QUIZ DATES: ____________ & ____________ **TEST DATE:** ____________________

Math 2

Unit 3 – Quadratic Functions Continued

Lesson 1 → Simplifying Square Roots

Name____________________

Date____________________ Pd______

PERFECT SQUARES

NUMBER MULTIPLIED	PERFECT SQUARES	NUMBER MULTIPLIED	PERFECT SQUARES	NUMBER MULTIPLIED	PERFECT SQUARES
1 X 1 =		7 X 7 =		13 X 13 =	
2 X 2 =		8 X 8 =		14 X 14 =	
3 X 3 =		9 X 9 =		15 X 15 =	
4 X 4 =		10 X 10 =		16 X 16 =	
5 X 5 =		11 X 11 =		17 X 17 =	
6 X 6 =		12 X 12 =		18 X 18 =	

SQUARE ROOTS and CUBE ROOTS

Taking the square root of a number is the inverse of raising the number to the second power.

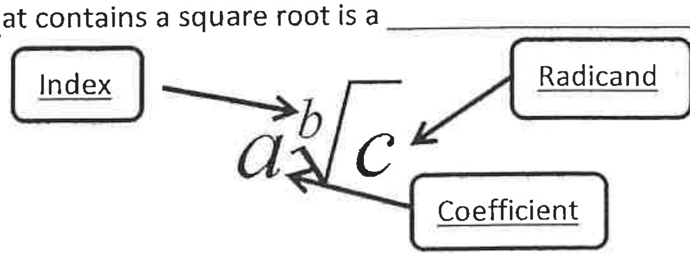
For example: If $3^2 =$ _______, then $\sqrt{9} =$ _______. For example: If $7^2 =$ _______, then $\sqrt{49} =$ _______.

Taking the cube root of a number is the inverse of raising the number to the third power.

For example: If $3^3 =$ _______, then $\sqrt[3]{27} =$ _______. For example: If $7^3 =$ _______, then $\sqrt[3]{343} =$ _______.

PARTS OF A RADICAL

An expression that contains a square root is a ________________. It can have three parts.



➢ Simplify the following radical expressions.

$\sqrt{100} =$ __________ $3\sqrt{121} =$ __________ $-\sqrt{225} =$ __________ $-2\sqrt{144} =$ __________

$\sqrt{25} =$ __________ $7\sqrt{81} =$ __________ $\pm\sqrt{49} =$ __________ $\pm 9\sqrt{9} =$ __________

Math 2
Unit 3 – Quadratic Functions Continued
Lesson 1 → Simplifying Square Roots **HOMEWORK**

Name____________________________
Date________________________ Pd_____

- **What is the radicand is not a perfect square but has a factor that is a perfect square?**

  - Simplify: $\sqrt{24}$ =

What is the highest factor of 24 that is also a perfect square? ______. Therefore, 24 = ____ • _____

  - Simplify: $\sqrt{32}$ =

What is the highest factor of 32 that is also a perfect square? ______. Therefore, 32 = ____ • _____

  - Simplify: $\sqrt{54}$

What is the highest factor of 54 that is also a perfect square? ______. Therefore, 54 = ____ • _____

PERFECT SQUARES:

- Classwork:

1. $\sqrt{18}$	2. $\sqrt{20}$	3. $\sqrt{40}$	4. $\sqrt{50}$	5. $\sqrt{63}$
6. $\pm\sqrt{63}$	7. $\sqrt{48}$	8. $\sqrt{98}$	9. $2\sqrt{75}$	10. $\frac{1}{2}\sqrt{256}$

Math 2
Unit 3 – Quadratic Functions Continued
Lesson 1 → Simplifying Square Roots **HOMEWORK**

Name________________________________
Date__________________________Pd______

1. $5\sqrt{50}$	2. $3\sqrt{32}$	3. $-\sqrt{52}$	4. $\frac{1}{6}\sqrt{99}$	5. $\pm\sqrt{48}$
6. $2\sqrt{18}$	7. $-4\sqrt{12}$	8. $5\sqrt{24}$	9. $\frac{-1}{2}\sqrt{20}$	10. $5\sqrt{500}$
11. $-\sqrt{44}$	12. $12\sqrt{60}$	13. $-10\sqrt{80}$	14. $\frac{1}{2}\sqrt{8}$	15. $\pm\sqrt{12}$
16. $3\sqrt{250}$	17. $-\frac{4}{5}\sqrt{50}$	18. $\pm 7\sqrt{90}$	19. $3\sqrt{10}$	20. $\pm 2\sqrt{117}$

Math 2
Unit 3 – Quadratic Functions Continued
Lesson 2 → Sets of Numbers

Name______________________________
Date__________________________Pd______

In mathematics, the numbers we use can be categorized into sets. Our number system has two sets, the real numbers and the complex numbers. We will work with both the real numbers and the complex numbers in this course.

- **DEFINITIONS:**

REAL NUMBERS is the set of rational numbers and irrational numbers.

COUNTING NUMBERS OR NATURAL NUMBERS is the set of numbers defined by {1, 2, 3, 4, 5, ...}.

WHOLE NUMBERS is the set of numbers defined by {0, 1, 2, 3, 4, 5, ...}.

INTEGERS is the set of numbers defined by {..., -3, -2, -1, 0, 1, 2, 3, ...} or the set of all positive and negative whole numbers.

RATIONAL NUMBERS is the set of numbers defined by $\{\frac{p}{q} \mid p \text{ and } q \text{ are integers}, q \neq 0\}$ or the set of numbers in which the decimal terminates or the decimal repeats.

Examples: These are all **rational** numbers.

$\frac{1}{2} = 0.5$ *terminated decimal*

$\frac{-2}{3} = -0.6666\ldots$ *repeating decimal*

$\frac{2}{7} = 0.285714285\ldots$ *repeating decimal*

$\frac{9}{4} = 2.25$ *terminated decimal*

$5 = 5.0$ *terminated decimal*

$-\frac{12}{3} = 4.0$ *terminated decimal*

$\sqrt{4} = 2.0$ *terminated decimal*

IRRATIONAL NUMBERS is the set of numbers in which the decimal does not terminate and does not repeat.

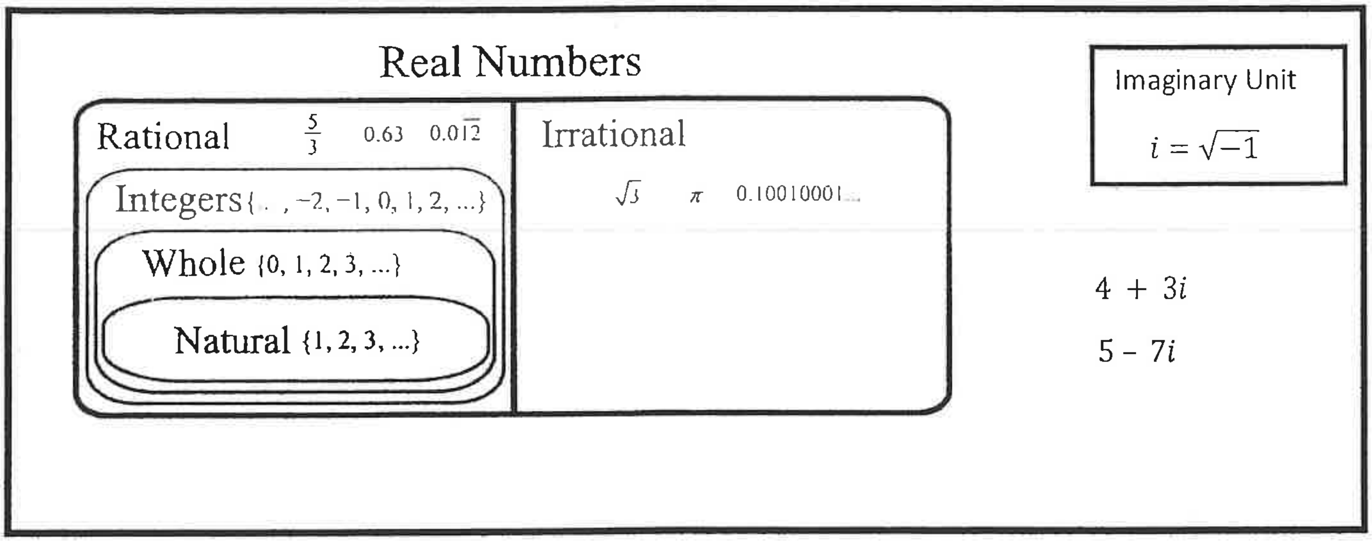
Examples: These are all **irrational** numbers.

$\sqrt{2} = 1.414213562\ldots$ *does not terminate nor repeats*

$\pi = 3.141592654\ldots$ *does not terminate nor repeats*

$\frac{\sqrt{3}}{5} = 0.3464101615\ldots$ *does not terminate nor repeats*

COMPLEX NUMBERS



COMPLEX NUMBERS: the set of numbers including the Real Numbers and the imaginary unit, i. Complex number are written in the form $\boldsymbol{a + bi}$ where a is the real part and bi is the imaginary part.

IMAGINARY UNIT:

Some polynomial equations have complex (non-real) solutions, when a negative number is under the radical symbol.

For example: there is no real solution to $\sqrt{-16}$ or $\sqrt{-36}$.

Mathematicians created a new system of numbers using the imaginary unit, i, defined as $i = \sqrt{-1}$. With this new system of numbers, radicals of negative numbers can now be simplified!

Therefore: $\boldsymbol{i = \sqrt{-1}}$

Simplify:

$\sqrt{-16}$ = ______________ $\sqrt{-36}$ = ______________

$\sqrt{-20}$ = ______________ $\sqrt{-27}$ = ______________

$\sqrt{-45}$ = ______________ $\sqrt{-75}$ = ______________

Math 2
Unit 3 – Quadratic Functions Continued
Lesson 2 → Sets of Numbers **HOMEWORK**

Name________________________
Date____________________Pd______

- Determine whether each number is **rational** or **irrational**:

6	$\frac{5}{6}$	$\sqrt{6}+\sqrt{3}$	$1-\pi$	$5+\sqrt{6}$
$0.\overline{6}$	π	$\frac{\pi}{2}$	$\frac{\sqrt{6}}{\sqrt{3}}$	0.45
-6	$0.456789\ldots$	$4+\sqrt{3}$	0	$0.\overline{273}$

- Express each number in terms of ***i*** and then **simplify**:

1. $\sqrt{-36}$	2. $\sqrt{-100}$	3. $-\sqrt{-81}$	4. $2\sqrt{-49}$
5. $\frac{1}{8}\sqrt{-64}$	6. $\frac{-2}{3}\sqrt{-9}$	7. $\frac{3}{4}\sqrt{-144}$	8. $\frac{1}{3}\sqrt{-25}$
9. $\sqrt{-\frac{1}{4}}$	10. $\sqrt{-\frac{16}{25}}$	11. $4\sqrt{-\frac{49}{64}}$	12. $\frac{3}{5}\sqrt{-\frac{100}{9}}$
13. $\sqrt{-3}$	14. $\sqrt{-29}$	15. $3\sqrt{-11}$	16. $-\sqrt{-10}$
17. $\sqrt{-20}$	18. $-\sqrt{-28}$	19. $2\sqrt{-75}$	20. $5\sqrt{-8}$
21. $3\sqrt{-98}$	22. $-2\sqrt{-75}$	23. $\pm\sqrt{-45}$	24. $\frac{3\sqrt{7}}{\sqrt{-28}}$

Foundations of Math 2
Unit 7 - Solving More Quadratic Equations
Lesson 2 → Quadratic Formula

Name: ____________________
Date: ________________ Pd: ___

➢ Simplify:

1. $\sqrt{9} =$ ________	2. $\sqrt{25} =$ ________	3. $\sqrt{81} =$ ________	4. $\sqrt{121} =$ ________

If a number is a perfect square, simplify it.
If not, leave the number in radical form (do not change into a decimal).

There are many methods that can be used to solve a quadratic equation:

1) Graphing the related parabola → look for x-intercepts
2) Solve by Factoring → equation must be equal to 0
3) Square Root Property: $If\ x^2 = a,\ then\ x = \pm\sqrt{a}$
4) Completing the Square → works best when $a = 1$ and $b\ is\ an\ even\ number$
5) **QUADRATIC FORMULA**

- Quadratic Equation: $\boxed{ax^2 + bx + c = 0}$
- Practice evaluating $\boxed{b^2 - 4ac}$ and $\boxed{2a}$

1. $2x^2 + 3x - 5 = 0$ $\boxed{b^2 - 4ac}$: $\boxed{2a}$:	2. $x^2 + 4x + 1 = 0$ $\boxed{b^2 - 4ac}$: $\boxed{2a}$:	3. $3x^2 - 2x + 3 = 0$ $\boxed{b^2 - 4ac}$: $\boxed{2a}$:
4. $x^2 - 6x - 2 = 0$ $\boxed{b^2 - 4ac}$: $\boxed{2a}$:	5. $-4x^2 + x + 5 = 0$ $\boxed{b^2 - 4ac}$: $\boxed{2a}$:	6. $-x^2 + 2x + 6 = 0$ $\boxed{b^2 - 4ac}$: $\boxed{2a}$:

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

✓ Used to solve for x in the equation $ax^2 + bx + c = 0$

✓ The Quadratic Formula is most helpful to solve for x **when the equation will not factor**.

1. $2x^2 - x - 6 = 0$ $x =$ __________	$b^2 - 4ac$ $2a$	2. $x^2 + 4x - 9 = 0$ $x =$ __________	$b^2 - 4ac$ $2a$
3. $x^2 + 3x - 5 = 0$ $x =$ __________	$b^2 - 4ac$ $2a$	4. $x^2 - 10x + 25 = 0$ $x =$ __________	$b^2 - 4ac$ $2a$
3. $6x^2 + 6x + 5 = 0$ $x =$ __________	$b^2 - 4ac$ $2a$	4. $5x^2 - 2x - 2 = 0$ $x =$ __________	$b^2 - 4ac$ $2a$

Foundations of Math 2
Unit 7 - Solving More Quadratic Equations
Lesson 2 → Quadratic Formula **PRACTICE**

Name: ____________________
Date: ________________ Pd: ___

1. $4x^2 + 11x - 20 = 0$ $x =$ ____________	$b^2 - 4ac$ $2a$	2. $x^2 - 3x - 3 = 0$ $x =$ ____________	$b^2 - 4ac$ $2a$
3. $x^2 + x - 1 = 0$ $x =$ ____________	$b^2 - 4ac$ $2a$	4. $4x^2 + 6x - 1 = 0$ $x =$ ____________	$b^2 - 4ac$ $2a$
5. $x^2 + 3x - 10 = 0$ $x =$ ____________	$b^2 - 4ac$ $2a$	6. $5x^2 + 3x + 1 = 0$ $x =$ ____________	$b^2 - 4ac$ $2a$
7. $5x^2 + 50x + 125 = 0$ $x =$ ____________	$b^2 - 4ac$ $2a$	8. $2x^2 + 18x + 39 = 0$ $x =$ ____________	$b^2 - 4ac$ $2a$

Foundations of Math 2
Unit 7 - Solving More Quadratic Equations
Lesson 2 → Quadratic Formula **CLASSWORK**

Name: ______________________
Date: __________________ Pd: ___

1. $4x^2 + 8x - 1 = 0$ $x =$ __________	$b^2 - 4ac$ $2a$	2. $x^2 - 10x + 25 = 0$ $x =$ __________	$b^2 - 4ac$ $2a$
3. $4x^2 + 11x - 20 = 0$ $x =$ __________	$b^2 - 4ac$ $2a$	4. $x^2 + 2x + 4 = 0$ $x =$ __________	$b^2 - 4ac$ $2a$
5. $x^2 + 8x + 5 = 0$ $x =$ __________	$b^2 - 4ac$ $2a$	6. $x^2 + 12x - 4 = 0$ $x =$ __________	$b^2 - 4ac$ $2a$
7. $x^2 - 6x + 63 = 0$ $x =$ __________	$b^2 - 4ac$ $2a$	8. $2x^2 + 12x - 18 = 0$ $x =$ __________	$b^2 - 4ac$ $2a$

Math 2
Unit 3 – Quadratic Functions Continued
Lesson 4 → Quadratic Formula

Name_______________________________
Date_________________________Pd_____

- Ways to solve quadratic equations in standard for $(ax^2 + bx + c = 0)$:

FACTORING:	COMPLETEING the SQUARE:	QUADRATIC FORMULA
$x^2 - 7x + 12 = 0$ $x =$ ______________	$x^2 - 6x + 12 = 0$ $x =$ ______________	$x^2 - 6x + 12 = 0$ (this is what we will learn today)

- The Quadratic Formula is used to solve **any** quadratic equation, especially those that will not factor.

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

- Examples: Solve using the Quadratic Formula

1. $x^2 - 5x - 24 = 0$	2. $x^2 + 5x + 5 = 0$
3. $4x^2 + 8x - 1 = 0$	4. $4x^2 + 11x - 20 = 0$
5. $x^2 - 10x = -25$	6. $x^2 + 2x + 4 = 0$

Math 2
Unit 3 – Quadratic Functions Continued
Lesson 4 → Quadratic Formula **HOMEWORK**

Name________________________________
Date__________________________ Pd_____

- Solve using the Quadratic Formula → $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
- Express answers in simplest radical form or complex form. NO DECIMALS!!

1. $4x^2 + 11x - 20 = 0$	2. $x^2 - 5x - 24 - 0$
3. $x^2 - 3x - 3 = 0$	4. $x^2 + 5x + 5 = 0$
5. $x^2 + x - 1 = 0$	6. $4x^2 + 8x = 1$

7. $4x^2 + 7x - 15 = 0$	8. $x^2 + 3x - 10 = 0$
9. $x^2 - x + 3 = 0$	10. $2x^2 - 14x + 23 = 0$
11. $x^2 - 2x - 48 = 0$	12. $2x^2 + 18x + 39 = 0$
13. $5x^2 + 3x + 1 = 0$	14. $5x^2 + 50x + 125 = 0$

Math 2
Unit 3 – Quadratic Functions Continued
Review for Quiz #2

Name________________________
Date________________________Pd______

Solve using the best method: **Factoring, Completing the Square or Quadratic Formula**
Express all solutions in simplest form.

1. $x^2 + 4x - 9 = 13$	2. $x^2 + 7x + 12 = 0$
3. $7(x-3)^2 = 35$	4. $4x^2 = 36$
5. $x^2 = 81$	6. $x^2 + 9x + 38 = 13$
7. $3x^2 - 6x = 13$	8. $x^2 + 6x - 8 = 0$
9. $x^2 = 3x + 8$	10. $x^2 - 121 = 0$
11. $(x+2)^2 - 6 = 11$	12. $5x^2 - 7x + 13 = 0$

Math 2
Unit 3 – Quadratic Functions Continued
Lesson 3 → Completing the Square

Name________________________________
Date__________________________Pd______

Forms of a quadratic equation:

- Vertex Form: $y = a(x-h)^2 + k$
- Standard Form: $y = ax^2 + bx + c$
  - ✓ If an equation is in standard form we can use the graphing calculator to find the vertex.

❖ Complete the information for each parabola by graphing on the calculator.

$y = -2x^2 - 12x - 16$	$y = 3x^2 + 10x - 2$	$y = 2x^2 + 15x + 29$
1. Vertex:	1. Vertex:	1. Vertex:
2. Maximum or Minimum	2. Maximum or Minimum	2. Maximum or Minimum
3. Axis of Symmetry:	3. Axis of Symmetry:	3. Axis of Symmetry:
4. y – intercept:	4. y – intercept:	4. y – intercept:
5. x – intercepts:	5. x – intercepts:	5. x – intercepts:
6. Domain:	6. Domain:	6. Domain:
7. Range:	7. Range:	7. Range:

- How can we solve a quadratic equation that has **irrational** or **complex** solutions?

❖ **COMPLETING THE SQUARE** will allow us to find all solutions (rational, irrational & imaginary).

1) **REWRITE** as $x^2 + bx + c = 0$ as $x^2 + bx = -c$
2) $x^2 + bx +$ _____ $= -c +$ _____
3) **COMPLETE THE SQUARE** by taking half of b; square it and ADD IT TO BOTH SIDES of the equation in the blanks.
4) **FACTOR** the perfect square trinomial.
5) Take the **SQUARE ROOT** of both sides. Don't forget to include a $\pm$ to create 2 solutions.
6) **SOLVE** both equations. **SIMPLIFY** all irrational and complex solutions.

1. $x^2 - 6x + 8 = 0$	2. $x^2 + 16x - 16 = 0$

3. $x^2 + 12x + 43 = 0$	4. $x^2 - 2x - 15 = 0$

1) **BEGIN** with $ax^2 + bx + c = 0$ and **MULTIPLY** "a" to "c"
2) **REWRITE** $x^2 + bx = -c \cdot a$
3) $x^2 + bx +$ _____ $= -c \cdot a +$ _____
4) **COMPLETE THE SQUARE** by taking half of b; square it and ADD IT TO BOTH SIDES of the equation in the blanks.
5) **FACTOR** the perfect square trinomial.
6) Take the **SQUARE ROOT** of both sides. Don't forget to include a $\pm$ to create 2 solutions.
7) **SOLVE** both equations. **SIMPLIFY** all irrational and complex solutions.
8) **DIVIDE** by "a" and **REDUCE** all final solutions.

5. $3x^2 + 10x - 8 = 0$	6. $4x^2 - 8x + 3 = 0$
7. $4x^2 - 16x + 71 = 0$	8. $2x^2 + 5x - 4 = 0$

Math 2
Unit 3 – Quadratic Functions Continued
Lesson 3 → Completing the Square **HOMEWORK**

Name________________________________
Date__________________________Pd______

❖ **SOLVE BY COMPLETING THE SQUARE:**

1. $x^2 + 14x - 51 = 0$	2. $x^2 - 12x + 23 = 0$
3. $x^2 - 4x + 6 = 0$	4. $x^2 - 10x + 18 = 0$
5. $x^2 + 18x - 40 = 0$	6. $x^2 + x + 9 = 0$
7. $x^2 + 2x + 20 = 0$	8. $x^2 + 4x + 7 = 0$

❖ Remember the DRS method:	
9. $3x^2 - 8x + 4 = 0$	10. $3x^2 - 2x - 5 = 0$
11. $2x^2 - 2x - 5 = 0$	12. $10x^2 + 4x + 68 = 0$

Foundations of Math 2
Unit 7 - Solving More Quadratic Equations
QUIZ REVIEW PROBLEMS

Name: ____________________
Date: ________________ Pd: ___

Solve by factoring.

1.) $x^2 - 64 = 0$

2.) $8x^2 - 2x - 3 = 0$

3.) $x^2 + 3x - 40 = 0$

4.) $2x^2 + 3x + 1 = 0$

5.) $4x^2 - 8x = 0$

6.) $x^2 + 5x - 14 = 0$

Solve by square roots.

7.) $x^2 = 81$

8.) $(4x - 3)^2 = 25$

9.) $x^2 = 17$

10.) $(x - 5)^2 = 45$

Solve by completing the square.

11.) $x^2 - 2x - 3 = 0$

12.) $x^2 + 2x - 14 = 0$

Solve using the quadratic formula.

13. $2x^2 + 5x + 3 = 0$ $x =$ __________	$\boxed{b^2 - 4ac}$ $\boxed{2a}$	14. $2x^2 + x - 6 = 0$ $x =$ __________	$\boxed{b^2 - 4ac}$ $\boxed{2a}$
15. $3x^2 - 2x - 5 = 0$ $x =$ __________	$\boxed{b^2 - 4ac}$ $\boxed{2a}$	16. $x^2 - 2x - 5 = 0$ $x =$ __________	$\boxed{b^2 - 4ac}$ $\boxed{2a}$
17. $2x^2 - 6x - 9 = 0$ $x =$ __________	$\boxed{b^2 - 4ac}$ $\boxed{2a}$	18. $x^2 - 12x + 36 = 0$ $x =$ __________	$\boxed{b^2 - 4ac}$ $\boxed{2a}$

Math 2 – Honors
Unit 3 – Quadratic Functions Continued

Name______________________
Date__________________ Pd_____

Solve using the best method: **Factoring, Completing the Square or Quadratic Formula**
Express all solutions in simplest form.

1. $x^2 + 4x - 9 = 13$	2. $x^2 + 7x + 12 = 0$
3. $7(x-3)^2 = 35$	4. $4x^2 = 36$
5. $x^2 = 81$	6. $x^2 + 9x + 38 = 13$
7. $3x^2 - 6x = 13$	8. $x^2 + 6x - 8 = 0$
9. $x^2 = 3x + 8$	10. $x^2 - 121 = 0$
11. $(x+2)^2 - 6 = 11$	12. $5x^2 - 7x + 13 = 0$