

Mastery Checklist

Quadratic Formula

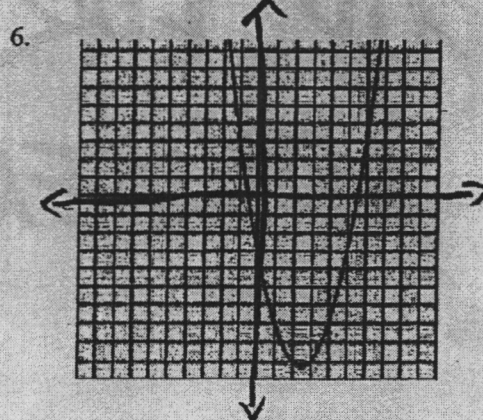
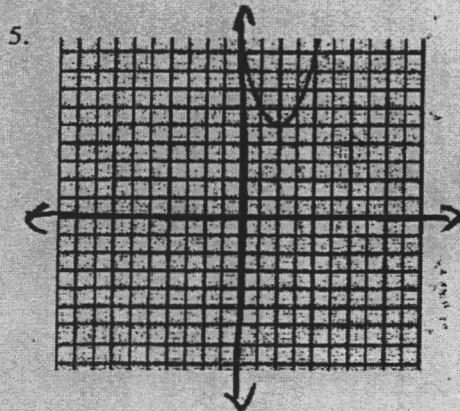
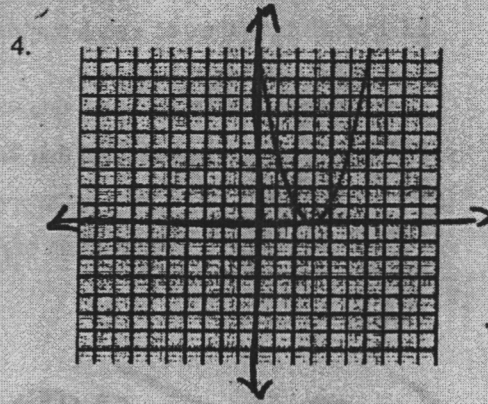
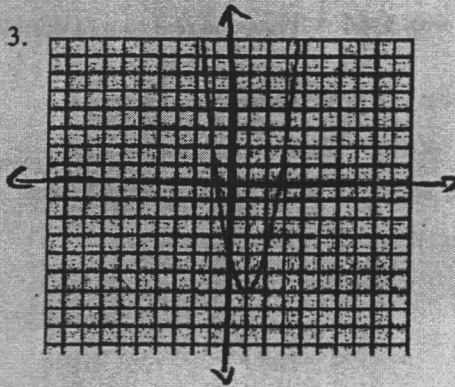
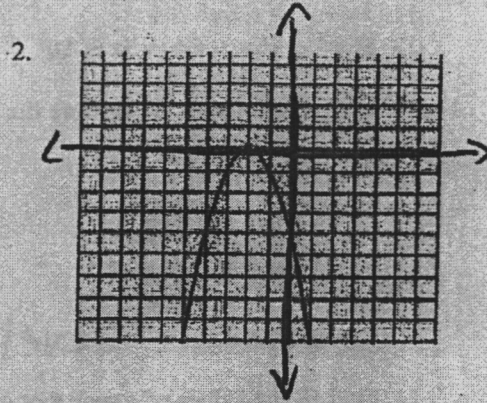
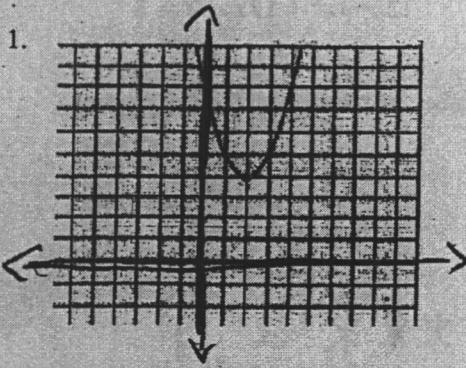
In order to prove Mastery for this concept you must be able complete the following all by **yourself**. No help from Notes, Partners or Teacher. Use all other problems to practice and test yourself with the following:

- Complete #6 Level * on "MATH Worksheets Go"
- Complete # 17 Level ** on "MATH Worksheets Go"
- Complete #24 Level *** on "MATH Worksheets Go"
- Complete #12 on "Complex Numbers Worksheet"
- Complete # 11 & 13 on "Using the Quadratic Formula" worksheet
- Complete Advanced Level on Totempole
- Create a Mind Map for all the concepts linked to the Quadratic Formula

Level *

Practice using the discriminant.

Given the graph below determine a) the sign of the discriminant b) the number and nature of the roots.



Level **

Find the discriminant to determine the number and nature of the roots of the equation.

7. $x^2 + 6x + 4 = 0$

9. $2x^2 - 3x + 2 = 0$

11. $3x + 7 = -5x^2 - 4$

13. $25x^2 - 15x - 64 = 5x - 10$

8. $x^2 - 5x - 34 = 0$

10. $3x^2 - 6x + 2 = 0$

12. $-3x^2 + 17x - 2 = 3$

Find the discriminant to determine the number of x-intercepts of the function.

14. $f(x) = 3x^2 - 4x + 2$

16. $f(x) = x^2 - 7x + 6$

18. $f(x) = x^2 - 3x + 4$

20. $f(x) = 4x^2 - 28x + 49$

15. $f(x) = -2x^2 + 6x - 8$

17. $f(x) = 9x^2 + 24x + 16$

19. $f(x) = -x^2 - 4$

Challenge Problems

Level ***

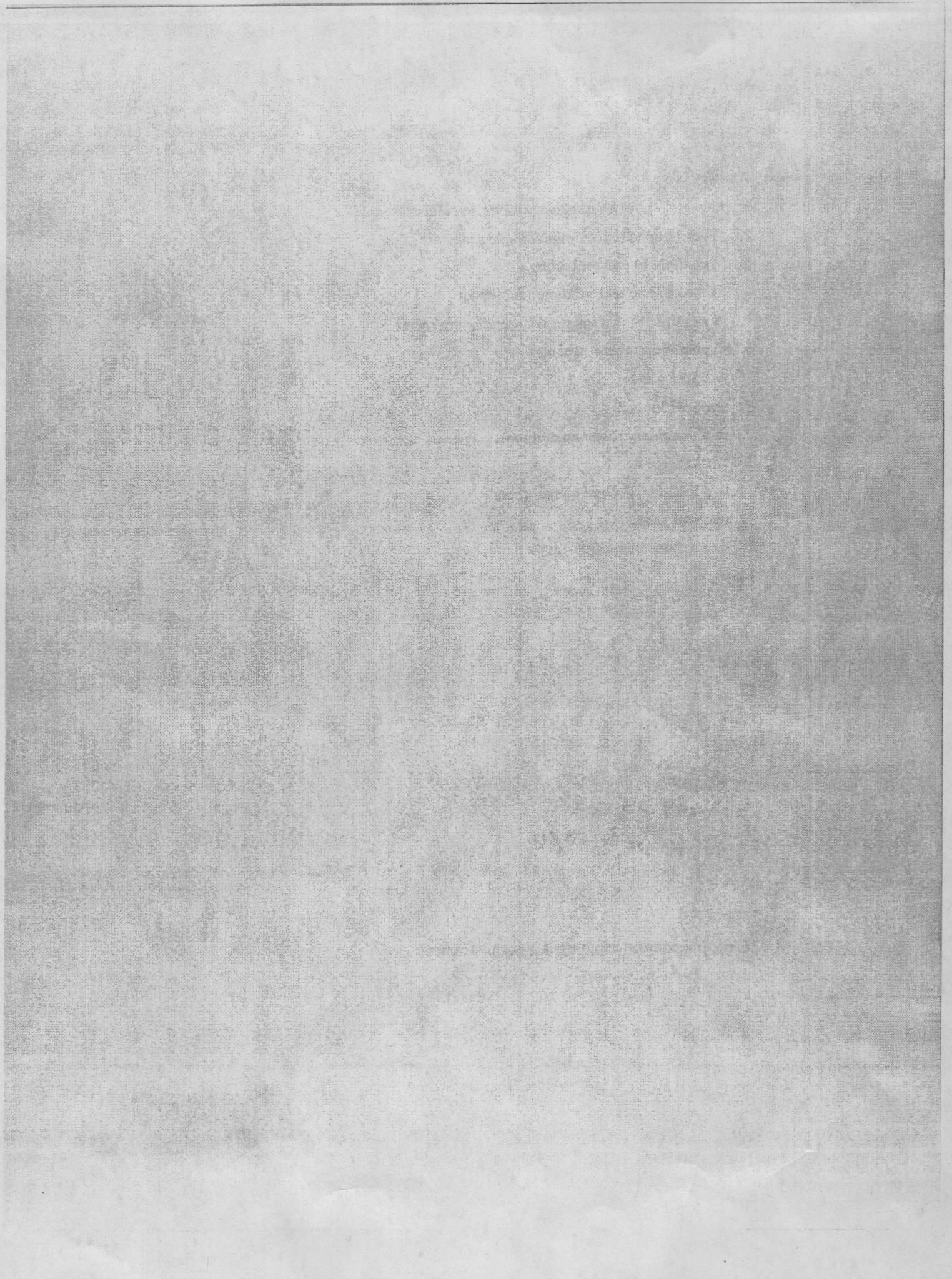
- Find all the values of a such that $ax^2 + 3x + 5 = 0$ has two real roots.
- Find all the values of a such that $ax^2 + 48x + 64 = 0$ has one real root (a double root).
- Find all the values of a such that $ax^2 + 3x - 6 = 0$ has two imaginary roots.
- Find all the values of c such that $2x^2 - 6x + c = 0$ has two imaginary roots.
- Find all the values of c such that $-4x^2 + 8x + c = 0$ has two real roots.
- Assuming $b \neq 0$, does the sign of b affect the value of the discriminant?

FUP FOR
ANSWERS

MATH
MAGAZINE

IV. Answer Key

1. a) negative b) two imaginary roots/ no real roots
2. a) zero b) one real solution/double root
3. a) positive b) two real roots
4. a) zero b) one real solution/double root
5. a) negative b) two imaginary roots/ no real roots
6. a) positive b) two real roots
7. two real roots
8. two real roots
9. two imaginary roots/ no real roots
10. two real roots
11. two imaginary roots/ no real roots
12. two real roots
13. one real solution/double root
14. 0
15. 2
16. 2
17. 1
18. 0
19. 0
20. 1
21. $a < \frac{9}{20}$
22. $a = 9 \rightarrow a = 9$
23. $a > \frac{3}{8} \rightarrow a < -\frac{3}{8}$
24. $c > \frac{9}{2}$
25. $c > -4$
26. no, b is squared resulting in a positive number



Algebra 3-4
Complex Numbers Worksheet

Name _____
Date _____ Hour _____

Set A

Simplify the radical.

1. $\sqrt{-9}$

2. $\sqrt{-4}$

3. $-\sqrt{-25}$

4. $-\sqrt{-1}$

5. $\sqrt{-16}$

6. $-\sqrt{-49}$

Set B

Simplify the radical.

7. $\sqrt{-20}$

8. $\sqrt{-75}$

9. $\sqrt{-50}$

10. $\sqrt{-18}$

11. $\sqrt{-96}$

12. $\sqrt{-150}$

Set C

Simplify the radical.

13. $\sqrt{-27a^2}$

14. $\sqrt{-16c^2d^2}$

15. $\sqrt{-50x^2yz^3}$

16. $\sqrt{-320y^9z^{10}}$

17. $\sqrt{-64x^4}$

18. $\sqrt{-100a^4b^2}$

19. $\sqrt{-56a^3b^5}$

20. $\sqrt{-125x^3y^6}$

21. $\sqrt{-150x^7y^8}$

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____



Get Initials or Loose ALL Credit

7. _____
8. _____
9. _____
10. _____
11. _____
12. _____



Get Initials or Loose ALL Credit

13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____



Get Initials or Loose ALL Credit

Algebra 3-4
Complex Numbers Worksheet

Name _____
Date _____ Hour _____

$\sqrt{-1} = i$

Set A

Simplify the radical.

1. $\sqrt{-9} = \sqrt{9} \sqrt{-1} = 3i$
 2. $\sqrt{-4} = \sqrt{4} \sqrt{-1} = 2i$
 3. $-\sqrt{-25} = -\sqrt{25} \sqrt{-1} = -5i$
 4. $-\sqrt{-1} = -i$
 5. $\sqrt{-16} = \sqrt{16} \sqrt{-1} = 4i$
 6. $-\sqrt{-49} = -\sqrt{49} \sqrt{-1} = -7i$

1. $3i$
2. $2i$
3. $-5i$
4. $-i$
5. $4i$
6. $-7i$

Set B

Simplify the radical.

7. $\sqrt{-20} = \sqrt{4} \sqrt{5} \sqrt{-1} = 2i\sqrt{5}$
 8. $\sqrt{-75} = \sqrt{25} \sqrt{3} \sqrt{-1} = 5i\sqrt{3}$
 9. $\sqrt{-50} = \sqrt{25} \sqrt{2} \sqrt{-1} = 5i\sqrt{2}$
 10. $\sqrt{-18} = \sqrt{9} \sqrt{2} \sqrt{-1} = 3i\sqrt{2}$
 11. $\sqrt{-96} = \sqrt{16} \sqrt{6} \sqrt{-1} = 4i\sqrt{6}$
 12. $\sqrt{-150} = \sqrt{25} \sqrt{6} \sqrt{-1} = 5i\sqrt{6}$

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7. $2i\sqrt{5}$
8. $5i\sqrt{3}$
9. $5i\sqrt{2}$
10. $3i\sqrt{2}$
11. $4i\sqrt{6}$
12. $5i\sqrt{6}$

Set C

Simplify the radical.

13. $\sqrt{-27a^2} = \sqrt{9} \sqrt{3} \sqrt{-1} a = 3ai\sqrt{3}$
 14. $\sqrt{-16c^2d^2} = \sqrt{16} \sqrt{c^2} \sqrt{d^2} \sqrt{-1} = 4cdi$
 15. $\sqrt{-50x^2yz^3} = \sqrt{25} \sqrt{2} \sqrt{y} \sqrt{z^2} \sqrt{-1} xz = 5xz\sqrt{2yz}$
 16. $\sqrt{-320y^9z^{10}} = \sqrt{64} \sqrt{5} \sqrt{y^8} \sqrt{z^{10}} \sqrt{-1} = 8y^4z^5\sqrt{5y}$
 17. $\sqrt{-64x^4} = \sqrt{64} \sqrt{x^4} \sqrt{-1} = 8x^2i$
 18. $\sqrt{-100a^4b^2} = \sqrt{100} \sqrt{a^4} \sqrt{b^2} \sqrt{-1} = 10a^2bi$
 19. $\sqrt{-56a^3b^5} = \sqrt{4} \sqrt{14} \sqrt{a^2} \sqrt{b^4} \sqrt{-1} = 2ab^2\sqrt{14ab}$
 20. $\sqrt{-125x^3y^6} = \sqrt{25} \sqrt{5} \sqrt{x^2} \sqrt{y^6} \sqrt{-1} = 5xy^3\sqrt{5x}$
 21. $\sqrt{-150x^7y^8} = \sqrt{25} \sqrt{6} \sqrt{x^6} \sqrt{y^8} \sqrt{-1} = 5x^3y^4\sqrt{6x}$

Get Initials or Lose ALL Credit

13. $3ai\sqrt{3}$
14. $4cdi$
15. $5xz\sqrt{2yz}$
16. $8y^4z^5\sqrt{5y}$
17. $8x^2i$
18. $10a^2bi$
19. $2ab^2\sqrt{14ab}$
20. $5xy^3\sqrt{5x}$
21. $5x^3y^4\sqrt{6x}$

Get Initials or Lose ALL Credit

Using the Quadratic Formula

Solve each equation with the quadratic formula.

1) $v^2 + 2v - 8 = 0$

2) $k^2 + 5k - 6 = 0$

3) $2v^2 - 5v + 3 = 0$

4) $2a^2 - a - 13 = 2$

5) $2n^2 - n - 4 = 2$

6) $b^2 - 4b - 14 = -2$

7) $8n^2 - 4n = 18$

8) $8a^2 + 6a = -5$

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

10) $n^2 = 9n - 20$

11) $3a^2 = 6a - 3$

12) $x^2 = -3x + 40$

13) $9x^2 - 11 = 6x$

14) $4a^2 - 8 = a$

15) $14m^2 + 1 = 6m^2 + 7m$

16) $4x^2 + 4x - 8 = 1$

Using the Quadratic Formula

Solve each equation with the quadratic formula.

1) $v^2 + 2v - 8 = 0$

$\{2, -4\}$

2) $k^2 + 5k - 6 = 0$

$\{1, -6\}$

3) $2v^2 - 5v + 3 = 0$

$\left\{\frac{3}{2}, 1\right\}$

4) $2a^2 - a - 13 = 2$

$\left\{3, -\frac{5}{2}\right\}$

5) $2n^2 - n - 4 = 2$

$\left\{2, -\frac{3}{2}\right\}$

6) $b^2 - 4b - 14 = -2$

$\{6, -2\}$

7) $8n^2 - 4n = 18$

$\left\{\frac{1 + \sqrt{37}}{4}, \frac{1 - \sqrt{37}}{4}\right\}$

8) $8a^2 + 6a = -5$

$\left\{\frac{-3 + i\sqrt{31}}{8}, \frac{-3 - i\sqrt{31}}{8}\right\}$

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

$\left\{\frac{1 + i\sqrt{359}}{20}, \frac{1 - i\sqrt{359}}{20}\right\}$

10) $n^2 = 9n - 20$

$\{5, 4\}$

11) $3a^2 = 6a - 3$

$\{1\}$

12) $x^2 = -3x + 40$

$\{5, -8\}$

13) $9x^2 - 11 = 6x$

$\left\{\frac{1 + 2\sqrt{3}}{3}, \frac{1 - 2\sqrt{3}}{3}\right\}$

14) $4a^2 - 8 = a$

$\left\{\frac{1 + \sqrt{129}}{8}, \frac{1 - \sqrt{129}}{8}\right\}$

15) $14m^2 + 1 = 6m^2 + 7m$

$\left\{\frac{7 + \sqrt{17}}{16}, \frac{7 - \sqrt{17}}{16}\right\}$

16) $4x^2 + 4x - 8 = 1$

$\left\{\frac{-1 + \sqrt{10}}{2}, \frac{-1 - \sqrt{10}}{2}\right\}$

Totempole: PLAYER A

Directions: Start from the bottom and work your way up. In order to level up you must to check your work with the answers listed on the back of your partner's paper. You can choose to work with your partner to do each problem or you can play cut-throat. If you play cut throat, your partner only tells you if it is wrong or right and you try the problem at that level over and over until it is right.

SUPER Genius: Level ***	Find the factors of the following Quadratics. a.) $x^2 + 25 = 0$ b.) $x^2 + 72 = 0$
Genius: Level ***	Use the remainder theorem and quadratic formula to find <u>all the roots</u> of the following polynomial if $x-3$ is a factor. $f(x) = x^3 - 5x^2 + kx - 15$
Advanced: Level **	Use the Quadratic Formula to find the roots of the following equation $x^2 - 4x + 3 = -4$
Baller: Level **	Use the Quadratic Formula to find the roots of the following equation $3x + 6 = -6x^2$
Proficient: Level **	Use the Quadratic Formula to find the roots of the following functions $f(x) = -12x^2 + 5x + 2$
Novice: Level *	a.) $2i\sqrt{-54}$ b.) $-\sqrt{-324}$ c.) $\sqrt{-18}$
Rookie: Level *	a.) $\sqrt{8}$ b.) $\sqrt{192}$ c.) $\sqrt{484}$
START HERE: Level *	a.) $\sqrt{36}$ b.) $i\sqrt{-144}$

Player B's Answers

SUPER Genius:	$a) x^2 + 16 = 0$ $x = \frac{\pm \sqrt{0 - 4(1)(16)}}{2}$ $x = \pm \frac{\sqrt{0 - 64}}{2}$ $x = \pm \frac{8i}{2} = \pm 4i$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: 20px;"> $\therefore x = 4i$ $(x - 4i)$ $x = -4i$ $(x + 4i)$ </div>	$b.) x^2 + 16i = 0$ $x = \frac{\pm \sqrt{-4(16i)}}{2}$ $x = \pm \frac{i\sqrt{92 \cdot 8}}{2}$ $x = \pm \frac{i\sqrt{736}}{2}$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: 20px;"> $x = \pm \frac{3 \cdot 2\sqrt{2}}{2}$ $x = \pm \frac{6\sqrt{2}}{2}$ $x = \pm 3\sqrt{2}$ $(x - 3\sqrt{2})(x + 3\sqrt{2})$ </div>
Genius:	$x^2 - 4x - 5$ $x+2 \overline{) x^3 - 2x^2 - 13x - 10}$ $\underline{-x^3 + 2x^2}$ $\quad -4x^2 - 13x$ $\quad \underline{+4x^2 + 8x}$ $\quad \quad -5x - 10$ $\quad \quad \underline{+5x + 10}$ $\quad \quad \quad 0$	$x^2 - 4x - 5 = 0$ $\begin{matrix} \uparrow & \uparrow & \uparrow \\ a & b & c \end{matrix}$ $x = \frac{4 \pm \sqrt{(4)^2 - 4(1)(-5)}}{2(1)}$ $x = \frac{4 \pm \sqrt{16 + 20}}{2}$ $x = \frac{4 \pm \sqrt{36}}{2}$ $x = \frac{4 \pm 6}{2}$ <div style="display: inline-block; vertical-align: middle; margin-left: 20px;"> $x = \frac{4+6}{2} = \frac{10}{2} = 5$ $x = \frac{4-6}{2} = \frac{-2}{2} = -1$ </div> <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: 20px;"> $\therefore \text{Roots}$ $x = -2$ $x = -1$ $x = 5$ </div>
Advanced:	$4x^2 + 7 = 9x$ $4x^2 - 9x + 7 = 0$ $\begin{matrix} \uparrow & \uparrow & \uparrow \\ a & b & c \end{matrix}$	$x = \frac{9 \pm i\sqrt{31}}{8}$
Baller:	$x^2 - 2x = -5$ $x^2 - 2x + 5 = 0$ $\begin{matrix} \uparrow & \uparrow & \uparrow \\ a & b & c \end{matrix}$	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> $x = 1 \pm 2i$ </div>
Proficient:	$f(x) = x^2 + 4x - 1$ $x^2 + 4x - 1 = 0$ $\begin{matrix} \uparrow & \uparrow & \uparrow \\ a & b & c \end{matrix}$	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> $x = -2 \pm \sqrt{5}$ </div>
Novice:	$a) i\sqrt{-92} = i\sqrt{(-1)16 \cdot 2} = i\sqrt{(-1)4^2 \cdot 4 \cdot 2} = i \cdot 4 \cdot \sqrt{2 \cdot 3} = 4i^2 \cdot 2\sqrt{3} = 8(-1)\sqrt{3} = -8\sqrt{3}$ $b) i\sqrt{-320} = i\sqrt{(-1)64 \cdot 5} = i \cdot \sqrt{8^2 \cdot 5} = 8i^2 \sqrt{5} = -8\sqrt{5}$ $c) \sqrt{-125} = \sqrt{(-1)5^2 \cdot 5} = 5i\sqrt{5}$	
Rookie:	$a) \sqrt{18} = \sqrt{9 \cdot 2} = \sqrt{3^2 \cdot 2} = 3\sqrt{2}$ $b) \sqrt{180} = \sqrt{36 \cdot 5} = \sqrt{6^2 \cdot 5} = 6\sqrt{5}$ $c) \sqrt{175} = \sqrt{25 \cdot 7} = \sqrt{5^2 \cdot 7} = 5\sqrt{7}$	
START HERE:	$a) \sqrt{16} = \sqrt{4^2} = 4$ $b) i\sqrt{-121} = i\sqrt{(-1)11^2} = i \cdot i \cdot 11 = 11i^2 = 11(-1) = -11$	

Totempole: PLAYER B

Directions: Start from the bottom and work your way up. In order to level up you must to check your work with the answers listed on the back of your partner's paper. You can choose to work with your partner to do each problem or you can play cut-throat. If you play cut throat, your partner only tells you if it is wrong or right and you try the problem at that level over and over until it is right.

SUPER Genius: Level ***	Find the factors of the following Quadratics. a.) $x^2 + 16 = 0$ b.) $x^2 + 162 = 0$
Genius: Level ***	Use the remainder theorem and quadratic formula to find all the roots of the following polynomial if $x+2$ is a factor. $f(x) = x^3 - 2x^2 - 13x - 10$
Advanced: Level **	Use the Quadratic Formula to find the roots of the following equation $4x^2 + 7 = 9x$
Baller: Level **	Use the Quadratic Formula to find the roots of the following equation $x^2 - 2x = -5$
Proficient: Level **	Use the Quadratic Formula to find the roots of the following functions $f(x) = x^2 + 4x - 1$
Novice: Level *	a.) $i\sqrt{-192}$ b.) $i\sqrt{-320}$ c.) $\sqrt{-125}$
Rookie: Level *	a.) $\sqrt{18}$ b.) $\sqrt{180}$ c.) $\sqrt{175}$
START HERE: Level *	a.) $\sqrt{16}$ b.) $i\sqrt{-121}$

Player A's Answers

<p>SUPER Genius:</p>	<p>a) $x^2 + 25 = 0$ $x = 5x \rightarrow x - 5i$ $x^2 + 72 = 0$ $x = \pm \frac{\sqrt{0 - 4(1)(25)}}{2}$ $x = -5i \rightarrow x + 5i$ $x = \pm \frac{\sqrt{0 - 4(72)}}{2}$ $x = \pm \frac{\sqrt{-100}}{2} = x = \pm \frac{10i}{2} = \pm 5i$ factors $x = \pm \frac{\sqrt{-288}}{2}$ $x = \pm \frac{i\sqrt{144 \cdot 2}}{2}$ $x = \pm \frac{i\sqrt{12^2 \cdot 2}}{2}$ $x = \pm \frac{12i\sqrt{2}}{2}$ $x = \pm 6i\sqrt{2}$ $x = 6i\sqrt{2} \rightarrow (x - 6i\sqrt{2})$ $x = -6i\sqrt{2} \rightarrow (x + 6i\sqrt{2})$</p>
<p>Genius:</p>	<p>$x^2 - 2x + 5$ $x - 3 \overline{) x^3 - 5x^2 + 15x - 15}$ $-x^3 + 8x^2$ $\underline{-2x^2 + 15x}$ $+2x^2 + 6x$ $\underline{-10x + 15}$ $5x - 15$ $\underline{-5x + 15}$ 0</p> <p>$x^2 - 2x + 5$ $a \quad b \quad c$ $x = \frac{2 \pm \sqrt{(-2)^2 + 4(1)(5)}}{2(1)}$ $x = \frac{2 \pm \sqrt{4 + 20}}{2}$ $x = \frac{2 \pm \sqrt{24}}{2}$ $x = \frac{2 \pm 2\sqrt{6}}{2}$ $x = 1 \pm \sqrt{6}$</p> <p>$\therefore x = 3, x = 1 + 2i$ $x = 1 - 2i$ Roots</p>
<p>Advanced:</p>	<p>$x^2 - 4x + 3 = -4$ $+4 \quad +4$ $x^2 - 4x + 7 = 0$ $a \quad b \quad c$</p> <p>$x = 2 \pm i\sqrt{3}$</p>
<p>Baller:</p>	<p>$3x + 6 = -6x^2$ \downarrow $6x^2 + 3x + 6 = 0$ $a \quad b \quad c$</p> <p>$x = \frac{-1 \pm \sqrt{15}}{4}$</p>
<p>Proficient:</p>	<p>xxxx $-12x^2 + 5x + 2 = 0$ $a \quad b \quad c$</p> <p>$x = \frac{-5 \pm 11}{-24} \rightarrow x = \frac{-5 + 11}{-24} = \frac{6}{-24} = \boxed{-\frac{1}{4}}$ $x = \frac{-5 - 11}{-24} = \frac{-16}{-24} = \boxed{\frac{2}{3}}$</p>
<p>Novice:</p>	<p>a.) $2i\sqrt{-54} = 2i\sqrt{(-1) \cdot 9 \cdot 6} = 2i\sqrt{(-1)3^2 \cdot 6} = 2i \cdot i \cdot 3\sqrt{6} = 6i^2\sqrt{6} = \boxed{-6\sqrt{6}}$ b.) $-\sqrt{-324} = -\sqrt{(-1)4 \cdot 81} = -\sqrt{(-1)2^2 \cdot 9^2} = -i \cdot 2 \cdot 9 = \boxed{-18i}$ c.) $\sqrt{-18} = \sqrt{(-1) \cdot 9 \cdot 2} = \sqrt{(-1)3^2 \cdot 2} = 3i\sqrt{2}$</p>
<p>Rookie:</p>	<p>a.) $\sqrt{8} = \sqrt{4 \cdot 2} = \sqrt{2^2 \cdot 2} = \boxed{2\sqrt{2}}$ b.) $\sqrt{192} = \sqrt{64 \cdot 3} = \sqrt{8^2 \cdot 3} = \boxed{8\sqrt{3}}$ c.) $\sqrt{484} = \sqrt{4 \cdot 121} = \sqrt{2^2 \cdot 11^2} = 2 \cdot 11 = \boxed{22}$</p>
<p>START HERE:</p>	<p>a.) $\sqrt{36} = \sqrt{6^2} = 6$ b.) $i\sqrt{-144} = i\sqrt{(-1) \cdot 12^2} = i \cdot i \cdot 12 = 12i^2 = 12(-1) = \boxed{-12}$</p>

Mind Map

Quadratic Formula

Task 1:

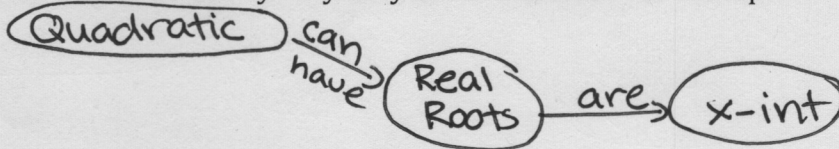
Review your notes/Quick Check/Unit 4 Test and write down all key ideas/concepts/vocabulary/examples for LT: 4C

Task 2:

Group and Connect all your concepts together

Task 3:

Label each Connection by why they are connected. For example:



Task 4:

Add in examples and visuals where they fit.

Task 5:

Review Checklist below and make sure that your Mind Map contains everything you need.

- Contains all of these Concepts/Vocabulary

Quadratic

Quadratic Formula

Discriminant

1 Real Root

2 Real Root

No Real Roots

Simplifying Radicals

- All Connections are labeled
- Contains Example Problems
- Contains Visuals
- Review Mind Map on the Backside and see if you need to adjust or add anything.

