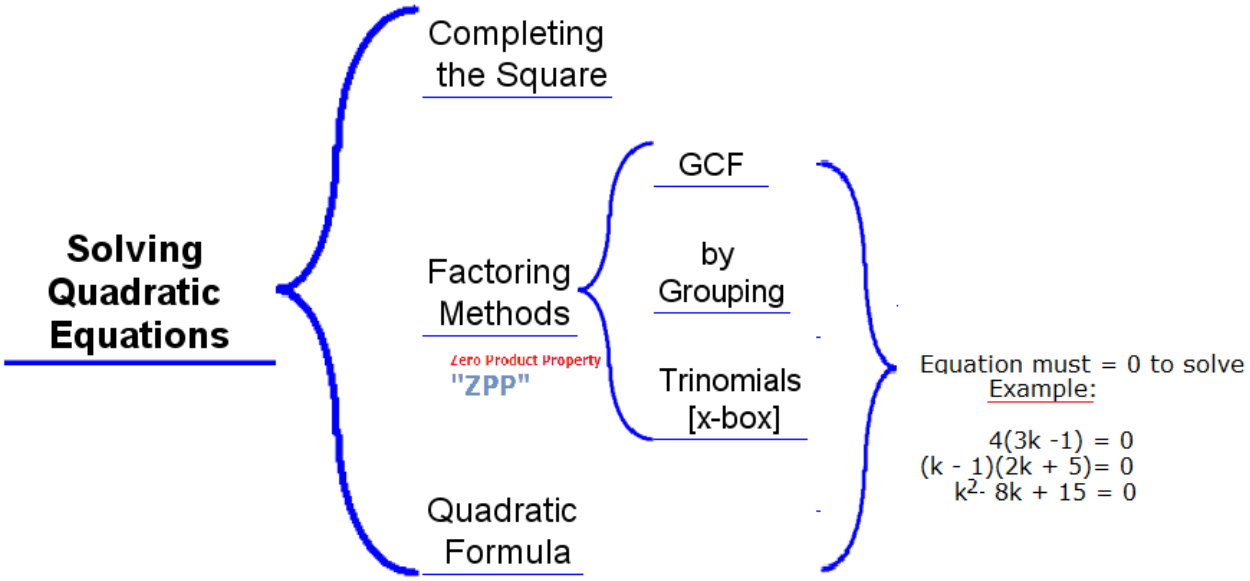
Book of Quadratic Equations



**when asked to FACTOR the answer will be =(expression)(expression)

**when asked to SOLVE the answer will be x = number & x= number

Words with similar meaning:

function = equation; difference = -

product = multiply; factor = divide

roots = x-intercept = solution; sum = add

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Quadratic equation always represent parabola. Parabola is open up when the coefficient of x square is positive and open down when it is negative.

The parabola can lie entirely above or below the x-axis without any intersection. Such parabolas do have imaginary roots. If the parabola touches the x axis, then it has solutions, these are called real roots.

2 methods to graph a PARBOLA: Using a xy-chart or Vertex Form

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Here are the steps required for Graphing Parabolas in the Vertex Form $y = a(x - h)^2 + k$:

Step 1: Find the vertex. Since the equation is in vertex form, the vertex will be at the point (h, k).

Step 2: Find the y-intercept. To find the y-intercept let x = 0 and solve for y.

Step 3: Find the x-intercept(s). To find the x-intercept let y = 0 and solve for x. You can solve for x by using the square root principle or the quadratic formula (if you simplify the problem into the correct form).

Step 4: Graph the parabola using the points found in steps 1 – 3.

Solve by Graphing

Sketch the graph and find the solution of the quadratic equations:

1) $y = x^2 - x - 6$	2) $y = x^2 + 6x + 8$
3) $y = x^2 + 3x - 10$	4) $y = x^2 + 8x + 12$

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Sketching parabola and finding the roots is not easy all time.

Other techniques are available to find Roots of a quadratic equation without graphing the quadratic equations. See how many techniques we have below:

Remember : If $x^2 = m$ then $x = \pm\sqrt{m}$

Solve by Taking Square Roots

Example $(x-2)^2 - 25 = 0$ $(x-2)^2 = 25$ $\sqrt{(x-2)^2} = \pm\sqrt{25}$ $x - 2 = \pm 5$ so $x = -3, 7$	Example $(x-2)^2 = 12$ $\sqrt{(x-2)^2} = \pm\sqrt{12}$ $x - 2 = \pm\sqrt{4 \cdot 3}$ $= \pm 2\sqrt{3}$ $x = 2 \pm 2\sqrt{3}$
1) $x^2 - 16 = 0$	2) $3x^2 - 27 = 0$
3) $(x+1)^2 - \frac{9}{4} = 0$	4) $(x-3)^2 - 18 = 0$

Solve by Squaring Both Sides

1) $\sqrt{10x - 9} = x$	2) $\sqrt{x(10x+1)} = \sqrt{2}$
3) $\sqrt{1 - 8x} = 3x$	4) $\sqrt{x(x-7)} = 2\sqrt{2}$
5) $\sqrt{4x + 5} = x$	6) $\sqrt{(x-2)x} = \sqrt{3}$

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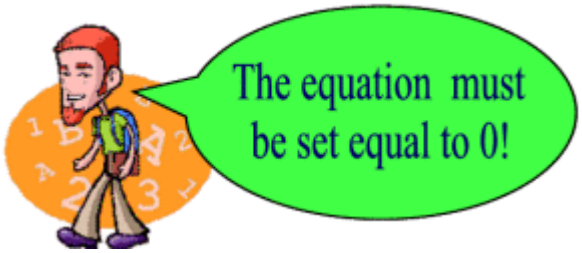
SOLVING: by using the Quadratic Formula

Quadratic Formula: For $ax^2 + bx + c = 0$, $$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ Example 1. $3x^2 - 5x - 2 = 0$	Use **whenever**… Steps: 1. Start with the equation in the form $ax^2 + bx + c = 0$ ➧Be sure it is set equal to zero! 2. Factor the left hand side (assuming zero is on the right) 3. Set each factor equal to zero 4. Solve to determine the roots (the values of *x*) Example 2. $x^2 - 2x + 1 = 4$
1) $9x^2 - 8x - 1 = 0$	2) $2x^2 + 6 = 7x$
3) $3x^2 + 2x = 8$	4) $8x^2 + 10x = 7$
5) $4x^2 + 5 = -12x$	6) $5x^2 - 17x + 6 = 0$



SOLVING: by Completing the Square

Steps for Completing the Square:	
1. Be sure that the coefficient of the highest power is one. If it is not, divide each term by that value to create a leading coefficient of one.	$x^2+8x-4=0$
2. Move the constant term to the right hand side.	$x^2+8x=4$
3. Prepare to add the needed value to create the perfect square trinomial. Be sure to balance the equation. The boxes may help you remember to balance.	$x^2+8x+\square=4+\square$
4. To find the needed value for the perfect square trinomial, take half of the coefficient of the *middle term* (x-term), square it, and add that value to both sides of the equation. Take half and square $x^2+8x+\square=4+\square$	$x^2+8x+\boxed{16}=4+\boxed{16}$
5. Factor the perfect square trinomial.	$(x+4)^2=20$
6. Take the square root of each side and solve. Remember to consider both plus and minus results.	$x+4=\pm\sqrt{20}$ $x=-4\pm\sqrt{20}=-4\pm2\sqrt{5}$ $x=-4+2\sqrt{5}$ $x=-4-2\sqrt{5}$

Example:

$$x^2 - 2x - 1 = 0$$
$$x^2 - 2x = 1$$
$$x^2 - 2x + \square = 1 + \square$$
$$x^2 - 2x + \boxed{1} = 1 + \boxed{1}$$
$$x^2 - 2x + 1 = 2$$
$$(x-1)^2 = 2$$
$$x - 1 = \pm\sqrt{2}$$
$$x = 1 \pm \sqrt{2}$$
$$x = 1 + \sqrt{2}; \quad x = 1 - \sqrt{2}$$

Example:

$$5x^2 - 6x = 8$$
$$x^2 - \frac{6}{5}x = \frac{8}{5}$$
$$x^2 - \frac{6}{5}x + \square = \frac{8}{5} + \square$$
$$x^2 - \frac{6}{5}x + \boxed{\frac{9}{25}} = \frac{8}{5} + \boxed{\frac{9}{25}}$$
$$x^2 - \frac{6}{5}x + \frac{9}{25} = \frac{40}{25} + \frac{9}{25}$$
$$x^2 - \frac{6}{5}x + \frac{9}{25} = \frac{49}{25}$$
$$\left(x - \frac{3}{5}\right)^2 = \frac{49}{25}$$
$$x - \frac{3}{5} = \pm\frac{7}{5}$$
$$x = \frac{3}{5} \pm \frac{7}{5} = \frac{3 \pm 7}{5}$$
$$x = \frac{10}{5} = 2; \quad x = \frac{-4}{5}$$

Solve by Completing the Square Method

Solve the quadratic equations using completing the square method:

1) $x^2 - 7x + 10 = 0$	2) $x^2 + x - 2 = 0$
3) $x^2 + 5x + 6 = 0$	4) $x^2 - 5x + 4 = 0$
5) $x^2 + 7x + 12 = 0$	6) $x^2 + 9x + 8 = 0$
7) $8x^2 - 30x + 7 = 0$	8) $6x^2 + 17x + 5 = 0$
9) $9x^2 - 18x + 8 = 0$	10) $4x^2 + 5x - 6 = 0$

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FACTORING: Trinomials (split the middle)

Example: $3x^2 - 14x + 11 =$ More ex. See wkst MF4	Check for GCF first
1) $3x^2 - 4x - 7 =$	2) $x^2 + 5x + 6 =$
3) $2m^2 + 7m - 4 =$	4) $a^2 - 10a + 9 =$
5) $2x^2 - 3x - 5 =$	6) $y^2 - 10y + 24 =$
7) $3x^2 - 7x + 2 =$	8) $a^2 - a - 72 =$
9) $5x^2 - 14x - 3 =$	10) $m^2 + m - 30 =$
11) $4x^2 + 4x - 3 =$	12) $15x^2 - 14x - 8 =$

SOLVING: Quadratic Expression

Example: $2x^2 - x - 6 = 0$ $(2x + 3)(x - 2) = 0$ $2x + 3 = 0 \quad x - 2 = 0$ $x = -\frac{3}{2} \qquad x = 2$	<u>Steps:</u> 1. Start with the equation in the form $ax^2 + bx + c = 0$ ➧Be sure it is set equal to zero! 2. Factor the left hand side (assuming zero is on the right) 3. Set each factor equal to zero 4. Solve to determine the roots (the values of *x*)
1) $3x^2 + 10x + 7 = 0$	2) $2x^2 - 9x + 9 = 0$
3) $5x^2 + 8x - 4 = 0$	4) $3x^2 - 11x + 10 = 0$
5) $6x^2 - 13x - 5 = 0$	6) $4x^2 + 5x - 6 = 0$

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FACTORING: DOTS_ difference of two squares

Example: $64a^2b^2 - 49c^2d^2 =$ (8ab – 7cd)(8ab + 7cd)	Only use when… **There is a minus between two *perfect squares*.
1) $36m^2 - 25n^2 =$	2) $81 - z^2 =$
3) $x^2 - 9 =$	4) $s^2 - 1 =$
5) $121p^2 - 9q^2 =$	6) $169a^2 - 25b^2 =$
7) $(3a - 4b)^2 - 16 =$	8) $25b^2 - 64c^2 =$

SOLVING: Quadratic Expression

Example: $x^2 - 64 = 0$ $(x+8)(x-8) = 0$ $x+8=0 \quad x-8=0$ $x=-8 \quad x=8$	Caution: Be sure the equation is set equal to zero!
1) $9a^2 - 16 = 0$	2) $81a^2 - 36 = 0$
3) $a^2 - 20 = 5$	4) $16 - x^2 = 0$
5) $(x-1)^2 - 4 = 0$	6) $(p-q)^2 - 49 = 0$

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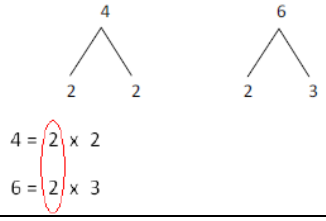
FACTORING: GCF _Greatest Common Factor

Example:	Use **whenever possible**… Find the largest value that can be factored from each of the elements of the expression.
1) GCF of 36 and 48=	2) GCF of 14 and 18 =
3) GCF of 16 and 24 =	4) $4x^2 - 9y^2$=
5) $16m^2 - 25n^2$ =	6) $p^3q - pq^3$=
7) $169a^2 - 144b^2$ =	8) $8x^2 - 18y^2$ =



SOLVING: Quadratic Expression

Example:	Caution:
$3x^2 + 6x = 0$ $3x(x+2) = 0$ $3x = 0 \quad x + 2 = 0$ $x = 0 \quad x = -2$	Be sure the equation is set equal to zero! Practice: $2x^2 - 10x$
1) $5x - 20x^2$ =	2) $13x^3 - 26x$ =
3) $15x^2 + 36x + 12 = 0$	4) $8x^2 + 44x + 20 = 0$

Student Name: _____ **Score:**

Find the G.C.F of Monomials

Work Space

$G.C.F\ of\ 3xy, 6xz\ and\ 9xyz\ is$ _____

$G.C.F\ of\ x^3y^2, xy\ and\ x\ is$ _____

$G.C.F\ of\ mn^3, m^4n\ and\ mn\ is$ _____

$G.C.F\ of\ a^3b^7c^4, (abc)^5\ and\ a^2b^3c^2\ is$ _____

$G.C.F\ of\ 2r^5, 4r^9\ and\ 6r^4\ is$ _____

$G.C.F\ of\ x^3yz^2, x^2y^3z^4\ and\ 2x^3yz^3\ is$ _____

$G.C.F\ of\ 5m^8, 10m^6\ and\ 7m^3\ is$ _____

$G.C.F\ of\ 6a, 4b\ and\ 2c\ is$ _____

$G.C.F\ of\ pq^4, q^3r\ and\ pq^2r\ is$ _____

$G.C.F\ of\ (ab)^4, (abc)^3 and\ (abcd)^6\ is$ _____

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FACTORING: by grouping common factors

Example:	Only use when…
x(6w – 4v + u) – (6w – 4v + u) = (x – 1) (6w – 4v + u)	**Break** up the polynomial into sets of 2 Factor each pair. Factor out the common (shared) binomial parenthesis.
1) $m(n-2)-2(n-2)=$	2) $3(x+5)-y(x+5)=$
3) $xy + 7x + 4y + 28 =$ $x($ $) + 4($ $) =$	4) $xy+y+xz+z=$
5) $3xy-y^2+3x-y=$	6) $a^3+a^2+a+1=$
7) $x^2-2x-3x+6=$	8) $x^3 - 8x^2 - x + 8 =$

More Factoring by grouping common factors

Example: Factor $xy - 4y + -3x + 12 =$ $(xy - 4y) + (-3x + 12) = y(x - 4) + 3(-x + 4)$ $= y(x - 4) - 3(x - 4)$ $= (x - 4)(y - 3)$	Caution: Whenever there is a (x – 5) and (5 – x) You can NOT take out a common (x – 5) **S**witch (5 – x) to (x – 5) by "●-1" see ex.
1) 3x(x – y) + y(y – x) =	2) 6(m – n) – 3k(n – m) =
3) 5a(a + 7) – (7 + a) =	4) $6a^3 - 15a^2 - 10 + 4a =$

Last unit rubric:

Notes in notebook: 3 stamps = 15 points

Graphing the quadratic equations:	5 pts
Solve by taking SquareRoot & Squaring bs:	5pts
Solving: by using Quadratic Formula	5pts
Solving: by Completing the Square	5pts
Factoring & Solving Trinomials (split the middle):	5pts
Factoring & Solving DOTS:	5pts
Factoring & Solving GCF:	10pts
Factoring: by grouping common factors	5pts

+ 40 points to make a tab book

Eight-Tab Book Rubric

	4 40 points Excellent	3 30 points Good	2 35 points Fair	1 10-25 Poor
Required Elements 1. Tab: Graphing QE 2. Tab: Solve by taking √ and square both sides 3. Tab: Solve by Quadratic Formula 4. Tab: Solve by Completing the Square 5. Tab: Factor & Solve Trinomials 6. Tab: Factor & Solve DOTS 7. Tab: Factor & Solve GCF 8. Tab: Factor by Grouping <u>Optional:</u> other page such as Summary/notes/reflections..	The book includes all **8** required tabs	6 tabs are included	4 tabs are included	2 tabs are included
Timeliness	Turned in on time 01/15/13	Turned in 2 days late	Turned in the next week	Turned in a week or more late

On each tab you can have the following:

- Vocab/concept/formla/procedures, and
- 2 examples and/or graphics <u>Possible: 40points</u>

or

- Write a story or make cartoon drawings of the process to solve the Quadratic Equation [open for creativity]

+ 10ec for creativity/completeness <u>Possible: 50points</u>

Please keep tab on Ms. Nong teacher's website:

Video Math Tutorials (by Ms. Nong)

&

Math Practice and Tutoring (other videos/recommended websites)

I will continue to post… the end.