a guest speaker who uses GPS systems in their work (e.g. Coast Guard employee, commercial fisherman, hikers, and fireman).

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Show a clip from Contact.
Students will: write a skit incorporating an imagined alien world reached through telecommunications.
Class/team/individual product: Students will present the skits to the class.

INDIVIDUAL JOURNAL ASSIGNMENT:
Keep a record of the number of times you rely on tele-communications in a week.

HOMELINK:
Listen to Art Bell's extraterrestrial radio show at 9:00 on 650am or visit his webpage.

STATE STANDARD #E1.3.2   STUDENTS WILL BE ABLE TO APPLY MATHEMATICAL SKILLS AND PROCESSES TO SITUATIONS WITH PEERS AND COMMUNITY.

ESSENTIAL QUESTION: How does the Universal Theme of Protecting and Conserving create mastery learning of essential concepts in this unit?

4. PROTECTING AND CONSERVING
   (Algebra 1: Explorations and Applications by McDougal/Littel)

   KNOWLEDGE:
   Anticipatory Set: Show a clip from Back draft
   Students will: describe how a high pressure job would affect your decision-making abilities.
   Describe the path of the water from a fire-fighter's hose in terms of a graph.

   COMPREHENSION:
   Describe the mathematically based decisions a fire-fighter must make when fighting a fire with a hose
   or ladder or a rope.

   APPLICATION:
   Anticipatory Set: A fire-fighter aims a hose at a window 25 feet above the ground. The equation
   $h = -0.01d2 + 1.06d + 5$ models the path of the water, when h = height in feet. Estimate to the
   nearest foot the horizontal distance d in feet between the fire-fighter and the building. (Draw a
   sketch.)
   Students will: investigate the relationship between heights of buildings and fire-fighter's position in
   relation to a fire.
   Class/team product: A manual to accompany a new hose including specific information so the fire-
   fighter can adjust his position. Information on ladder use should be included.
   Multicultural and/or ESL and/or Bilingual Link: A flipbook that illustrates the information in the
   manual to reach non-readers.
   Mathematics/Science Link and/or Humanities Link: Investigate the ingredients other than water
   that are used to fight fires.
   School-to-Career/Tech Prep Link: A visit to a fire training centre to see fire-fighters performing
   simulations of fire containment.

   HIGHER ORDER THINKING SKILLS (H.O.T.S.):
   Anticipatory set: A clip from the ABC September 11th Special
   Students will: Investigate how fire-fighters fought the World Trade Center fires before and after the
   collapse of the buildings.
   Class/team/individual product: Simulated news cast on a local fire that includes specific details on
   fire fighting techniques.

   INDIVIDUAL JOURNAL ASSIGNMENT:
   Create scale drawings of two buildings of different heights and the position of the fire-fighter
   containing the fire.

   HOMELINK:
   Watch the movie Daylight with your family.

STATE STANDARD #E1.4.1   STUDENTS WILL BE ABLE TO APPLY MATHEMATICAL SKILLS
AND PROCESSES TO GLOBAL ISSUES.

ESSENTIAL QUESTION: How does the Universal Theme of Providing Education create mastery
learning of essential concepts in this unit?

5. PROVIDING EDUCATION
   (Algebra 1: Explorations and Applications by McDougal/Littel)

   KNOWLEDGE:
   Anticipatory Set: Clips of anti-drug commercials

Students will: discuss within groups whether they believe current drug use in U.S. high schools would be represented by a quadratic with a positive or negative lead coefficient.

COMPREHENSION:
Considering whether you believed the quadratic was increasing or decreasing, how would that affect a quadratic graph of percentage of high school students who graduated over the same time period?

APPLICATION:
Anticipatory Set: Visual collage of anti-drug, pro-math education commercials
Students will: consider the following situation: The percentage of high school seniors who have tried marijuana can be modelled by $p = -0.228596t2 + 2.7783t + 49.813783$ where is the number of years past 1995.
Class/team product: Make a poster of this graph and include a set of questions that address drug use in high schools that can be answered from your graph. (Remember to use the critical points.) Create an answer key for the back of your poster.
Multicultural and/or ESL and/or Bilingual Link: Investigate marijuana use among high school students in one country on each of two continents.
Mathematics/Science Link and/or Humanities Link: Read an excerpt from Go Ask Alice.
School-to-Career/Tech Prep Link: Visit from the school nurse to discuss local drug use trends.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Students will visit five application posters and answer the questions on each while listening to music mix of songs with a drug theme.
Students will: poll 20 students anonymously asking the question "Have you ever tried marijuana?" Each person will calculate a class percentage using "yes" responses and compare it to the application equation. Make an informed and justified decision on the accuracy of the equation.
Class/team/individual product: Divide into positive quadratic and negative quadratic teams for increasing or decreasing marijuana use to debate your opinion justified by the poll results and research.

INDIVIDUAL JOURNAL ASSIGNMENT:
Discuss your reaction to the poll results.

HOMELINK:
Ask your family how drug use affected its education.

STATE STANDARD #C1.4.1   STUDENTS WILL BE ABLE TO USE APPROPRIATE TECHNOLOGY TO REPRESENT THE INFORMATION AND IDEAS IN A PROBLEM.

ESSENTIAL QUESTION: How does the Universal Theme of Making and Using Tools and/or Technology create mastery learning of essential concepts in this unit?

6. **MAKING AND USING TOOLS AND/OR TECHNOLOGY**
   (Algebra 1: Explorations and Applications by McDougal/Littel)

   KNOWLEDGE:
   Anticipatory Set: Teacher demonstration on graphing calculator and CBL use.
   Students will: model teacher in step by step calculator process.

   COMPREHENSION:
   Students will enter a list of values and perform a quadratic regression.

   APPLICATION:
   Anticipatory Set: **Sing**-A-Long following the bouncy ball.

Students will: collect data using a CBL, a program, and three different brands of tennis balls. (Technology Ancillary, McDougal Littell, pg. 67-68)
Class/team product: A display of the three tennis balls rated from worst to best, giving maximum heights and time in air.
Multicultural and/or ESL and/or Bilingual Link: Write a tennis player and ask what type of tennis balls they prefer and why.
Mathematics/Science Link and/or Humanities Link: Find ads of tennis balls promoted by specific players, and compare to their own results.
School-to-Career/Tech Prep Link: Try different types of graphing calculators and choose a preference.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Repeat the experiment with a golf ball and a basket ball.
Students will: investigate the materials and rebound height of the three kinds of balls. A chemistry teacher should be interviewed to gain knowledge on composition of various balls.
Class/team/individual product: A film clip displaying the experiment and research results.

INDIVIDUAL JOURNAL ASSIGNMENT:
How have sports influenced your life?

HOMELINK:
Choose three objects in your home and discuss the ability of those objects to bounce.

STATE STANDARD #A4.4.2   STUDENTS WILL BE ABLE TO CREATE AND SOLVE LINEAR AND QUADRATIC EQUATIONS AND INEQUALITIES.

ESSENTIAL QUESTION: How does the Universal Theme of Providing Recreation create mastery learning of essential concepts in this unit?

7. PROVIDING RECREATION
   (Algebra 1: Explorations and Applications by McDougal/Littel)

KNOWLEDGE:
Anticipatory Set: Slow motion footage or time-lapse photography of a table tennis match showing that the path of the ball is parabolic.
Students will: play table tennis to see the path of the ball and make a conjecture about the lead coefficient, roots, and maximum height of the equation modelling this path.

COMPREHENSION:
The equation $h = -4.9t^2 + 2.1t$ models the relationship between the height of the ball above the table and the time since the ball bounced. Graph this equation with time measured in tenths of a second and height measured in meters. Calculate the zeros of the equation. What do the solutions tell you about this situation? Estimate the maximum height reached by the ball. How much time has elapsed when the ball reached this height?

APPLICATION:
Anticipatory Set: Video clip of one our school's football games.
Students will: work the following: Juan kicked a football modelled by the equation
$h = -16t^2 + 4t + 1$ where h is the height of the football in feet t seconds after it was kicked. Find the t-intercepts.
Class/team product: Make a sketch of the path of the ball that demonstrates why the algebraic solution has to be modified. Can you think of other situations where this could happen?
Multicultural and/or ESL and/or Bilingual Link: Students should list the techniques for solving quadratic equations and summarize why there may be fewer than two solutions.

Mathematics/Science Link and/or Humanities Link: Solve other application problems using recreational activities. (e.g. The force on a sail of wind blowing perpendicular to the sail. p. 341 #14-16, Skydiving free fall p. 342 #32-33)
School-to-Career/Tech Prep Link: From the Bill Pinkey interview, pp. 322-324, lists the uses of quadratic equations.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Clip from the Blue Angel exhibitions.
Students will: Students will extend the table on page 342 finding average velocity measured in feet per second. Average velocity is the change in distance fallen from one row of the table to the next divided by the change in time after jump from one row of the table to the next. How long does it take the skydiver to reach terminal velocity? Estimate the terminal velocity. Justify your answers.
Class/team/individual product: A labelled diagram depicting the diver's fall with time after jump, distance fallen, and average velocity at 7 different points.

INDIVIDUAL JOURNAL ASSIGNMENT:
Write a newspaper article of a recreational event that might be modelled by a quadratic.

HOMELINK:
Watch the movie Terminal Velocity.

STATE STANDARD #D1.4.1   STUDENTS WILL BE ABLE TO FOLLOW AND EVALUATE AN ARGUMENT, JUDGING ITS VALIDITY USING INDUCTIVE OR DEDUCTIVE REASONING AND LOGIC.   .

ESSENTIAL QUESTION: How does the Universal Theme of Organizing and Governing create mastery learning of essential concepts in this unit?

8. ORGANIZING AND GOVERNING
   (Algebra 1: Explorations and Applications by McDougal/Littel)

   KNOWLEDGE:
   Anticipatory Set: Clip from Norma Rae
   Students will: List the pros and cons for belonging to a union.

   COMPREHENSION:
   Make a list of characteristics that a student must possess to belong to a specific school group.

   APPLICATION:
   Anticipatory Set: The following table shows the percentages of U.S. workers who belonged to unions for selected years from 1930 to 1989.

Year	Percentage
1930	11.6
1940	26.9
1950	31.5
1960	31.4
1970	27.3
1975	22.5
1980	21.9
1985	18
1989	16.4

   Assume that this data can be modelled by this function:
   $$u(x) = -39.3 + 2.38x - 0.02x^2 \text{ where x is the number of years past 1900.}$$

Students will: plot the values from the table. On the same set of axis, graph u(x).
Class/team product: Oral report addressing these questions:
For what year does u(x) indicate a maximum percentage of workers belonging to unions?
Does this answer agree with the data in the table?
For what years does u(x) predict that no U.S. workers (0%) will belong to unions?
When you can guarantee that u(x) can no longer be used to model the percentage of U.S. workers that belong to unions?
Multicultural and/or ESL and/or Bilingual Link: Create a slogan that would encourage people to join a union.
Math/Science Link and/or Humanities Link: Create a skit or puppet show examining the question: Should you hire outside union workers or Alaskan non-union workers for Alaskan jobs?
School-to-Career/Tech Prep Link: Bring in a union or non-union worker to discuss their opinions on membership.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Show a clip from Hoffa
Students will: research the reasons for the parabolic shape (rise and fall) of union membership data.
Class/team/individual product: Draw a political cartoon that supports the research.

INDIVIDUAL JOURNAL ASSIGNMENT:
Are you pro-union or anti-union? Defend your position.

HOMELINK:
Examine articles in your home to look for the union label.

STATE STANDARD #C1.4.3   STUDENTS WILL BE ABLE TO EXPLAIN, JUSTIFY AND DEFEND MATHEMATICAL IDEAS, SOLUTIONS AND METHODS TO VARIOUS AUDIENCES.

ESSENTIAL QUESTION: How does the Universal Theme of Moral, Ethical and Spiritual Behavior create mastery learning of essential concepts in this unit?

9. MORAL, ETHICAL AND SPIRITUAL BEHAVIOR
   (Algebra 1: Explorations and Applications by McDougal/Littel)

KNOWLEDGE:
Anticipatory Set: "Right and Wrong" by Joe Jackson
Students will: list issues that they have a strong opinion about and could defend or contest.

COMPREHENSION:
Choose one school-related issue and argue from the position opposite your stance.

APPLICATION:
Anticipatory Set: Divide the class into three groups. One group will be given graphing calculators, one group will be given four-function calculators, and the remaining group may not use any calculator.
Students will: graph and solve a quadratic equation and discuss the fairness of calculator use. The group with the calculators will represent calculator manufacturers, the group with four function calculators will represent students, and the group with no calculators will represent teachers and build an argument for how calculators should be used in the classroom.
Class/team product: Students will present an oral defense for their designated group's position.
Multicultural and/or ESL and/or Bilingual Link: Create a jingle for or against the use of calculators in the classroom.

Mathematics/Science Link and/or Humanities Link: Write a letter to the superintendent as an irate parent who disagrees with calculator use in the classroom.
School-to-Career/Tech Prep Link: Have a representative from a calculator company discuss the calculator advances being considered for the future.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Student skit portraying calculator issues other than simply to use or not to use (e.g. money, over-reliance, self-esteem, and usage on test).
Students will: list the issues that are presented in complete question form.
Class/team/individual product: Write song or a parody to save or abolish the use of calculators in the classroom.

INDIVIDUAL JOURNAL ASSIGNMENT:
Compare the cost of different graphing calculators.

HOMELINK:
Talk to relatives and acquaintances to find what technology was available to them during school.

STATE STANDARD #B1.4.3   STUDENTS WILL BE ABLE TO VERIFY THE ANSWER BY USING AN ALTERNATIVE STRATEGY.

ESSENTIAL QUESTION: How does the Universal Theme of Aesthetic Needs create mastery learning of essential concepts in this unit?

10. **AESTHETIC NEEDS**
    (Algebra 1: Explorations and Applications by McDougal/Littel)

    KNOWLEDGE:
    Anticipatory Set: Pictures of Mondriaan's artwork.
    Students will: define a perfect square and find the area of a square.

    COMPREHENSION:
    Use algebra tiles to multiply perfect square binomials and explain why they are named "perfect squares".

    APPLICATION:
    Anticipatory Set: Teacher demonstration of completing the square method for solving quadratics.
    Students will: solve $x2 + 6x + 8 = 0$ using the complete the square method and check with factoring or the quadratic formula.
    Class/team product: Write a letter to a friend explaining step by step instructions for completing the square.
    Multicultural and/or ESL and/or Bilingual Link: Demonstration of a square dance.
    Mathematics/Science Link and/or Humanities Link: Take a reproduction of Mondriaan's artwork and find the areas.
    School-to-Career/Tech Prep Link: Have an artist come in and explain his/her use of mathematics in art.

    HIGHER ORDER THINKING SKILLS (H.O.T.S.):
    Anticipatory set: Given tangram pieces, recreate a given shape.
    Students will: derive the quadratic formula using the complete the square method.
    Class/team/individual product: Create problem cards and a solution key for Quadratic Bingo.

    INDIVIDUAL JOURNAL ASSIGNMENT:
    Solve five quadratic problems using the complete the square method.

Visit a local museum.

STATE STANDARD #A4.4.2   STUDENTS WILL BE ABLE TO CREATE AND SOLVE LINEAR AND QUADRATIC EQUATIONS.

ESSENTIAL QUESTION: How does the discipline/sub-discipline of MULTIIPLYING BINOMIALS relate to mastery learning of QUADRATICS?

11. **MULTIPLYING BINOMIALS**
(Algebra 1: Explorations and Applications by McDougal/Littel)

KNOWLEDGE:
Anticipatory Set: Teacher demonstration of multiplying binomials with algebra tiles.
Students will: describe the set up of an algebra tile problem.

COMPREHENSION:
Multiply five binomials using algebra tiles and sketch results.

APPLICATION:
Anticipatory Set: Teacher demonstration of the smiley man and foil.
Students will: create ten binomial multiplication problems (use mixed signs and x coefficients) and find the solutions using foil or tiles.
Class/team product: create a deck of concentration cards with 10 problem cards and 10 solution cards.
Multicultural and/or ESL and/or Bilingual Link: Decorate your cards with cultural themes.
Mathematics/Science Link and/or Humanities Link: Explain the acronym for FOIL.
School-to-Career/Tech Prep Link: Demonstrate multiplying binomials on a TI-89.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Show pictures of the AIDS Memorial Quilt.
Students will: read and solve problems p. 263 #24.
Class/team/individual product: A scale drawing of the display space for the Aids Quilt.

INDIVIDUAL JOURNAL ASSIGNMENT:
Create an alternate mnemonic device for multiplying two binomials.

HOMELINK:
Tell your family about the AIDS Memorial Quilt.

STATE STANDARD #A4.4.2   STUDENTS WILL BE ABLE TO CREATE AND SOLVE LINEAR AND QUADRATIC EQUATIONS.

ESSENTIAL QUESTION: How does the discipline/sub-discipline of FACTORING relate to mastery learning of QUADRATICS?

12. **FACTORING**
(Algebra 1: Explorations and Applications by McDougal/Littel)

KNOWLEDGE:
Anticipatory Set: Given specific algebra tiles, create a rectangle or a square.

Students will: describe the lengths of the sides of the rectangle or square in terms of variables and constants.

COMPREHENSION:
Convert a quadratic expression into an algebra tile representation and name the two factors.

APPLICATION:
Anticipatory Set: Connect multiplication problems to the concept of factoring (inverse relationship)
Students will: discover the connection by multiplying binomials and creating factoring problems. (e.g. $(x + 2)(2x - 1)$ would create the problem $2x2 + 3x - 2$.)
Class/team product: A five question factoring quiz with solution key.
Multicultural and/or ESL and/or Bilingual Link: Do exploration on page 429 and create a factoring problem for your box.
Mathematics/Science Link and/or Humanities Link: You have a large, irregular item that must be shipped. Explain how you would find the proper sized carton for shipping.
School-to-Career/Tech Prep Link: Invite a carpet layer to speak about what characteristics of a room influence how much carpet you need to buy and explain the tricks for saving money on irregular shaped rooms.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Financial advisor question on page 446
Students will: discuss and solve the first two problem as a team.
Class/team/individual product: Solutions to #32 and #33.

INDIVIDUAL JOURNAL ASSIGNMENT:
Find five different ways to complete the following trinomial so that it can be factored __$x2$ + 5x + ___

HOMELINK:
Have family members check the work in journal assignment.

STATE STANDARD #A4.4.2   STUDENTS WILL BE ABLE TO CREATE AND SOLVE LINEAR AND QUADRATIC EQUATIONS

ESSENTIAL QUESTION: How does the discipline/sub-discipline of THE QUADRATIC FORMULA relate to mastery learning of QUADRATICS?

13. THE QUADRATIC FORMULA
   (Algebra 1: Explorations and Applications by McDougal/Littel)

KNOWLEDGE:
Anticipatory Set: Teach the quadratic cheer presenting quadratic formula
Students will: learn the quadratic cheer

COMPREHENSION:
Students will "plug and chug" a, b, and c values into the quadratic formula with and without a calculator.

APPLICATION:
Anticipatory Set: Clips of divers jumping from the cliffs in Acapulco.
Students will: work problems to find how long it takes a diver to reach the water.
Class/team product: A poem that tells the significance of coefficients in the quadratic formula.

Multicultural and/or ESL and/or Bilingual Link: Make a collage various sports where quadratics is in play. (e.g. Soccer in Brazil, rugby player in Australia, a polo player in Great Britain.)
Mathematics/Science Link and/or Humanities Link: Students write in words the steps to solve an equation using the quadratic formula.
School-to-Career/Tech Prep Link: Research the salaries of professional and semi-professional athletes.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Define the discriminate. Create a table with the columns: equation, number of solutions, and discriminate value.
Students will: in groups work together to make a connection between the discriminate and the number of solutions.
Class/team/individual product: Students will write a program for the graphing calculator that will allow them to plug in the values for a, b, and c, so the calculator will provide a solution.

INDIVIDUAL JOURNAL ASSIGNMENT:
Explain the benefits of finding the discriminate value before solving with the quadratic formula.

HOMELINK:
Teach the quadratic cheer to their families.

STATE STANDARD #A4.4.2   STUDENTS WILL BE ABLE TO CREATE AND SOLVE LINEAR AND QUADRATIC EQUATIONS

ESSENTIAL QUESTION: How does the discipline/sub-discipline of FINDING AND GRAPHING WITH CRITICAL POINTS relate to mastery learning of QUADRATICS?

14. FINDING AND GRAPHING WITH CRITICAL POINTS
   (Algebra 1: Explorations and Applications by McDougal/Littel)

   KNOWLEDGE:
   Anticipatory Set: Songs clips using words "High and Low" (e.g. High Enough by Damn Yankees)
   Students will: create two equations: one with a high point and one with a low point

   COMPREHENSION:
   Students will graph several equations in a calculator and
           a) Name the vertex coordinates
           b) Identify vertex as a maximum or a minimum
           c) Identify the equation for the line of symmetry
           d) Name the zeros and the y-intercept

   APPLICATION:
   Anticipatory Set: "Can We Reach Higher" playing while formulas are displayed for the vertex and axis of symmetry.
   Students will: pair shares to find the vertex point, line of symmetry, zeros and y-intercept of an equation.
   Class/team product: sketch on large graph paper marking vertex point, line of symmetry, zeros and the y-intercept
   Multicultural and/or ESL and/or Bilingual Link: Translate the words "maximum", "minimum", "vertex", and "zeros" into three different languages and look at the similarities.
   Mathematics/Science Link and/or Humanities Link: Find six different synonyms for "maximum" or "minimum".
   School-to-Career/Tech Prep Link: Name uses for finding maximums and minimums in business situations.

Anticipatory set: Play "Big Time" by Peter Gabriel
Students will: explore the following situation: A farmer has 100 feet of fencing and needs to build two pig sties along the side of his barn. Find the largest sties possible.
Class/team/individual product: Given ten straws, each representing 10 feet, create a two dimensional model of your solution.

INDIVIDUAL JOURNAL ASSIGNMENT:
Write a law for deciphering whether a vertex is a maximum or a minimum.

HOMELINK:
Explain to family members why area problems are represented by parabolas.

STATE STANDARD #A4.4.2   STUDENTS WILL BE ABLE TO CREATE AND SOLVE LINEAR AND QUADRATIC EQUATIONS

ESSENTIAL QUESTION: How does the discipline/sub-discipline of Projectile Motion relate to mastery learning of QUADRATICS?

15. **PROJECTILE MOTION**
   (Textbook or Database: Algebra 1: Explorations and Applications by McDougal/Littel)

KNOWLEDGE:
Anticipatory Set: Archery clip from "Prince of Thieves"
Students will: sketch the shape of an arrow shot at a target. What factors will influence the height, the distance, and accuracy?

COMPREHENSION:
Students will compare the caber toss to archery.

APPLICATION:
Anticipatory Set: Play "Spinning Wheel" by Blood, Sweat and Tears
Students will: define the coefficients for projectile motion $-1/2gt2 + vot + ho$ and given the fact the g is a constant, explain the possible values and units for the first coefficient.
Class/team product: Estimate your personal values for initial velocity and height when throwing a ball. Create a problem involving projectile motion with your values. Exchange problems with a partner and solve.
Multicultural and/or ESL and/or Bilingual Link: Field trip to the Scottish Highland Games to observe the caber toss.
Mathematics/Science Link and/or Humanities Link: Aside from tossing a ball, list other activities that use the projectile motion equation.
School-to-Career/Tech Prep Link: Invite a pyrotechnic expert to discuss the calculations necessary to create a fireworks display.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Show a clip from Nova's "Secret's of Lost Empires II - Medieval Stage"
Students will: Create a model of a trebuchet.
Class/team/individual product: A competition to see whose trebuchet could knock down a Lego wall from a specific distance.

INDIVIDUAL JOURNAL ASSIGNMENT:
What could you have done to improve your trebuchet's performance?

Share your project with family members.

STATE STANDARD #A4.4.2   STUDENTS WILL BE ABLE TO CREATE AND SOLVE LINEAR AND QUADRATIC EQUATIONS

ESSENTIAL QUESTION: How does the discipline/sub-discipline of ENGINEERING relate to mastery learning of QUADRATICS?

16. ENGINEERING
   (Algebra 1: Explorations and Applications by McDougal/Littel)

   KNOWLEDGE:
   Anticipatory Set: Footage of fountains and aqueducts
   Students will: examine the correlation between water structures and quadratics

   COMPREHENSION:
   Give examples of equations for water paths, specifically looking at the lead coefficient.

   APPLICATION:
   Anticipatory Set: The water arc is a fountain that shoots recirculated water across the Chicago River from a water canon. The path of the water arc is modelled by the equation $y = -0.066x2 + 1.2x + 10$ where x is the horizontal distance in feet and y is the vertical distance. How many solutions are there when y = 0? How many solutions are there when y = 70?

   Students will: Find solutions using the quadratic formula.
   Class/team product: Sketch the path of the water labelling key points and the location of the water canon.
   Multicultural and/or ESL and/or Bilingual Link: Find the solutions to this situation using a calculator.
   Mathematics/Science Link and/or Humanities Link: Research the reasons for the water arc project which reversed the direction of the Chicago River.
   School-to-Career/Tech Prep Link: Visit an engineering firm for an overview of its function and then make a trip to a job site.

   HIGHER ORDER THINKING SKILLS (H.O.T.S.):
   Anticipatory set: "The Bridge Over Troubled Waters" by Simon and Garfunkel and footage of a bridge collapse. A clip from "Super Bridge" by Nova.
   Students will: participate in the bridge building contest sponsored by the Society of Engineers.
   Class/team/individual product: Students will build a bridge from Balsa wood to maximize the weight that can be supported.

   INDIVIDUAL JOURNAL ASSIGNMENT:
   List the bridges you have crossed and comment on their shapes.

   HOMELINK:
   Using Legos or Lincoln logs, have a competition among your family members to see who can build the strongest bridge.

STATE STANDARD #A4.4.2   STUDENTS WILL BE ABLE TO CREATE AND SOLVE LINEAR AND QUADRATIC EQUATIONS

ESSENTIAL QUESTION: How does the discipline/sub-discipline of INEQUALITIES relate to mastery learning of QUADRATICS?

17. **INEQUALITIES**
(Algebra 1: Explorations and Applications by McDougal/Littel)

KNOWLEDGE:
Anticipatory Set: List all words that imply more or less and not an exact amount.
Students will: follow teacher example for graphing a system of quadratic inequalities.

COMPREHENSION:
Given 3 inequalities, find the solution region through graphing.

APPLICATION:
Anticipatory Set: Take a poll of how many students attended the Alaska State Fair.
Students will: solve the following equation for zeros and maximum:
$-100t^2 - 5000000t + 200 = p$ where t is number of hours after opening and p is the number of people in the fairgrounds.

Class/team product: Given that the fire department has mandated a maximum capacity of 20,000 people on fairgrounds, graph the system of inequalities and find the times during which people will wait to be admitted.
Multicultural and/or ESL and/or Bilingual Link: Explain what $x = 100$, $x < 100$, and $x > 100$ would mean for a specific situation. (e.g. 100 could be a person's weight.)
Mathematics/Science Link and/or Humanities Link: Explain how a system of linear inequalities would be applied to the manufacturing of skis.
School-to-Career/Tech Prep Link: Explore your graphing calculator's ability to graph inequalities.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Present the problem: Machine A produces 200 spark plugs per hour. Machine B produces 375 spark plugs per hour. Machine a runs at least two hours per day. Machine B runs at least 3 hours per day. The two machines together can run no more than 10 hours per day.
Students will: write at least four inequalities to describe this situation including a definition of the variables.
Class/team/individual product: Create a chart of points in the feasible region and the number of spark plugs produced per day. Conjecture which combination would result in the maximum production.

INDIVIDUAL JOURNAL ASSIGNMENT:
Expand on the spark plug question by assigning prices to the spark plugs and finding maximum profits.

HOMELINK:
Take home quiz on graphing inequalities.

**MORAL/ETHICAL/SPIRITUAL
REASONING AND DILEMMAS**

TEN ETHICAL DILEMMAS

STATE STANDARD # E1.4.1 Apply mathematical skills and processes to global issues.

ESSENTIAL QUESTION: How does the content of this unit reflect character education through Moral and Ethical dilemmas?

1. **Producing, Exchanging, and Distributing [Economics]**
ESSENTIAL QUESTION: How do the Human Activity of Producing, Exchanging and Distributing create moral/ethical dilemmas?
DILEMMA: Your product is essential to everyday living for all people in your community. Your competition has gone out of business, and you have a monopoly. Do you take advantage of the situation to raise your prices knowing that this will mean some people will not be able to afford this product?

2. **Transportation**
ESSENTIAL QUESTION: How does the Human Activity of Transportation create moral/ethical dilemmas?
DILEMMA: It's late at night and you have been working for 12 hours. You are anxious to get home. As you approach a traffic light, it turns red. There are no other cars around. Do you run the red light?

3. **Communications**
ESSENTIAL QUESTION: How does the Human Activity of Communications create moral/ethical dilemmas?
DILEMMA: Your friend knows how to illegally connect cable television and shows you how easy it was to do. Your family cannot afford cable. Do you go home and connect your own televisions?

4. **Protecting and Conserving**
ESSENTIAL QUESTION: How does the Human Activity of Protecting and Conserving create moral/ethical dilemmas?
DILEMMA: The teacher has given you a test that will determine your quarter grade. The teacher did not record the grades for this test, and they are destroyed by fire. The teacher is asking each member of the class to report his or her score. Despite the fact that you failed the test, you need to pass this class to remain on the football team. Would you lie about your score?

5. **Providing Education**
ESSENTIAL QUESTION: How does the Human Activity of Providing Education create moral/ethical dilemmas?
DILEMMA: A few years age, a dear friend of yours begins using marijuana, and she makes you promise not to tell anyone. As time passes, she graduates to harder drug use, and though your friendship is not as strong, you still do not tell anyone. During a drug deal, your friend is shot and killed. During the investigation, you are confronted by family members and police officers about your knowledge of her drug history. Do you admit that you knew of her activities?

6. **Making and Using Tools and/or Technology**
ESSENTIAL QUESTION: How do the Human Activity of Making and Using Tools and/or Technology create moral/ethical dilemmas?
DILEMMA: You are an athletic superstar in your community. A local business offers you a great deal of money to endorse its equipment which you know is of poor quality. Do you take its offer?

7. **Providing Recreation**
ESSENTIAL QUESTION: How does the Human Activity of Providing Recreation create moral/ethical dilemmas?
DILEMMA: You are flying on a small airplane with four passengers when the engines falter. The only hope for survival is to parachute from the plane. There are only three parachutes. Do you volunteer to stay behind?

8. **Organizing and Governing**
ESSENTIAL QUESTION: How does the Human Activity of Organizing and Governing create moral/ethical dilemmas?

DILEMMA: Your union is on strike, and no settlement is in sight. Your family has no other means of support, and you have run out of money. The company has offered large salaries to employees who cross the line and return to work. Do you cross the line?

9. Moral, Ethical and Spiritual Behavior
ESSENTIAL QUESTION: How do the Human Activity of Moral, Ethical and Spiritual Behavior create moral/ethical dilemmas?
DILEMMA: As a teacher, you need to decide if students can share calculators on an exam. While you realize this raises the possibility of cheating, you also know that some students would be disadvantaged because they do not own a graphing calculator. Do you allow the sharing of graphing calculators?

10. Aesthetic Needs
ESSENTIAL QUESTION: How does the Human Activity of Aesthetic Needs create moral/ethical dilemmas?
DILEMMA: As a curator, you have recently sold a Mondriaan painting. After the sale and delivery, you discover that the certificate of authenticity was a forgery. Do you contact your customer or ignore the new information?

<div align="center">

PRODUCTIVE THINKING SKILLS
DIVERGENT/CREATIVE THINKING

</div>

1. BRAINSTORM MODEL
    A. BRAINSTORM ALL OF THE_____:
        AHA #1.   Anything that is not straight
        AHA #2.   The things you can ride
        AHA #3. The ways you could communicate with an alien
        AHA #4. The things a fire-fighter might have with him that have nothing to do with fighting fires
        AHA #5. Types of things you can be addicted
        AHA #6. Uses for a CBL
        AHA #7. Ways to use a ball that are not playing a game

    B. BRAINSTORM AS MANY_____AS YOU CAN THINK OF.
        AHA #8.   Professions
        AHA #9.   Ways to change someone's mind
        AHA #10.   Places where you see perfect squares
        AHA #11.   Uses for tiles
        AHA #12.   Factors for success in school
        AHA #13.   Formulas
        AHA #14.   Natural highs

    C. HOW MANY WAYS CAN YOU COME UP WITH TO_____?
        AHA #15.   Travel in a parabolic path
        AHA #16.   Get to the other side
        AHA #17.   Estimate size a distance object

2. VIEWPOINT MODEL (Human or Animate) (Use Cultural Literacy Terms)
    A. HOW WOULD_____ LOOK TO A(N) _____?

AHA #1.	Eiffel Tower	mouse
AHA #2.	Skid mark	tire
AHA #3.	Satellite dish	prehistoric man
AHA #4.	Water	flame
AHA #5.	Cocaine	nosehairs
AHA #6.	Calculator	abacus
AHA #7.	Tennis ball	racquet
AHA #8.	Picket line	Omish person

B. WHAT WOULD A _____MEAN FROM THE VIEWPOINT OF A (N)_____?

AHA #9.	Graphing calculator	Neanderthal
AHA #10.	Perfect square	surrealist
AHA #11.	Variable	exponent "2"
AHA #12.	Prime polynomial	factor
AHA #13.	Discriminate	radical
AHA #14.	Maximum	minimum
AHA #15.	bull's-eye	arrowhead
AHA #16.	bridge	body of water
AHA #17.	boundary line	feasible region

C. HOW WOULD ___Galileo__ VIEW THIS?
1. Algebra Tiles
2. Graphing Calculators
3. White Boards
4. Satellite Dish
5. Laptop Computer
6. Super balls

3. **INVOLVEMENT MODEL (Personification/Inanimate object brought to life)**
   A. HOW WOULD YOU FEEL IF YOU WERE_____?

AHA #1.	Vertex of a parabola
AHA #2.	The break pedal to a speeding car
AHA #3.	Radio signal
AHA #4.	The top rung of a fireman's ladder
AHA #5.	Drug that cured cancer
AHA #6.	The outlier of a list of data
AHA #7.	The ball that scored the winning goal of the World Cup

   B. IF YOU WERE A_____, WHAT WOULD YOU (SEE, TASTE, SMELL, FEEL, etc.)?

AHA #8.	Picket sign	say
AHA #9.	Locker	hear
AHA #10.	Square peg in a round whole	cope
AHA #11.	Quadratic solution	feel
AHA #12.	Zero	see
AHA #13.	Table of values	accomplish
AHA #14.	Axis of symmetry	govern

   C. YOU ARE A _____ . DESCRIBE HOW IT FEELS.

AHA #15.	Caber
AHA #16.	Keystone in a bridge
AHA #17.	Less than sign

4. **CONSCIOUS SELF-DECEIT MODEL**
   A. SUPPOSE_____. WHAT_____.

AHA #1. You were on a bridge and the cables starting to break   would you do to save yourself
AHA #2. You could travel at any speed   speed would you travel
AHA #3. You met an alien   would you do and say
AHA #4. You could be the Dalmatian on a fire engine   would your most important role be
AHA #5. You were expelled from school   would you be willing to do to renter
AHA #6. You could obtain a calculator that read and solved problems   would you be willing to pay for it
AHA #7. You won the World table tennis competition   you do with your winnings
AHA #8. You were a union leader   would you do to inspire your members
AHA #9. Calculators were never invented   would you do to solve problems today

B. YOU CAN_____. WHAT_____?

AHA #10. Have any kind of machine for your classroom. would you want
AHA #11. Choose any method to multiply binomials. method do you choose
AHA #12. Have a computer chip implanted in your brain would you want it to do
AHA #13. Can breathe under water ocean would you explore
AHA #14. Can reach anything in the universe do you touch first
AHA #15. Travel at any speed is your comfort level
AHA #16. Build a bridge to Mars material would you need
AHA #17. Modify a historical inequality correction would you make

5. **FORCED ASSOCIATION MODEL (Use cultural literacy terms here)**

A. HOW IS_____ LIKE_____?

AHA #1. Parabola pair of jeans
AHA #2. Brake pencil eraser
AHA #3. Cell phone smoke signal
AHA #4. Fire extinguisher perfume
AHA #5. Graduation being born
AHA #6. Ball brain issue
AHA #7. Football game space expedition

B. GET IDEAS FROM_____ TO IMPROVE_____

. AHA #8. past strikes school working conditions
AHA #9. Einstein calculator usage
AHA #10. cookbook a square cake
AHA #11. children games your lottery chances
AHA #12. factoring categorizing
AHA #13. formulas understanding
AHA #14. cooperative learning global racial interactions

C. I ONLY KNOW ABOUT_____. EXPLAIN_____ TO ME.

AHA #15. Tossing a ball rocketry
AHA #16. Bridges tunnels
AHA #17. Equations inequalities

6. **REORGANIZATION/SYNECTICS MODEL**

A. WHAT WOULD HAPPEN IF_____?

AHA #1. Computers cost 5 dollars?
AHA #2. You could stop on a dime regardless of your speed?
AHA #3. You met an alien on your way to school today?
AHA #4. You could go back to September 10th, 2001?
AHA #5. You could destroy all the recreational drugs in the world?
AHA #6. You could bounce a ball hard enough to put it into orbit?
AHA #7. You could skydive without a parachute?

B. SUPPOSE_____ (HAPPENED)
WHAT WOULD BE THE CONSEQUENCES?

AHA #8. Unions were outlawed
AHA #9. You could have a calculator implant in your fingernail
AHA #10. There were no perfect squares
AHA #11. You found a cure for Aids that causes cancer
AHA #12. CEO ran off with the company's money
AHA #13. A quadratic had three zeros
AHA #14. Farmlands of Matanuska Valley were flooded

C. WHAT WOULD HAPPEN IF THERE WERE NO_____?

AHA #15.   Catapults
AHA #16.   Engineers
AHA #17.   Factories

CULTURAL LITERACY

1. Dates:
1657 (first pendulum clock)
1940 (first radio telescope)

2. Names:
Parabola
Pendulum
Scatter plot
Union
Height
Graph
Vertex
Symmetric
Scale drawing
Telescope
Trinomial
Perfect square
Linear

3. Proper Names:
Galileo
Bill Pinkney
Hoffa
CBL
Pythagoras
Escher
Newton

4. Ideas:

acceleration	lead coefficient	horizontal
Terminal velocity	root	exponent
Quadratic	minimum	binomial
Formula	maximum	product
Discriminate	FOIL	approximate solutions
Aesthetics	calculate	imaginary
Increase	absolute value	quadratic regression

5. Phrases:
stop on a dime
Look for the union label

RESOURCES

I. Bibliography Teacher/Professional Books and Resources

1. Gale Group, Inc (2002). Video Hound's Golden Movie Retriever. Detroit, MI.
2. Green, J. (1995). The Green Book of Songs by Subject. The thematic guide to popular music. (4th ed. Updated and expanded). Nashville, TN: Professional Desk References, Inc.
3. Harshbarger, Reynolds (1996). Mathematical Applications.
4. Hirsch, E.D. Jr., Kett, Joseph and Trefil, James (1988). Cultural Literacy: What Every American Needs To Know. Random House, Inc., New York

5. Littell, McDougal. Algebra 1 - Explorations and Applications.
6. Littell, McDougal. Algebra 1 - Explorations and Applications, Technology Book
7. National Council on Economic Education (2001).Mathematics & Economics: Connections for Life. New York, NY.

II. Educational Films/Videos
1. 5.8 Applications of Quadratics.
2. ABC News: 9/11 Special.
3. Building Big Bridges.
4. Commercial Collage (Drug/ Education)
5. Donald Duck In Math Magic Land.
6. MSNBC News Footage From The World Trade Center, Sept. 11, 2001.
7. Super Bridge
8. War of the World (Orson Welles Radio Program)
9. Rollercoaster (Nova)
10. Why the Towers Tell.

III. Commercial Films/Videos

1. Apollo 13	11. Haffa	21. Space Cowboys
2. Back To The Future	12. Jerry McGuire	22. The Towering Inferno
3. Backdraft	13. Jingle All The Way	23. George of the Jungle
4. Backfire!	14. Matrix	24. The Bridges of Madison County
5. Beautiful Mind	15. Never Cry Wolf	25. The Right Stuff
6. Bridge Over River Kwai	16. Norma Ray	26. Terminal Velocity
7. Bullitt	17. Outbreak	27. Speed
8. Contact	18. Robin Hood	28. The Goalie's Anxiety at the Penalty Kick
9. Dam Busters	19. Rocket Man	29. Braveheart
10. The Dish	20. Rocketeer	30. The Three Musketeers

V. Literature/Language Arts (on reserve in Media Center for interest reading)
Fiction
1. Dot And The Hive
2. Incredible Voyager
3. Journey to The Center Of The Earth
4. Time Machine
5. Quo Vadis
6. Ivanhoe
7. 20,000 Leagues Under the Sea
8. Robin Hood
9. Calvin and Hobbes

Non-Fiction
McCullough, Conde Balcom. Arched Bridges.
Archimedes' Revenge
Beautiful Mind
200% of Nothing
Trebuche (Nova)
The Joy of Mathematics
Go Ask Alice
Mathematics and Humor
The Right Stuff
Labyrinths of Reason
How to Lie with Statistics
Pi in the Sky

Math on Call
The Man Who Counted
The History of Π
Men of Mathematics
19. The Most Beautiful Mathematical Formulas
The Universe and the Teacup
Art and Physics

Drama (Stage Productions)
1. Cat on a Hot Tin Roof
2. Othello
3. Hamlet
4. Cleopatra

Art Works
1. Golden Gate Bridge
2. Eiffel Tower
3. Brooklyn Bridge
4. Arc de Triumph
5. St. Louis Arch
6. "Composition in Red & Blue" - Piet Mondrinan
7. "Composition NumberOne" – Jackson Pollock
8. Works of Pablo Picasso
9. Works of Henry Moore
10. Works of Van Gogh

Music
1. "59th Street Bridge Song" (Feelin' Groovy) - Simon & Garfunkel.
2. "Addicted to Love" - Robert Palmer.
3. "Candy Man" - Sammy Davis Jr.
4. "Carmelita" - Linda Rondstadt
5. "Getaway" - Earth, Wind, and Fire.
6. "I Want a New Drug" - Huey Lewis.
7. "With a Little Help" - Beattles.
8. "Hard Habit to Break" - Chicago
9. "Right and Wrong" - Joe Jackson
10. Theme "Bridge over River Kwai"
11. "Spinning Wheel" - Blood, Sweat, & Tears
12. "High Enough" - Damn Yankees
13. "Can We Reach Higher"
14. "Big Time" - Peter Gabrielleg
15. "Bridge Over Troubled Water" - Simon & Garfunkel

VI. Resource People/Mentors
1. Art Bell - Radio 650 AM
2. Faculty member involved in business venture - guest speaker
3. Global Positioning System - guest speaker
4. Jr. Achievement - guest speaker
5. School nurse - guest speaker
6. Vocational Education Teacher
7. Calculator Manufacturer - Guest Speaker

VII.   Field Trips
1. AK State Crime Lab
2. Kincaid Park

3. Fire Training Center

VIII.   Other Material (CDROM, Laser Disc, Internet sites, etc.)
1. www.free-clipart.net/main.html
2. www.artbell.com
3. www.nida.nih.gov
4. www.unitedstreaming.com
5. www.reelclassics.com/gallery/video.htm
6. www.lyrics.coolfreepages.com
7. www.kaza.com
8. www.winmx.com
9. www.limewire.com
10. www.dawcl.com