Algebra 2GT Solving Quadratics Review

1st 3 Questions

- Solutions of quadratic equations represent the zeros (or x-intercepts) of a quadratic function.
- You can solve a quadratic equation by isolation, by completing the square, by using the quadratic formula, or by factoring.
- If a quadratic equation is not factorable, we can either complete the square or use the quadratic formula.

I. Isolation or Completing the Square

1) $x^2 - 8x - 5 = 0$

$x^2 - 8x + 16 = 5 + 16$

$(x-4)^2 = 21$

$x - 4 = \pm\sqrt{21}$

$x = 4 \pm \sqrt{21}$

2) $5x^2 - 5 = 120$

$5x^2 = 125$

$x^2 = 25$

$x = \pm 5$

3) $3x^2 + 9x + 9 = 3$

$x^2 + 3x + 3 = 1$

$x^2 + 3x = -2$

$x^2 + 3x + \frac{9}{4} = -2 + \frac{9}{4}$

$\left(x + \frac{3}{2}\right)^2 = \frac{1}{4}$

$x + \frac{3}{2} = \pm\frac{1}{2}$

$x = -\frac{3}{2} \pm \frac{1}{2}$

$x = -2, -1$

4) $6(x-2)^2 - 60 = 36$

$6(x-2)^2 = 96$

$(x-2)^2 = 16$

$x - 2 = \pm 4$

$x = 2 \pm 4$

$x = 6, -2$

5] $3(x+5)^2+32=64$

$3(x+5)^2=32$

$(x+5)^2=\frac{32}{3}$

$x+5=\pm\sqrt{\frac{32}{3}}$

$x+5=\pm\frac{4\sqrt{2}}{\sqrt{3}}\left(\frac{\sqrt{3}}{\sqrt{3}}\right)$

$x+5=\pm\frac{4\sqrt{6}}{3}$

$x=-5\pm\frac{4\sqrt{6}}{3}$

6] $x^2+10x-21=0$

$x^2+10x+25=21+25$

$(x+5)^2=46$

$x+5=\pm\sqrt{46}$

$x=-5\pm\sqrt{46}$

7] $x^2-95=14x$

$x^2-14x+49=95+49$

$(x-7)^2=144$

$x-7=\pm\sqrt{144}$

$x-7=\pm12$

$x=7\pm12$

$x=19,-5$

8] $2x^2-12x-9=0$

~~x^2-6x~~

$2x^2-12x=9$

$2(x^2-6x+9)=9+18$

$2(x-3)^2=27$

$(x-3)^2=\frac{27}{2}$

$(x-3)=\pm\sqrt{\frac{27}{2}}\frac{\sqrt{2}}{\sqrt{2}}$

$(x-3)=\pm\frac{3\sqrt{6}}{2}$

$x=3\pm\frac{3\sqrt{6}}{2}$

II. Vertex Form

7] $y=x^2-8x+4$

$y=x^2-8x+16+4-16$

$y=(x-4)^2-12$

$y=(x-4)^2-12$

Vertex $(4,-12)$

8] $y = 2x^2 - 10x - 6$

$y = 2(x^2 - 5x + \frac{25}{4}) - 6 - \frac{25}{2}$

$y = 2(x - \frac{5}{2})^2 - \frac{37}{2}$

Vertex $(\frac{5}{2}, -\frac{37}{2})$

9] $y = -3x^2 + 12x - 10$

$-3(x^2 - 4x + 4) = 10 + 12$

$y = -3(x-2)^2 + 2$

Vertex $(2, 2)$

III. Quadratic Formula

9. $2x^2 + 9x + 7 = 0$

$x = \frac{-9 \pm \sqrt{(9)^2 - 4(2)(7)}}{2(2)}$

$x = \frac{-9 \pm \sqrt{81 - 56}}{4}$

$x = \frac{-9 \pm \sqrt{25}}{4}$

$x = \frac{-9 \pm 5}{4}$

$x = -\frac{7}{2}, -1$

10] $2x^2 + 4x + 2 = 0$

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

$x = \frac{-4 \pm \sqrt{0}}{4}$

$x = -1$

11) $3+6x = -3x^2$

$\frac{3x^2}{3} + \frac{6x}{3} + \frac{3}{3} = \frac{0}{3}$

$x^2 + 2x + 1 = 0$

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

$x = \frac{-2 \pm \sqrt{0}}{2}$

$x = -1$

12) $x^2 + 3x - 5 = 0$

$x = \frac{-3 \pm \sqrt{(3)^2 - 4(1)(-5)}}{2(1)}$

$x = \frac{-3 \pm \sqrt{9 - 20}}{2}$

$x = \frac{-3 \pm \sqrt{-11}}{2}$

No Real Solution!

13) $x^2 + 6x - 25 = 0$

$x = \frac{-6 \pm \sqrt{(6)^2 - 4(1)(-25)}}{2(1)}$

$x = \frac{-6 \pm \sqrt{136}}{2}$

$x = \frac{-6 \pm 2\sqrt{34}}{2}$

$x = -3 \pm \sqrt{34}$

14) $x^2 - 14x = 5x$

$x^2 - 19x = 0$

$x = \frac{19 \pm \sqrt{(-19)^2 - 4(1)(0)}}{2(1)}$

$x = \frac{19 \pm \sqrt{361}}{2}$

$x = \frac{19 \pm 19}{2}$

$x = 19, 0$

IV. Factoring

15) $x^2 + 7x - 30 = 0$

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

$x = -10, 3$

16) $3x^2 - 3x - 6 = 0$

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

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

$x = 2, -1$

17] $x^2 - 81 = 0$
$(x+9)(x-9) = 0$
$x = -9, 9$

18] $x^2 + 6x - 40 = 0$
$(x+10)(x-4) = 0$
$x = -10, 4$

19] $4x^2 - 25 = 0$
$(2x+5)(2x-5) = 0$
$x = -\frac{5}{2}, \frac{5}{2}$

20] $2x^2 - 4x = 0$
$2x(x-2) = 0$
$x = 0, 2$

21] $2x^2 + 13x + 15 = 0$
$(2x+3)(x+5) = 0$
$x = -\frac{3}{2}, -5$

22] $3x^2 - 7x - 6 = 0$
$(3x+2)(x-3) = 0$
$x = -\frac{2}{3}, 3$

23] $10x^2 - 17x + 3 = 0$
$(5x-1)(2x-3) = 0$
$x = \frac{1}{5}, \frac{3}{2}$

24] $9x^2 - 4 = 0$
$(3x+2)(3x-2) = 0$
$x = -\frac{2}{3}, \frac{2}{3}$

25] $3x^2 + 21x = 0$
$3x(x+7) = 0$
$x = 0, -7$

26] $x^2 - 3x - 54 = 0$
$(x-9)(x+6) = 0$
$x = 9, -6$

V Any Method

12] $3(x-5)^2 + 7 = 28$
$3(x-5)^2 = 21$
$(x-5)^2 = 7$
$x - 5 = \pm\sqrt{7}$
$x = 5 \pm \sqrt{7}$

13] $10 + 2(3x+2)^2 = 50$
$2(3x+2)^2 = 40$
$(3x+2)^2 = 20$
$3x + 2 = \pm\sqrt{20}$
$x = \frac{-2 \pm 2\sqrt{5}}{3}$

14] $x^2-3x+4=10x-36$

$x^2-13x+42=0$

$(x-6)(x-7)=0$

$x=6,7$

15] $x^2-7x+15=10$

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

$x=\frac{7\pm\sqrt{(-7)^2-4(1)(5)}}{2(1)}$

$x=\frac{7\pm\sqrt{29}}{2}$

16] $8x^2=10x+3$

$8x^2-10x+3=0$

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

$x=\frac{3}{4},\frac{1}{2}$

17] $-2x^2+5x+4=0$

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

$x=\frac{-5\pm\sqrt{57}}{-4}$

$x=\frac{5\pm\sqrt{57}}{4}$

18] $x^2-12x+35=0$

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

$x=5,7$

VI. Word Problems

1] x = 1st integer

$x+1$ = 2nd integer

$x(x+1)=240$

$x^2+x-240=0$

$(x+16)(x-15)=0$

$x=-16, 15$

The consecutive integers are either -16 & -15 or $15, 16$.

26) $h(t) = -4.9t^2 + 10$

a) $-4.9t^2 + 10 = 0$

$-4.9t^2 = -10$

$t^2 = \frac{10}{4.9}$

$t = \pm\sqrt{\frac{10}{4.9}}$

$t \approx 1.43$ seconds

In about 1.43 seconds, the hammer will hit the ground.

b) $h(.5) = -4.9(.5)^2 + 10 = 8.775$

After .5 seconds the hammer is at about 8.76 meters.

c) $-4.9t^2 + 10 = 5$

$-4.9t^2 = -5$

$t^2 = \frac{-5}{-4.9}$

$t = \pm\sqrt{5/4.9}$

$t \approx 1.01$

The hammer will be 5 ft of the ground at about 1.01 seconds after it was dropped.

d) $h(t) = -4.9t^2 + 10$

Vertex (0, 10)

At the time the hammer is dropped ($t=0$), it is at a height of 10 meters.

30) $h(t) = -4.9t^2 + 19.6t$

a) $-4.9t^2 + 19.6t = 0$

$-4.9t(t - 4) = 0$

$t = 0 \quad t = 4$

The ball is in the air for 4 seconds.

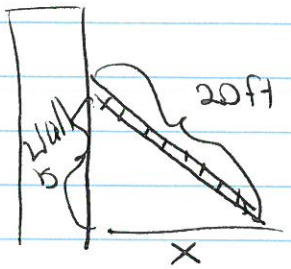
b) $h = -4.9(t^2 - 4t \quad)$

$h = -4.9(t^2 - 4t + 4) + 4.9(4)$

$h = -4.9(t-2)^2 + 19.6$

The maximum height of the ball is 19.6 meters.

29)



$x^2 + 15^2 = 20^2$

$x^2 + 225 = 400$

$x^2 = 175$

$x = 13.23$ ft