Answer Key

Common Core Regents Review
Quadratic Equations

A ***quadratic equation*** is a polynomial of the second degree in one variable. The standard form for a quadratic equation is $ax^2 + bx + c = 0$ where a, b, and c are real numbers.

1. Rules for Solving quadratic equations:
   - Write the equation in standard form.
   - Factor the quadratic using the GCF, Double Bubble, DOTS , or Grouping.
   - Set each factor equal to zero to solve. Each solution will have the opposite sign of the second term in the factor. The solutions are also called the roots or the zeros.

2. To solve ***fractional quadratic equations***:
   - Cross Multiply.
   - Simplify by using distributive property.
   - Rewrite in standard form.
   - Factor and solve.

3. The ***Quadratic Formula***: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, where $a \neq 0$.
   - Make sure the equation is in standard form.
   - Write a "variable key". A= B= C=
   - Write the quadratic formula.
   - Substitute the values from the variable key.
   - Simplify and determine the two roots.

   If the question asks you to state the solution in ***simplest radical form***: Rewrite the radical as the product of its factors, one of which is a perfect square; then simplify.

4. ***Completing the Square***: An equation in which one side is a *perfect square trinomial* can be easily solved by taking the square root of each side. If the equation is not a perfect square trinomial, then we "change" the equation to create one.

$$x^2 + 6x - 16 = 0$$
$$x^2 + 6x + \_\_\_\_ = 16 + \_\_\_\_$$
$$x^2 + 6x + 9 = 16 + 9$$
$$(x+3)^2 = 25$$
$$\sqrt{(x+3)^2} = \sqrt{25}$$
$$x + 3 = \pm 5$$
$$x = -3 + 5 \quad x = -3 - 5$$
$$x = 2, -7$$

Regents Review

1. $x^2+10x+16$

$(x+8)(x+2)$

2. $x^2-11x+24=0$

$(x-8)(x-3)=0$

$x-8=0$ | $x-3=0$

$+8\ +8$ | $+3\ +3$

$x=8$ | $x=3$

3. $x^2+6x-16=0$

$(x+8)(x-2)=0$

$x+8=0$ | $x-2=0$

$-8\ -8$ | $+2\ +2$

$x=-8$ | $x=2$

4. $x^2+7x-30=0$

$(x+10)(x-3)=0$

$x+10=0$ | $x-3=0$

$-10\ -10$ | $+3\ +3$

$x=-10$ | $x=3$

5. $4x^2-81=0$

$(2x-9)(2x+9)=0$

$2x-9=0$ | $2x+9=0$

$+9\ +9$ | $-9\ -9$

$\frac{2x}{2}=\frac{9}{2}$ | $\frac{2x}{2}=\frac{-9}{2}$

$x=\frac{9}{2}$ | $x=-\frac{9}{2}$

6. $4x^2-49=0$

$(2x-7)(2x+7)=0$

$2x-7=0$ | $2x+7=0$

$+7\ +7$ | $-7\ -7$

$\frac{2x}{2}=\frac{7}{2}$ | $\frac{2x}{2}=\frac{-7}{2}$

$x=\frac{7}{2}$ | $x=-\frac{7}{2}$

7. $x^2+5x=0$

$x(x+5)=0$

$x=0$ | $x+5=0$

$-5\ -5$

$x=-5$

8. $2x^2+x=0$

$x(2x+1)=0$

$x=0$ | $2x+1=0$

$-1\ -1$

$\frac{2x}{2}=\frac{-1}{2}$

$x=-\frac{1}{2}$

9. $2x^2+18x+40=0$

$2(x^2+9x+20)=0$

$2(x+5)(x+4)=0$

$x+5=0$ | $x+4=0$

$-5\ -5$ | $-4\ -4$

$x=-5$ | $x=-4$

10. $4x^2-24x+36=0$

$4(x^2-6x+9)=0$

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

$x-3=0$ | $x-3=0$

$+3\ +3$ | $+3\ +3$

$x=3$ | $x=3$

11. $5x^2 - 35x - 90 = 0$

$5(x^2 - 7x - 18) = 0$

$5(x-9)(x+2) = 0$

$x-9=0$	$x+2=0$
$+9\ +9$	$-2\ -2$
$x=9$	$x=-2$

12. $3x^2 + 15x - 108 = 0$

$3(x^2 + 5x - 36) = 0$

$3(x+9)(x-4) = 0$

$x+9=0$	$x-4=0$
$-9\ -9$	$+4\ +4$
$x=-9$	$x=4$

13. $2x^2 + 7x + 6 = 0$

$(2x+3)(x+2) = 0$

$2x+3=0$	$x+2=0$
$-3\ -3$	$-2\ -2$
$\frac{2x}{2} = \frac{-3}{2}$	$x=-2$
$x=-\frac{3}{2}$	

$2x^2 + 4x + 3x + 6$

$2x^2 + 7x + 6 = 0$

$2x^2 + 7x + 12$

$(2x+3)(2x+4)$

2

$(2x+3)(x+2)$

14. $3x^2 + 8x + 4 = 0$

$(3x+2)(x+2) = 0$

$3x+2=0$	$x+2=0$
$-2\ -2$	$-2\ -2$
$\frac{3x}{3} = \frac{-2}{3}$	$x=-2$
$x=-\frac{2}{3}$	

15. $2x^2 + 5x + 3 = 0$

$(2x+3)(x+1) = 0$

$2x+3=0$	$x+1=0$
$-3\ -3$	$-1\ -1$
$\frac{2x}{2} = \frac{-3}{2}$	$x=-1$
$x=-\frac{3}{2}$	

16. $5x^2 + 16x + 3 = 0$

$(5x+1)(x+3) = 0$

$5x+1=0$	$x+3=0$
$-1\ -1$	$-3\ -3$
$\frac{5x}{5} = \frac{-1}{5}$	$x=-3$
$x=-\frac{1}{5}$	

17. Solve by completing the square:

$x^2 + 6x - 7 = 0$

$(x^2 + 6x + 9) - 9 - 7 = 0$

$(x+3)(x+3) - 16 = 0$

$(x+3)^2 - 16 = 0$

$+16\ +16$

$(x+3)^2 = 16$

$\left(\frac{b}{2}\right)^2$

$\left(\frac{6}{2}\right)^2$

$(3)^2$

9

18. Solve by completing the square:

$x^2 + 16x + 15 = 0$

$(x^2 + 16x + 64) - 64 + 15 = 0$

$(x+8)(x+8) - 49 = 0$

$(x+8)^2 - 49 = 0$

$+49\ 49$

$(x+8)^2 = 49$

$\left(\frac{b}{2}\right)^2$

$\left(\frac{16}{2}\right)^2$

$(8)^2$

64

19. Solve by completing the square:

$x^2+4x-14=0$

$(x^2+4x+4)-4-14=0$

$(x+2)(x+2)-18=0$

$(x+2)^2-18=0$

$+18\ +18$

$\boxed{(x+2)^2=18}$

$\left(\frac{b}{2}\right)^2$ $\left(\frac{4}{2}\right)^2$ $(2)^2$ 4

20. Solve by completing the square:

$x^2+10x-3=0$

$(x^2+10x+25)-25-3=0$

$(x+5)(x+5)-28=0$

$(x+5)^2-28=0$

$+28\ +28$

$\boxed{(x+5)^2=28}$

$\left(\frac{b}{2}\right)^2$ $\left(\frac{10}{2}\right)^2$ $(5)^2$ 25

Express each of the following irrational numbers in simplest radical form:

(a) $\sqrt{50}$ $\sqrt{25}\sqrt{2}$ $\boxed{5\sqrt{2}}$

(b) $\sqrt{72}$ $\sqrt{36}\sqrt{2}$ $\boxed{6\sqrt{2}}$

(c) $\sqrt{54}$ $\sqrt{9}\sqrt{6}$ $\boxed{3\sqrt{6}}$

Solve the following equations using the quadratic formula: $x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$

21. $x^2+8x-4=0$

$x=\dfrac{-8\pm\sqrt{(8)^2-4(1)(-4)}}{2(1)}$

$x=\dfrac{-8\pm\sqrt{64+16}}{2}$

$x=\dfrac{-8\pm\sqrt{80}}{2}$

$x=\dfrac{-8\pm\sqrt{16}\sqrt{5}}{2}$

$x=\dfrac{-8\pm4\sqrt{5}}{2}$

$\boxed{x=-4\pm2\sqrt{5}}$

22. $x^2-6x-1=0$

$x=\dfrac{--6\pm\sqrt{(-6)^2-4(1)(-1)}}{2(1)}$

$x=\dfrac{6\pm\sqrt{36+4}}{2}$

$x=\dfrac{6\pm\sqrt{40}}{2}$

$x=\dfrac{6\pm\sqrt{4}\sqrt{10}}{2}$

$x=\dfrac{6\pm2\sqrt{10}}{2}$

$\boxed{x=3\pm\sqrt{10}}$

23. $3x^2 - 10x + 5 = 0$

$x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(3)(5)}}{2(3)}$

$x = \frac{10 \pm \sqrt{100 + 60}}{6}$

$x = \frac{10 \pm \sqrt{40}}{6}$

$x = \frac{10 \pm \sqrt{4}\sqrt{10}}{6}$

$x = \frac{10 \pm 2\sqrt{10}}{6}$ $\quad \boxed{x = \frac{5 \pm \sqrt{10}}{3}}$

24. Place in standard form and solve.

$x^2 + 5x - 5 = 3x + 10$

$-3x - 10 \quad -3x - 10$

$x^2 + 2x - 15 = 0$

$(x + 5)(x - 3) = 0$

$x + 5 = 0$	$x - 3 = 0$
$-5 \quad -5$	$+3 \quad +3$
$\boxed{x = -5}$	$\boxed{x = 3}$

25. Place in standard form and solve

$x^2 + 7x + 24 = -2x + 4$

$+2x - 4 \quad +2x - 4$

$x^2 + 9x + 20 = 0$

$(x + 5)(x + 4) = 0$

$x + 5 = 0$	$x + 4 = 0$
$-5 \quad -5$	$-4 \quad -4$
$\boxed{x = -5}$	$\boxed{x = -4}$

26. $\frac{x+2}{2} = \frac{12}{x}$

$x(x + 2) = 2(12)$

$x^2 + 2x = 24$

$-24 \quad -24$

$x^2 + 2x - 24 = 0$

$(x + 6)(x - 4) = 0$

$x + 6 = 0$	$x - 4 = 0$
$-6 \quad -6$	$+4 \quad +4$
$\boxed{x = -6}$	$\boxed{x = 4}$

27. $\frac{8}{x} = \frac{x+2}{3}$

$x(x + 2) = 8(3)$

$x^2 + 2x = 24$

$-24 \quad -24$

$x^2 + 2x - 24 = 0$

$(x + 6)(x - 4) = 0$

$x + 6 = 0$	$x - 4 = 0$
$-6 \quad -6$	$+4 \quad +4$
$\boxed{x = -6}$	$\boxed{x = 4}$

28. The square of a number increased by 3 times the number equals 4. Find the number.

Let x = the number

$x^2 + 3x = 4$

$-4 \quad -4$

$x^2 + 3x - 4 = 0$

$(x + 4)(x - 1) = 0$

$x + 4 = 0$	$x - 1 = 0$
$-4 \quad -4$	$+1 \quad +1$
$x = -4$	$x = 1$

29. Find two pairs of consecutive odd integers whose product is 63.

Let x = first consecutive odd integer

$x + 2$ = second consecutive odd integer

$x(x+2) = 63$

$x^2 + 2x = 63$

$-63 \quad -63$

$x^2 + 2x - 63 = 0$

$(x + 9)(x - 7) = 0$

$x + 9 = 0$	$x - 7 = 0$
$-9 \quad -9$	$+7 \quad +7$
$x = -9$	$x = 7$

$\{-9, -7\}$ and $\{7, 9\}$

30. The base of a parallelogram measures 7 centimeters more than its height. If the area of the parallelogram is 30 square centimeters, find the measure of the base and height. *(Area = base * height)*

Let h = height

$h + 7$ = base

3 cm, 10 cm

$h(h + 7) = 30$

$h^2 + 7h = 30$

$-30 \quad -30$

$h^2 + 7h - 30 = 0$

$(h + 10)(h - 3) = 0$

$h + 10 = 0$	$h - 3 = 0$
$-10 \quad -10$	$+3 \quad +3$
reject $h = -10$	$h = 3$

31. The length of a rectangle is 4 less than twice the width. The area of the rectangle is 70. Find the dimensions of the rectangle.

Let w = width

$2w - 4$ = length

7 units, 10 units

$w(2w - 4) = 70$

$2w^2 - 4w = 70$

$-70 \quad -70$

$2w^2 - 4w - 70 = 0$

$2(w^2 - 2w - 35) = 0$

$2(w - 7)(w + 5) = 0$

$w - 7 = 0$	$w + 5 = 0$
$+7 \quad +7$	$-5 \quad -5$
$w = 7$	$w = -5$
	reject

32. What is the solution set of the equation $x^2 - 5x - 24 = 0$?

(1) $\{-3, 8\}$ (2) $\{-3, -8\}$ (3) $\{3, 8\}$ (4) $\{3, -8\}$

$(x - 8)(x + 3) = 0$

$x - 8 = 0$	$x + 3 = 0$
$+8 \quad +8$	$-3 \quad -3$
$x = 8$	$x = -3$

2

33. Factored completely, the expression $2x^2+10x-12$ is equivalent to $2(x^2+5x-6)$

(1) $2(x-6)(x+1)$ (2) $2(x+6)(x-1)$ (3) $2(x+2)(x+3)$ (4) $2(x-2)(x-3)$ $2(x+6)(x-1)$

4

34. What are the solutions of the equation $(y-2)(y-5)=0$?

(1) $y=-2$ and $y=5$ (2) $y=-2$ and $y=-5$ (3) $y=0$ and $y=2$ (4) $y=2$ and $y=5$

$(y-2)(y-5)=0$

$y-2=0$ | $y-5=0$

$+2\ +2$ | $+5\ +5$

$y=2$ | $y=5$

3

35. Which of the following quadratic equations, in factored form, has the solution set $\{-3,5\}$?

(1) $(x-3)(x+5)=0$ (2) $3x(x-5)=0$ (3) $(x+3)(x-5)=0$ (4) $5x(x+3)=0$

$x+3=0$ | $x-5=0$

$-3\ -3$ | $+5\ +5$

$x=-3$ | $x=5$

1

36. Which equation has the solution set $\{1,3\}$?

(1) $x^2-4x+3=0$ (2) $x^2-4x-3=0$ (3) $x^2+4x+3=0$ (4) $x^2+4x-3=0$

$(x-1)(x-3)=0$

$x-1=0$ | $x-3=0$

$+1\ +1$ | $+3\ +3$

$x=1$ | $x=3$