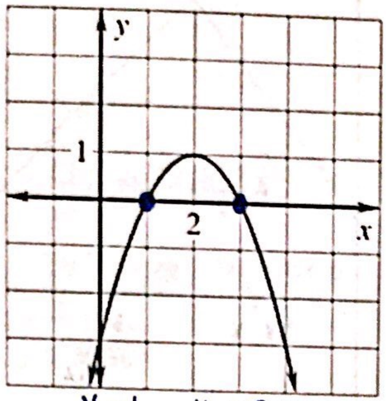
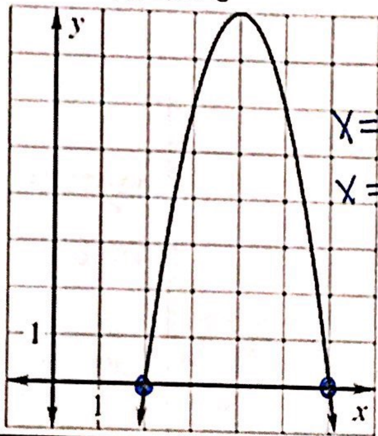
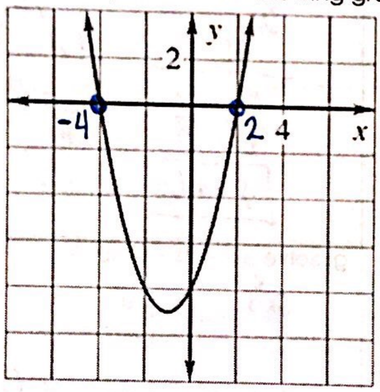
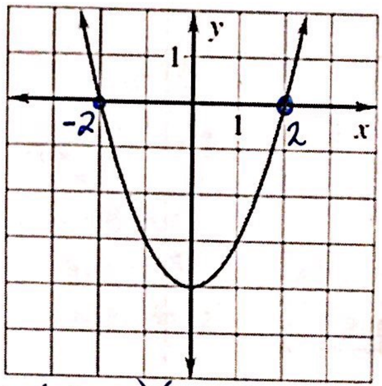
Algebra 1
Unit 9 Review – Quadratic Equations

Name: Key
Date: ________ Period: ______

What you need to know & be able to do	Things to remember	Examples	
1. Solve a quadratic function by graphing	Determine where the graph crosses the x-axis. Solution is written as x = ______. Solutions are called: x-intercepts zeros roots	a. Solve by graphing  $x=1$, $x=3$	b. Solve by graphing  $x=2$ $x=6$
2. Determine the equation of a parabola using its zeros.	The zeros and factors in the equation have opposite signs.	a. Create an equation, in factored form, to represent the following graph.  Y = $(x+4)(x-2)$	b. Create an equation, in factored form, to represent the following graph.  Y = $(x+2)(x-2)$
3. Solve equations in factored form.	Zero Product Property	a. Solve $(x-7)(x+3)=0$ $x-\cancel{7}=0$ $+\cancel{7}\ +7$ $\boxed{x=7}$ $x+\cancel{3}=0$ $-\cancel{3}\ -3$ $\boxed{x=-3}$	b. Solve: $(x-4)(5x-7)=0$ $x-\cancel{4}=0$ $+\cancel{4}\ +4$ $\boxed{x=4}$ $5x-\cancel{7}=0$ $+\cancel{7}\ +7$ $\frac{\cancel{5}x}{\cancel{5}}=\frac{7}{5}$ $\boxed{x=7/5}$
4. Solve equations by factoring.		a. Solve for x: $x^2-9x+20=0$ $(x-4)(x-5)=0$ $x-\cancel{4}=0$ $+\cancel{4}\ +4$ $\boxed{x=4}$ $x-\cancel{5}=0$ $+\cancel{5}\ +5$ $\boxed{x=5}$	b. Solve for x: $x^2-13x+47=\cancel{7}$ $-7\ -\cancel{7}$ $x^2-13x+40=0$ $(x-8)(x-5)=0$ $x-\cancel{8}=0$ $+\cancel{8}\ +8$ $\boxed{x=8}$ $x-\cancel{5}=0$ $+\cancel{5}\ +5$ $\boxed{x=5}$

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		c. $x^2 - 13x + 47 = 7$ Repeat of b	d. $x^2 - 100 = 0$ $(x+10)(x-10)=0$ $x+\cancel{10}=0$ $x-\cancel{10}=0$ $-\cancel{10}\ -10$ $+\cancel{10}\ +10$ $\boxed{x=-10}$ $\boxed{x=10}$
		e. Solve $5x^2 - 16x + 12 = 0$ $5x \cdot x$ $3\cdot4$, $2\cdot6$, $1\cdot12$ $(5x-6)(x-2)=0$ $5x-\cancel{6}=0$ $x-\cancel{2}=0$ $+\cancel{6}\ +6$ $+\cancel{2}\ +2$ $\frac{\cancel{5}x}{\cancel{5}}=\frac{6}{5}$ $x=2$ $\boxed{x=6/5}$	f. Solve $\frac{3x^2}{3} - \frac{18x}{3} + \frac{15}{3} = \frac{0}{3}$ $3(x^2-6x+5)=0$ $3(x-1)(x-5)=0$ $x-\cancel{1}=0$ $x-\cancel{5}=0$ $+\cancel{1}\ +1$ $+\cancel{5}\ +5$ $\boxed{x=1}$ $\boxed{x=5}$
		g. Solve $3x^2 + 2x - 8 = 0$ $3x\cdot x$ $-2\cdot4$, $-1\cdot8$ $(3x+8)(x-2)=0$ $3x+\cancel{8}=0$ $x-\cancel{2}=0$ $-\cancel{8}\ -8$ $+\cancel{2}\ +2$ $\frac{\cancel{3}x}{\cancel{3}}=\frac{-8}{3}$ $\boxed{x=2}$ $\boxed{x=-\frac{8}{3}}$	h. $6x^2 - 5x - 11 = -\cancel{5}$ $+5\ +\cancel{5}$ $6x^2-5x-6=0$ $3x\cdot2x$, $6x\cdot x$ $-3\cdot2$, $-1\cdot6$ $(3x+2)(2x-3)=0$ $3x+\cancel{2}=0$ $2x-\cancel{3}=0$ $-\cancel{2}\ -2$ $+\cancel{3}\ +3$ $\frac{\cancel{3}x}{\cancel{3}}=\frac{-2}{3}$ $\boxed{x=-2/3}$ $\frac{\cancel{2}x}{\cancel{2}}=\frac{3}{2}$ $\boxed{x=\frac{3}{2}}$
		i. Solve $\frac{x^2}{x} - \frac{4x}{x} = \frac{0}{x}$ $x(x-4)=0$ $\boxed{x=0}$ $x-\cancel{4}=0$ $+\cancel{4}\ +4$ $\boxed{x=4}$	j. Solve $12x^2 = -3\cancel{6}x$ $+36x\ +3\cancel{6}x$ $\frac{12x^2}{12x}+\frac{36x}{12x}=\frac{0}{12x}$ $12x(x+3)=0$ $\frac{\cancel{12}x}{\cancel{12}}=\frac{0}{12}$ $x+3=0$ $-3\ -3$ $\boxed{x=0}$ $\boxed{x=-3}$

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5. Solve equations by finding square roots.	Use solving by square roots when your equations have parenthesis or two terms (a & c). PEMDAS (backwards)	a. $\sqrt{x^2}=\sqrt{12}$ $x=\pm\sqrt{12}$ $\boxed{x=\pm 2\sqrt{3}}$	b. $\frac{\cancel{8}x^2}{8}=\frac{392}{8}$ $\sqrt{x^2}=\sqrt{49}$ $\boxed{x=\pm 7}$
		c. $7x^2-\cancel{3}=445$ $+\cancel{3}\quad +3$ $\frac{\cancel{7}x^2}{\cancel{7}}=\frac{448}{7}$ $\sqrt{x^2}=\sqrt{64}$ $\boxed{x=\pm 8}$	d. $\sqrt{(x-4)^2}=\sqrt{9}$ $x-4=\pm 3$ $x-\cancel{4}=3$ $+\cancel{4}\quad +4$ $\boxed{x=7}$ $x-\cancel{4}=-3$ $+\cancel{4}\quad +4$ $\boxed{x=1}$
		e. $\frac{\cancel{2}(x+2)^2}{\cancel{2}}=\frac{72}{2}$ $\sqrt{(x+2)^2}=\sqrt{36}$ $x+2=\pm 6$ $x+\cancel{2}=6$ $-\cancel{2}\quad -2$ $\boxed{x=4}$ $x+\cancel{2}=-6$ $-\cancel{2}\quad -2$ $\boxed{x=-8}$	f. $3(x-3)^2+\cancel{2}=26$ $-\cancel{2}\quad -2$ $\frac{\cancel{3}(x-3)^2}{\cancel{3}}=\frac{24}{3}$ $\sqrt{(x-3)^2}=\sqrt{8}$ $x-3=\pm\sqrt{8}$ $x-3=\pm 2\sqrt{2}$ $x-\cancel{3}=2\sqrt{2}$ $+\cancel{3}\quad +3$ $\boxed{x=3+2\sqrt{2}}$ $x-\cancel{3}=-2\sqrt{2}$ $+\cancel{3}\quad +3$ $\boxed{x=3-2\sqrt{2}}$
6. Solve equations by completing the square	Move the c term to the right side Use $\left(\frac{b}{2}\right)^2$ to complete the square and then apply square root method $b=4$ $\frac{b}{2}=2$ $\left(\frac{b}{2}\right)^2=4$	a. Solve $x^2+4x+11=10$. Then find the vertex. $-11\quad -11$ $x^2+4x+\underline{4}=-1+4$ $\sqrt{(x+2)^2}=\sqrt{3}$ $x+2=\pm\sqrt{3}$ $x+\cancel{2}=\sqrt{3}$ $-\cancel{2}\quad -2$ $\boxed{x=-2+\sqrt{3}}$ $x+\cancel{2}=-\sqrt{3}$ $-\cancel{2}\quad -2$ $\boxed{x=-2-\sqrt{3}}$ $(x+2)^2=\cancel{3}$ $-3\quad -\cancel{3}$ $y=(x+2)^2-3$ $\boxed{\text{Vertex: } (-2,-3)}$	b. Solve $x^2-16x+52=0$. Then find the vertex. $-52\quad -52$ $b=-16$ $\frac{b}{2}=-8$ $\left(\frac{b}{2}\right)^2=64$ $x^2-16x+\underline{64}=-52+64$ $\sqrt{(x-8)^2}=\sqrt{12}$ $x-8=\pm\sqrt{12}$ $x-8=\pm 2\sqrt{3}$ $x-\cancel{8}=2\sqrt{3}$ $+\cancel{8}\quad +8$ $\boxed{x=8+2\sqrt{3}}$ $x-8=-2\sqrt{3}$ $+8\quad +8$ $\boxed{x=8-2\sqrt{3}}$ $(x-8)^2=1\cancel{2}$ $-12\quad -1\cancel{2}$ $y=(x-8)^2-12$ $\boxed{\text{Vertex: } (8,-12)}$

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7. Solve equations by using Quadratic Formula	Use Q.F. when the equation is in standard form and number diamonds does not work. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	a. $x^2 + 10x + 15 = 0$ ① $b^2 - 4ac = (10)^2 - 4(1)(15)$ $= 40$ ② $x = \frac{-b \pm \sqrt{\ }}{2a} = \frac{-10 \pm \sqrt{40}}{2(1)}$ $= \frac{-10 \pm \sqrt{40}}{2}$ $= \frac{-\overset{-5}{\cancel{10}} \pm \overset{1}{\cancel{2}}\sqrt{10}}{\cancel{2}_1}$ $= \boxed{-5 \pm \sqrt{10}}$	b. $2x^2 + 10x = 1$ $-1 \quad -1$ $2x^2 + 10x - 1 = 0$ ① $b^2 - 4ac = (10)^2 - 4(2)(-1)$ $= 108$ ② $x = \frac{-b \pm \sqrt{\ }}{2a} = \frac{-10 \pm \sqrt{108}}{2(2)}$ $= \frac{-10 \pm \sqrt{108}}{4}$ $= \frac{-\overset{-5}{\cancel{10}} \pm \overset{3}{\cancel{6}}\sqrt{3}}{\cancel{4}2}$ $= \boxed{\frac{-5 \pm 3\sqrt{3}}{2}}$
		c. $3x^2 + 6x + 3 = 0$ ① $b^2 - 4ac = (6)^2 - 4(3)(3)$ $= 0$ ② $x = \frac{-b \pm \sqrt{\ }}{2a} = \frac{-6 \pm \sqrt{0}}{2(3)}$ $= \frac{-6}{6}$ $= \boxed{-1}$	d. $8x^2 - 4x + 7 = \cancel{2}$ $-2 \quad -\cancel{2}$ $8x^2 - 4x + 5 = 0$ ① $b^2 - 4ac = (-4)^2 - 4(8)(7)$ $= -144$ $\boxed{\text{No Solution}}$
8. Use the discriminant to determine the number of solutions	Discriminant: $b^2 - 4ac$ If the discriminant is: Positive: two real Zero: one real Negative: zero real	a. Calculate the discriminant and tell number of solutions: $6x^2 + 2x + 1 = 0$ $b^2 - 4ac$ $(2)^2 - 4(6)(1) = -20$ $\boxed{\text{No Solution}}$	b. Calculate the discriminant and tell how many times it will cross the x-axis. $6x^2 - 7x - 3 = 0$ $b^2 - 4ac$ $(-7)^2 - 4(6)(-3) = 121$ $\boxed{\text{Two Solutions}}$

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9. *Determine the best method for solving quadratic equations.*

Use graphic organizer to determine the best method for solving each equation.

☆ you may choose to use a different method than I choose, but you still should get the same answers. ☆

a. $x^2 - \cancel{9} = 5$

$+\cancel{9} \quad +9$

$\sqrt{x^2} = \sqrt{14}$

$\boxed{x = \pm\sqrt{14}}$

b. $5x^2 - 7x = 0$

$x(5x - 7) = 0$

$\boxed{x = 0}$

$5x - \cancel{7} = 0$

$+\cancel{7} \quad +7$

$\frac{\cancel{5}x}{\cancel{5}} = \frac{7}{5}$

$\boxed{x = 7/5}$

c. $\cancel{4}(x + 5)^2 = 64$

$\frac{}{\cancel{4}} \quad \frac{}{4}$

$\sqrt{(x+5)^2} = \sqrt{16}$

$x + 5 = \pm 4$

$x + \cancel{5} = 4$, $-\cancel{5} \quad -5$, $\boxed{x = -1}$

$x + \cancel{5} = -4$, $-\cancel{5} \quad -5$, $\boxed{x = -9}$

d. $x^2 + 12x + 30 = -\cancel{5}$

$+5 \quad +\cancel{5}$

$x^2 + 12x + 35 = 0$

$(x + 7)(x + 5) = 0$

$x + \cancel{7} = 0$, $-\cancel{7} \quad -7$, $\boxed{x = -7}$

$x + \cancel{5} = 0$, $-\cancel{5} \quad -5$, $\boxed{x = -5}$

e. $6x^2 + 8x + 1 = 0$

① $b^2 - 4ac = (8)^2 - 4(6)(1)$

$= 40$

② $x = \frac{-b \pm \sqrt{}}{2a} = \frac{-8 \pm \sqrt{40}}{2(6)}$

$= \frac{\overset{-4}{\cancel{-8}} \pm \overset{1}{\cancel{2}}\sqrt{10}}{\cancel{12}\,6}$

$= \boxed{\frac{-4 \pm \sqrt{10}}{6}}$

f. $3x^2 + 13x + 12 = 0$

$3x \cdot x$

$3 \cdot 4$

$2 \cdot 6$

$1 \cdot 12$

$(3x + 4)(x + 3) = 0$

$3x + \cancel{4} = 0$, $-\cancel{4} \quad -4$, $\frac{\cancel{3}x}{\cancel{3}} = \frac{-4}{3}$, $\boxed{x = -\frac{4}{3}}$

$x + \cancel{3} = 0$, $-\cancel{3} \quad -3$, $\boxed{x = -3}$

g. $\cancel{5}(x - 2)^2 = 125$

$\frac{}{\cancel{5}} \quad \frac{}{5}$

$\sqrt{(x-2)^2} = \sqrt{25}$

$x - 2 = \pm 5$

$x - \cancel{2} = 5$, $+\cancel{2} \quad +2$, $\boxed{x = 7}$

$x - \cancel{2} = -5$, $+\cancel{2} \quad +2$, $\boxed{x = -3}$

h. $x^2 - 16 = 0$

$(x + 4)(x - 4) = 0$

$x + \cancel{4} = 0$, $-\cancel{4} \quad -4$, $\boxed{x = -4}$

$x - \cancel{4} = 0$, $+\cancel{4} \quad +4$, $\boxed{x = 4}$

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		i. $5x^2 - 3x - 1 = \cancel{7}$ $-7 \; -\cancel{7}$ $5x^2 - 3x - 8 = 0$ $5x \cdot x \quad -2 \cdot 4 \quad -1 \cdot 8$ $(5x-8)(x+1) = 0$ $5x - \cancel{8} = 0 \quad x + \cancel{1} = 0$ $+\cancel{8} \; +8 \quad -\cancel{1} \; -1$ $\frac{\cancel{5}x}{\cancel{5}} = \frac{8}{5}$ $\boxed{x = -1}$ $\boxed{x = 8/5}$	j. $x^2 - 15x + 56 = 0$ $(x-8)(x-7) = 0$ $x - \cancel{8} = 0 \quad x - \cancel{7} = 0$ $+\cancel{8} \; +8 \quad +\cancel{7} \; +7$ $\boxed{x = 8}$ $\boxed{x = 7}$
10. Applications of Quadratics		A ball is thrown into the air from a height of 4 feet at time t = 0. The function that models this situation is h(t) = -16t² + 63t + 4, where t is measured in seconds and h is the height in feet. a. When will the ball be at 50 feet? $-16t^2 + 63t + 4 = \cancel{50}$ $-50 \; -\cancel{50}$ $-16t^2 + 63t - 46 = 0$ ① $b^2 - 4ac = (63)^2 - 4(-16)(-46) = 1025$ ② $x = \frac{-b \pm \sqrt{}}{2a} = \frac{-63 \pm \sqrt{1025}}{2(-16)} = \frac{-63 \pm \sqrt{1025}}{-32} \to .97, \; \to 2.97$ The ball will be 50 feet high at 0.97 and 2.97 seconds. b. When will the ball be on the ground? $-16t^2 + 63t + 4 = 0$ ① $b^2 - 4ac = (63)^2 - 4(-16)(4) = 4225$ ② $x = \frac{-b \pm \sqrt{}}{2a} = \frac{-63 \pm \sqrt{4225}}{2(-16)} = \frac{-63 \pm \sqrt{4225}}{-32} \to \cancel{-.0625}, \; \to 4$ The ball hits the ground at 4 seconds.	
11. Solving literal equations	Remember you "literally" write what you see. Think about how you will undo the square term.	a. Solve for r: $\frac{A}{\pi} = \frac{\cancel{\pi} r^2}{\cancel{\pi}}$ $\sqrt{\frac{A}{\pi}} = \sqrt{r^2}$ $\boxed{\sqrt{\frac{A}{\pi}} = r}$	b. Solve for s: $3 \cdot V = \frac{\cancel{3} \cdot 1}{\cancel{3}} s^2 h$ $\frac{3V}{h} = \frac{s^2 \cancel{h}}{\cancel{h}}$ $\sqrt{\frac{3V}{h}} = \sqrt{s^2}$ $\boxed{S = \sqrt{\frac{3V}{h}}}$

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