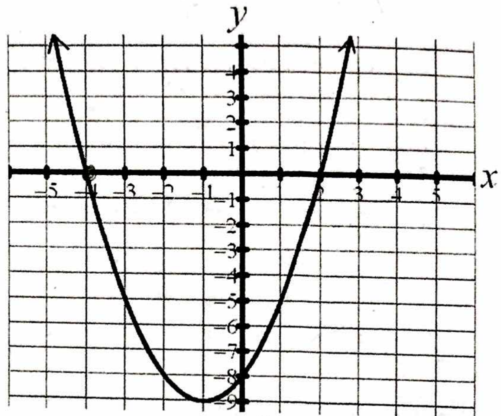
Lesson #67
Solving Quadratic Functions by Graphing

Success Criteria: I can find the zeros of an equation by graphing, the table and factoring.

Problem #1: The graph of the equation $y = x^2 + 2x - 8$ is given below.



(A) Locate the points on the graph where $y = 0$ and write them below as ordered pairs (x, y)

(-4, 0)   (2, 0)

(B) What are these points called?
x-int
zeros   solutions

(C) Remember that every ordered pair on the graph makes the equation $y = x^2 + 2x - 8$ true. Choose one of the points from part (A) and show that it makes the equation true:

$y = x^2 + 2x - 8$
$0 = (-4)^2 + 2(-4) - 8$
$0 = 16 - 8 - 8$
$0 = 0$ ✓

(D) Graph the function on a calculator and look at the table. When does $y = 0$?

-4 and 2

(E) Find the zeros of $y = x^2 + 2x - 8$ by factoring. What do you see?
$a=1$ $b=2$ $c=-8$ $y=(x+4)(x-2)$
-8, 4, -2, 2

So far you have learned 3 methods for solving quadratic functions. After setting the equation equal to zero, you can:

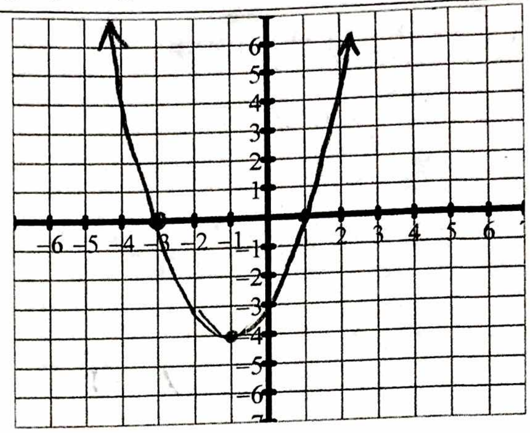
1. Solve by factoring
2. Solve by graphing
3. Solve by table

Example #1: Solve the equation $x^2 + 2x = 3$ by graphing.

$x^2 + 2x = 3$

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

Solutions: $x = -3$ and $x = 1$



Success Criteria: I can find the zeros on a calculator using the "zero" feature.

To find the x-intercepts (or zeros) of a graph using a graphing calculator:

While on the graph screen,

STEP #1: Press 2ND then press TRACE then choose "zero"

STEP #2: Move the cursor to set a Left Bound then press ENTER,

then set a Right Bound then press ENTER,

and then press ENTER again.

Example #2: Use a graphing calculator to find the solutions of the equation.

(A) $x^2 + 24 = -10$ $x^2+24x+10=0$ Solutions:	**(B)** $x^2 - 10x = -16$ $x^2-10x+16=0$ Solutions: (8,0) (2,0)

Example #3: Use two methods to find the solutions of $x^2 + 6 = -7x$.

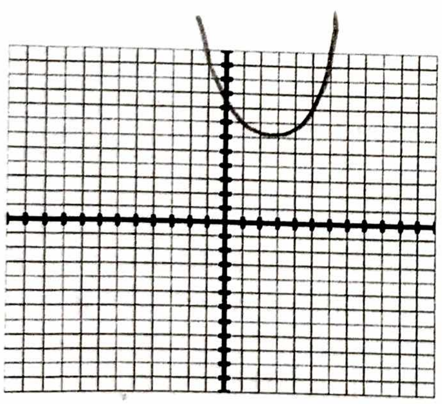
Method 1: Factoring	Method 2: Graphing calculator
$x^2 + 6 = -7x$ $x^2 + 7x + 6 = 0$ $(x+6)(x+1) = 0$ $x+6=0 \quad x+1=0$ $x=-6 \quad x=-1$ 6 / 6 1 / 7	$x^2 + 6 = -7x$ Graph: $y_1 = x^2 + 7x + 6$
Solutions: $x = -6$ and $x = -1$	Solutions: $x = -6$ and $x = -1$

Example #4: Use your graphing calculator to determine HOW MANY solutions the equation will have (0, 1, or 2). You don't need to find the solutions.

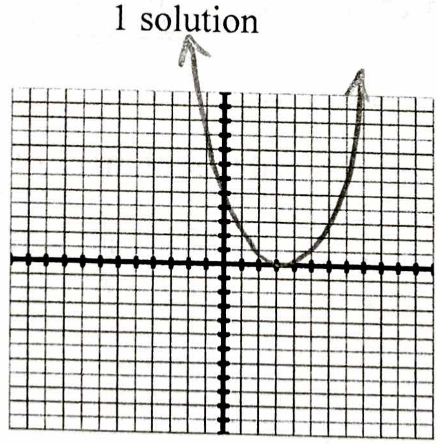
$-x^2 = 4x - 5$ $0 = x^2 + 4x - 5$ two solutions	$x^2 = -4$ $x^2 + 4 = 0$ no solutions

Example #5: Sketch a graph with the given number of solutions:

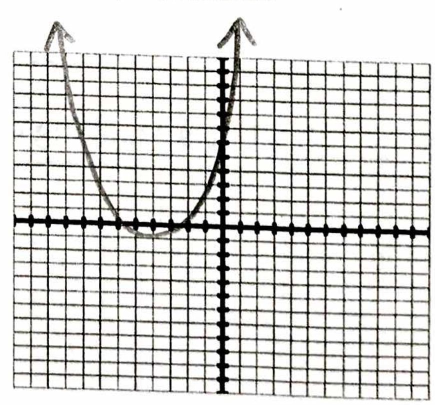
O solutions



1 solution



2 solutions



Success Criteria: I can write an equation to model projectile motion. I can use the calculator to answer questions about a situation.

Example #6: A football player kicks a football 2 feet above the ground with an initial upward velocity of 75 feet per second.

(A) The equation $h = -16t^2 + vt + s$ will give the height h of the ball (in feet) after t seconds. The variable v represents the initial velocity (positive if up and negative if down) and the variable s represents the initial height of the ball.

Write the equation: $h = -16t^2 + 75t + 2$

(B) After how many seconds is the football 50 feet above the ground?

0.76 Seconds 3.92 seconds

(C) After how many seconds does the football hit the ground?

4.71 seconds

Lesson #68
Solving Quadratic Equations Using Square Roots

Success Criteria: I can solve a quadratic equation using square roots.

(A) EVALUATE $3(5)^2+4$ $3(25)+4$ $75+4$ $\boxed{79}$	(B) SOLVE $3x^2+4=52$ $3x^2=48$ $x^2=16$ $x=4,-4$

You need to DO the operations in problem (A) to find the value.

You need to UNDO the operations in problem (B) to solve for the variable x.

Follow the order of operations (PEMDAS) when we DO operations.	Follow the order of operations in **reverse** order (SADMEP) when we UNDO operations.
State the order in which you would <u>undo</u> the operations that are connected to the variable x in the equation $3x^2+4=52$: First undo: $+4$ Then undo: 3 Then undo: ^{2} (exponent)	Now go through the process of undoing the operations to solve for the variable x: $3x^2+\cancel{4}=52$ $\cancel{-4}\quad -4$ $\frac{\cancel{3}x^2}{\cancel{3}}=\frac{48}{3}$ $x^2=16$ $\sqrt{x^2}=\sqrt{16}$ $x=\sqrt{16}$ $\boxed{x=\pm 4}$

<u>Example #2:</u> Solve the equation by UNDOing operations.

(A) $4x^2-\cancel{5}=31$ $\cancel{+5}\quad +5$ $\frac{\cancel{4}x^2}{\cancel{4}}=\frac{36}{4}$ $x^2=9$ $x=\sqrt{9}$ $\boxed{x=\pm 3}$	(B) $7x^2-\cancel{10}=-10$ $\cancel{+10}\quad +10$ $\frac{7x^2}{7}=\frac{0}{7}$ $x^2=0$ $x=\sqrt{0}$ $\boxed{x=0}$

(C) $-5x^2 + \cancel{6} = 26$ $-\cancel{6} \quad -6$ $\frac{\cancel{-5}x^2}{\cancel{-5}} = \frac{20}{-5}$ $x^2 = -4$ $x = \sqrt{-4}$ $\boxed{\text{no solution}}$ Check against the graph on the calculator.	**(D)** $\frac{\cancel{4}(x-3)^2}{\cancel{4}} = \frac{100}{4}$ $\sqrt{(x-3)^2} = \sqrt{25}$ $x-3 = \pm 5$ $x-\cancel{3} = 5$ $+\cancel{3} \quad +3$ $\boxed{x=8}$ $x-\cancel{3} = -5$ $+\cancel{3} \quad +3$ $\boxed{x=-2}$

Note: Because the quadratic equation $5x^2 + 2x - 6 = 0$ contains more than one variable term that cannot be combined, we do not have one variable term to UNDO operations on. Therefore, we cannot UNDO operations to solve such quadratic equations.

Success Criteria: I can tell by looking at an equation if it can be solved using a square root.

Example #2: For each equation, decide if it can be solved by UNDOing operations. Write "YES" or "NO" for each equation.

(A) $3x^2 - 2x + 7 = 0$ No	**(B)** $x^2 - 2 = 5$ Yes	**(C)** $x^2 - 2x = 5$ No
(D) $4x - 1 = 5x^2$ No	**(E)** $4x^2 - 2 = 15$ Yes	**(F)** $3x^2 = 6$ Yes

Lesson #68b
Review: Solving Quadratic Functions

1. Solve: $(x-3)(x+7)=0$

$x-\cancel{3}=0$ $\quad$ $x+7=0$

$+\cancel{3}\ +3$ $\quad$ $-7\ -7$

$\boxed{x=3}$ $\quad$ $\boxed{x=-7}$

2. Solve using a calculator: $v^2+3v=4$

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

$\boxed{x=1}$ $\quad$ $\boxed{x=-4}$

3. Solve by factoring: $6m^2+9m=0$

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

$\frac{\cancel{3}m}{\cancel{3}}=\frac{0}{3}$ $\quad$ $2m+\cancel{3}=0$

$-\cancel{3}\ -3$

$\boxed{m=0}$ $\quad$ $\frac{\cancel{2}m}{\cancel{2}}=\frac{-3}{2}$

$\boxed{m=\frac{-3}{2}}$

4. Solve by factoring: $x^2-13x=-42$

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

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

$x-\cancel{7}=0$ $\quad$ $x-6=0$

$+\cancel{7}\ +7$ $\quad$ $+6\ +6$

$\boxed{x=7}$ $\quad$ $\boxed{x=6}$

5. Solve by factoring: $y^2-25=0$

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

$y-\cancel{5}=0$ $\quad$ $y+5=0$

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

$\boxed{y=5}$ $\quad$ $\boxed{y=-5}$

6. Solve by taking square roots: $y^2-25=0$

$y^2=25$

$y=\sqrt{25}$

$\boxed{y=\pm 5}$

7. Solve by factoring: $3x^2-7x=-2$

$3x^2-7x+2=0$

$(x-\frac{6}{3})(x-\frac{1}{3})=0$

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

$x-\cancel{2}=0$ $\quad$ $3x-\cancel{1}=0$

$+\cancel{2}\ +2$ $\quad$ $+\cancel{1}\ +1$

$\boxed{x=2}$ $\quad$ $\frac{\cancel{3}x}{\cancel{3}}=\frac{1}{3}$

$\boxed{x=\frac{1}{3}}$

8. Solve by any method: $4x^2+13x+3=0$

$(x+\frac{12}{4})(x+\frac{1}{4})=0$

$(x+3)(4x+1)=0$

$x+\cancel{3}=0$ $\quad$ $4x+\cancel{1}=0$

$-\cancel{3}\ -3$ $\quad$ $-\cancel{1}\ -1$

$\boxed{x=-3}$ $\quad$ $\frac{\cancel{4}x}{\cancel{4}}=\frac{-1}{4}$

$\boxed{x=\frac{-1}{4}}$

Solve by the given method. Would there be a better method for any of the problems?

1. **Factoring:** $x^2 + 2x = 35$

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

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

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

$\cancel{-7} \ -7 \quad \cancel{+5} \ +5$

$\boxed{x=-7} \quad \boxed{x=5}$

2. **Calculator:** $x^2 - 7x + 10 = 0$

Factoring $(x-5)(x-2)=0$

$x-\cancel{5}=0 \quad x-\cancel{2}=0$

$\cancel{+5} \ +5 \quad \cancel{+2} \ +2$

$\boxed{x=5} \quad \boxed{x=2}$

3. **Factoring:** $x^2 - 4 = 0$

Square Roots

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

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

$\boxed{x=2} \quad \boxed{x=-2}$

$x^2=4$

$x=\sqrt{4}$

$x=\pm 2$

4. **Square Roots:** $25x^2 - 36 = 0$

$\frac{\cancel{25}x^2}{\cancel{25}}=\frac{36}{25}$

$\sqrt{x^2}=\frac{\sqrt{36}}{\sqrt{25}}$

$x=\pm\frac{6}{5}$

5. **Factoring:** $3x^2 + 2x - 8$

Calc.

$(x+\frac{6}{3})(x-\frac{4}{3})$

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

$x+\cancel{2}=0 \quad 3x-4=0$

$\cancel{-2} \ -2 \quad 3x=4$

$\boxed{x=-2} \quad \boxed{x=\frac{4}{3}}$

6. **Calculator:** $6x^2 - 11x - 10$

$\boxed{x=-0.\overline{6}}$

$\boxed{x=2.5}$

Lesson #68b
Homework: Solving Quadratic Functions

Solve by any method:

1. $x^2 + 8x = 9$

$x^2+8x-9=0$

$(x+9)(x-1)=0$

$x+9=0 \quad x-1=0$

$\boxed{x=-9} \quad \boxed{x=1}$

2. $2x^2 + 19x = -24$

$2x^2+19x+24=0$

$(x+\frac{16}{2})(x+\frac{3}{2})=0$

$(x+8)(2x+3)=0$

$x+8=0 \quad 2x+3=0$

$\boxed{x=-8} \quad \frac{\cancel{2}x}{\cancel{2}}=\frac{-3}{2}$

$\boxed{x=\frac{-3}{2}}$

3. $x^2 = 25$

$x=\sqrt{25}$

$\boxed{x=\pm 5}$

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

$\frac{\cancel{4}x^2}{\cancel{4}}=\frac{49}{4}$

$x^2=\frac{49}{4}$

$x=\sqrt{\frac{49}{4}}$

$\boxed{x=\pm\frac{7}{2}}$

Lesson #69
Solving Quadratic Equations Using the Quadratic Formula

Success Criteria: I can identify the a, b and c values in a quadratic equation. I can use the quadratic formula to solve a quadratic equation.

The Quadratic Formula: (Useful when the trinomial does not factor)

For any quadratic equation $ax^2 + bx + c = 0$, the solutions are

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

We can read this as: "x equals the opposite of b, plus or minus the square root of b squared minus $4ac$, all divided by $2a$"

Example #1: Use the Quadratic Formula to solve the following equations.

(A) $4x^2 - 13x + 3 = 0$

Solution:

First pick out $a = 4$, $b = -13$, $c = 3$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-13) \pm \sqrt{(-13)^2 - 4(4)(3)}}{2(4)}$$

$$x = \frac{13 \pm \sqrt{169 - 48}}{8}$$

$$x = \frac{13 \pm \sqrt{121}}{8}$$

$$x = \frac{13 \pm 11}{8}$$

$$x = \frac{13 + 11}{8} \quad \text{or} \quad x = \frac{13 - 11}{8}$$

$$x = \frac{24}{8} \quad \text{or} \quad x = \frac{2}{8}$$

$$x = 3 \quad \text{or} \quad x = \frac{1}{4}$$

(B) $-5x^2 + x + 4 = 0$

First pick out $a = -5$, $b = 1$, $c = 4$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

$$x = \frac{5 \pm \sqrt{25 + 80}}{-10}$$

$$x = \frac{5 \pm \sqrt{105}}{-10}$$

$$x = \frac{5 \pm 10.25}{-10}$$

$$\frac{5 + 10.25}{-10} \qquad \frac{5 - 10.25}{-10}$$

$$\frac{15.25}{-10} \qquad \frac{-5.25}{-10}$$

$$\boxed{-1.525} \qquad \boxed{0.525}$$

(C) $-x^2-1=-6x$

$+x^2 \quad +1 \qquad +x^2+1$

(Note: First put it in standard form)

$0=x^2-6x+1$

$a=1 \quad b=-6 \quad c=1$

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

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

$x=\dfrac{6\pm\sqrt{32}}{2}$

$x=\dfrac{6\pm5.66}{2}$

$\dfrac{6+5.66}{2} \qquad \dfrac{6-5.66}{2}$

$\dfrac{11.66}{2}=\boxed{5.83} \qquad \dfrac{0.34}{2}=\boxed{0.17}$

(D) $-4x+1=-4x^2$

$4x^2-4x+1=0$

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

$x=\dfrac{4\pm\sqrt{16-16}}{8}$

$x=\dfrac{4\pm\sqrt{0}}{8}$

$x=\dfrac{4\pm0}{8}$

$\dfrac{4+0}{8}=\dfrac{4}{8} \qquad \dfrac{4-0}{8}=\dfrac{4}{8}$

$\boxed{\dfrac{1}{2}} \qquad \boxed{\dfrac{1}{2}}$

Example #3: The average monthly bill y (in dollars) for a customer's cell phone x years after the year 2000 can be modeled by $y=-0.2x^2+2x+45$. In what year was the average monthly bill about \$50?

$\cancel{50}=-0.2x^2+2x+45$

$-\cancel{50} \qquad\qquad -50$

$0=-0.2x^2+2x-5$

$\boxed{2005}$

$x=\dfrac{-2\pm\sqrt{2^2-4(-0.2)(-5)}}{2(-0.2)}$

$x=\dfrac{-2\pm\sqrt{4-4}}{-0.4}$

$x=\dfrac{-2\pm\sqrt{0}}{-0.4}$

$x=\dfrac{-2\pm0}{-0.4}$

$x=\dfrac{-2}{-0.4} \qquad \dfrac{-2}{-0.4}$

$x=5$

Lesson #69b
Quadratic Formula Practice

Success Criteria: I can identify the a, b and c values in a quadratic equation. I can use the quadratic formula to solve a quadratic equation.

The Quadratic Formula: For any quadratic equation $ax^2 + bx + c = 0$, the solutions are

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

1. Set equation equal to zero.
2. Identify *a, b, c*.
3. Write the quadratic formula.
4. Substitute values.
5. Simplify (calculator).

Example #1: Use the Quadratic Formula to solve the following equations.

(A) $2x^2 - 4x - 6 = 0$

Pick out $a = 2$, $b = -4$, $c = -6$

Write: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Substitute:

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

$x = \dfrac{4 \pm \sqrt{16+48}}{4}$

Simplify: $x = \dfrac{4 \pm \sqrt{64}}{4}$ $\quad \dfrac{4 \pm 8}{4}$ $\quad \dfrac{12}{4}$ $\quad \dfrac{-4}{4}$

$x = 3$ or $x = -1$

(B) $2x^2 + 5x - 12 = 0$

Follow the same sequence of steps as (A).

$a = 2$ $b = 5$ $c = -12$

$x = \dfrac{-5 \pm \sqrt{5^2 - 4(2)(-12)}}{4}$

$x = \dfrac{-5 \pm \sqrt{25+96}}{4}$

$x = \dfrac{-5 \pm \sqrt{121}}{4}$

$x = \dfrac{-5 \pm 11}{4}$

$\dfrac{-5+11}{4}$ $\quad \dfrac{-5-11}{4}$

$\dfrac{6}{4} = \boxed{1.5}$ $\quad \dfrac{-16}{4} = \boxed{-4}$

(C)Graph part (B) on the calculator and find both zeros.

$x = 1.5$ or $x = -4$

(D) Solve $2x^2 + 3x = 8$

(Note: First put it in standard form)

$2x^2 + 3x - 8 = 0$ $a=2$ $b=3$ $c=-8$

$x = \frac{-3 \pm \sqrt{3^2 - 4(2)(-8)}}{2(2)}$

$x = \frac{-3 \pm \sqrt{9+64}}{4}$

$x = \frac{-3 \pm \sqrt{73}}{2}$

$x = \frac{-3 \pm 8.54}{2}$

$\frac{-3+8.54}{2}$ $\frac{-3-8.54}{2}$

$\frac{5.54}{2} = \boxed{2.77}$ $\frac{-11.54}{2} = \boxed{-5.77}$

(E) Solve $-10x + 6x^2 = -5$

$6x^2 - 10x + 5 = 0$

$a=6$ $b=-10$ $c=5$

$x = \frac{10 \pm \sqrt{(-10)^2 - 4(6)(5)}}{2(6)}$

$x = \frac{10 \pm \sqrt{100-120}}{12}$

$x = \frac{10 \pm \sqrt{-20}}{12}$

$\boxed{\text{no solution}}$

(F) Calculate $b^2 - 4ac$ from (E). How could that help you determine the answer?

$(-10)^2 - 4(6)(5)$

$100 - 120$

-20 negative

Example #2: The number y of Northern Rocky Mountain wolf breeding pairs x years since 1995 can be modeled by $y = 0.34x^2 + 3.0x + 9$. When were there about 30 breeding pairs?

$30 = 0.34x^2 + 3x + 9$

$-30 \qquad -30$

$0 = 0.34x^2 + 3x - 21$

$a = 0.34$ $b = 3$ $c = -21$

$x = \frac{-3 \pm \sqrt{3^2 - 4(0.34)(-21)}}{2(0.34)}$

$x = \frac{-3 \pm \sqrt{9 + 28.56}}{0.68}$

$x = \frac{-3 \pm \sqrt{37.56}}{0.68}$

$\frac{-3 \pm 6.13}{0.68} = \frac{3.13}{0.68} = 4.6$

$\frac{-3-6.13}{0.68} = \frac{-9.13}{0.68} = -13.4$

$\boxed{1999}$

Lesson #70
Choosing a Solution Method

Success Criteria: I can solve quadratic equations by undoing operations, factoring the quadratic formula or the calculator. I can determine what method is best depending on the problem.

Solve $x^2 - 3 = 0$ by different methods:

a) Calculator

$\boxed{X = \pm 1.73}$

b) Factoring

not factorable

c) UNDOing operations

$x^2 = 3$

$X = \sqrt{3}$

$\boxed{X = \pm 1.73}$

See Concept Map

d) Quadratic Formula

$a=1 \quad b=0 \quad c=-3$

$X = \frac{0 \pm \sqrt{0^2 - 4(1)(-3)}}{2}$

$X = \frac{0 \pm \sqrt{12}}{2}$

$\frac{\sqrt{12}}{2} = \boxed{\pm 1.73}$

Example #1: For each equation, decide on what method (other than by graphing on a calculator) might be easiest to use to solve it, and then solve the equation.

(A) $x^2 - 10 = 0$

Which method appears to be easiest?

undoing operations

Why?

$x^2 - \cancel{10} = 0$

$\cancel{+10} \quad +10$

$x^2 = 10$

$X = \sqrt{10}$

$\boxed{X = \pm 3.16}$

(B) $x^2 - 10x = 0$

Which method appears to be easiest?

Factoring

Why?

$x(x-10) = 0$

$\boxed{X = 0}$

$x - \cancel{10} = 0$

$\cancel{+10} \quad +10$

$\boxed{X = 10}$

(C) $x^2 + 8x + 12 = 0$

Which method appears to be easiest?

Factoring or calculator

Why?

$a=1 \quad b=8 \quad c=12$

$(x+6)(x+2)=0$

$x+\cancel{6}=0 \qquad x+\cancel{2}=0$

$\cancel{-6} \; -6 \qquad \cancel{-2} \; -2$

$\boxed{x=-6} \qquad \boxed{x=-2}$

(D) $4x^2 = 36$

Which method appears to be easiest?

Undoing operations

Why?

$\frac{\cancel{4}x^2}{\cancel{4}} = \frac{36}{4}$

$x^2 = 9$

$x = \sqrt{9}$

$\boxed{x = \pm 3}$

(E) $x^2 + 2 = 5x$

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

Which method appears to be easiest?

Calculator / Quad Form

Why?

$a=1 \quad b=-5 \quad c=2$

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

$x = \frac{5 \pm \sqrt{25-8}}{2}$

$x = \frac{5 \pm \sqrt{17}}{2}$

$x = \frac{5 \pm 4.12}{2}$

$\frac{5+4.12}{2} = \frac{9.12}{2} = \boxed{4.56}$

$\frac{5-4.12}{2} = \frac{0.88}{2} = \boxed{0.44}$

(F) $4x^2 = 7x - 10$

$4x^2 - 7x + 10 = 0$

Which method appears to be easiest?

Calculator / Quad Form

Why?

$a=4 \quad b=-7 \quad c=10$

$x = \frac{7 \pm \sqrt{(-7)^2 - 4(4)(10)}}{2(4)}$

$x = \frac{7 \pm \sqrt{49-160}}{8}$

$x = \frac{7 \pm \sqrt{-111}}{8}$

$\boxed{\text{no solution}}$

Lesson #70b
Solving Equation Practice

Success Criteria: I can determine how many zeros an equation has by using my calculator. I can solve quadratic equations using many different methods. I can answer questions about a real life quadratic model.

Use your graphing calculator to determine HOW MANY solutions the equation will have (0, 1, or 2). Then find the solutions using the given method.

1. $x^2 + 8x - 20$ by Factoring

-20
10 -2
8

$(x+10)(x-2)$

$x+10=0 \quad x-2=0$
$-10 \ -10 \quad +2 \ +2$
$\boxed{x=-10} \quad \boxed{x=2}$

Number of Solutions: 2

Solutions: -10, 2

2. $x^2 = -4$ by UNDOing operations

$x=\sqrt{-4}$

no solution

Number of Solutions: 0

Solutions: none

3. $13x = 2x^2 + 6$ by Quadratic Formula

$-13x \quad -13x$

$0=2x^2-13x+6 \quad a=2 \ b=-13 \ c=6$

$x=\frac{13\pm\sqrt{(-13)^2-4(2)(6)}}{2(2)}$

$x=\frac{13\pm\sqrt{169-48}}{4}$

$x=\frac{13\pm\sqrt{121}}{4}$

$x=\frac{13\pm 11}{4}$

$\frac{13+11}{4}=\frac{24}{4}=6$

$\frac{13-11}{4}=\frac{2}{4}=\frac{1}{2}$

Number of Solutions: 2

Solutions: $6, \frac{1}{2}$

What other methods could have been used other than Quadratic Formula on #3?

Factoring calculator

4. $x^2 = 8$ by UNDOing operations

$x=\sqrt{8}$

$x=\pm 2.83$

Number of Solutions: 2

Solutions: ± 2.83

5. $9 - 24x = -16x^2$ by Graphing

$+16x^2$ $+16x^2$

$16x^2 - 24x + 9 = 0$

Number of Solutions: 1

Solutions: 0.75

6. $2x - \cancel{5} = 14$ by UNDOing operations

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

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

$x = 9.5$

Number of Solutions: 1

Solutions: 9.5

Solve the remaining problems by any appropriate method.

7. $2x^2 + 8x = 0$

$2x(x+4) = 0$

$\frac{2x}{2} = \frac{0}{2}$ $x + \cancel{4} = 0$

$-\cancel{4}$ -4

$\boxed{x=0}$ $\boxed{x=-4}$

8. $x^2 - 4x = -\cancel{4}$

$+4$ $+\cancel{4}$

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

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

$x - 2 = 0$

$\boxed{x=2}$

9. $5x + \cancel{4} = 8$

$-\cancel{4}$ -4

$\frac{\cancel{5}x}{\cancel{5}} = \frac{4}{5}$

$\boxed{x=0.8}$

10. $\cancel{3}x^2 = \frac{48}{3}$

$\cancel{3}$

$x^2 = 16$

$x = \sqrt{16}$

$\boxed{x = \pm 4}$

11. The height h (in feet) of a javelin thrown at a track and field competition can be modeled by $h = -16t^2 + 50t + 6$, where t is time in seconds.

a. What is the highest the javelin gets?

45.0625 feet

b. How high is the javelin after 1 second?

40 ft

c. After how many seconds is the javelin 30 feet above the ground?

0.59 2.53