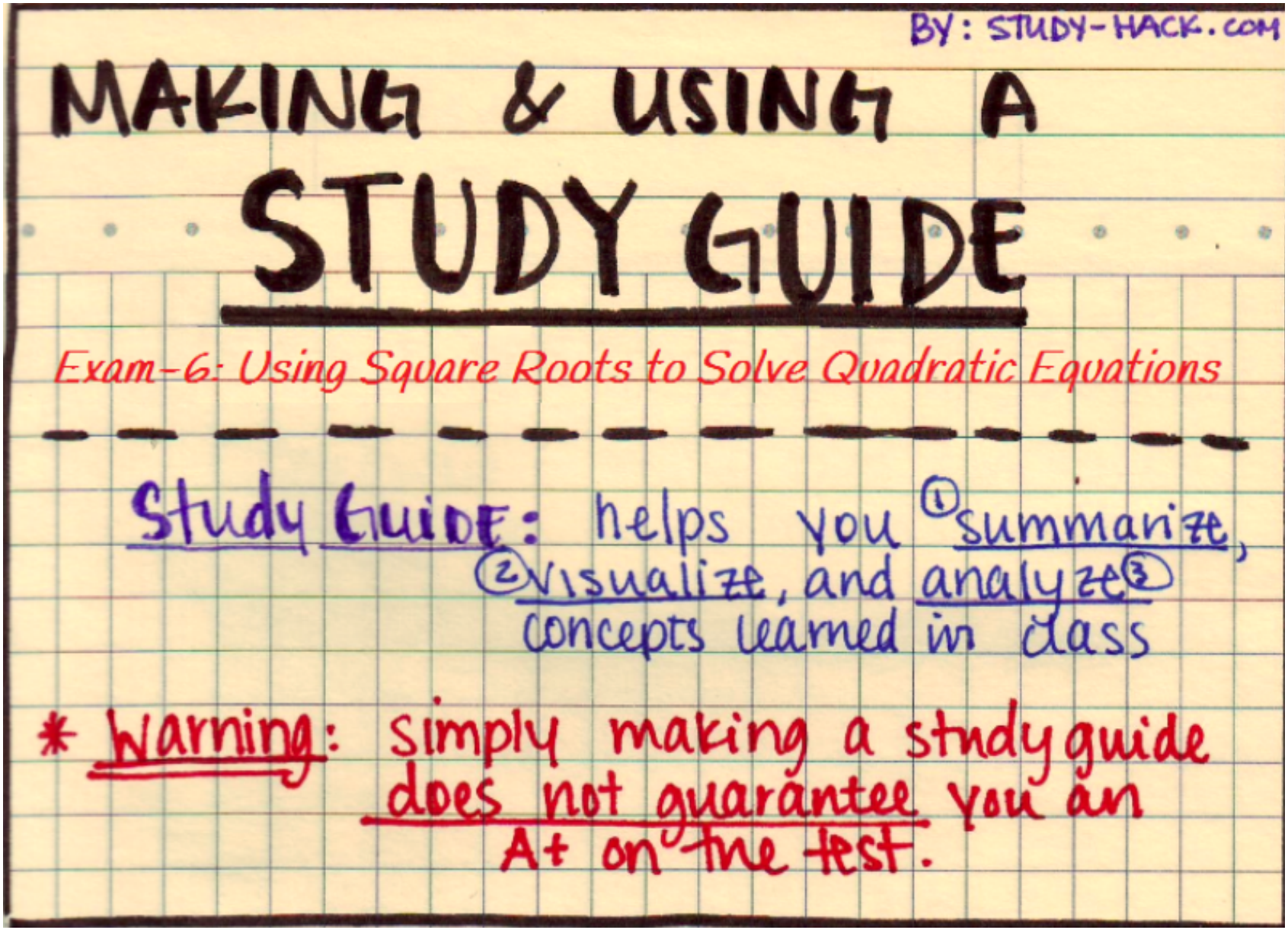

BY: STUDY-HACK.COM
MAKING & USING A
STUDY GUIDE
Exam-6: Using Square Roots to Solve Quadratic Equations
Study Guide: helps you ① summarize, ② visualize, and analyze ③ concepts learned in class
* Warning: simply making a study guide does not guarantee you an A+ on the test.

1

A quadratic equation has the zeros −3 and 6. Can the quadratic equation be the given equation?

A. $(2x + 6)(x - 6) = 0$

$2x+6=0$ $\quad x-6=0$

$-6\ -6$ $\quad +6\ +6$

$\frac{2x}{2} = \frac{-6}{2}$ $\quad x=6$

$x=-3$

Yes No

B. $(6x - 1)(x + 3) = 0$

$6x-1=0$ $\quad x+3=0$

$+1\ +1$ $\quad -3\ -3$

$6x=1$ $\quad x=-3$

Yes No

C. $-3x(x - 6) = 0$

$x-6=0$

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

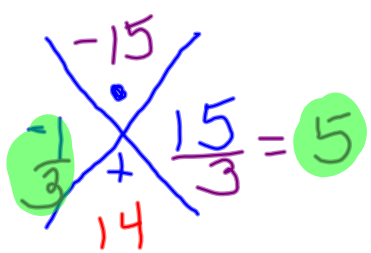
$x=0$

Yes No

2

Factor and solve each equation. Does the equation have a solution of $x = -5$?

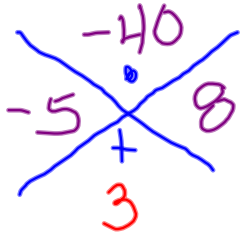
A. $3x^2 + 14x - 5 = 0$



switch sign → $x = \frac{1}{3}$ $x = -5$

Yes B No

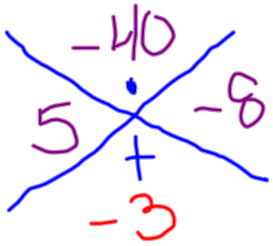
B. $1x^2 + 3x - 40 = 0$



switch sign → $x = 5$ $x = -8$

A Yes No

C. $x^2 - 3x - 40 = 0$



switch sign → $x = -5$ $x = 8$

Yes B No

3

Consider the equation $4x^2 - 20 = 0$. Is the given statement True or False?

A. The equation has 2 solutions. True B False

$b^2 - 4ac$ if Negative, zero, or Positive

then none, 1, or 2 solutions.

$a = 4 \quad b = 0 \quad c = -20$

$0^2 - 4(4)(-20) = 320 =$ Positive

B. A zero of the equation is $-\sqrt{20}$. A True False

$4x^2 - 20 = 0$

$+20 \quad +20$

$\frac{4x^2}{4} = \frac{20}{4} \Rightarrow \sqrt{x^2} = \sqrt{5} \Rightarrow x = \pm\sqrt{5}$

C. A solution of the equation is $\sqrt{5}$. True B False

4

Solve $\left(2x+\frac{2}{3}\right)(x+5)=0$. Is the given value a solution of the equation?

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

$-\frac{2}{3}\quad -\frac{2}{3}$

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

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

$x+5=0$

$-5\quad -5$

$x=-5$

A. $x=-\frac{1}{3}$ C Yes B No

B. $x=-5$ B Yes B No

C. $x=\frac{2}{3}$ A Yes C No

5

The equation $ax^2 + 12x + c = 0$ has one solution. Can a and c equal each of the following values?

$2 \cdot \sqrt{a} \cdot \sqrt{c} = 12$

A. $a = 4, c = 9$ Yes B No

$2\sqrt{4} \cdot \sqrt{9} \stackrel{?}{=} 12$

$2 \cdot 2 \cdot 3 = 12$

$12 = 12$ True

B. $a = 9, c = 16$ A Yes No

$2 \cdot \sqrt{9} \cdot \sqrt{16} \stackrel{?}{=} 12$

$2 \cdot 3 \cdot 4 = 12$

$24 \neq 12$ False

C. $a = 36, c = 1$ Yes B No

$2 \cdot \sqrt{36} \cdot \sqrt{1} \stackrel{?}{=} 12$

$2 \cdot 6 \cdot 1 = 12$ True

6

Solve the equation using the given method.

$7x^2 - 63 = 0$; square root

$7x^2 = 63$ Equations in the form $a(x + b)^2 = c$ can be solved by taking square roots

$\frac{7x^2}{7} = \frac{63}{7}$

$\sqrt{x^2} = \sqrt{9}$ Take the square root of both sides

$x = \pm 3$

The solutions are $x =$ -3 and $x =$ 3 .

7

Solve the equation using the given method. $25x^2 + 30x = 6$; complete the square

$a = 25 \quad b = 30$

Find $\frac{b^2}{4a} = \frac{(30)^2}{4(25)} = 9$

$25x^2 + 30x + 9 = 6 + 9$ Complete the square

$(5x + 3)^2 = 15$ Factor left side

$5x + 3 = \pm\sqrt{15}$ take Sq. Root both sides

$-3 \quad -3$

$\frac{5x}{5} = \frac{-3 \pm \sqrt{15}}{5}$

The solutions are $x = \frac{-3+\sqrt{15}}{5}$ and $x = \frac{-3-\sqrt{15}}{5}$.

8

Solve the equation using the given method.

$3x^2 + 30x + 27 = 0$; factoring

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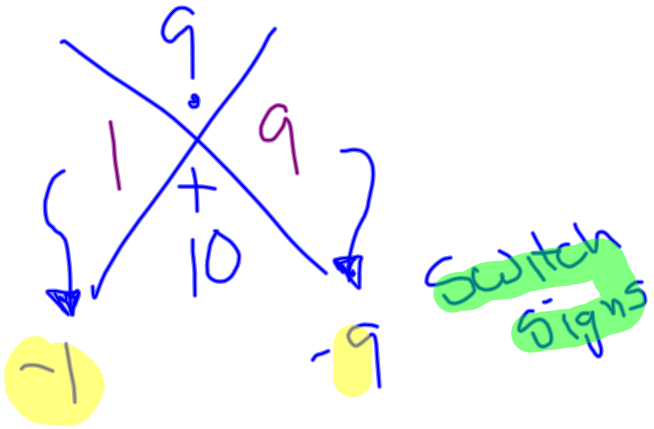
$\frac{3x^2}{3} + \frac{30x}{3} + \frac{27}{3}$

Divide by 3

$x^2 + 10x + 9 = 0$



The solutions are $x = -1$ and $x = -9$.

9

Is the given expression a perfect-square trinomial? Select Yes or No for each expression.

A. $x^2 + 20x + 100$

$2\sqrt{a} \cdot \sqrt{c} \stackrel{?}{=} 20$

$2\sqrt{1}\ \sqrt{100} = 20$

$2 \cdot 10 = 20$ True

Yes No

B. $4x^2 + 64x + 16$

$2 \cdot \sqrt{a} \cdot \sqrt{c} \stackrel{?}{=} 64$

$2\sqrt{4}\ \sqrt{16} = 64$

$2 \cdot 2 \cdot 4 \neq 64$ False

Yes No

C. $16x^2 + 8x + 1$

$2 \cdot \sqrt{a} \cdot \sqrt{c} \stackrel{?}{=} 8$

$2 \cdot \sqrt{16}\ \sqrt{1} = 8$

$2 \cdot 4 = 8$ True

Yes No

10

Consider the following statements.

Using the Discriminant to determine the types of solutions -

If $b^2 - 4ac < 0$ (*negative*)
then there are no real solutions

If $b^2 - 4ac = 0$ (*zero*)
then there is one real solution

If $b^2 - 4ac > 0$ (*positive*)
then there are two real solutions

A. $4x^2 - 64 = 0$ has 2 real solutions.

$a = 4 \quad b = 0 \quad c = -64$

$4^2 - 4(4)(-64) =$ Positive

True

True False

B. $x^2 - 5x - 9 = 0$ has only 1 real solution.

$a = 1 \quad b = -5 \quad c = -9$

$(-5)^2 - 4(1)(-9) =$ Positive

So, 2 solutions

False

True False

C. $3x^2 + 4x + 2 = 0$ has no real solutions.

$a = 3 \quad b = 4 \quad c = 2$

$4^2 - 4(3)(2) =$ Negative

True

True False

11 Solve $-2x^2 - 9x = -4$. What are the solutions?

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

Rewrite in standard form:

$-2x^2 - 9x + 4 = 0$

$a = -2 \quad b = -9 \quad c = 4$

$$x = \frac{9 \pm \sqrt{9^2 - 4(-2)(4)}}{2(-2)} = \frac{9 \pm \sqrt{81 + 32}}{-4} = \frac{9 \pm \sqrt{113}}{-4}$$

(A) $x = \frac{9 + \sqrt{113}}{-4}$ and $x = \frac{9 - \sqrt{113}}{-4}$

(B) $x = \frac{9 + \sqrt{89}}{4}$ and $x = \frac{9 - \sqrt{89}}{4}$

(C) $x = \frac{1}{2}$ and $x = 4$

(D) There are no real solutions.

12

Solve the quadratic equations by any method you chose. Identify the method and complete the explanation on why you chose it.

The method is to take the square roots because $b =$ 0.

$4x^2 - 81 = 0$

$$4x^2 - 81 = 0$$
$$+81 \quad +81$$
$$\sqrt{4x^2} = \sqrt{81}$$
$$2x = \pm 9$$
$$2 \quad 2$$
$$x = \pm \frac{9}{2}$$

13

Solve the quadratic equations by any method you chose. Identify the method and complete the explanation on why you chose it.

The method is to complete the square ▼ because it is not factorable ▼.

$x^2 + 6x - 14 = 0$

$+14 \quad +14$

$x^2 + 6x = 14$

Find $\frac{b^2}{4a} = \frac{6^2}{4 \times 1} = 9$

This is done by adding $\frac{b^2}{4a}$ to both sides.

$$x^2 + 6x + 9 = 23$$

$$(x + 3)^2 = 23$$

Solve for x. $x + 3 = \pm\sqrt{23}$

$$x = -3 \pm \sqrt{23}$$

14

Solve the quadratic equation by any means. Identify the method and complete the explanation on why you chose it. Leave irrational answers in radical form. $4x^2 - 4x - 10 = 13$

Completing the square ▾ should be used because it is not factorable ▾.

$$\begin{array}{rcl} 4x^2 - 4x - 10 & = & 13 \\ +10 & & +10 \\ \hline 4x^2 - 4x & = & 23 \end{array}$$

Find $\frac{b^2}{4a}$. $= \frac{(-4)^2}{4 \times 4} = \frac{16}{16} = 1$

Add $\frac{b^2}{4a}$ to both sides of the equation.

$$4x^2 - 4x + 1 = 24$$

Factor the left side. $(2x - 1)^2 = 24$

Take the square root of both sides.

$$2x - 1 = \pm\sqrt{24}$$

$$2x - 1 = \pm 2\sqrt{6}$$

$\sqrt{24}$

$\sqrt{4 \cdot 6}$

$2\sqrt{6}$

Solve for x.

$$\begin{array}{rcl} 2x - 1 & = & \pm 2\sqrt{6} \\ +1 & & +1 \\ \hline \frac{2x}{2} & = & \frac{1 \pm 2\sqrt{6}}{2} \end{array}$$

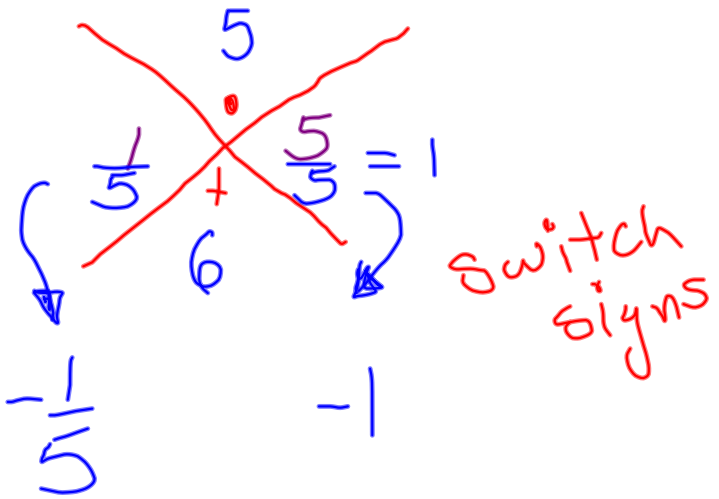
$$x = \frac{1}{2} \pm \sqrt{6}.$$

15

Solve the quadratic equation by any means. Identify the method and complete the explanation of why you chose it. Irrational answers may be left in radical form. $5x^2 + 6x + 1 = 0$

Factoring ▼ should be used because there are not many factors to check ▼.

$5x^2 + 6x + 1 = 0$



$$x = -\frac{1}{5} \text{ or } x = -1$$

16

Solve the quadratic equation by any means. Identify the method and complete the explanation on why you chose it. Irrational answers may be left in radical form. $2x^2 + 0x - 11 = 0$

Taking the square roots ▾ should be used because b is equal to 0 ▾.

$2x^2 - 11 = 0$

$+11 \quad +11$

$\frac{2x^2}{2} = \frac{11}{2}$

$\sqrt{x^2} = \sqrt{\frac{11}{2}}$ Take the square roots of both sides.

Use rationalization to remove the square root from the denominator.

$$x = \pm\frac{\sqrt{11}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \pm\frac{\sqrt{22}}{\sqrt{4}} = \frac{\pm\sqrt{22}}{2}$$

$$x = \pm\frac{\sqrt{22}}{2}$$

17

Solve the quadratic equation by any means. Identify the method and complete the explanation on why you chose it. Convert irrational answers into decimals for your final answer. (Round to two decimal places.)

The quadratic formula ▼ should be used because it is not factorable ▼ and completing the square ▼ will be complicated.

$7x^2 - 6x - 3 = 0$

Enter the values into the quadratic formula. $a = 7$ $b = -6$ $c = -3$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{6 \pm \sqrt{(-6)^2 - 4 \times 7 \times (-3)}}{2 \times 7} = \frac{6 \pm \sqrt{120}}{14}$$

Solve for x.

$x = 1.21$ or $x = -0.35$ Round to two decimal places.

18

Solve the quadratic equation by any means. Identify the method and complete the explanation on why you chose it. Leave irrational answers in radical form.

Completing the squares ▾ should be used because it is not factorable ▾ but the coefficients are small and will not ▾ lead to a lot of fractional terms.

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

Move the constant to the right side.

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

Multiply both sides by 2 to make a perfect square.

$$4x^2 + 8x = 6$$

Find $\frac{b^2}{4a}$ and add to both sides of the equation.

$$4x^2 + 8x + 4 = 10$$

Factor the left side.

$$(2x + 2)^2 = 10$$

Take the square root of both sides.

$$\sqrt{(2x + 2)^2} = \pm\sqrt{10}$$

Solve for x.

$$2x = -2 \pm \sqrt{10}$$
$$x = -1 \pm \frac{\sqrt{10}}{2}$$

19

Solve the quadratic equation by any means. Identify the method and complete the explanation on why you chose it. Irrational answers may be left in radical form.

Taking the square roots ▼ should be used because the equation can be easily converted into a squared binomial and a constant ▼.

$$2(x+4)^2 - 8 = 6$$

Add 8 to both sides of the equation.

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

Divide both sides by 2.

$$(x+4)^2 = 7$$

Round your answer to two decimal places if necessary.

Take the square root of both sides.

$$x+4 = \pm\sqrt{7}$$

Write two equations.

$$x+4 = \sqrt{7} \text{ or } x+4 = -\sqrt{7}$$

Solve both equations for x.

$$x = \sqrt{7} - 4 \text{ or } x = -\sqrt{7} - 4$$

Leave the square root in radical form.

20

Solve the quadratic equation by any means. Identify the method and complete the explanation on why you chose it. Irrational answers may be approximated with a calculator (round to two decimal places).

Taking the square roots ▾ should be used because it is not factorable ▾ but the coefficients are small and will not ▾ lead to a lot of fractional terms.

$(2x-3)^2 = 4x$

$(2x-3)^2 = 4x$

$4x^2 - 12x + 9 = 4x$

$-4x \quad -4x$

$4x^2 - 16x + 9 = 0$

Move the constant to the right side of the equation.

$$4x^2 - 16x = -9$$

When completing the square, you must add $\frac{b^2}{4a}$ to both sides of the equation.

$$4x^2 - 16x + 16 = -9 + 16$$

$$4x^2 - 16x + 16 = 7$$

Substitute factors into the quadratic expression.

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

Take the square root of both sides.

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

Solve for x and round to two decimal places.

$x = 3.33$ or $x = 0.68$

21

Solve the quadratic equation by any means. Identify the method and complete the explanation on why you chose it. Leave irrational answers in radical form.

The quadratic formula ▼ should be used because the equation cannot be factored ▼ and completing the squares ▼ will be complicated.

$5x^2 - 6x + 14 = 0$ Enter the values into the quadratic formula.

$$x = \frac{-(6) \pm \sqrt{(-6)^2 - 4(5)(14)}}{2(5)}$$

$$x = \frac{6 \pm \sqrt{-244}}{10}$$

The discriminant is negative ▼, so there is no ▼ real solution.

22

Solve the quadratic equation by any means. Identify the method and complete the explanation on why you chose it. Irrational answers may be left in radical form.

The quadratic formula ▼ should be used because the equation cannot be factored ▼ and completing the square ▼ will be complicated.

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

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

$$x = \frac{-10 \pm \sqrt{60}}{10}$$

$$x = \frac{-5 \pm \sqrt{15}}{5}$$

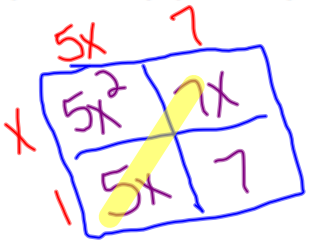
$$x = -1 \pm \frac{\sqrt{15}}{5}$$

23

Solve the quadratic equation by any means. Identify the method and complete the explanation on why you chose it. Convert irrational answers to a decimal (round to two decimal places).

The quadratic formula ▾ should be used because factoring and completing the square ▾ will be time consuming.

$$(5x+7)(x+1)=31$$



$$5x^2+12x+7=31$$
$$-31 \quad -31$$
$$5x^2+12x-24=0$$

Enter the values of a, b, and c into the quadratic formula and solve.

$$x = \frac{(-12)\pm\sqrt{12^2-4(5)(-24)}}{2(5)}$$

$$x = \frac{-12\pm\sqrt{624}}{10}$$

Write two equations.

$$x = \frac{-12+\sqrt{624}}{10} \text{ or } x = \frac{-12-\sqrt{624}}{10}$$

Solve for x.

$$x = 1.3 \text{ or } x = -3.7$$

Round the final answer to two decimal places if necessary.

24

Create and solve a linear quadratic system to solve the problem. Solve using the quadratic formula. Leave answers that are not perfect squares in radical form.

Give the system of equations. $23x + 6 = -15x^2$

$$23x + 6 = -15x^2$$

$15x^2 + 23x + 6 = 0$ Write in standard form.

$a = 15\ b = 23\ c = 6$ Identify a, b, and c.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ Use the quadratic formula.

$$x = \frac{-23 \pm \sqrt{(23)^2 - 4(15)(6)}}{2(15)}$$ Substitute the identified values into the quadratic formula.

$$x = \frac{-23 \pm \sqrt{169}}{30}$$ Simplify the radicand and denominator.

$$x = \frac{-23 \pm 13}{30}$$ Evaluate the square root.

$$x = \frac{-23 + 13}{30} \text{ or } x = \frac{-23 - 13}{30}$$ Write as two equations.

$$x = -\frac{1}{3} \text{ or } x = -\frac{6}{5}$$ Simplify both equations.

25

Solve using the quadratic formula. Leave irrational answers in radical form.

$5x^2 = 5 - x$

$5x^2 = 5 - x$

$5x^2 + x - 5 = 0$ Write in standard form.

$a = 5 \; b = 1 \; c = -5$ Identify a, b, and c.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ Use the quadratic formula.

$$x = \frac{-1 \pm \sqrt{(1)^2 - 4(5)(-5)}}{2(5)}$$ Substitute the identified values into the quadratic formula.

$$x = \frac{-1 \pm \sqrt{101}}{10}$$ Simplify the radicand and denominator.

The exact solutions are $\frac{-1 + \sqrt{101}}{10}$ and $\frac{-1 - \sqrt{101}}{10}$.

The approximate solutions are 0.905 and −1.105.