DESTINATION Math®

Mastering Algebra I:

Course II
Print Activities

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Destination Math
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Mastering Algebra I: Course II

Name ______________________ Date ______________________

Notes to the Teacher

Welcome to *Destination Math.* The student materials in this packet are designed to help students as they progress through the course. These materials, which remain consistent with the philosophy of *Destination Math,* are specifically intended to:

- keep students focused on the instruction.
- provide students an opportunity to take notes, record information from the program, and reflect on the tutorials.
- allow students an opportunity for additional practice of the instruction in each session.
- provide a more open-ended assessment of the concepts in each session.
- use real-world examples and situations that students can identify with.

There is a set of materials designed to support each session. Each set consists of:

- **Student Logbook:** This sheet is designed for students to use while viewing the tutorials. It consists of a one-page worksheet where students can record information from the tutorial, take notes, and reinforce their understanding.
- **Your Turn:** This is a one-page worksheet that provides additional practice for each session. It is designed for students to complete away from the computer to reinforce the concepts they have studied. It may also serve as a guide to what students need to review to complete their mastery of algebraic concepts.

In addition, two sets of materials are provided to cover all the concepts presented in each unit.

- **Unit Assessment:** The assessment has two pages of problems that cover all skills and concepts in the unit.
- **Unit Investigation:** This two page activity is designed to explore an algebraic concept that serves as he theme for the unit. It can be used as an initial exploration or as a culminating activity.

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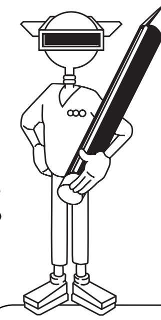
MASTERING ALGEBRA I: Course 2
MODULE 1: **The Real Number System**
UNIT 1: **Rational & Irrational Numbers**

Student Logbook



Defining the Real Numbers

As you work through the tutorial, complete the following questions or sentences.

1. A rational number is a number that is a ratio between two____________, as long as the integer in the denominator is not ___________.

2. A rational number, when expressed as a decimal, either ________________________or________________________.

3. The property of density states that between any ________ numbers, there is always another___________.

4. An irrational number is a number that cannot be expressed as a ____________________between_________________.

5. When expressed as a decimal, an irrational number is neither __________________________nor______________________.

6. The property of density is true for both ___________________and __________________ numbers.

7. Together, the sets of rational numbers and irrational numbers make up the set of_________________numbers.

8. The radical symbol, $\sqrt{}$, expresses the square____________ of any number.

9. The irrational number $\sqrt{5}$ is expressed exactly when written in ______________form.

Key Words:
Integer
Whole number
Rational number
Radical
Property of density
Irrational number
Real number
Root

Learning Objectives:
- Define rational numbers.
- Define irrational numbers
- Use the Pythagorean theorem to demonstrate the existence of irrational numbers.
- Approximate the square roots of a set of real numbers and locate them on a number line.

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MASTERING ALGEBRA I: Course 2
MODULE 1: **The Real Number System**
UNIT 1: **Rational & Irrational Numbers**

Your Turn

Defining the Real Numbers

1. Write each rational number in three different ways using equivalent ratios.

a. -6 ________ ________ ________

b. $\frac{1}{5}$ ________ ________ ________

c. $-\frac{8}{3}$ ________ ________ ________

d. $2\frac{1}{4}$ ________ ________ ________

2. Write each rational number as a decimal. If it is a repeating decimal, use the bar notation to indicate the repeating pattern.

a. $\frac{3}{8}$________ **a.** $\frac{2}{9}$ ________

c. $\frac{7}{2}$________ **d.** $\frac{5}{7}$ ________

3. Which rational number lies between 1.22234 and 1.222346?

____

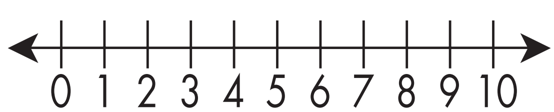
4. Give an example of an irrational number expressed first in its radical form and then in its decimal form.________________

____

5. Approximate the square root of each of the following real numbers to the nearest thousandth. Then plot the approximate locations of the square roots on the number line.

a. $\sqrt{7} \approx$__________ **b.** $\sqrt{35} \approx$__________

c. $\sqrt{22} \approx$__________ **d.** $\sqrt{14} \approx$__________



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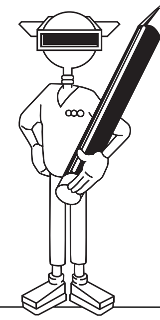
MASTERING ALGEBRA I: Course 2
MODULE 1: **The Real Number System**
UNIT 1: **Rational & Irrational Numbers**

Student Logbook



Working with Radicals

As you work through the tutorial, complete the following questions or sentences.

1. In the formula for the circumference of a circle, $C = 2\pi r$, the irrational number π is approximately equal to ____________.

2. In the formula for the speed of a tidal wave, $s = 3.1\sqrt{d}$, the value of s can be rational or irrational, depending on the value of ________.

3. The expression under a radical symbol is called the _______________ .

4. List the first five non-zero perfect squares: ______, ______, ______, ______, ______

5. The property of perfect squares states that if $a \geq 0$, then____________.

6. The principal square root of a real number is the __________________ _____________ ______________of a number.

7. Complete the statement $\sqrt{a} \times \sqrt{b} =$________________.

8. Expressed in its simplest radical form, $\sqrt{250}$ is written as ___________.

9. Complete the statement $\sqrt{\frac{a}{b}} =$________, where $b \neq 0$.

10. To ____________ means to convert the _______________ of a fraction under a radical sign to a ________number.

11. To add or subtract radicals, express the radicals in ________ form and then combine___________radicals.

Key Words:

Perfect square
Principal square root
Radical
Radicand
Rationalize

Learning Objectives:

- Evaluate the square root of a perfect square.
- Simplify the square root of a product.
- Simplify the quotient of two radicals.
- Rationalize the denominator of a radical expression.
- Add or subtract radical expressions using the distributive property.

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MASTERING ALGEBRA I: Course 2
MODULE 1: **The Real Number System**
UNIT 1: **Rational & Irrational Numbers**

Working with Radicals

Your Turn

1. Use the property of perfect squares to complete each expression.

a. $\sqrt{81} = \sqrt{(___)^2} = $ ________

b. $\sqrt{______} = \sqrt{25^2} = $ ________

c. $\sqrt{\_\_\_\_\_\_} = \sqrt{(\_\_\_)^2} = 12$

2. List the first five consecutive perfect squares greater than 100.

______ ______ ______ ______ ______

3. Express each radical in simplest form.

a. $\sqrt{160}$ ________ **b.** $5\sqrt{108}$ ________ **c.** $-\frac{1}{14}\sqrt{490}$ ____

4. Simplify the product $(3\sqrt{4^3})\ (-2\sqrt{28})$. ____________________

5. Simplify the expression $\frac{\pi}{3}\sqrt{\frac{8}{32}}$ ____________________

6. Rationalize each denominator.

a. $\sqrt{\frac{1}{6}}$ ________ **b.** $\sqrt{\frac{3}{11}}$ ________ **c.** $\sqrt{\frac{2}{7}}$ ________

7. Simplify these radical expressions by rationalizing the denominators.

a. $\frac{8\sqrt{32}}{8\sqrt{50}}$ ________ **b.** $\frac{\sqrt{1000}}{\sqrt{8}}$ ________ **c.** $\sqrt{\frac{36}{27}}$ ________

8. Simplify the expression $7\sqrt{2} + 3\sqrt{18}$. ____________________

9. The formula $t = \sqrt{\frac{2s}{9.8}}$ gives the time, t, in seconds that it takes an object at rest to fall s meters, where 9.8 is the acceleration due to gravity, in meters per second squared. How many seconds will it take an object to fall 58.8 meters? Write your answer in simplest radical form.____________________________

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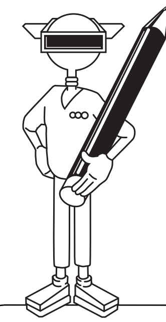
MASTERING ALGEBRA I: Course 2
MODULE 1: **The Real Number System**
UNIT 1: **Rational & Irrational Numbers**

The Square Root Function

Student Logbook



As you work through the tutorial, complete the following questions or sentences.

1. If x represents the area of a square, then__________represents the length of its side.

2. Explain how you know that the square root relationship is not linear.

____

____

3. Why is the square root relationship a function? ______________________

____

4. To______________is to estimate the value of a function between two known values in the ______________,

5. To ______________is to infer the value of a function in an unobserved interval from values in an already ______________interval.

6. What set of numbers describes the domain of the square root function?

____

7. What set of numbers describes the range of the square root function?

____

8. In the equation $y = 3.1\sqrt{x}$, the coefficient 3.1 is called a __________.

9. For graphs of functions in the form $y = a\sqrt{x}$, the value of a affects the ______________________________of the graph and determines the ____________________through which the graph passes.

Key Words:
Square root
Domain
Range
Interpolate
Extrapolate
Parameter
Nonlinear function

Learning Objectives:
- Graph a finite set of ordered pairs (x, $\sqrt{x}$).
- Graph the square root function.
- Identify the domain, range, and equation of the square root function.
- Examine the effect of a on the graph of $y = a\sqrt{x}$.

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MASTERING ALGEBRA I: Course 2
MODULE 1: **The Real Number System**
UNIT 1: **Rational & Irrational Numbers**

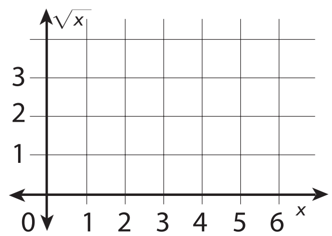
The Square Root Function

Your Turn

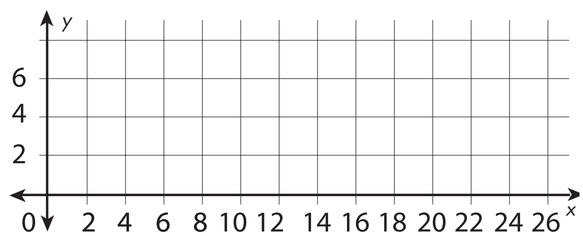
1. Complete the table of values below. Round values of $\sqrt{x}$, to two decimal places.

x	0	1.3	2.0	2.7	3.4	4.8	5.2	5.9
$\sqrt{x}$								

2. Plot the points in the table above on these axes.



3. Graph the square root function $y = \sqrt{x}$ for values of x from 0 to 25.



4. Identify the graph of each equation by matching the number of the graph to the corresponding equation.

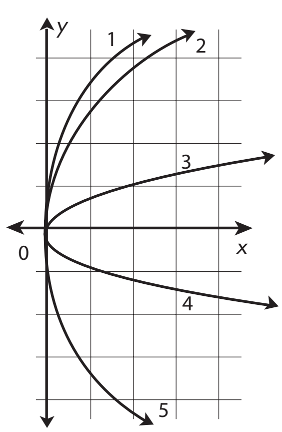
a. $y = 0.7\sqrt{x}$ ____________

b. $y = -\frac{2}{3}\sqrt{x}$ ____________

c. $y = 2.4\sqrt{x}$ ____________

d. $y = 3\sqrt{x}$ ____________

e. $y = -3\sqrt{x}$ ____________



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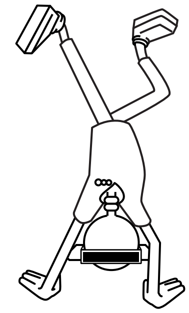
MASTERING ALGEBRA I: Course 2
MODULE 1: **The Real Number System**
UNIT 1: **Rational & Irrational Numbers**



Unit Assessment

1. Identify each number as rational or irrational. Justify your answer.

a. 0.35621 ________ **b.** $\frac{12.5}{7}$ ________

c. $.5\pi$ ________ **d.** 0.552552________

e. $-\sqrt{9}$ **f.** $\sqrt{8}$________

g. $12.31\overline{45}$________ **h.** 2.121121112.________

2. Is it always, sometimes, or never true that a rational number can be expressed as a terminating decimal?_____________

3. Is it always, sometimes, or never true that an irrational number can be expressed as a nonterminating decimal? ___________

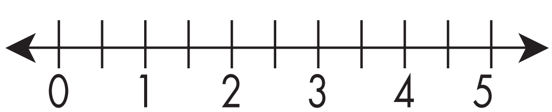
4. In a right triangle with sides of length *a* and *b* and *a* hypotenuse of length *c*, the Pythagorean theorem states that $a^2 + b^2 = c^2$. Determine whether the length of the hypotenuse of a right triangle whose sides are 4 units and 5 units long is a rational or irrational number.____________
Explain your answer. ____
____
____

5. Each pair of numbers below represents the lengths of the sides of a right triangle. Which pairs represent the legs of a right triangle where hypotenuse has a length that is irrational? Circle your answers.

a. (12, 5) **b.** (12, 13) **c.** (8, 15) **d.** (2, 4)

6. Plot each irrational number on the number line below.

a. $\sqrt{0.2}$ **b.** $\sqrt{17}$ **c.** $\sqrt{3}$ **d.** $\sqrt{1.4}$



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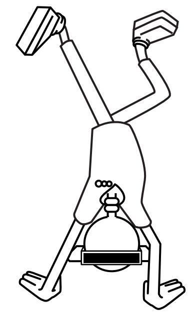
Name ______________________ Date ______________

Unit Assessment



7. Which statements below are true if $a \neq b$ and $b \neq 0$? Circle your answer.

a. $\sqrt{a+b} = \sqrt{a} + \sqrt{b}$ **b.** $\sqrt{a-b} = \sqrt{a} - \sqrt{b}$

c. $\sqrt{a \times b} = \sqrt{a} \times \sqrt{b}$ **d.** $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$, $b \neq 0$

8. Express each radical expression in its simplest radical form.

a. $\sqrt{75}$ ________ **b.** $\sqrt{0.0036}$ ________

c. $\sqrt{5} \times \sqrt{85}$ ________ **d.** $\sqrt{98 \times 14}$ ________

e. $\sqrt{\frac{96}{2}}$ ________ **f.** $\frac{\sqrt{96}}{\sqrt{8}}$ ________

g. $\sqrt{180} - \sqrt{45}$ ________ **h.** $3\sqrt{12} + 4\sqrt{108}$ ________

i. $\sqrt{\frac{9}{5}}$ ________ **j.** $\frac{2}{\sqrt{10}} \times \frac{5}{\sqrt{2}}$ ________

9. Which of the following ordered pairs describe points that lie on the graph of $y = \sqrt{x}$? Circle your answers.

a. (1.8, 1.34) **b.** (2, 4) **c.** (16, 4) **e.** (4.90, 24)

10 Identify the graph of each equation by matching the number of the graph with the corresponding equation.

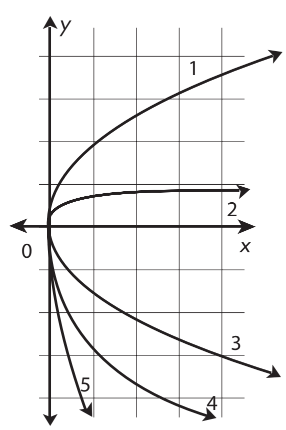
a. $y = -\frac{12}{5}\sqrt{x}$ ________

b. $y = -\frac{3}{2}\sqrt{x}$ ________

c. $y = \frac{1}{3}\sqrt{x}$ ________

d. $y = -\frac{11}{2}\sqrt{x}$ ________

e. $y = \frac{7}{4}\sqrt{x}$ ________



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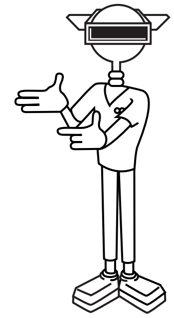
MASTERING ALGEBRA I: Course 2
MODULE 1: **The Real Number System**
UNIT 1: **Rational & Irrational Numbers**



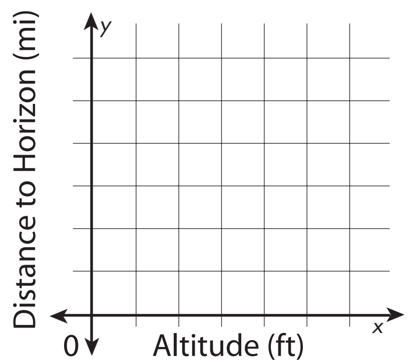
Unit Investigation

Exploring the View from an Aircraft

When flying on a clear day, you can see all the way to the horizon. However, because the Earth is nearly a sphere, it is not possible to see beyond the horizon even with binoculars or a telescope.

The approximate distance in miles to the horizon is given by the formula $d = 1.22\sqrt{x}$, where x represents the altitude in feet.

1. Graph this function, scaling the horizontal axis to include values from 0 to 35,000 and the vertical axis to include values from 0 to 300.



2. List the coordinates of five reference points from the graph________

________ ________ ________ ________

3. What does the point whose x-coordinate is zero represents?

____

4. Use the graph to find the approximate distance to the nearest ten, to the horizon from an aircraft at an altitude of 30,000 feet.________

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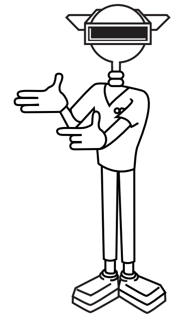

Unit Investigation

5. Use the graph to find the approximate altitude to the nearest thousand, of an aircraft whose distance from the horizon is 100 miles. ____________.

6. Use the graph to find the approximate altitude to the nearest thousand, of an aircraft whose distance from the horizon is 200 miles.____________

7. Calculate to the nearest ten, how the distance to the horizon changes as the altitude of the plane decreases from 35,000 feet to 25,000 feet. Show your work.

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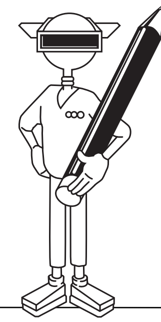
MASTERING ALGEBRA I: Course 2
MODULE 2: **Powers & Polynomials**
UNIT 1: **Polynomial Arithmetic**

Student Logbook



Working with Powers

As you work through the tutorial, complete the following questions or sentences.

1. An ____________ indicates the number of times a __________ is used as a factor.

2. Any non-zero number raised to the zero power equals ___________.

3. $a^{-n} =$ ________, where $a \neq 0$ and n is an integer.

4. A non-zero number raised to a power is equal to the ______________ of the number raised to the _________ of that power.

5. In the example $10^{11} \times 10^{2}$, you can multiply these two expressions because each factor has the same __________.

6. For any non-zero real number a, $a^r \times a^s =$__________, where r and s are ______________.

7. For any non-zero real number a, $a^r \div a^s =$__________, where r and s are ______________.

8. For any non-zero real number a, $(a^r)^s =$__________, where r and s are ______________.

9. For any non-zero real numbers a and b $(ab)^n =$__________, where n is an ______________.

10. For any non-zero real numbers a and b $\left(\frac{a}{b}\right)^n =$__________, where n is an ______________.

Key Words:
Power
Base
Exponent

Learning Objectives:
- Simplify expressions containing negative exponents and 0.
- Simplify expressions involving the product and quotient of two powers.
- Simplify expressions involving the power.
- Simplify expressions involving the power of a product and a quotient.

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MASTERING ALGEBRA I: Course 2
MODULE 2: **Powers & Polynomials**
UNIT 1: **Polynomial Arithmetic**

Working with Powers

Your Turn

1. Express each of the following numbers as a power of a base that is a prime number.

a. 9________ **b.** $\frac{1}{9}$ ________

c. 3^{5-1} ________ **d.** $\frac{1}{3^{-2}}$ ________

2. 85° is equal to ____________.

3. Apply the laws of exponents and simplify the following expressions:

a. $b^{-3} \times b^{8}$ ________ **b.** $-(c^4)(3c^{-2})c$_______

c. $\frac{25°}{25^{-6}}$ ________ **d.** $3^3 \times (3^2)^{-2}$ _______

e. $(2x^3y^4)^5$ ________ **f.** $\left(\frac{5x}{2y}\right)^4$_______

4. The following chart shows approximate distance in Kilometers from the sun to some of the planets in our solar system. Complete the chart using scientific notation.

Planet	Approximate distance (km)	Distance in scientific notation
Mercury	58,000,000	
Earth	150,000,000	
Mars	230,000,000	
Saturn	1,400,000,000	
Pluto	5,900,000,000	

5. One kilometer is equal to 1,000 or 10^3 meters. Use scientific notation to express the distance in meters from Saturn to the sun. ______________

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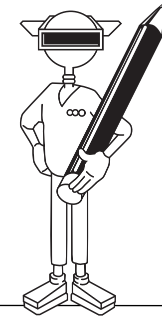
MASTERING ALGEBRA I: Course 2
MODULE 2: **Powers & Polynomials**
UNIT 1: **Polynomial Arithmetic**

Adding & Subtracting Polynomial Expressions

Student Logbook



As you work through the tutorial, complete the following questions or sentences.

1. The area of a square with sides of length x is written as _______.

2. A monomial in one variable is a term of the form______ , where a is a __________ ______________, x is a ___________________, and n is a _________________integer.

3. A _________________ is a monomial or a finite sum of unique monomials.

4. The polynomial expressions $x^2 + 2x + 1$ is a _______________. because it is made up of ___________ ______________________.

5. When the terms in a polynomial are arranged so that the exponents of the variable decrease from ____________ to ____________, the polynomial is said to be arranged in _____________ ____________.

6. When the terms in polynomial are arranged so that the exponents of the variable increase from __________ to ____________, the polynomial is said to be arranged in __________________ ___________________.

7. To determine if the sum of two polynomials is correct, substitute a _____________ ______________ for x. If you ______________ the expressions and the result is an ____________, then you know the sum is correct.

8. Why are x^2 and $2x$ not like terms? ________________________.

9. Fill in each box with an example of each type of expression.

Monomial	Binomial	Trinomial
__________	______________	______________

Key Words:

Monomial
Polynomial
Binomial
Trinomial
Descending order
Ascending order (opposite) of a polynomial

Learning Objectives:

- Explore the definitions related to polynomial expressions.
- Arrange the terms of a polynomial expression in ascending or descending order.
- Find the sum and difference of two (or more) polynomials.

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MASTERING ALGEBRA I: Course 2
MODULE 2: **Powers & Polynomials**
UNIT 2: **Polynomial Arithmetic**

Adding & Subtracting Polynomial Expressions

Your Turn

1. Is $2x^{-3}$ a monomial? ___________Explain your answer, using the definition of a monomial. ______________________________________

____

____

2. Simplify the following polynomial expressions. Then indicate whether the simplified expression is a monomial, a binomial, or a trinomial.

a. $-6 + 2x^2 + 9 + x - 3$__________________ __________________

b. $4s^{23} + 15s - 7s^{17} - 16s$__________________ __________________

3. Add the following polynomials and Write each sum in descending order.

a. $(5x^2 - 3x + 7) + (2x^3 + 5x^2 + x + 5)$__________________________

b. $(-3b^4 + b^2 - b) + (b^4 - b^2 + 4)$__________________________

c. $(9c^2 + 3c - 2) + (7c^3 - 3c^2 - 3c)$__________________________

4. Subtract the following polynomials and Write each difference in ascending order.

a. $(7a^3 - a) - (-4a^3 + 2a)$__________________________

b. $(8x^3 - 2x^2 + 1) - (4x^2 + x - 2)$__________________________

c. $(b^2 + b - 4) - (b^3 - 2b^2 - 4)$__________________________

5. The center pane in a panel of three windows has an area represented by the trinomial $2n^2 + 5n + 3$. Each side pane in the panel has an area represented by the binomial $n^2 + 2n$.

a. What is the total area of the two side panes in terms of n?__________

b. What is the area of the center pane and one side pane in terms of n?

____

c. What is the total area of the panel of three windows in terms of n?

____

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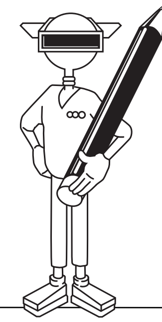
MASTERING ALGEBRA I: Course 2
MODULE 2: **Powers & Polynomials**
UNIT 1: **Polynomial Arithmetic**

Multiplying Polynomials

Student Logbook



As you work through the tutorial, complete the following questions or sentences.

1. The width of the front of the brochure is represented by the binomial ___________.

2. For the front cover of the brochure, the expression that demonstrates the application of the _____________ property to $(n + 10)(n + 1)$ is _________________.

3. The result of multiplying two binomials, is the _________ of four _____________.

4. What do the letters in FOIL represent when multiplying two binomials?

F ____________
O ____________
I ____________
L ____________

5. To check that a product is correct, ___________ a value for the variable and see if the result is an ________________.

6. For all real numbers a and b, $(a + b)^2$ = _______________.

7. For all real numbers a and b, $(a - b)^2$ is equal to the trinomial ____________________.

8. For all real numbers a and b, $(a + b)(a - b)$ is equal to ____________________.

Key Words:

Product
Factor
Binomial
Trinomial
Perfect square trinomial

Learning Objectives:

- Use an area model to represent the product of two binomials.
- Use the distributive property to find the product of two polynomials.
- Recognize the square of a binomial as a perfect square trinomial.
- Recognize the product of the sum and difference of two monomials as the difference of two squares.

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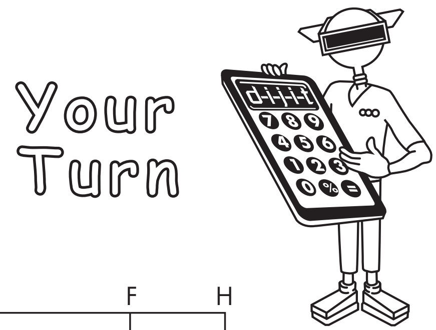
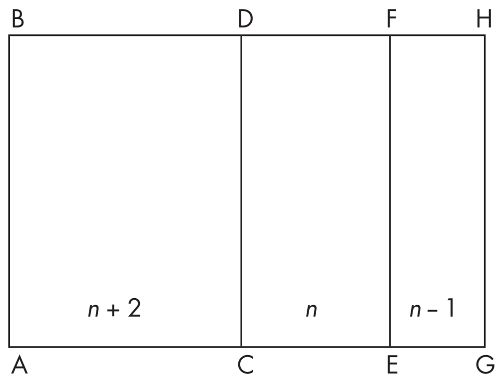
MASTERING ALGEBRA I: Course 2
MODULE 2: **Powers & Polynomials**
UNIT 1: **Polynomial Arithmetic**

Multiplying Polynomials



1. Express the area of each rectangle in this diagram as the product of its length and width, and as a trinomial in terms of *n*.



a. Rectangle *ABDC* ____________________=____________________

b. Rectangle *CDFE* ____________________=____________________

c. Rectangle *EFHG* ____________________=____________________

d. Rectangle *ABHG* ____________________=____________________

2. Use the FOIL method to multiply and simplify $(n + 3)(4n - 2)$.

3. Find the square of the following binomials. Verify that your answers are correct by substituting −2 for the variable.

a. $(3b + 2)^2$____________________

b. $(5y + 3)^2$____________________

4. The product of $(x + 4)(x - 4)$ is ___________.

5. The length of one panel of a greeting card is *n*. The width is $n + 8$. If the greeting card consists of two panels of equal size, what is the area of the card in terms of *n*? _____________ Explain how you arrived at your answer. ____

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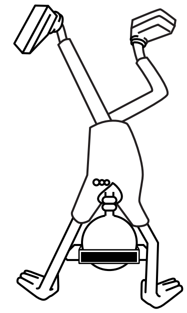
MODULE 2: **Powers & Polynomials**
UNIT 1: **Polynomial Arithmetic**

Unit Assessment



1. Which of the following expressions are equivalent to $\frac{1}{4^{-2}}$? ____________

a. 4^{-2} **b.** 4^{2}

c. 16 **d.** $\frac{1}{8}$

2. Simplify each of the following expressions.

a. $-(8a^{-6})\ (4a^{9})$____________________

b. $\frac{15r}{3r^{-5}}$____________________

c. $4^{5}\ x\ (4^{3})^{-3}$ ____________________

d. $(-2x^{0}\,y^{3})^{4}$____________________

e. $(2s^{n+2})^{3}$____________________

f. $(\ \frac{4r}{7s}\ )^{3}$____________________

3. An adult spider mite is typically 0.038 inch long. Express this number in scientific notation.____________________

4. The following trinomials represent the areas of three rectangular floor mats.
Mat A: $4n^2 + 11n - 3$
Mat B: $3n^2 - n - 2$
Mat C: $2n^2 + 14n + 12$

a. What polynomials represents the area of the floor covered by Mats A and B?________________

b. What polynomials represents how much more of the floor is covered by Mat C than Mat A?____________

c. What polynomials represents how much more of the floor is covered by Mat B than Mat C?____________

5. Use the FOIL method to multiply and simplify $(2n + 3)(3n - 4)$
____________.

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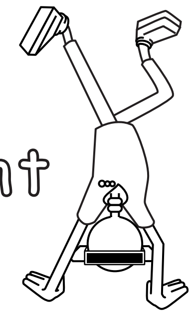


Unit Assessment

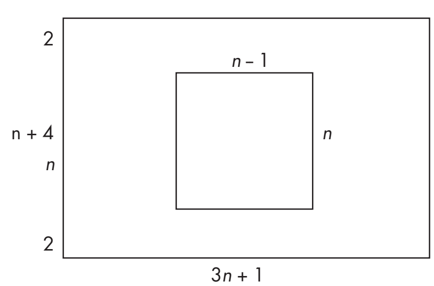
6. The product of $(x-5)(x+5)$ is ___________.

a. $x^2 + 10x - 25$ **b.** $x^2 - 10x - 25$

c. $x^2 + 25$ **d.** $x^2 - 25$

7. Verify that the answer choice you selected for Question 6 is correct by letting x equal 3. Show your work.

8. The diagram below represents a rectangular garden with a rectangular fountain in the center. Complete the following statement, expressing your answers in terms of n.



a. A binomial that represents the area of the fountain is ___________.

b. A trinomial that represents the total area needed for the flowers and the fountain is ___________.

c. A trinomial that represents the area where flowers can be planted is ___________.

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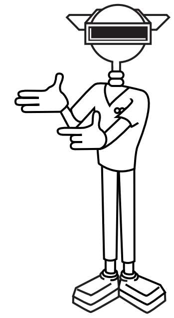
MASTERING ALGEBRA I: Course 2
MODULE 2: **Powers & Polynomials**
UNIT 1: **Polynomial Arithmetic**



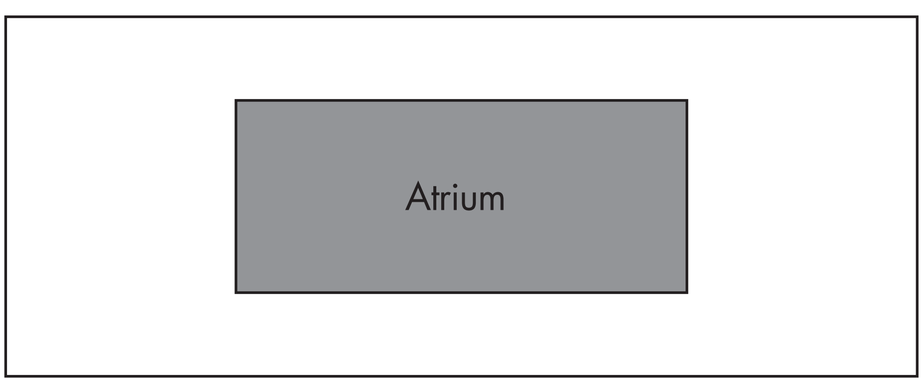
Unit Investigation

Investigating Area

A developer plans to build a new shopping mall. The mall will occupy a large rectangular area, with a center atrium with a walkway and sitting area for shoppers. Three department stores have already committed to rent space in the mall. Design a mall based on the following specifications.

- The length of the mall is three times the width of the mall.
- The minimum area that can be used for the mall is 30,000 square feet.
- The maximum area that can be used for the mall is 120,000 square feet.
- Carlyle & Company is the largest store
- The other two department stores have the same area, but their dimensions are different, and they are smaller than Carlyle & Company.
- The area of the rectangular atrium is equal to one half the area of Carlyle & Company.
- The mall must have a minimum of six stores in order to cover development costs.
- The maximum number of stores than can occupy the mall space is 10.
- The parking area must have one level of parking for every 10,000 square feet of space used for stores.

1. Complete the diagram below to illustrate your mall design.



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Unit Investigation

2. Using the variable *m*, list the algebraic expressions for the dimension and area of each following.

a. Carlyle & Company
Length ____________ Width ____________ Area ______________

b. Department store 1
Length ____________ Width ____________ Area ______________

c. Department store 2
Length ____________ Width ____________ Area ______________

d. Atrium Length
Length ____________ Width ____________ Area ______________

e. Other stores in the mall:

____

____

____

____

3. Decide on the area of your mall within the given limits. ________________

a. Based on the area, what are the dimensions of the mall?
Length ____________ Width ____________

b. How many parking levels will your mall need?

4. The construction costs per square foot for store and atrium space is $50.

a. What will it cost to build the mall you designed? ________________

b. If the initial budget allocated for construction is $5,000,000, can you construct your mall? ________________

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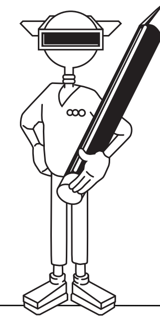
MASTERING ALGEBRA I: Course 2
MODULE 2: **Powers & Polynomials**
UNIT 2: **Factoring Polynomials**

Finding Common Factors

Student Logbook



As you work through the tutorial, complete the following questions or sentences.

1. A prime number is a ____________ ____________ with exactly two factors: ____________ and ____________.

2. Why is 1 not a prime number?

____

3. A positive integer that is neither prime nor equal to 1 is a ____________ ____________.

4. To find the nearest common factor of two numbers, match the ____________ ____________ that the numbers have in common and then find the ____________ of these numbers.

5. To find the greatest variable common factor of two monomials having the same base, ____.

6. The exponent of the variable in a monomial term in one variable is the ____________ of the monomial term.

7. What is the greatest common factor of $24n^3$ and $60n^2$? ____________

8. To factor a polynomial means to express it as ____

9. The degree of a polynomial is the ____________ degree of the____________ terms within it.

Key Words:

Factor
Prime number
Composite number
Greatest common factor
Degree of a monomial
Degree of a polynomial
Prime polynomial
Common monomial factor
Fundamental theorem of arithmetic

Learning Objectives:

- Discriminate between prime and composite numbers.
- Identify the greatest common monomial factor of two (or more) monomials.
- Factor a polynomial by finding its greatest common monomial factor.
- Factor a polynomial by finding a common binomial factor.

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MASTERING ALGEBRA I: Course 2
MODULE 2: Powers & Polynomials
UNIT 2: Factoring Polynomials

Finding Common Factors

Your Turn

1. Write the prime factorization for each of the following monomial.

a. 60 ______________________

b. $155xy$ ______________________

c. $144n^2$ ______________________

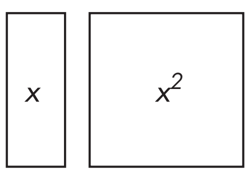
2. Find the greatest common monomial factor of each of the following groups of monomial expressions.

a. $72y^4$, $40y^3$ ______________________

b. $4a^5$, $-12a^4$, $28a^3$ ______________________

3. Consider the polynomial $6x^2 + 3x$.

a. Draw or use algebra tiles such as x and x^2, as shown on the left, to make a geometric representation of the rectangular area represented by the polynomial.



b. Use your drawing to express the polynomial as the product of two polynomials. ______________________

c. Verify that the product of the two polynomial factors represents $6x^2 + 3x$ by substituting 4 for x.

4. Factor the following polynomials completely.

a. $12n^3 + 20n$ ______________________

b. $72y^4 + 40y^3$ ______________________

c. $x^2 + 2x + 5x + 10$ ______________________

d. $3m^2 + 21m + 6m + 42$ ______________________

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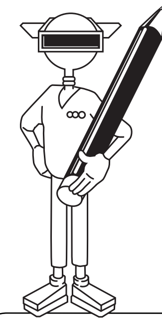
MASTERING ALGEBRA I: Course 2
MODULE 2: **Powers & Polynomials**
UNIT 2: **Factoring Polynomials**

Factoring Quadratic Trinomials

Student Logbook



As you work through the tutorial, complete the following questions or sentences.

1. When factoring the trinomial $x^2 + 10x + 24$, you are looking for a pair of numerical factors whose product is _____ and whose sum is ______.

2. What are the binomial factors for $x^2 + 10x + 24$? ____________________

3. A monomial term whose degree is 2 is called a ____________________

4. A ______________ __________ is a monomial term whose degree is 1.

5 A ______________ __________ is another name for a monomial term whose degree is 0.

6. Is the quadratic expression $x^2 + 10x + 24$ written in standard form? ________ Explain your answer. ____

____

7. If the constant in a quadratic polynomials that can be factored is negative, then the signs of the constants in the binomial factors are _______________.

8. What are the binomial factors of $y^2 + 7y - 12$? ________ _________

9. Represent the quadratic expression $2r^2 + 7r + 6$ as the product of two binomial factors ___________________.

10. Represent the quadratic expression $6n^2 + 11n - 10$ as the product of two binomial factors. ___________________

Key Words:

Binomial
Trinomial
Quadratic term
Linear term
Constant term
Standard form of a quadratic expression

Learning Objectives:

- Factor a quadratic trinomial of the form $1x^2 + bx + c$, where $c > 0$.
- Factor a quadratic trinomial of the form $1x^2 + bx + c$, where $c > 0$.
- Factor a quadratic trinomial of the form $ax^2 + bx + c$, where $a = 1$.

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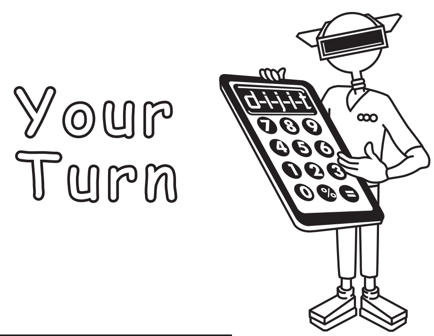
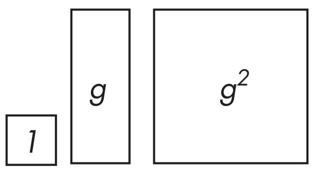
MASTERING ALGEBRA I: Course 2
MODULE 2: **Powers & Polynomials**
UNIT 2: **Factoring Polynomials**



Factoring Quadratic Trinomials

1. Consider the trinomial $2g^2 + 9g + 10$, ______________________

a. Draw or use algebra tiles to complete a rectangle whose area is $2g^2 + 9g + 10$.



b. Use the model to express the trinomial as the product of two binomials

____

c. Check your factors by substituting 2 for g in the factors and the original polynomial.

2. Given the trinomial $5s + s^2 + 1$:

a. Rewrite the quadratic expression in standard form. ____________

b. Name the quadratic term. ________

c. Name the linear term. ________

d. Name the constant term. ______

3. Factor each of the following polynomials completely.

a. $x^2 + 5x + 6$ ______________________

b. $d^2 - 4d - 32$ ______________________

c. $2p^2 + 7p + 3$ ______________________

d. $3y^2 - 7y + 4$ ______________________

e. $3f^2 - 3f - 18$ ______________________

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MASTERING ALGEBRA I: Course 2
MODULE 2: **Powers & Polynomials**
UNIT 2: **Factoring Polynomials**

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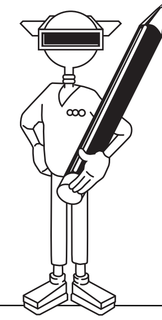

Special Cases

As you work through the tutorial, complete the following questions or sentences.

1. If a trinomial is of the form $a^2 + 2ab + b^2$, then it is a perfect square and is equal to ____________________.

2. The polynomial $(a^2 - b^2)$ is known as the ____________________ of ______________ ________________.

3. What are the binomial factors of $4x^2 - 9$?____________________

4. If a and b are real numbers, $a^2 - b^2 =$ ____________________

5. Factor $25k^2 - 144$. ____________________

6. Is the polynomial $x^4 - 64$ an example of the difference of two squares? __________ Explain your answer. ____________________

7. Factor $x^4 - 64$ completely ____________________

8. A polynomial that cannot be factored is ____________________

9. When factoring a polynomial expression, use the following quidelines.

a. First, always check for any ______________ ________________ and apply the ________________________ property to simplify the expression.

b. Then, look at the remaining polynomial to see if you recognize a pattern, such as a ______________ ____________ ________________________ or the ______________ ________ __________ ______________.

10. If a and b are real numbers and have no common factors then $a^2 + b^2$ is ______________.

Key Words:

Perfect square trinomial
Quadratic term
Linear term
Constant term
Cubic polynomial

Learning Objectives:

- Recognize and factor a perfect square trinomial $ax^2 + 2ab + b^2$.
- Recognize and factor the difference of two squares $a^2 - b^2$.
- Factor a given polynomial completely.

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MASTERING ALGEBRA I: Course 2
MODULE 2: **Powers & Polynomials**
UNIT 2: **Factoring Polynomials**

Your Turn

Special Cases

1. Complete the table below.

Factored form	Trinomial expression	Special case
	$x^2 + 18x + 81$	
$(2x + 10)^2$		
	$x^2 - 6x + 9$	
	$x^2 - 25$	
$(x + 7)$ (__________)	x^2 – ________	difference of two squares
	$x^2 + 81$	sum of two squares
	$4x^2 - 80x + 400$	

2. a. What is meant by the "square of the difference" and the "difference of squares?" Give an example of each.

____

____

____

b. Use numerical substitution to verify that the examples you gave in (a) are not equivalent.

____

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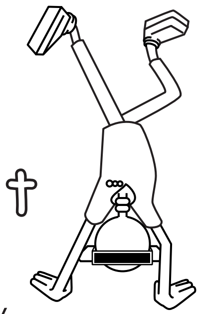
UNIT 2: **Factoring Polynomials**



Unit Assessment

1. In the first step of his technique to find prime numbers, Erastosthenes began by eliminating all numbers greater than 2 that were multiples of 2. Describe the additional steps. Erastosthenes used to identify the other prime numbers less than 100.

____

____

____

____

2. Factor the number 24 into its prime factors. ____________________

3. a. Find two numbers whose greatest common factor is a composite number
__________ and __________

b. Find two numbers whose greatest common factor is a prime.
__________ and __________

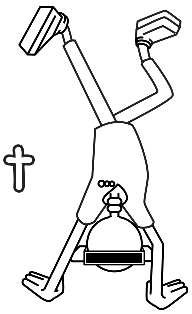
4. What is the greatest common factor of $b^4 - b^7$? __________

5. List the greatest common factor(s) of the terms below.

Terms	Greatest common factor
16, 24	
$64m$, $32m$, $96m$	
$42x^2$, $18x^3$	

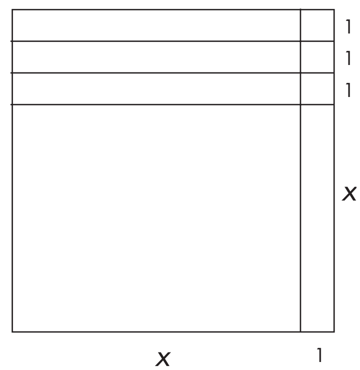
Name ______________________ Date ______________

Unit Assessment



6. a. Use he following set of algebra tiles to write an identity showing that the product of two binomials is equal to a trinomial.

____



b. Check your answer using numeric substitution.

____

____

7. Factor each of the following

a. $g^2 - 10g + 2g - 20$ ______________________

b. $k^2 + 12k + 36$ ______________________

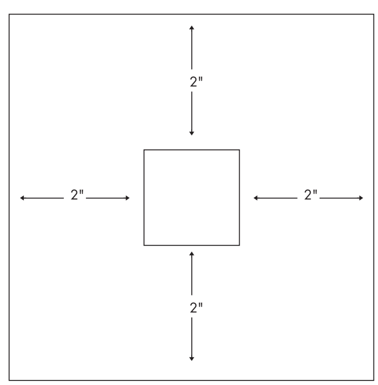
c. $p^2 - 6p - 16$ ______________________

d. $4x^2 + 16x + 15$ ______________________

e. $y^2 + 64$ ______________________

f. $16a^2 - 25$ ______________________

8. A shop makes rectangular picture frames of different sizes. A standard frame is 2 inches wide. The expressions below represent the dimensions in inches of four rectangular unframed pictures. Find a factored expression for the area of the frame around each picture.



a. p by p

b. h by 12

c. d by $2d$

d. x^2 by $x^2 - 12$

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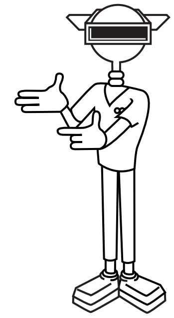
MASTERING ALGEBRA I: Course 2
MODULE 2: **Powers & Polynomials**
UNIT 2: **Factoring Polynomials**

Unit Investigation



Investigating Floor Plans

A person wants to install a carpet in a square room whose dimensions are *s* feet by *s* feet. Along two adjacent sides of the room, the owner wants 2 feet of tile instead of carpet.

1. Let *C* represent the length of the carpet in feet, then Make a sketch of the floor plan of the room. Label the parts that are to be carpeted and the parts than are to be tiled.

2. Label the sketch above in terms of C and 2.

3. Use the tiles to help you write a polynomial in expanded form and in factored form that represents the total area of the square region to be tiled and carpeted.

Expanded form ______________________________

Factored form ______________________________

4. Suppose the owner wants the same arrangement of carpeting but wants *n* feet of tile instead of 2 feet.

a. In the space above, represent the new floor plan and label all parts in terms of *c* and *n*.

b. Write a polynomial in expanded form and in factored form that represents the new area of the tiled region and the carpeted region.

Expanded form ______________________________

Factored form ______________________________

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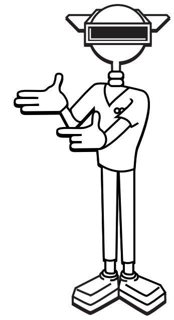

Unit Investigation

5. What special case of polynomial is represented when the width of the tile on two walls is equal?

____

6. Draw an example of a rectangular floor with carpeting and tile whose total area equals the product of two binomials.

7. Represent the total area of the floor, including its carpet and tiles as binomials in expanded form and factored form.

Expanded form ____________________________________

Factored form ____________________________________

8. What is the advantage to factoring the polynomial that represents the area of a rectangular floor. ______________________

____

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MASTERING ALGEBRA I: Course 2
MODULE 3: **Quadratic Functions & Equations**
UNIT 1: **Graphing Quadratic Functions & Equations**

Student Logbook

Graphing Parabolas

As you work through the tutorial, complete the following questions or sentences.

1. What is a quadratic function? ______________________________

2. In the function $y = ax^2$, the ________________ can be any real number, and the ________________ must be greater than or equal to zero.

3. When the coefficient a in $y = ax^2$ is positive, the parabola is concave ________________.

4. When the coefficient a in $y = ax^2$ is negative, the parabola is concave ________________.

5. What is the minimum of a parabola whose equation is of the form $y = ax^2$.____________

6. What is the maximum of a parabola whose equation is of the form $y = ax^2$.____________

7. An __________ ______ ___________ is a line that divides a shape so that, when folded, the two sides of the shape coincide.

8. What is the equation of the axis of symmetry for a parabola whose equation is of the form $y = ax^2$?____________

9. The intersection of a parabola and its axis of symmetry is called the __________ of a parabola.

Key Words:

Quadratic function
Parabola
Parabolic function
Minimum of a parabola
Maximum of a parabola
Symmetry
Axis of symmetry
Vertex of a parabola
Even function

Learning Objectives:

- Recognize that the graph of the quadratic equation $y = ax^2$ is a function.

For a graph of $y = ax^2$:

- Identify the domain and range.
- Describe the effect of the parameter a on the shape of the graph.
- Determine the minimum and maximum.
- Determine the equation of the axis of symmetry.
- Determine the coordinates of the vertex.

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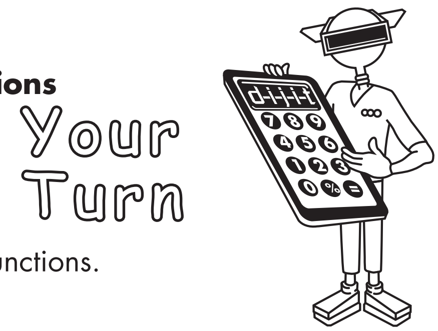
MASTERING ALGEBRA I: Course 2
MODULE 3: **Quadratic Functions & Equations**
UNIT 1: **Graphing Quadratic Functions & Equations**



Graphing Parabolas

1. Which of the following equations represent parabolic functions.

a. $y = 3x^2$

b. $y = 2x$

c. $d = 16xt^2$

2. Determine whether the parabolas represented by the following equations are concave up or concave down.

a. $y = -8x^2$ ______________

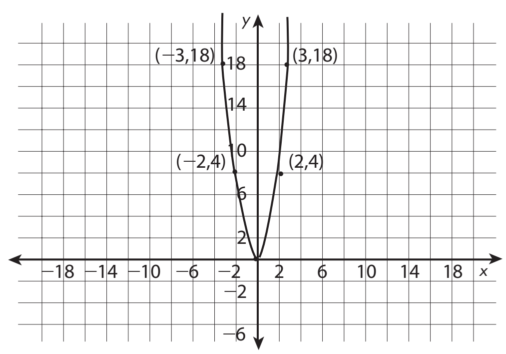
b. $d = 6t^2$ ______________

c. $a = 25(-8)b^2$ ______________

3. a. Which of the parabolas in Question 2 have a minimum? ___________
b. Which of the parabolas in Question 2 have a maximum? ___________

4. Which of the parabolas in Question 2 rises or falls most steeply? ______________

5. Construct a graph of the function $y = 2x^2$, and then answer the questions below. ____________



a. What is the domain and range of this function? ______________________________

b. What is the equation of the axis of symmetry? ______________

c. What are the coordinates of the vertex of this parabola? ___________

d. Is the parabola concave up or concave down? ______________

e. What is the minimum or maximum of the parabola? ___________

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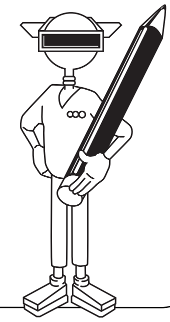
MASTERING ALGEBRA I: Course 2
MODULE 3: **Quadratic Functions & Equations**
UNIT 1: **Graphing Quadratic Functions & Equations**

Analyzing Properties Of Parabolas



Student Logbook

As you work through the tutorial, complete the following questions or sentences.

1. What does the constant 1,000 in the equation $y = -4.9x^2 + 1{,}000$ represent? ______________________________

2. The parabola defined by the quadratic equation $y = -4.9x^2 + 1{,}000$ is concave __________ and has *a* __________ whose y-coordinate is __________.

3. The standard form of a quadratic function in two variables is $y = ax^2 + bx + c$, where a ≠ ___, and *a, b,* and *c* are ____________________.

4. The equation $h = -4.9t^2 + vt$ is an __________ quadratic equation in two variable s because the constant *c* is equal to _______.

5. To find the maximum of the parabola $h = -4.9t^2 + 44.1t$, first find the __________ between the horizontal intercepts, then substitute that value of *t* into the equation to find the value of _____.

6. The maximum of the parabola whose equation is $h = -4.9t^2 + 68.6t$ is ________.

7. The maximum of the parabola whose equation is $h = -4.9t^2 + 68.6t$ occurs when $t =$ ________.

8. If $b = 0$, then the graph of $y = ax^2 + c$ is a ___________ whose axis of symmetry is the _________, and whose __________is $(0, c)$.

9. If $c = 0$, then the graph of $y = ax^2 + bx$ has a y-intercept of 0 and two ____________________, one of which is always ________.

Key Words:

Quadratic function
Parabola
Parabolic function
Minimum of a parabola
Maximum of a parabola
Symmetry
Axis of symmetry
Vertex of a parabola
Standard form of a quadratic equation in two variables

Learning Objectives:

- Examine the properties of parabolas whose equations are of the form $y = ax^2 + c, c \neq 0$.
- Examine the properties of parabolas whose equations are of the form $y = ax^2 + bx$.
- Examine the properties of parabolas whose equations are of the form $y = ax^2 + bx + c$, $b \neq 0, c \neq 0$.

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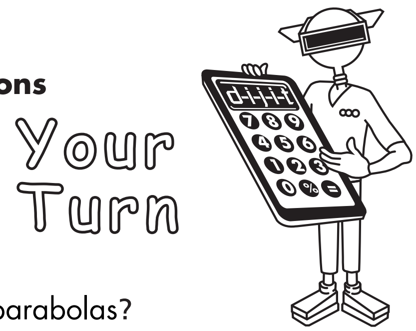
MASTERING ALGEBRA I: Course 2
MODULE 3: **Quadratic Functions & Equations**
UNIT 1: **Graphing Quadratic Functions & Equations**



Analyzing Properties Of Parabolas

1. What is the vertical x-intercept for each of the following parabolas?

a. $y = 3x^2 - 8x - 5$ ___________

b. $h = 4.9t^2 + 16t$ ___________

c. $d = -4.9t^2 + 67$ ___________

2. Which of these equations represent parabolas that have $x = 0$ as the axis of symmetry? ___________

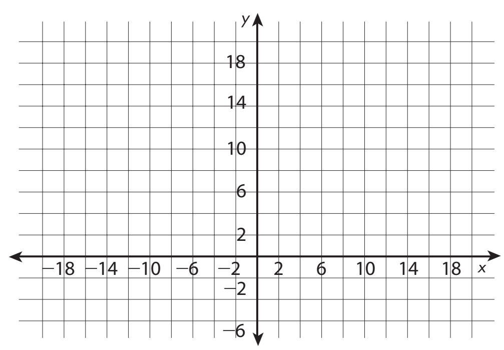
a. $y = -8x^2 + 2x + 16$

b. $h = 4.9t^2$

c. $d = 24.9t^2 + 125$

d. $h = 4.9t^2 + 2t$

3. Use the axes to the right to sketch a parabola hat has the following properties: it is concave up, has an axis of symmetry whose equation is $x = -2$, and has a minimum of -3.



4. What is the vertex of a parabola that is concave down if the equation of its axis of symmetry is $x = 8$, and its maximum is 15? _______________

5. A stone is dropped over the edge of a cliff. The distanced between the stone and the ground at any given time t can be calculated using $d = 4.9t^2 + 400$.

a. What is the maximum of the parabola represented by the equation $d = 4.9t^2 + 400$? __________.

b. What does the maximum represent?

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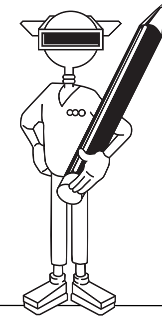
Solving Quadratic Equations by Graphing

Student Logbook



As you work through the tutorial, complete the following questions or sentences.

1. The flight path of an object that is struck or thrown is called its ________________.

2. Adding the constant −6 to the right side of the equation $h = -0.036d^2 + 1.29d$ does not affect the ____________ and ____________ terms of the equation; it only changes the vertical intercept of the graph from ______ to ______.

3. The axis of symmetry intersects the parabola at its ________________.

4. A ________, or __________, off an equation is a number that satisfies the equation when it is substituted for a variable.

5. The ____________________ __________________ of a function are roots of the corresponding equation when the value of the second coordinate is equal to zero.

6. If a quadratic function has two x-intercepts, then the corresponding quadratic equation when set equal to zero has two ______________ ______________.

7. What is the maximum of the parabola whose equation is $h = -0.036d^2 + 1.29d - 6$, rounded to the nearest tenth? _______

8. If a quadratic function has only one x-intercept, then the corresponding quadratic equation when set equal to zero has exactly one ______________________.

9. If a quadratic function has no __________________, then the corresponding quadratic equation when set equal to zero has no real solution.

Key Words:

Quadratic function
Trajectory
Standard form of a quadratic equation in one variable
x-intercept of a graph
Solutions(s) of a quadratic equation in one variable
Root of an equation

Learning Objectives:

- Discover that the maximum number of real solutions of a quadratic equation is 2.
- Recognize the relationship between the number of x-intercepts of a parabola $y = ax^2 + bx.+ c$ and the number of real solutions of the corresponding quadratic equation $y\ ax^2 + bx.+ c = O.$

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MASTERING ALGEBRA I: Course 2
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UNIT 1: **Graphing Quadratic Functions & Equations**

Solving Quadratic Equations by Graphing

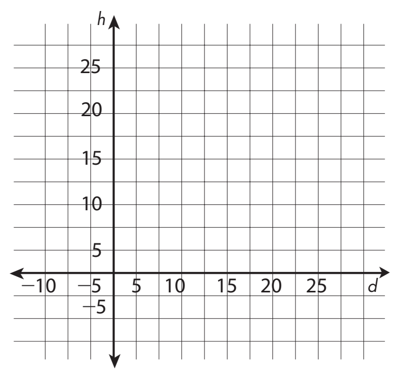
Your Turn

1. During a softball game, the pitcher throws the ball to the catcher. The catcher misses the ball, and it hits the ground at a horizontal distance of 25 feet from where it was thrown. The ball's trajectory can be represented by the equation $h = -0.06d^2 + 1.3d + 5$, where h is the height of the ball in feet, and d is the distance in feet of the ball from where it was thrown.

a. How high above he ground was the ball when it was thrown? ______

b. What was the maximum height of the ball?___________

c. Graph the parabola whose equation is $h = -0.06d^2 + 1.3d + 5$. What portion of this graph corresponds to the trajectory of the ball? (*Hint:* Remember that distance, d, is always nonnegative.) ____________________



2. Analyze the equations below to determine whether the parabola corresponding to each equation has zero, one or two horizontal intercepts; whether it is concave up or down; and if it has a maximum or a minimum.

Equation	Horizontal Intercepts	Concavity	max/min
$h = 0.5d^2 + 1$			
$y = -3x^2 + 6x + 1$			
$d = -1.9t^2$			
$y = 4x^2 + 4x - 35$			

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MASTERING ALGEBRA I: Course 2
MODULE 3: **Quadratic Functions & Equations**
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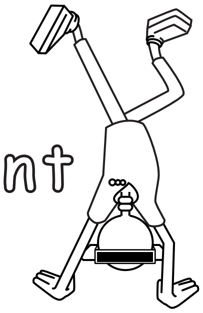


Unit Assessment

3. Given the equation $y = 3x^2 + 5x - 7$.

a. What is the quadratic term? ___________

b. What is the linear term? ___________

c. What is the constant term? ___________

d. How can you tell if an equation represents a parabola? ___________

e. Which part of a quadratic equation affects the steepness of the parabola? ______________________________

f. What part of equation determines whether the corresponding parabola is concave up or concave down?
____

g. What part of the equation is the y-intercept of the parabola? ________

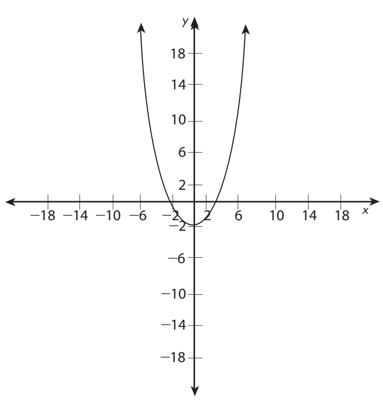
2. Determine whether the parabolas that correspond to each equation have a minimum or a maximum.

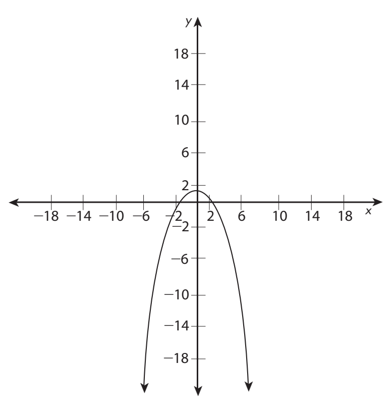
a. $h = -4.9t^2$ ___________ ___________

b. ___________ $y = 5x^2 - 2x - 4$

c. $h = 0.5d^2 + 1.2d + 2$ ___________

3. Match each parabola below with its corresponding equation:
$y = x^2 - 1$, $y = -x^2 + 1$.





a. ___________ **b.** ___________

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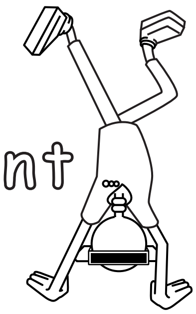
Unit Assessment



4. Analyze the equations of these parabolas to determine the number of real solutions of the corresponding quadratic equations set equal to 0.

a. $d = 2t^2 + 6t$ ____________________

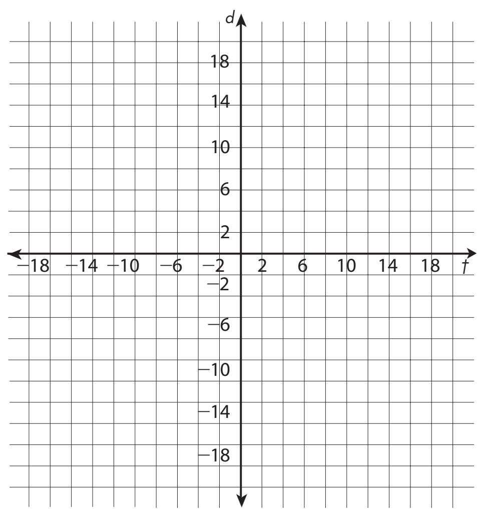
b. $y = 5x^2 + 17$ ____________________

c. $h = 4.9t^2 + 5t - 6$ ______________

d. $y = x^2$ __________________________

A car accelerates to merge onto the highway. If the acceleration remains constant, the distance the car has traveled after any given time can be found using the equation $d = 2t^2 + vt$, where t is the time in seconds, v is the initial velocity in meters per second, and d is the distance in meters.

5. Graph the function $d = 2t^2 + 4t$, with t on the horizontal axis, and d on the vertical axis.



6. Suppose a car enters the highway with an initial velocity of 4 meters per second and accelerates for 5 seconds. What is the domain of the function that represents the car's motion during this time period?

____

7. What is the range of the function during the 5-second interval?

____

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MASTERING ALGEBRA I: Course 2
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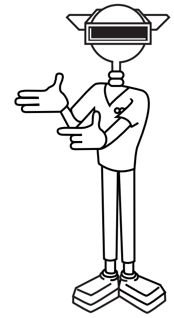


Investigating Parabolic Motion

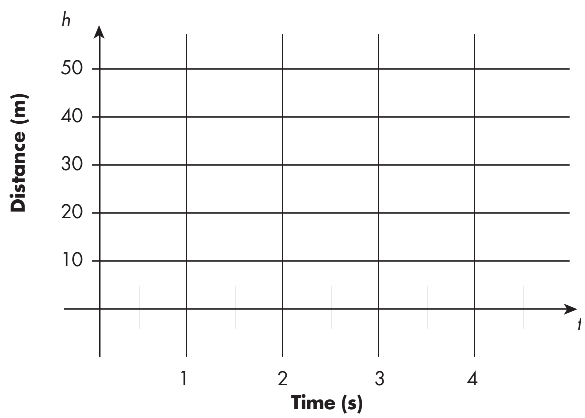
Unit Investigation

1. Two students are studying the motion of falling bodies. One student drops a ball from the top of a wall that is 50 feet above the ground. The second student throws a ball from the top of the same wall. The ball that was thrown has an initial speed of 10 meters per second. The tables below list the heights h^1 and h^2 above the ground for each ball, b^1 and b^2 at various times t, measured in seconds.

b^1	
t	b^1
0	50
1	45.1
1.5	39
2	30.4
2.5	19.4
3	5.9
3.2	0

b^2	
t	h^1
0	50
1	55.1
1.5	54
2	50.4
2.5	44.4
3	35.9
4.4	0

a. On this set of axes, plot the points that lie on the trajectory of each ball.



b. Draw and label a smooth curve through each set of points to show the trajectory of each ball.

c. Which ball spent a longer time in the air? ____________Explain.

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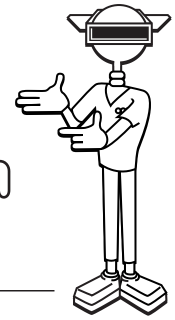


Unit Investigation

d. Use the graph and approximate the maximum height reached by b^2 _______

e. After about how many seconds did b^2 reach its maximum height? _________

f. What was the maximum height of b^1 _________

2. The equations for the parabolas that represent the trajectory of each ball are $h^1 = 4.9t^2 + 50$ and $h^2 = -4.9t^2 + 10t + 50$.

a. What does the coefficient of the linear term in the equation of h^2 represent?

____

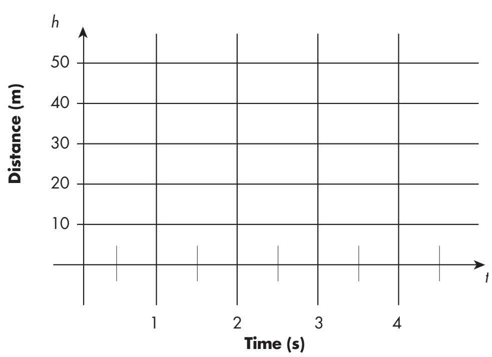
b. What does the constant in each equation represent? ______________________

c. What is the initial velocity of b^1__________

3. The formula to find the distance an object travels is $d = vt$, where d is the distance, v is the speed of the object, and t is the time. How many meters from the foot of the wall did each ball fall when it landed?

b^1: ____________________ b^2:____________________

4. Use the formula in (3) and complete the table to calculate the horizontal distance of b^2 from the wall as it fell. Then, on the axes below, plot the points and sketch the graph of $d = vt$.



b^2	
t	d^2
0	
1	
1.5	
2	
2.5	
3	
4.4	

5 What does the shape of the graph tell you about the motion of the ball?

____

____

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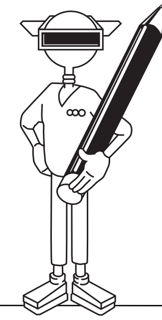
MASTERING ALGEBRA I: Course 2
MODULE 3: **Quadratic Functions & Equations**
UNIT 2: **Solving Quadratic Equations Using Algebra**

Factoring & the Zero Product Theorem

Student Logbook



As you work through the tutorial, complete the following questions or sentences.

1. The __________ __________ __________ states that if a and b are real numbers and $ab = 0$, then $a = 0$ or $b = 0$.

2. In an equation where the product of two binomials equal to zero, as in $0 = (0.4x + 2)(0.4x - 2)$, there are __________ possible values for the variable x.

3. If a quadratic equation in one variable, x, has two roots, then the graph of the equation in two variables has two __________.

4. Once you know the values of the horizontal intercepts, you can find the __________ ___ __________ and the __________ of the parabola.

5. If $0 = x(x + 20)$ then $x =$ __________ or $x + 20 =$ __________

6. Since the graph of the function $y = \pi x^2 + 20\pi x$ represents he relationship between the width and area of the annulus, it makes sense to select points in quadrant ________.

7. If $x + 22 = 0$ or $x - 2 = 0$, then $x =$ ________ or $x =$ ________ .

8. If the factors of a quadratic polynomial in an equation of the form $ax^2 + bx + c = 0$ are the square of a linear binomial, then the corresponding equation has a __________. __________.

9. The real solutions of the quadratic equation $ax^2 + bx + c = 0$ are the ____________________ of the corresponding ____________________ ____________________ $y = ax^2 + bx + c$.

Key Words:

Zero product theorem

Double roots of a quadratic equation

Learning Objectives:

- Recognize that the solutions of a quadratic equation are the x-intercepts of the corresponding function.
- Solve a quadratic equation in one variable by factoring the difference of two squares.
- Solve a complete quadratic equation in one variable by factoring.
- Solve a quadratic equation in one variable by factoring a perfect square trinomial.

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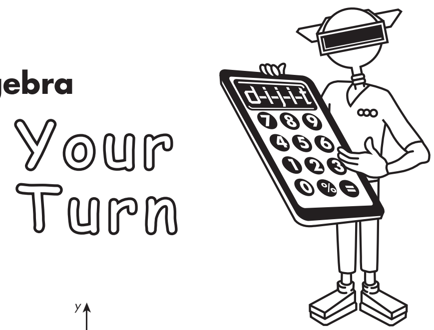
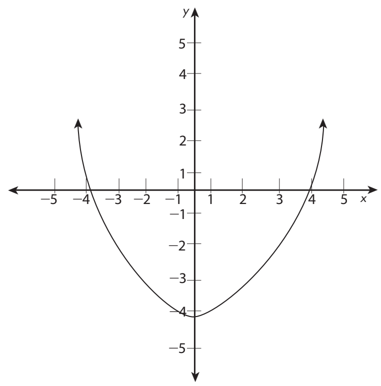
MASTERING ALGEBRA I: Course 2
MODULE 3: **Quadratic Functions & Equations**
UNIT 2: **Solving Quadratic Equations Using Algebra**



Factoring & the Zero Product Theorem

1. The quadratic function $y = 0.25x^2 - 4$ is represented by the parabola shown.



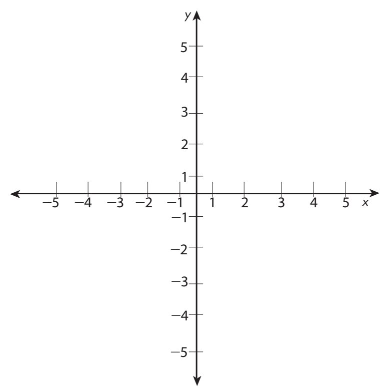
a. Based on the graph, how many x-intercepts does the parabola have? ________

b. Solve the quadratic equation algebraically for $y = 0$. Show your work.

2. Factor the expression $x^2 + 4x$.

____

3. Use the equation $y = -3x^2 + 6x$, to answer the following questions.



a. What are the x-intercepts of the corresponding parabola? __________

b. What are the coordinates of the vertex of the parabola?__________

c. Using this information, sketch the graph of the parabola.

4. A parabola is defined by the quadratic equation $y = 36x^2 + 24x + 4$.

a. Factor $36x^2 + 24x + 4$. ____________________

b. What is the value of when $y = 0$? ________________

c. How many x-intercepts does the corresponding parabola have? _______

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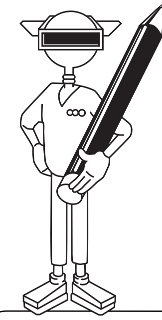
MASTERING ALGEBRA I: Course 2
MODULE 3: **Quadratic Functions & Equations**
UNIT 2: **Solving Quadratic Equations Using Algebra**

The Square Root Method & Completing the Square

Student Logbook



As you work through the tutorial, complete the following questions or sentences.

Key Words:
Pi (π)
Volume
Isolate
Inverse operation

Learning Objectives:
- Using the properties of equality to rewrite a formula for a particular variable

1. According to the ____________ ____________ ____________, if $n^2 = k$, then $n = \pm\sqrt{k}$ for any real number k, where $k \geq 0$.

2. The property of opposites states that for any real number a, ____________________ and ____________________.

3. The two number $\frac{6}{5}$ and $-\frac{6}{5}$ are opposites because their ________ is zero.

4. One way to solve for x in an equation such as $x^2 + 10x = 39$ is to add a number to both sides of the equation that gives a ______________________ ____________ on the left side.

5. If $(x + 5)^2 = 64$, then $x =$ ________ or $x =$ ________.

6. What constant is added to each side of the equation $-1 = x^2 - 4x$ so that the right side is a perfect square trinomial?________

7. The equation $x - 2 = \pm\sqrt{3}$ means that __________or__________.

8. To find the roots of a quadratic equation of the form $y = ax^2 + c$ when $y = 0$, you can use the ____________ ____________ ____________.

9. To solve a quadratic equation of the form $ax^2 + bx + c = 0$, where $a = 1$ and b and c are rational numbers, use the method of ______________ the __________________.

10. If the quadratic expression in the original equation is prime, the real roots will be __________________.

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MASTERING ALGEBRA I: Course 2
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UNIT 2: **Solving Quadratic Equations Using Algebra**

The Square Root Method & Completing the Square

Your Turn

1. How many real solutions are there for he quadratic equation $x^2 = 9$?

____

2. Find the roots of the following equations using the square root property.

a. $2x^2 - 18 = 0$ ______________

b. $15x^2 - 15 = 0$. ______________

c. $13x^2 - 52 = 0$. ______________

3. What term must be added to the expression $x^2 + 2bx$ to make it a perfect square trinomial?______________

4. What term must be added to each of the following expressions so that the result is a perfect square trinomial?

a. $x^2 + 12x$ ______________

b. $x^2 + 20x$.______________

c. $x^2 + 3x$ ______________

5. Use the method of completing the square to solve the quadratic equation $x^2 + 4x - 5 = 0$. Show your work.

6. Use the method of completing the square to solve the quadratic equation $x^2 - 10x + 18 = 0$. Show your work.

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MASTERING ALGEBRA I: Course 2
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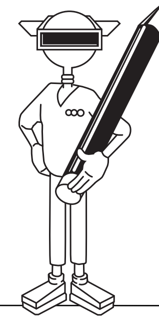
UNIT 2: **Solving Quadratic Equations Using Algebra**

The Quadratic Formula

Student Logbook



As you work through the tutorial, complete the following questions or sentences.

1. The quadratic formula states that the solutions of $ax^2 + bx + c = 0$, where a, b and c are real numbers and $a \neq 0$ are: ____________________

2. In the quadratic equation $2x^2 + 8x - 13 = 0$, a = ______, b = ______ c = ______.

3. Express $\sqrt{168}$ in simplest radical form. __________

4. If the quadratic formula is used to solve an equation for which a corresponding parabola has no x-intercepts, then the value of x when $y = 0$ is not a _______ number.

5. The discriminant in the quadratic formula is the expression __________.

6. In the quadratic formula, the ______________ is the discriminant.

7. If the discriminant is negative, the equation has ______ ____________ roots.

8. If the discriminant equals zero, the the equation has _________ _________ root.

9. If the discriminant is positive, the equation has ______ ________ roots.

Key Words:

The quadratic formula
Discriminant

Learning Objectives:

- Recognize the steps in the proof of the quadratic formula and interpret its meaning.
- Use the quadratic formula to determine that a quadratic equation does not have real roots.
- Use the discriminant to determine the nature of the roots of a quadratic equation in one variable.

Name ____________________ Date ____________________

MASTERING ALGEBRA I: Course 2
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UNIT 2: **Solving Quadratic Equations Using Algebra**

The Quadratic Formula

Your Turn

1. Write the method, property, or theorem used to move from one step to the next in each of the following equations.

a. $y^2 = 8$; $y = \pm\sqrt{8}$ ____________________

b. $y^2 + 6y = 5$; $y^2 + 6y + 9 = 5 + 9$ ____________________

c. $y(y + 3) = 0$; $y = 0$ or $y + 3 = 0$ ____________________

2. In the equation $fg^2 + hg + j = 0$, g is the variable, and f, h, and j are real numbers. Use the quadratic formula and express the value of g in terms of f, h, and j. ____________________

3. To apply the quadratic formula, an equation must be in the form $ax^2 + bx + c = 0$. Use the properties of equality to rewrite each of the following equations in standard form, and identify the values of a, b, and c.

a. $x^2 + 12x = 18$ ____________________
$a =$ ________ $b =$ ________ $c =$ ________

b. $3y^2 + 51x = 2y$ ____________________
$a =$ ________ $b =$ ________ $c =$ ________

c. $2y - 27 = 8y^2$ ____________________
$a =$ ________ $b =$ ________ $c =$ ________

d. $x + x + 2x^2 - 2 = -3x + x^2$ ____________________
$a =$ ________ $b =$ ________ $c =$ ________

4. Use the quadratic formula to solve the equation $5x^2 - 5x + 1 = 0$. Show your work.

Name ______________________ Date ______________

MASTERING ALGEBRA I: Course 2
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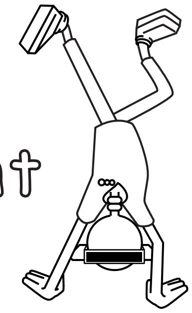
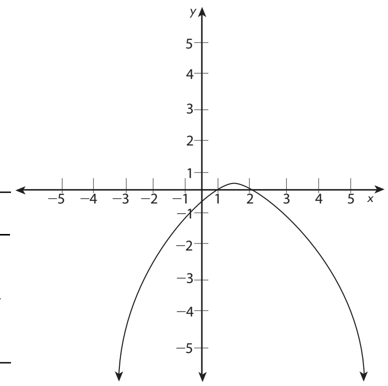
UNIT 2: **Solving Quadratic Equations Using Algebra**



Unit Assessment

1. This graph represents a rabbit's jump. The variable x represents the horizontal distance in feet of the jump and the y-axis represents the height in feet of the jump. The equation of the parabola that represents $y = -0.25x^2 + 0.5x$.

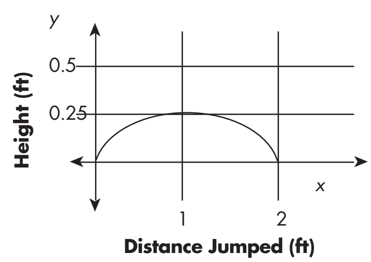


a. How many solutions does x have when $y = 0$? ______________ Why would this make sense in describing a rabbit's jump? ______________________________

b. What is x when $y = 0$? ______________________

c. How far did the rabbit jump? ________________

d. How high did the rabbit jump? ________________



2. Solve the quadratic equation $0 = m^2 - 81$. Show your work.

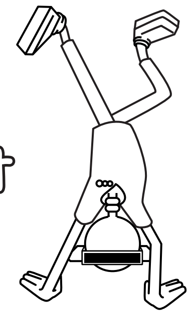
3. Solve the quadratic equation $0 = s(s - 99)$. Show your work.

4. To use the method of completing the square to solve a quadratic equation of the form $x^2 + bx = c$, what term must be added to both sides of the equation? ______________

5. Use the method of completing the square to solve the quadratic equation $x^2 + 18x - 19 = 0$. Show your work.

Name ______________________ Date ______________________

Unit Assessment



6. Use the quadratic formula to solve the equation $0 = x^2 + 7x + 5$. Show your work.

7. What does the discriminant tell you about the solutions of a quadratic equation?

____

____

8. Calculate the discriminant, then describe the nature of the roots for each of the following quadratic equations.

Quadratic equation	Discriminant	Nature of roots
a. $5x^2 + 6x + 5 = 0$		
b. $6x^2 + 6x + 7 = 0$		
c. $2x^2 + 8x + 2 = 0$		
d. $8x^2 + 3x - 4 = 0$		

9. Which of the following equations correspond to parabolas that have exactly one x-intercept.

a. $y = 5x^2 + 10x + 5$
b. $y = 0.25x^2 + 2x + 4$
c. $y = 4x^2 + 3x + 4$

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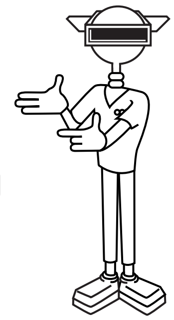
MASTERING ALGEBRA I: Course 2
MODULE 3: **Quadratic Functions & Equations**
UNIT 2: **Solving Quadratic Equations Using Algebra**



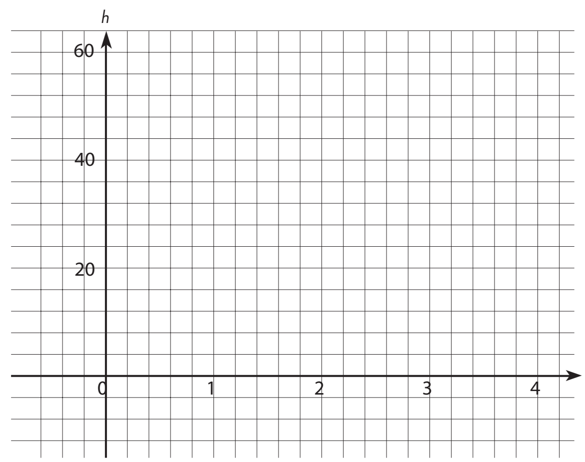
Investigating Parabolic Motion

Unit Investigation

1. Gravity affects all falling objects. The equation $h = \frac{1}{2} gr^2 + c$ represents the trajectory of a falling object, where the variables t and h represent the time measured in seconds, and the distance fallen, measured in meters. The constants in the equation are g and c, where g is the acceleration constant, -9.8m/s^2, and c is the height from which an object is dropped.

a. Suppose a boulder falls from the top of a cliff that is 60 feet high. What equation can you write to represent the trajectory of the boulder in terms of t and h?

$h =$ ______ $t^2 +$ ______



b. Use the equation in (a) and complete this table. Round values of h to the nearest whole number.

t	0	1	2	3	4
h					

c. Between what two values of t will the boulder strike the ground?

____

Explain. ____

____

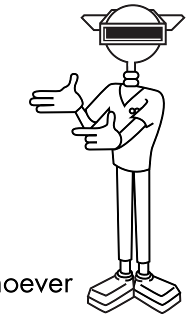
d. On the axes above, plot the points from the table, and sketch the parabola that represents the trajectory of the boulder.

e. What was the maximum height in meters of the boulder above the ground? __________

f. Calculate the value of t to the nearest tenth when the boulder struck the ground. Show your work below.

Name ______________________ Date ______________

Unit Investigation



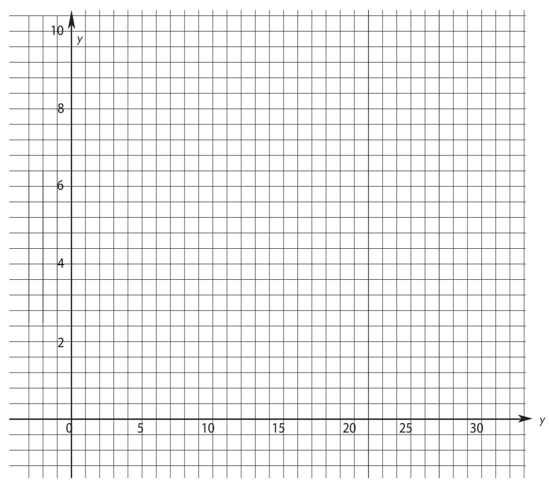
2. Two players, A and B, are trying out for a position on the softball team. Whoever throws the ball farther will make the team. The equation that represents the trajectory of a ball thrown by player A is $y = 0.04x^2 + x + 2$. The equation that represents the trajectory of a ball thrown by player B is $y = 0.05x^2 + 1.18x + 2$. In each equation, x represents the horizontal distance in feet between the ball and a player, and y represents the height in feet of the ball above each player's shoulder.

a. What is the initial height of the ball thrown by each player?.

Player A: ______
Player B: ______

b. Use the two equations above and for each value of x, calculate the values, to the nearest tenth, for y_A and y_B.

x	0	5	10	15	20	25	30
y_A							
y_B							



c. Plot the points from the table and sketch the trajectory of each ball.

d. Use the graph and tell which player threw the ball higher. __________

e. Use the graph and approximate the horizontal distance that each player threw the ball. Player A: ______ft. Player B: ______ft.

f. Use the quadratic formula and in the space below, calculate the distance, in feet, that the farther ball traveled. Round your answer to the nearest tenth.

g. Which player made the team? Player _______

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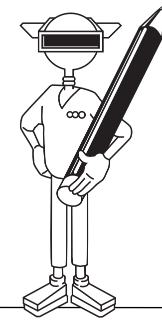
MASTERING ALGEBRA I: Course 2
MODULE 4: **Algebraic Expressions & Functions**
UNIT 1: **Radical Equations & Functions**

Student Logbook



Solving Radical Equations

As you work through the tutorial, complete the following questions or sentences.

1. A ____________ ____________ is an equation in which a variable is under a radical sing.

2. If a and b are real numbers and $a = b$, then ________________.

3. The ________ ________ of a number can be expressed using an exponent of ________.

4. Another way to solve a radical equation is to rewrite the ________ expression using the exponent $\frac{1}{2}$, and then to ________ both sides of the equation.

5. Explain how graphing the system of equations $y = \sqrt{x}$ and $y = 2$ can be used to check the solution of the radical equation $\sqrt{x} = 2$. ________
____
____

6. An __________ __________ is a solution of the square of a radical equation that is not a solution of the original radical equation.

7. Rewrite as an exponential equation. $\sqrt{x} =$ ________, if $x \geq 0$.

8. *True* or *false*: A radical equation may have no solution, one solution, or two solutions. ________

9. Always check the solutions of the square of a radical equation. However, do NOT include ________ ________in the solution set of the original radical equation.

Key Words:
Radical equation
Extraneous root

Learning Objectives:
- Recognize and solve a simple radical equation.
- Determine if a radical equation has a real solution.
- Solve radical equations algebraically.
- Determine if a radical equation has an extraneous solution.

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MASTERING ALGEBRA I: Course 2
MODULE 4: **Algebraic Expressions & Functions**
UNIT 1: **Radical Equations & Functions**

Solving Radical Equations

Your Turn

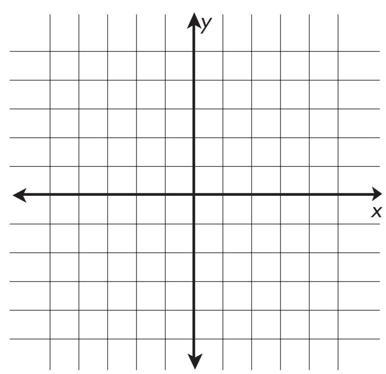
1. Solve the equation $\sqrt{x} = 5$ for x.

2. Would it make sense to attempt to solve the radical equation $\sqrt{m} = -49$? ________ Why or Why not? ______________________

____

3. Solve and check the equation $\sqrt{r - 5} - 8 = 0$ for r. Show all work.

4. Consider the functions $y = \sqrt{x + 2}$ and $y = x$.



a. Create a scale, and Plot the graphs of the two functions on the same set of axes. According to the graph, how many solutions do you expect for the radical equation $\sqrt{x + 2} = x$? ____________

b. Solve the radical equation $\sqrt{x + 2} = x$ and check your work.

c. What is the solution of the equation $\sqrt{x + 2} = x$? ____________

d. What is the extraneous solution if any? ______________________

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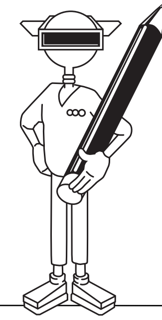
MASTERING ALGEBRA I: Course 2
MODULE 4: **Algebraic Expressions & Functions**
UNIT 1: **Radical Equations & Functions**

The Inverse of the Square Root Functon

Student Logbook



As you work through the tutorial, complete the following questions or sentences.

1. A ______________ function is a function in which each second coordinate is paired with one and only one first coordinate.

2. The ____________ of a one-to-one function obtained by interchanging the two variables in the one-to-one function.

3. When you ________ the variables of a one-to-one function, the relation you get is a _________, too, which is the _______ of the first function.

4. The inverse of $f(x)$ is denoted by the notation ______ and is read as "*f* inverse of *x*."

5. If $f(x) = \sqrt{x}$, then the domain of $f^{-1}(x)$ is the _________ of $f(x)$.

6. If $f(x) = \sqrt{x}$, then the range of $f^{-1}(x)$ is the _______ of $f(x)$.

7. The equation of the line of symmetry for a one-to-one function and its inverse function is ___________.

8. The inverse of the function $y = x^2$ is not a ________, because for all non-zero values of x, there are _____ values of y.

9. The relationship between the points (x, y) on the graph of the inverse of $y = x^2$ is _______.

10. You can investigate the inverse of a function that is not a one-to-one function by restricting its _________.

Key Words:
Inverse of a function
One-to-one function

Learning Objectives:
- Graph the inverse of the square root function, and identify its equation.
- Calculate the equation of the line of symmetry between the square root function and its inverse.
- Examine the inverse of a parabolic function with a restricted domain.

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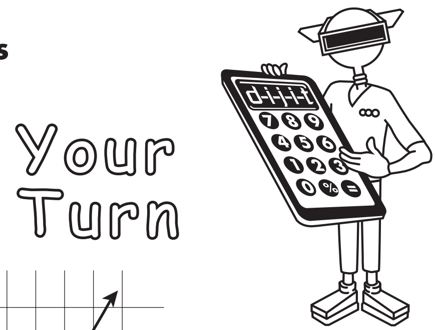
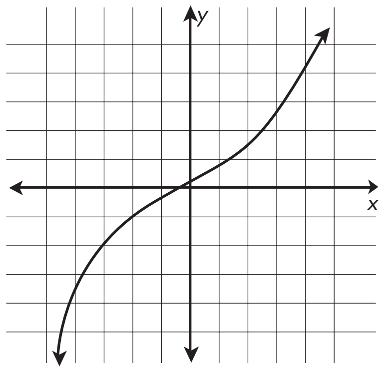
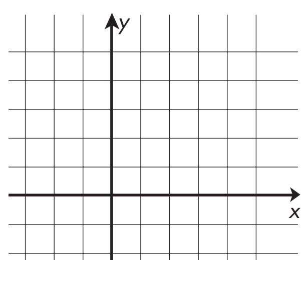
The Inverse of the Square Root Functon



1. Is the function shown in the graph a one-to-one function? ________
Why or why not? ______________
____
____
____



2. a. Create a scale and a graph the function $f(x) = \sqrt{x} - 1$.



b. What is the domain of $f(x)$?__________

c. What is the range of $f(x)$?__________

d. What is the equation of $f^{-1}(x)$?__________

e. What is the domain of $f^{-1}(x)$?__________

f. Graph $f^{-1}(x)$ on the same set of axes above.

g. Graph the line of symmetry between the graph of $f(x)$ and the graph of $f^{-1}(x)$, and write its equation.__________

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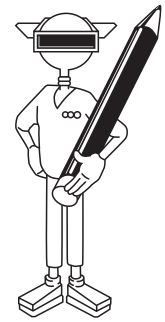
COURSE #: **MASTERING ALGEBRA I: Course 2**
MODULE #: **Algebraic Expressions & Functions**
UNIT #: **Radical Equations & Functions**

Unit Assessment



Solve and check the equations below. Show all your work. State all real solutions, and which, if any, roots are extraneous. If an equation has no solution, write "no solution."

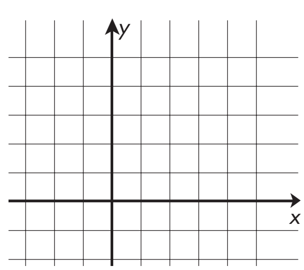
1. $\sqrt{a} = 12$

2. $\sqrt{k} + 2 = 0$

3. $\sqrt{d} - 15 = 0$

4. $z = \sqrt{z + 7} + 5$

5. Graph $y = \sqrt{x + 3}$ and $y = x + 1$ on the set of axes below. Based on your graphs, how many solutions are there to the equation $\sqrt{x + 3} = x + 1$? ______________ What is it? ________________



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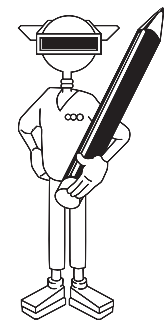
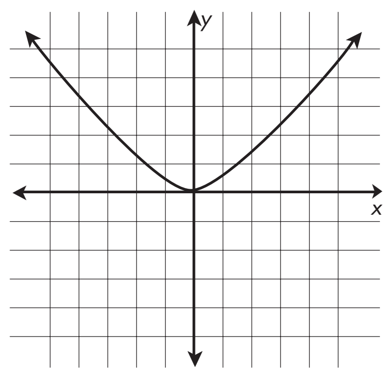


Unit Assessment

6. Solve and check the equation $\sqrt{x - 1} - 1 = \frac{x}{5}$. Show your work.

7. Is the function shown in this graph a one-to-one function? ____________
Why or why not? ______________
____
____
____



8. Consider the function $f(x) = \sqrt{x + 2}$

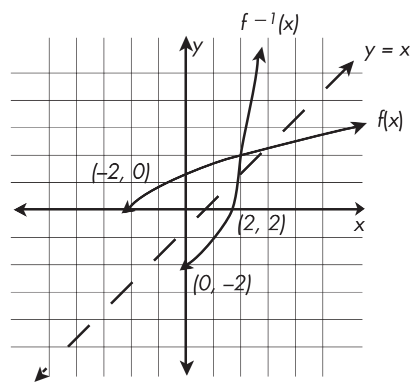
a. What is the domain of $f(x)$? ______________

b. What is the range? ______________

c. What is the equation of $f^{-1}(x)$? ______________

d. What is the domain of $f^{-1}(x)$? ______________

e. What is the range of $f^{-1}(x)$? ______________



f. Graph $f(x)$ and $f^{-1}(x)$ on the same set of axes. Show the line of symmetry between the graphs.

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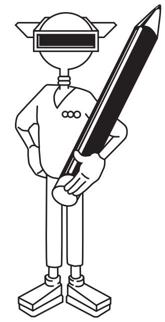
MASTERING ALGEBRA I: Course 2
MODULE 4: **Algebraic Expressions & Functions**
UNIT 1: **Radical Equations & Functions**



Unit Assessment

Investigating Gravity

The properties of radical equations can be used to discover how certain objects are affected by gravity. Suppose a large rock is dropped from a 256-foot high cliff.

The equation $t = \sqrt{16 - (\frac{1}{16})d}$ can be used to determine how long it will take the rock to fall a given distance. In the equation, the variable t represents the amount of time in seconds the object has been falling, and the variable d represents the height of the object in feet above the ground.

1. What is the distance between the rock and the ground after 2 seconds? ______________ Show your work.

2. Exactly 3 seconds after the rock is dropped, a bird flies across the vertical path of the falling rock at a height of 120 feet above the ground. Is the bird in danger? _________ Why or why not?

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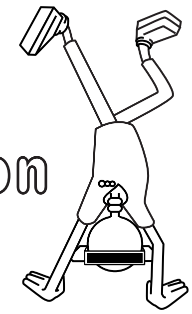

Unit Investigation

3. Draw the graph of $t = \sqrt{16 - (\frac{1}{16})d}$

4. Since *d* represents the height above the ground in feet, it has restricted values. What set of values is appropriate for *d*? ____________________

____

5. At what time, *t*, is the rock halfway to the ground? Round your answer to the nearest tenth.____________ Show your work.

6. At what time, *t*, does the rock hit the ground?________ Show your work.

7. What is the range of the function for values of d from 0 to 4? _________ Explain your answer.

8. Is the function a one-to-one function? ________ Explain.

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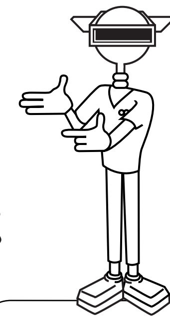
MASTERING ALGEBRA I: Course 2
MODULE 4: **Algebraic Expressions & Functions**
UNIT 2: **Rational Expressions, Equations & Functions**

Rational Functions

Student Logbook



As you work through the tutorial, complete the following questions or sentences.

1. A ____________ ______________ is a fraction whose numerator and denominator are polynomials, and the degree of the polynomial in the denominator is at least _________.

2. If *a*, *b*, *c*, and *d* are real numbers, and *c* and *d* are not equal to zero, $\frac{a \times b}{c \times d}$ = ______________________.

3. If a is a non-zero real number, ____________ is undefined.

4. Any value of a variable that results in a zero denominator is an ________________ ______________ in a rational expression.

5. Does finding the quotient of two rational expressions follow the same rules as dividing fractions?_________ Explain your answer.

____

6. If *a*, *b*, and *c* are real numbers and $b \neq 0$, then $\frac{a \times c}{b \times b}$ = _______

7. If *a*, *b*, *c*, and *d* are real numbers, and *b* and *d* are not equal to zero, then $\frac{a \times c}{b \times d}$ = _______

8. To find the excluded value of *x* in a rational expression, set the ________ of the expression equal to 0 and solve for ________.

9. If *a*, *b*, *c*, and *d* are real numbers, and *b*, *c*, and $d \neq 0$, then $\frac{a}{c} \div \frac{b}{d} = \frac{a}{c} \times$ ________.

Key Words:
Ratio
Rational expression
Excluded values

Learning Objectives:
- Identify value(s) of x for which a rational expression is undefined.
- Reduce a rational expression by removing common monomial factors.
- Find the product or quotient of two rational expressions and express it in simplest form.
- Identify the least common denominator of two algebraic fractions.
- Find the sum or difference of two rational expressions and express it in simplest form.

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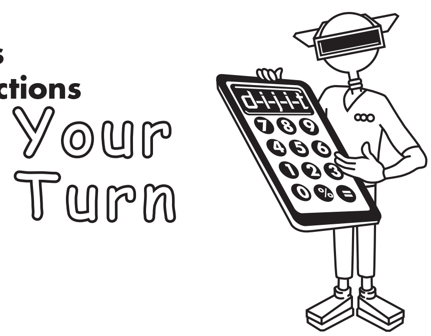
MASTERING ALGEBRA I: Course 2
MODULE 4: **Algebraic Expressions & Functions**
UNIT 2: **Rational Expressions, Equations & Functions**



Rational Functions

1. Find the excluded value(s) for each rational expression.

a. $\frac{4a + 4}{a + 2}$ ______________

b. $\frac{n^2 + 3n + 2}{6n}$ ______________

c. $\frac{t - 5}{3t + 3}$ ______________

d. $\frac{x^3 - x^2 + 5x + 22}{x^2 - 4}$ ______________

2. Determine the excluded value(s) of *x* for each rational expression and then simplify the expression.

a. $\frac{b + 2}{b^2} \times \frac{5b}{b^2 - 4}$, $b \neq$ ______________

b. $\frac{c^2 - 9}{5c} \div \frac{c - 3}{20}$, $c \neq$ ______________

c. $\frac{1}{2d^2} - \frac{5}{4d}$, $d \neq$ ______________

d. $\frac{2}{h - 6} - \frac{1}{h}$, $h \neq$ ______________

e. $\frac{k - 1}{k} - \frac{3}{k - 2} + 4$, $k \neq$ ______________

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MASTERING ALGEBRA I: Course 2
MODULE 4: **Algebraic Expressions & Functions**
UNIT 2: **Rational Expressions, Equations & Functions**

Student Logbook

Rational Functions

As you work through the tutorial, complete the following questions or sentences.

1. A __________ __________ is an equation that contains one or more rational expressions.

2. A plane curve represented by an equation such as $y = \frac{1}{x}$ is called a ____________________.

3. If zero is not included in the domain or the range of a function, then the graph of the function cannot intersect the __________ __________ or the __________ ______________.

4. Use symbols to complete these expressions for the function $y = \frac{1}{x}$.
As $x \rightarrow 0^+$, y _____ As $x \rightarrow 0^-$, y _____

As $x \rightarrow +\infty$, y _____ As $x \rightarrow -\infty$, y _____

5. A line that a hyperbola approaches but never intersects is called an __________ of the hyperbola.

6. The domain of $y = \frac{1}{x}$ does not include 0, but does include numbers on both sides of 0. Therefore the graph is a __________function.

7. For any rational function $y = \frac{a}{x-b}$, b represents the ______________ ________ of the rational expression and $x = b$ is the equation of the ______________ ______________.

8. For any rational function $y = \frac{a}{x-b}$, changing the value of b causes the hyperbola to shift ____________.

9. For any rational function $y = \frac{a}{x-b}$, the parameter a shifts the hyperbola toward or away from the ____________.

Key Words:
Rational function
Hyperbola
Asymptote
Continuous function
Discontinuous function

Learning Objectives:
- Graph the function $f(x) = \frac{1}{x}$.
- Identify the domain and range of $f(x) = \frac{1}{x}$.
- Identify the equations of the asymptotes and the inverse of $f(x) = \frac{1}{x}$.
- Examine the effects of parameters a and b on the graph of $f(x) = \frac{a}{x-b}$

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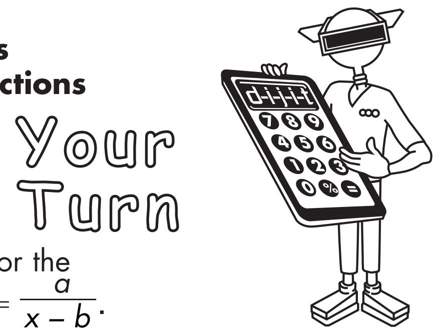
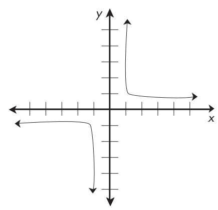
MASTERING ALGEBRA I: Course 2
MODULE 4: **Algebraic Expressions & Functions**
UNIT 2: **Rational Expressions, Equations & Functions**

Rational Functions

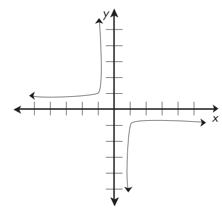


1. Use the symbols <, >, or = to complete each statement for the corresponding graph, which represents the equation $y = \frac{a}{x - b}$.

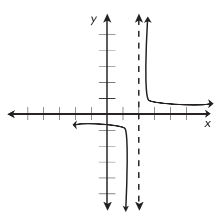
a. a ____ 0



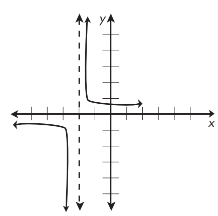
b. a ____ 0



c. b ____ 0

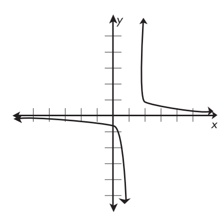


d. b ____ 0



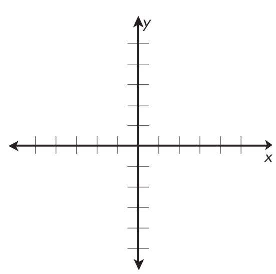
2. Each tick mark in the axes represents 1. What is the equation of the vertical asymptote for this hyperbola?

____

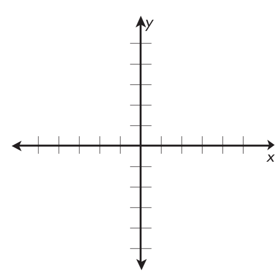


3. Sketch the graph of the hyperbola that represents each equation. Include the vertical asymptote of each hyperbola and equation.

a. $y = \frac{4}{x - 2}$



b. $y = \frac{4}{x + 2}$



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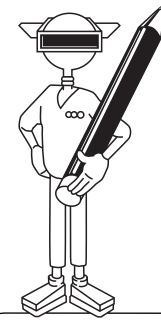
MASTERING ALGEBRA I: Course 2
MODULE 4: **Algebraic Expressions & Functions**
UNIT 2: **Rational Expressions, Equations & Functions**

Rational Equations

Student Logbook



As you work through the tutorial, complete the following questions or sentences.

1. To solve $\frac{3}{x} = \frac{1}{x-2}$ for x, first find the excluded values, then find a ____________ ____________.

2. What is the solution of the rational expression $\frac{3}{x} = \frac{1}{x-2}$? __________

3. The graphs of $y = \frac{3}{x}$ and $y = \frac{1}{x-2}$ intersect at a point whose x-coordinate is ________.

4. The formula for work is __________ × __________ = __________ .

5. What is the lowest common denominator of $\frac{5}{7}$ and $\frac{5}{x}$? __________

6. If $d = rt$, which equation expresses time in terms of distance and rate?
____

7. An ____________ ___________ is a solution of a modified rational equation that is not a solution of the original rational equation.

8. Before solving a rational equation, identify the ______________ ______________ of the variable.

9. One way to solve a ____________ ___________ is to multiply each term in the equation by a common nonzero denominator to reduce like factors.

Key Words:

Rational equation
Lowest common denominator
Extraneous solution

Learning Objectives:

- Solve a rational equation by multiplying by the LCD.
- Analyze and solve a work problem.
- Analyze and solve a uniform motion problem.
- Determine if a solution of a rational equation is extraneous.

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MASTERING ALGEBRA I: Course 2
MODULE 4: **Algebraic Expressions & Functions**
UNIT 2: **Rational Expressions, Equations & Functions**

Rational Equations

Your Turn

1. Find the lowest common denominator for the fractions in each equation.

a. $\frac{5}{2k} = \frac{3}{k + 4}$ ____________________

b. $\frac{2 + w}{12w} = \frac{2}{w - 3}$ ____________________

c. $\frac{4p}{p2 - 5p + 6} = \frac{14}{p - 3}$ ____________________

2. Solve for *p* in this rational equation. ____________________

$\frac{4p}{p2 - 5p + 6} = \frac{14}{p - 3}$ _

3. Solve for *b* in this rational equation. ____________________

$\frac{4p}{p2 - 5p + 6} = \frac{14}{p - 3}$

4. One person can mow a lawn in two hours. Two people, working together, can mow the same lawn in 1 hour and 15 minutes. How many hours would it take the second person to mow the lawn alone?

____

5. A local bus leaves the station at 7:30 A.M. An express bus leaves the station 20 minutes later, travels the same route, and arrives at the final stop 10 minutes before the local bus.

a. Use the formula $r = d/t$ and write an expression in terms of *r* and *t* to find the rate of the express bus. ____________________

b. If the local bus averages 20 miles per hour, and the express bus averages 50 miles per hour, what time does the express bus arrive at the final stop? ____________________

6. A student can bicycle to school in 10 minutes less time than it takes to walk the same distance. The student bicycles at a rate four times faster than the walking rate. How long does it take the student to ride a bike to school? ____________________

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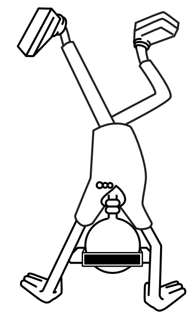
MASTERING ALGEBRA I: Course 2
MODULE 4: **Algebraic Expressions & Functions**
UNIT 2: **Rational Expressions, Equations & Functions**



Unit Assessment

1. Find the excluded value(s) for each rational expression.

a. $\frac{6h - 2}{2h^2}$, $h \not\approx$ ______________________

b. $\frac{4g}{3 + g}$, $g \not\approx$ ______________________

c. $\frac{d + 2}{d - 2}$, $d \not\approx$ ______________________

2. Simplify each expression.

a. $\frac{3w}{w - 2} \times \frac{2w + 6}{3w}$ ______________________

b. $\frac{2z}{z - 1} + \frac{3}{z + 1}$ ______________________

c. $\frac{4 - u}{12u} \div \frac{3}{u}$ ______________________

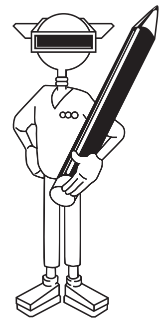
d. $\frac{8}{y + 2} - \frac{y + 3}{6}$ ______________________

3. Complete the table of values for the function $f(x) = (\frac{2}{x + 3})$.

x	***f(x)***
– 4	
– 3	
– 2	
– 1	
0	
1	
2	
3	
4	

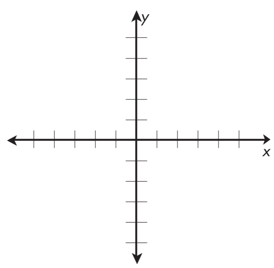
Name ________________________ Date ________________

Unit Assessment

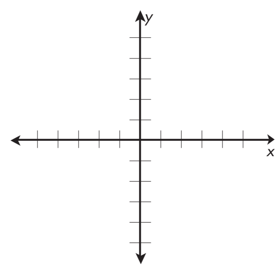


4. Sketch the graph of each function. Indicate each asymptote.

a. $f(x) = \frac{2}{x - 6}$



b. $f(x) = \frac{1}{x + 1}$



5. A house painter can paint a room in 6 hours. If an assistant helps, the two can paint the room in 4 hours. How long would it take the assistant working alone to paint the room? ________________

6. A runner leaves the gym and sets out on a training run at a rate of 6 miles per hour.

a. After half an hour, the runner increases his rate to 8 miles per hour and runs for another 15 minutes. What is the total distance the runner travels?

____

b. Suppose the runner maintains a steady rate of 6 miles per hour. The runner's coach leaves the gym on a bicycle 30 minutes after the runner leaves and catches up with the runner 15 minutes later. At what rate does the coach travel?

____

c. If the coach leaves the gym one hour after the runner does and rides at the same rate as in part (b), how long will it take the coach to catch up with the runner?

____

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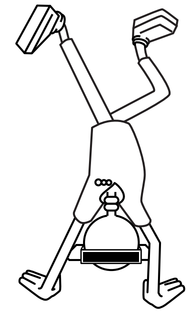
MASTERING ALGEBRA I: Course 2
MODULE 4: **Algebraic Expressions & Functions**
UNIT 2: **Rational Expressions, Equations & Functions**

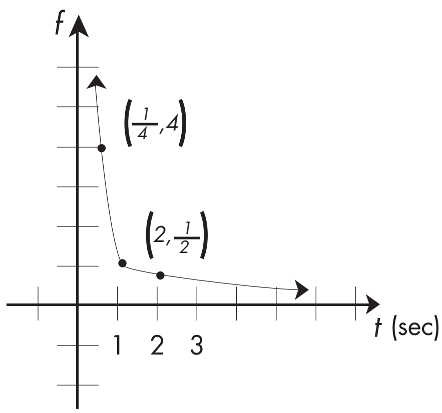
Unit Investigation



Investigating Waves

The frequency of a wave—such as a sound wave, electromagnetic wave, or mechanical wave—is represented by the equation $f = \frac{1}{t}$, where f is the frequency of the wave, and t is the time required for one complete vibration of the wave, which is called the period.

1. Graph the function $f = \frac{1}{t}$ and answer the following questions.



2. As the frequency of the wave increases, what happens to the period of the wave? ______________________

3. As the period of the wave increases, what happens to the frequency of the wave? ______________________

4. When a child swings on a swing set, the motion of the swing can be modeled as wave motion. Sketch the graph of $f = \frac{1}{t}$ to find the frequency of the wave if they swing makes one complete back-and-forth motion in 2 seconds. ______________________

5. Use the graph to find the period of the wave if an amusement-park swing ride makes four complete back-and-forth motions every second.

____

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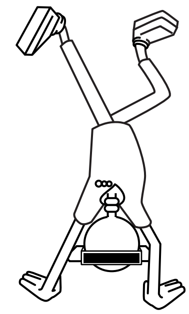
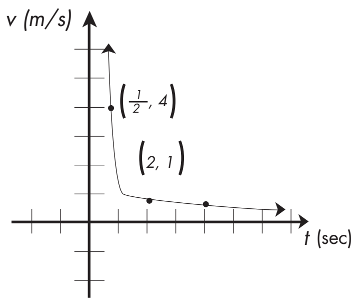
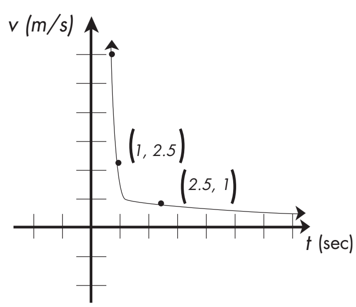


Unit Investigation

6. The speed of a wave is represent by $v = \frac{\lambda}{t}$ where v is the speed of the wave, and λ is a constant that represents the wavelength of the wave. Graph the function for a wave with a wavelength of 2.0 m.



7. Compare this graph with the graph of $f = \frac{1}{t}$. Then sketch a graph of a wave with a wavelength of 2.5 m.



8. According to the graphs, how does increasing the wavelength of a wave affect the time required for one complete vibration?

____

____

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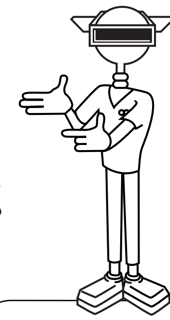
MASTERING ALGEBRA I: Course 2
MODULE 5: **Describing Data**
UNIT 1: **Graphical Displays**

Stem-&-Leaf Plots & Box Plots

Student Logbook



As you work through the tutorial, complete the following questions or sentences.

1. Statistics is the mathematical study of the __________, ____________, and ______________ of data.

2. A __________________________ is a type of bar graph that represents _______________ in a data set.

3. A graphical display made up of the numbers in a distribution is a ______________-and-______________ plot.

4. The range of data is the ____ between the maximum and minimum values in a data set.

5. A distribution of data that is asymmetrical is called ________________.

6. The _______________ is the middle number in a set of ordered data.

7. Quartiles are the three numbers that divide a set of data into ___________ equal parts.

8. The median of the data is the __________________ _________________________.

9. A _____________ ___________ is a graphical display that divides a set of data into quartiles.

10. The interquartile range is the difference between the __________ and ___________ quartiles of a distribution.

11. An ____________ is an extreme or uncharacteristic value in a data set.

Key Words:
- Statistics
- Data
- Mean
- Median
- Histogram
- Outlier
- Quartiles
- distribution of data
- Stem-and-leaf plot
- Range of data
- Skewed data
- Box plot (box-and-whisker plot)
- Interquartie range (IQR)

Learning Objectives:
- Create and analyze a stem-and-leaf plot
- Calculate the range and median of a set of data.
- Create a box plot.
- Analyze the information in a box plot.

Name ____________________________ Date ____________________

MASTERING ALGEBRA I: Course 2
MODULE 5: **Describing Data**
UNIT 1: **Graphical Displays**

Your Turn

Stem-&-Leaf Plots & Box Plots

Use the data table on the right to answer Questions 1-8.

1. The data in the table show the percentage of workers who used public transportation in the ten largest U.S. cities in 1990. Use the data to create a stem-and-leaf plot. Be sure to include a key.

City	Percent
Chicago, IL	29.7
Dallas, TX	6.7
Detroit, MI	10.7
Houston, TX	6.5
Los Angeles, CA	10.5
New York, NY	53.4
Philadelphia, PA	28.7
Phoenix, AZ	3.3
San Antonio, TX	4.9
San Diego, CA	4.2

% of Workers

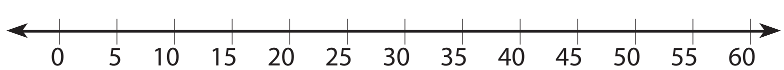
Key:____

2. Use your stem-and-leaf plot to determine the following statistics for this data set.
a. minimum value __________ **b.** maximum value ____________
c.mean __________ **d.** median ____________

3. Identify the quartiles of the data set.
first ______________ second ______________ third______________

4. What is the interquartile range of the data distribution? ____________

5. On the number line below, create a box-and-whisker plot for these data.



6. Identify the outlier in these data. ____________

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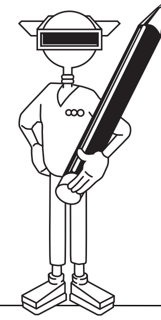
MASTERING ALGEBRA I: Course 2
MODULE 5: **Describing Data**
UNIT 1: **Graphical Displays**

Student Logbook



Scatter Plots & Linear Best-Fit Graphs

As you work through the tutorial, complete the following statements and questions.

1. A scatter plot can be used to represent all of the data in ____________ dimensions.

2. A line that best represents the relationship between the points in a scatter plot is called a ______________- ______________ line.

3. A best-fit line drawn on a scatter plot that uses a three-point summary based on the medians of the variables in three groups of data is called a ______________ - ________________ line.

4. Does the line M_1M_3 represent all of the data? ______ Why or why not?

5. The best-fit median-median line is ______________ to both the line M_1M_3 and the line through M_2, and must lie _________ of the distance from M_1M_3 and _______ of the distance from the line through M_2.

6. A best-fit line can suggest only a general ________________ in the relationship between two variables.

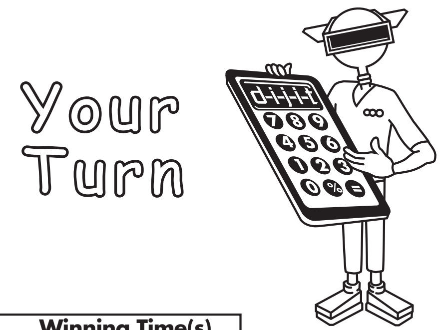
7. The equation of a best-fit line for a set of data can be used to make ________________.

Key Words:
Data
Median
Outlier
Scatter plot
Best-fit line
Median-median line

Learning Objectives:
- Approximate a best-fit line through a set of points in a scatter plot.
- Use a best-fit line to predict a future value.
- Compare actual and predicted values using a best-fit line.

Name ______________________ Date ______________________

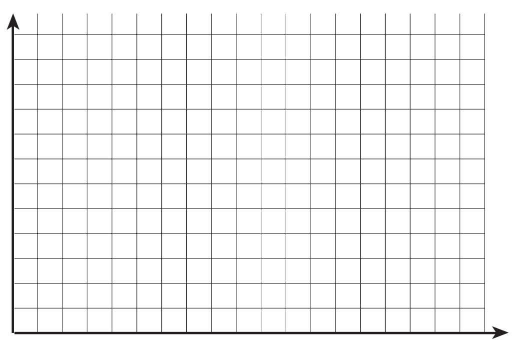
MASTERING ALGEBRA I: Course 2
MODULE 5: **Describing Data**
UNIT 1: **Graphical Displays**



Scatter Plots & Linear Best-Fit Graphs

1. The table on the right lists the winning times for men's 100-meter freestyle swim during the Olympic Games from 1924 to 1988. Graph the relationship as a scatter plot. Be sure to label the axes and put the independent variable on the vertical axis.

Year	Winning Time(s) (seconds)
1924	59.0
1928	58.6
1932	58.2
1936	57.6
1948	57.3
1952	57.4
1956	55.4
1960	55.2
1964	53.4
1968	52.2
1972	51.22
1976	49.99
1980	50.40
1984	49.80
1988	48.63



2. Divide the data on your graph into three equal groups. Find the median coordinates for each group and label these points M_1M_2 and M_3.

3. Find the equation for each of the following lines.
a. The one through point M_1 and M_3 ______________
b. The line through M_2 that is parallel to M_1M_3______________
c. The median-median best-fit line ______________________

4. Use the equation for the median-median line to predict the winning time in 1992.______________________

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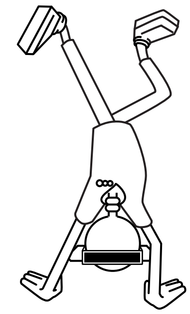
MASTERING ALGEBRA I: Course 2
MODULE 5: **Describing Data**
UNIT 1: **Graphical Displays**

Unit Assessment



1. The data table on the right shows the average speeds in miles per hour of several animals. Use the data to create a stem-and-leaf plot. Be sure to include a key.

Animal	Speed (in mph)
Cheetah	70
Coyote	43
Elephant	25
Elk	45
Giraffe	32
Gray fox	42
Grizzly bear	30
Lion	50
Reindeer	32
Zebra	40

Average Speed (m/hr)

Key:____

a. What is the mean of the data? ____________

b. What is the outlier? ______________

c. What is the median of these data? __________

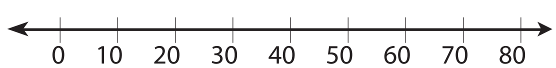
d. Does the mean represent a valid measure of central tendency in this data set? ______________ Explain your answer.

2. a. Determine the lower, middle, and upper quartiles for the data in the table in Question 1. Then use the information to create a box plot of the data.

Q1 =____________

Q2 =____________

Q3 =____________



b. What is the interquartile range of the data? ______________

c. What does the interquartile range tell you abut the data?

____

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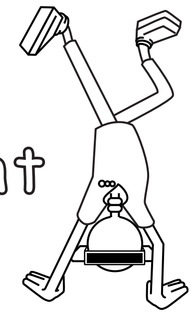
Unit Assessment



3. State whether the following types of graphical display are used to display one-dimensional or two-dimensional data.

a. Stem-and-leaf plot ______________________

b. Box plot ______________________

c. Scatter plot ______________________

4. The table on the right shows the life expectancy in years for women from 1930 to 1990. Without graphing the data, answer the following questions.

Year	Life Expectancy for Women (in years)
1930	61.6
1935	63.9
1940	65.2
1945	67.9
1950	71.1
1955	72.8
1960	73.1
1965	73.7
1970	74.8
1975	76.6
1980	77.4
1985	78.2
1990	78.8

a. Divide the data into three roughly equal groups of four, five, and four values, and find the coordinates of $M_1 M_2$ and M_3.

________, ________, ________.

b. Calculate the slope of the median-median best-fit line. ______________

c. What is the equation for the median median best-fit line? ______________

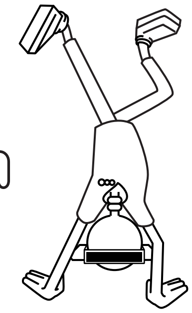
d. Use the median-median line to predict the ` life expectancy for women in 1995.

____

Name ______________________ Date ______________

MASTERING ALGEBRA I: Course 2
MODULE 5: **Describing Data**
UNIT 1: **Graphical Displays**

Unit Investigation



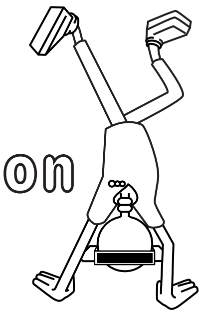
Investigating National Parks

1. The table on the right lists the national parks in Arizona, Colorado, Utah, and Wyoming, along with the number of years that each park has been a national park. Suppose you want to know the range of years that the middle 50% of the parks have been national parks. Identify and create the type of data distribution that most clearly shows this range. Then calculate this middle range and identify any outliers in the data. Show your graph and work below.

National park	Years Established
Arches	28
Bryce Canyon	75
Canyonlands	35
Capitol Reef	28
Grand Canyon	80
Grand Teton	70
Mesa Verde	93
Petrified Forest	37
Rocky Mountain	84
Saguaro	5
Yellowstone	127
Zion	80

Name ______________________ Date ______________________

Unit Investigation



2. Using the table in Question 1, identify and create the type of data distribution that most clearly shows the number of years since each national park was established. Identify the maximum and minimum years, and explain whether or not the mean of the data represents the best measure of central tendency in the data set. Show your work below.

3. The table on the right lists the total number of visitors to all national parks during a 45-year period. Create a graph that shows if there is a general trend in the data. Using what you have learned about the median-median best-fit line, predict the number of visitors for the year 2000. Explain whether your prediction is reasonable. Show your work below.

Year	Number of Visitors
1990	57,700
1985	50,000
1980	60,200
1975	58,800
1970	45,879
1965	36,566
1960	26,630
1955	18,830
1950	13,919
1945	4,538

Course 2 Answer Key

1.1 Rational & Irrational Numbers

Defining Real Numbers

Student Logbook

1. integers; 0
2. terminates; repeats
3. two; number
4. ratio; integers
5. terminating; repeating
6. rational; irrational
7. real
8. root
9. radical

Your Turn

1. The following answers are samples

   a. $-\frac{12}{2}$ $\frac{-18}{3}$; $-\frac{30}{5}$ **b.** $\frac{2}{10}$; $\frac{-3}{-15}$; $\frac{4}{20}$

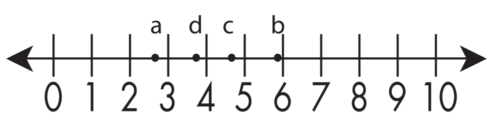
   c. $\frac{16}{6}$; $\frac{-24}{9}$; $-\frac{32}{12}$ **d.** $\frac{9}{4}$; $\frac{-9}{-4}$; $\frac{18}{8}$

2. **a.** 0.375 **b.** 0.222 ...

   c. 3.5 **d.** 0.714285 ...

3. 1.222343
4. Sample answers: $\sqrt{7}$, 5.1682032412 ...
5. **a.** 2.646 **b.** 5.916

   c. 4.690 **d.** 3.742



Working with Radicals

Student Logbook

1. 3.14
2. d, the depth of the water
3. radicand
4. 1, 4, 9, 16, 25
5. $\sqrt{a^2} = a$
6. non-negative square root
7. $\sqrt{a \times b}$
8. $5\sqrt{10}$
9. $\frac{\sqrt{a}}{\sqrt{b}}$
10. rationalize; denominator; rational
11. simplest; like

Your Turn

1. **a.** 9; 9 **b.** 625; 25 **c.** 144.; 12
2. 121, 144, 169, 196, 225
3. **a.** $4\sqrt{10}$ **b.** $30\sqrt{3}$ **c.** $-\frac{1}{2}\sqrt{10}$
4. $-96\sqrt{7}$
5. $\frac{\pi}{6}$
6. **a.** $\frac{\sqrt{6}}{6}$ **b.** $\frac{\sqrt{33}}{11}$ **c.** $\frac{\sqrt{14}}{7}$
7. **a.** $\frac{16}{5}$ **b.** $5\sqrt{5}$ **c.** $\frac{2\sqrt{3}}{3}$
8. $16\sqrt{2}$
9. $2\sqrt{3}$ seconds

The Square Root function

Student Logbook

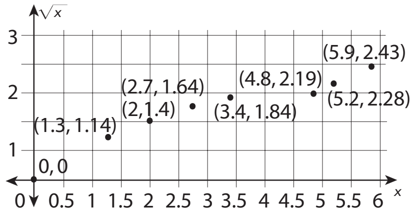
1. $\sqrt{x}$
2. Sample answer: The slope formula can be used to show that slopes between any two consecutive points are not equal.
3. Because for each first coordinate there is one and only one second coordinate.
4. interpolate; domain
5. extrapolate; observed
6. non-negative real numbers
7. non-negative real numbers
8. parameter
9. steepness; quadrant

Your Turn

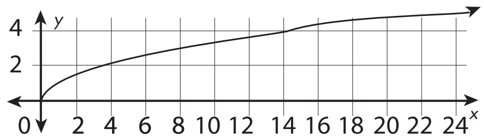
1.

x	0	1.3	2.0	2.7	3.4	4.8	5.2	5.9
$\sqrt{x}$	0	1.14	1.41	1.64	1.84	2.19	2.28	2.43

2.



3.



4. a. 3 **b.** 4 **c.** 2 **d.** 1 **e.** 5

Unit Assessment

1. a. rational, terminating decimal

b. rational, can be written as $\frac{25}{14}$

c. irrational, nonterminating and nonrepeating decimal (π is irrational)

d. rational, repeating decimal

e. rational, can be written as -3

f. irrational, nonterminating and nonrepeating decimal (2.8284 ...)

g. rational, repeating decimal

h. irrational, nonterminating and nonrepeating decimal

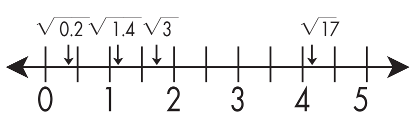
2. sometimes

3. always

4. Irrational; by the Pythagorean theorem, the length of the hypotenuse is given by the square root of $4^2 \times 5^2$, or the square root of 41. No rational number can be squared to equal 41, so the length of the hypotenuse is given by an irrational number.

5. b and d

6.



7. c and d

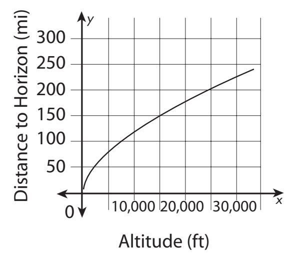
8. a. $5\sqrt{3}$ **b.** 0.06 **c.** $5\sqrt{17}$ **d.** $14\sqrt{7}$
e. $4\sqrt{3}$ **f.** $2\sqrt{3}$ **g.** $3\sqrt{5}$
h. $30\sqrt{3}$ **i.** $\frac{3\sqrt{5}}{5}$ **j.** $\sqrt{5}$

9. c

10. a. 4 **b.** 3 **c.** 2 **d.** 5 **e.** 1

Unit Investigation

1.



2. Answer will vary. (0, 0), 5,000, 86.26 ...) (15,000, 149.41...), (25,000, 192.89 ...), (35,000, 228.24 ...)

3. The distance to the horizon when the plane is on the ground

4. about 210 miles

5. about 7,000 feet

6. about 27,000 feet

7. The distance to the horizon decreases from about 230 miles to 190 miles.

2.1 Polynomial Arithmetic

Working with Powers

Student Logbook

1. exponent; base

2. 1

3. $\frac{1}{a^n}$

4. reciprocal; opposite

5. base

6. a^{r+s}; integers

7. a^{r-s}; integers

8. $a^{r \times s}$; integers

9. $a^n \times b^n$; integer

10. $\frac{a^n}{b^n}$; integer

Your Turn

1. a. 3^2 **b.** 3^{-2} **c.** 3^4 **d.** 3^2

2. 1

3. a. b^5 **b.** $-3c^2$ **c.** 25^6

d. $\frac{1}{3}$ or 3^{-1} **e.** $32x^{15}y^{20}$ **f.** $\frac{625x^4}{16y^4}$

4. Mercury: 5.8×10^7
Earth: 1.5×10^8
Mars: 2.3×10^8
Saturn: 1.4×10^9
Pluto: 5.9×10^9

5. 1.4×10^{12}

Transforming Equations Using Multiple Operations

Student Logbook

1. x^2

2. ax^n ; real number; variable; nonnegative

3. ploynomial

4. trinomial; 3 monomials or 3 terms

5. left; right; descending order

6. left; right; ascending order

7. nonzero value; simplify; identity

8. Their exponents are different.

9. Students' answers will vary.

Your Turn

1. No. In the definition of a monomial, a term of the form ax^n, n is a nonnegative integer. Since n in the expression $2x^{-3}$ is negative, this expression is not a monomial.

2. a. $2x^2 + x$; binomial

b. $4s^{23} - 7s^{17} - s$; trinomial

3. a. $2x^3 + 10x^2 - 2x + 12$

b. $-2b^4 - b + 4$

c. $7c^3 + 6c^2 - 2$

4. a. $-3a + 11a^3$

b. $3 - x - 6x^2 + 8x^3$

c. $b + 3b^2 - b^3$

5. a. $2n^2 + 4n$

b. $3n^2 + 7n + 3$

c. $4n^2 + 9n + 3$

Multiplying Polynomials

Student Logbook

1. $n + 1$

2. distributive; $(n + 10)n + (n + 10) \times 1$

3. sum; products

4. FOIL stands for First, Outer, Inner, Last: multiply the first terms of each binomial; multiply the outer terms; multiply the inner terms, multiply the last terms.

5. substitute; identity

6. $a^2 + 2ab + b^2$

7. $a^2 - 2ab + b^2$

8. $a^2 - b^2$

Your Turn

1. a. $(n + 2)(n + 8)$; $n^2 + 10n + 16$

b. $n(n + 8)$; $n^2 + 8n + 0$

c. $(n - 1)(n + 8)$; $n^2 + 7n - 8$

d. $(3n + 1)(n + 8)$; $3n^2 + 25n + 8$

2. $(n + 3)(4n - 2)$; $4n^2 - 2n + 12n - 6$; $4n^2 + 10n - 6$

3. a. $9b^2 + 12b + 4$; $(3(-2)+2)^2 = 9(-2)^2 + 12(-2) + 4$;
$169 = 169$

b. $25y^2 - 30y + 9$; $(5(-2)-3)^2 = 25(-2)^2 - 30(-2) + 9$;
$169 = 169$

4. $x^2 - 16$

5. $2n^2 + 16n$; Sample answer. The area of one panel is $n(n + 8)$ or $n^2 + 8n$. This multiplied by 2 equals $2n^2 + 16n$.

Unit Assessment

1. b and c

2. a. $-32a^3$ **b.** $5r^6$

c. 4^{-4}, or $\frac{1}{4^4}$ or $\frac{1}{256}$ **d.** $16y^{12}$

e. $8s^{3n+6}$ **f.** $\frac{64r^3}{343s^3}$

3. 3.8×10^{-2}

4. a. $7n^2 + 10n - 5$

b. $-2n^2 + 3n + 15$

c. $n^2 - 15n - 14$

d. $9n^2 + 24n + 7$

5. $(2n + 3)(3n - 4)$

$= 6n^2 - 8n + 9n - 12$

$= 6n^2 + n^2 + 2$

6. *d*

7. $(3-5)(3+5) = 3-25$

$(-2)(8) = 9-25$

$-16 = -16$

8. a. $n^2 - n$

b. $3n^2 + 13n + 4$

c. $2n^2 + 14n + 4$

Unit Investigation*

1. Students' diagrams will vary. Dimensions should be reasonable.

2. Students' diagrams will vary. Dimensions should be reasonable.

3. Students' diagrams will vary. Area and dimensions should be reasonable

4. Students' answers will vary.

2.2 Factoring Polynomials

Finding Common Factors

Student Logbook

1. positive integers; 1; itself

2. It has only one factor (itself).

3. composite number

4. prime factors; product

5. Factor the monomials. The greatest common factor of the variable terms is equal to the variable term with the lower exponent.

6. degree

7. $12n^2$

8. the product of two or more polynomials

9. highest; monomial

*This problem is appropriate for group work, as well as individual assignments.

Your Turn

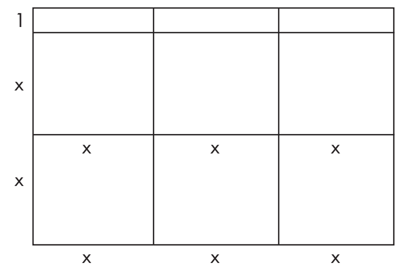
1. a. $2 \bullet 2 \bullet 3 \bullet 5$ or $2^3 \bullet 3 \bullet 5$

b. $5 \bullet 31 \bullet x \bullet y$

c. $2 \bullet 2 \bullet 2 \quad 2 \bullet 3 \bullet 3 \bullet n \bullet n$ or $2^4 \bullet 3^2 n^2$

2. a. $8y^3$ **b.** $4a^3$

3. a



b. $3(2x + 1)$

c. $3(4)(2(4) + 1) = 6(4)^2 + 3(4)$

$12(8 + 1) = 6 \bullet 16 + 12$

$12 \bullet 9 = 96 + 12$

$108 = 108$

4. a. $4n(3n^2 + 5)$ **b.** $8y^3(9y - 5)$

c. $(x + 2)(x + 5)$ **d.** $3(m + 7)(m + 2)$

Factoring Quadratic Trinomials

Student Logbook

1. 24; 10

2. $(x + 4)(x + 6)$

3. quadratic term

4. linear term

5. constant term

6. Yes. It is a form $ax^2 + bx + c$; a, b, c are 1, 10, 24 which are real numbers and $a \neq 0$.

7. opposites

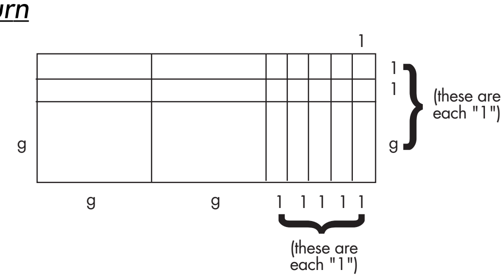
8. $(y - 3)(y - 4)$

9. $(2r + 3)(r + 2)$

10. $(2n + 5)(3n - 2)$

Your Turn

1. a.



b. $(g + 2)(2g + 5)$

c. $2(2)^2 + 9(2) + 10 = (2 \bullet 2 + 5)(2 + 2)$

$8 + 18 + 10 = 9 \bullet 4$

$36 = 36$

2. a. $s^2 + 5s - 1$ **b.** s^2

c. $5s$ **d.** -1

3. a. $(x + 2)(x + 3)$ **b.** $(d - 8)(d + 4)$

c. $(2p + 1)(p + 3)$ **d.** $(3y - 4)(y - 1)$

e. $3(f + 2)(f - 3)$

Special Cases

Student Logbook

1. $(a + b)^2$

2. difference; two squares

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

4. $(a + b)(a - b)$

5. $(5k + 12)(5k - 12)$

6. yes; $(x^2)^2 = x^4$ and $8^2 = 64$

7. $(x^2 - 8)(x^2 + 8)$

8. prime

9. a. common factors; distributive

b. perfect square trinomial; difference of two squares

10. prime

Your Turn

1.

Factored form	Trinomial expression	Special case
$(x + 9)^2$	$x^2 + 18x + 81$	perefect square trinomial
$(2x + 10)^2$	$4x^2 + 40x + 100$	perefect square trinomial
$(x - 3)^2$	$x^2 - 6x + 9$	perefect square trinomial
$(x + 5)(x - 5)$	$x^2 - 25$	difference of two squares
$(x + 7)(x - 7)$	$x^2 - 49$	difference of two squares
prime, not factorable	$x^2 + 81$	sum of two squares
$(2x + 20)^2$ or $4(x + 10)^2$	$4x^2 - 80x + 400$	perefect square trinomial

2. a. $(a - b)^2$ is the square of a difference and is equal to $a^2 - 2ab + b^2$. $(a^2 - b^2)$ is the difference of squares and factors as $(a + b)(a - b)$.

b. Solutions will vary. Example: If $a = 1$ and $b = 2$; $(a - b)^2 = (1 - 2)^2 = 1$ and $(a^2 - b^2) = 1^2 - 2^2 = 1^2 = -3$

Unit Assessment

1. The next step would be to eliminate all multiples of 3 from the table greater than 3, then multiples of 5 greater than 5, etc. The numbers remaining would not be multiples of any numbers preceding them, other than themselves and 1, and are therefore prime.

2. $24 = 2 \bullet 2 \bullet 2 \bullet 3$ or $2^3 \bullet 3$

3. a. Solutions will vary. Example: 8 and 12, GCF is 4

b. Solutions will vary. Example: 15 and 18, GCF is 4

4. b^4

5.

Terms	Greatest common factor
16, 24	8
$64m$, $32m$, $96m$	$32m$
$42x^2$, $18x^3$	$6x^2$

6. a. $(x + 3)(x + 1) = x^2 + 4x + 3$

b. Solutions will vary. Example: Let $x = 5$,
$(5 + 3)(5 + 1) = 5^2 + 4 \bullet 5 + 3$
$8 \bullet 6 = 25 + 20 + 3$
$48 = 48$

7. a. $(g - 10)(g + 2)$ **b.** $(k + 6)^2$

c. $(p - 8)(p + 2)$ **d.** $(2x + 3)(2x + 5)$

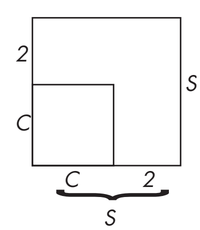
e. prime **f.** $(4a - 5)(4a + 5)$

8. a. $8(p + 2)$ **b.** $4(p + 4)$

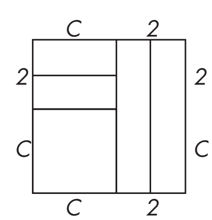
c. $4(3d + 4)$ **d.** $8(x + 2)(x - 2)$

Unit Investigation

1.

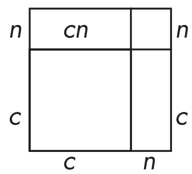


2.



3. $c^2 + 4c + 4$; $(c + 2)^2$

4. a.



b. $c^2 + 2nc + n^2$; $(c + n)^2$

5. a perfect square trinomial

6. Floor plans will vary.

7. Answers will vary. Example: If there is 6 feet of tile on one wall and 1 foot of tile on the other, then $x^2 + 7x + 6 = (x + 6)(x + 1)$

8. The factored form of the area gives the dimensions of the room, and shows the length of the carpet region and the length of the tiled region.

3.1 Graphing Quadratic Functions & Equations

Graphing Parabolas

Student Logbook

1. a second degree polynomial function

2. x–value; y–value

3. *up*

4. down

5. the least value of y on the graph of the parable

6. the greatest value of y on the graph of the parable

7. axis of symmetry

8. x = 0

9. vertex

Your Turn

1. a. *a*; c

2. a. concave down

b. concave up

c. concave up

3. a. *b* and c

b. *a*

4. *c*

5. Students' graphs should depict a parabola in quadrants I and II whose vertex is the origin. The curve is concave up and should pass through points (1, 2), (–1, 2), (2, 8), (–2, 8), (3, 18), (–3, 18), and so on.

a. domain: x = all real numbers; range: $y \geq 0$

b. $x = 0$

c. the origin, (0, 0)

d. concave up

e. y = 0 (minimum)

Analyzing Properties of Parabolas

Student Logbook

1. the *y*-intercept

2. down; vertex; 1,000

3. 0; real numbers

4. incomplete; 0

5. midpoint; *h*

6. 240.1

7. *7*

8. parabola; y-axis; vertex

9. *x*-intercepts; 0

Your Turn

1. a. –5

b. 0

c. *67*

2. *b, c*

3. Students' parabolas should open upward, the least value of *y* (the minimum) should be –3, and the parabola should be centered around the axis of symmetry, $x = -2$. The parabolas may have any width, provided these conditions are met.

4. (8, 15)

5. a. 400

b. the height of the cliff, or the distance between the cliff and the ground below it.

Solving Quadratic Equations by Graphing

Student Logbook

1. trajectory

2. quadratic; linear; 0; –6

3. vertex

4. root; solution

5. horizontal intercepts

6. real roots

7. 5.6

8. real root

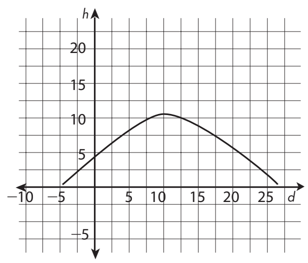
9. x-intercept

Your Turn

1. a. 5

b. 12 feet (at d = 10)

c.



Since d cannot be negative in this problem, only the curve in Quadrant 1 and the prints (0, 5) and (25.0) correspond to the ball's trajectory.

2.

Equation	Roots	Concavity	Max/min
h = 0, 5d^2 + 1	0	Concave up	1
y = 3x^2 + 6x + 1	2	Concave down	4
d = –1.9t^2	1	Concave down	0
y = 4x^2 + 4x – 35	2	Concave up	–36

Unit Assessment

1. a. $3x^2$

b. $5x$

c. –7

d. The equation is of the form y = ax^2 + bx + c.

e. the coefficient of the quadratic term, 3

f. The sign of the quadratic term. If it is positive, the parabola is concave up; if it is negative, the parabola is concave down.

g. the constant term, –7

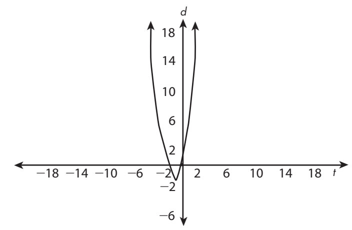
2. a. maximum **b.** minimum **c.** minimum

3. a. y = x^2 – 1 **b.** y = – x^2 + 1

4. a. 2 real roots **b.** 2 real roots

c. 0 real roots **d.** 1 real roots

5.

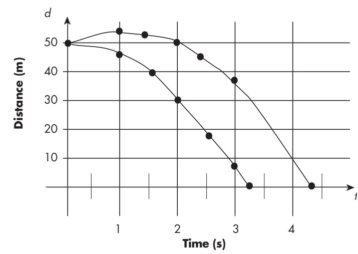


6. *t* = 0 to 5 inclusive

7. 0 to 70 inclusive

Unit Investigation

1.a. and b.



c. b_2 ; The ball that was dropped hit the ground after 3.2 seconds, and the ball that was thrown hit the ground after 4.4 seconds.

d. About 56 meters

e. Between 1 and 1.5 seconds

f. 50 meters

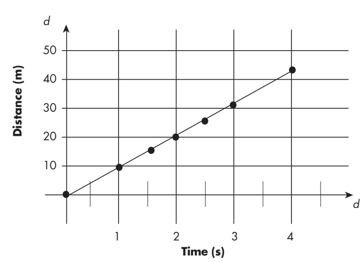
2. a. The initial velocity (speed) of the ball when it was thrown.

b. The height of the cliff above the ground (50 ft.).

c. 0 m/s

3. b_1 = 0 and b_2 = 44

4.



b_2	
t	d_2
0	0
1	10
1.5	15
2	20
2.5	25
3	30
4.4	44

5. The ball fell at a constant speed: 10 m/s.

3.2 Solving Quadratic Equations Using Algebra

Factoring & The Zero Product

Student Logbook

1. Zero product theorem

2. two

3. horizontal intercepts or x-intercepts

4. axis of symmetry, vertex

5. 0, 0

6. I

7. 22.2

8. double root

9. x-intercepts; parabolic function

Your Turn

1. a. two

b. $0 = 0.25x^2 - 4$

$0 = (0.5x + 2)(0.5x - 2)$

$0 = 0.5x + 2$ or $0 = 0.5x - 2$

$-2 = 0.5x$ or $2 = 0.5x$

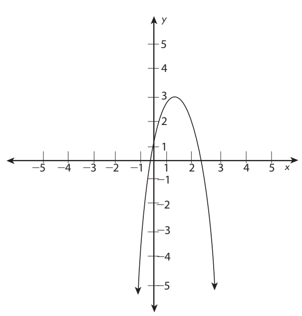
$-4 = x$ or $4 = x$

2. $x(x+ 4)$

3. a. 0, 2

b. (1, 3)

c.



4. a. $(6x + 2)(6x + 2)$, or $4(3x + 1)^2$

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

c. 1

The Square Root Method & Completing the Square

Student Logbook

1. square root property

2. $a + (-a) = 0$, $-(a) + a = 0$

3. sum

4. perfect square trinomial

5. 3; –13

6. 4

7. $x - 2 = \sqrt{3}$ or $x - 2 = -\sqrt{3}$
(or $(x-2)^2 = 3$)

8. square root property

9. completing; square

10. irrational

Your Turn

1. two

2. a. $x = \pm 3$ **b.** $x = \pm 1$ **c.** $x = \pm 2$

3. b^2

4. a. 36 **b.** 100 **c.** $\frac{9}{4}$

5. $x^2 + 4x - 5 = 0$

$x^2 + 4x = 5$

$x^2 + 4x + 4 = 5 + 4$

$(x + 2)^2 = 9$

$x + 2 = \pm 3$

$x + 2 = 3$ or $x + 2 = -3$

$x = 1$ or $x = -5$

6. $x^2 - 10x + 18 = 0$

$x^2 - 10x + 25 = 18 + 25$

$(x - 5)^2 = 7$

$x - 5 = \pm\sqrt{7}$

$x = 5 \pm \sqrt{7}$

The Quadratic Formula

Student Logbook

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

2. 2; 8; –13

3. $2\sqrt{42}$

4. real

5. $b2 - 4ac$

6. radicand

7. no real

8. one real

9. two real

<u>*Your Turn*</u>

1. a. square root property

b. completing the square

c. zero product theorem

2. $g = \frac{-h \pm \sqrt{h^2 - 4f}}{2f}$

3. a. $x^2 + 12x - 18 = 0$; 1; 12; –18

b. $3y^2 - 2y + 51 = 0$; 3; –2; 51

c. $8y^2 - 2y + 27 = 0$; 8; –2; 27

d. $x^2 + 5x - 2 = 0$; 1; 5; –2

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

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

$$x = \frac{5 \pm \sqrt{25 - 20}}{10}$$

$$x = \frac{0.5 + \sqrt{5}}{10} \quad \text{or} \quad x = \frac{0.5 - \sqrt{5}}{10}$$

Unit Assessment

1. a. The equation has two solutions. This makes sense because he rabbit touches the ground (x = 0) at two points, the point that it jumps from and the point where it lands.

b. $x = 0$ or $x = 2$

c. distance = 2 ft.

d. $\frac{1}{4}$ of a foot or 3 inches

2. $m = 9$ of $m = -9$

3. $s = 0$ or $s = 99$

4. $\left(\frac{b}{2}\right)^2$ or $\frac{b^2}{4}$

5. $x^2 + 18x - 19 = 0$

$x^2 + 18x = 19$

$x^2 + 18x + 81 = 19 + 81$

$(x + 9)^2 = 100$

$x + 9 = \pm\sqrt{100} = \pm 10$

$x + 9 = 10$ or $x + 9 = -10$

$x = 1$ or $x = -19$

6. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-7 \pm \sqrt{7^2 - 4(1)(5)}}{2(1)}$

$$x = \frac{-7 \pm \sqrt{49 - 20}}{2} = \frac{-7 \pm \sqrt{29}}{2}$$

$$x = -3.5 + \frac{\sqrt{29}}{2} \qquad x = -3.5 - \frac{\sqrt{29}}{2}$$

7. The discriminant tells you how many solutions here are; if they are real or not; and if they are real, if the are rational or irrational.

8.

Quadratic equation	Discriminant	Nature of roots
a. $5x^2 + 6x + 5 = 0$	–64	not real
b. $6x^2 + 6x + 7 = 0$	–132	not real
c. $2x^2 + 8x + 2 = 0$	48	two irrational
d. $8x^2 + 3x - 4 = 0$	137	two irrational

9. a and b

Unit Investigation

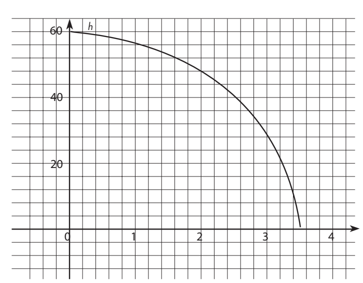
1. a. $h = -4.9t^2 + 60$

b.

t	0	1	2	3	4
h	60	55	29	16	–18

c. 3 and 4. The value of *h*, when *t* is 3, is positive. One second later, the value of *h* is negative. So, somewhere between 3 and 4, the value of *h* must have been 0, the value when the boulder strikes the ground.

d.



e. 60

f. Solve the equation for t when h equals 0.

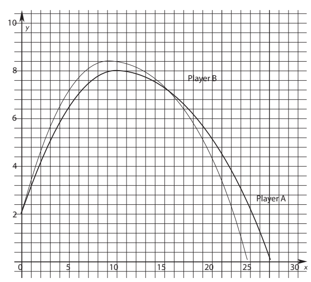
$-4.9t^2 + 60 = 0$
$60 = 4.9t^2$
$600 = 49t^2$
$\frac{600}{49} = t^2$
$\frac{10\sqrt{6}}{7} = t$
$3.5 \approx t$

2. a. 2 and 2. the initial position of the ball occurs when x = 0. therefore, since y is the height in feet above each player's shoulder, when x equals 0, y equals 2 in each equation.

b.

x	0	5	10	15	20	25	30
y_A	2	6	8	8	6	2	–4
y_B	2	6.7	8.8	8.5	5.6	0.3	–7.6

c.



d. Player B

e. Player A: 26.9 and Player B: 25.2

f. Solve he equation when $y = 0$.

$-0.04x^2 + x + 2 = 0$

$x = \frac{-1 \pm \sqrt{1^2 - 4(-0.04)(2)}}{2(-0.04)}$

$x = \frac{-1 \pm \sqrt{1.32}}{-0.08}$

$x \approx \frac{-1 \pm 1.15}{-0.08}$

$x \approx \frac{2.15}{0.08} \approx 26.9$

g. Player A

4.1 Radical Equations & Functions

Solving Radical Equations

Student Logbook

1. radical equation

2. $a^2 = b^2$

3. square root; $\frac{1}{2}$

4. radical;square

5. If the graphs of the functions intersect, then the x-coordinate of the point of intersection is the solution of the radical equation.

6. extraneous root

7. $x^{0.5}$

8. true

9. extraneous root(s)

Your Turn

1. x = 25

2. No. The symbol $\sqrt{m}$ indicates a principal, or non-negative root. Therefore $\sqrt{m}$ cannot be a negative.

3. $\sqrt{r - 5} - 8 = 0$

$\sqrt{r - 5} - 8 + 8 = 0 + 8$

$\sqrt{r - 5} = 8$

$[(r - 5)^{\frac{1}{2}}]^2 = 8^2$

$r - 5 = 64$

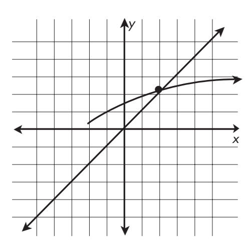
$r = 69$

Check: $\sqrt{69 - 5} - 8 = 0$

$\sqrt{64} - 8 = 0$

$8 - 8 = 0$

4. **a.** one solution:



b. $\sqrt{x+2} = x$ → $[(x+2)^{\frac{1}{2}}]^2 = x^2$

$x + 2 = x^2$

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

$0 = x + 1$ or $0 = x - 2$

$-1 = x$ or $2 = x$

c. $x = 2$

d. $x = -1$

The Inverse of the Square Root Function

Student Logbook

1. one-to-one

2. inverse

3. interchange; function; inverse

4. $f^{-1}(x)$

5. range

6. domain

7. $y = x$

8. function; 2

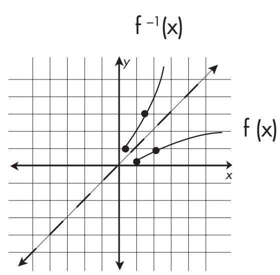
9. $y = \pm\sqrt{x}$

10. domain

Your Turn

1. Yes. For every point on the graph, each value of *y*. is paired with one and only one value of *x*, and each value of *x* is paired with one and only one value of *y*.

2. a.



b. $x \geq 1$.

c. $f(x) \geq 0$.

d. $f^{-1}(x) = x^2 + 1$

e. $x \geq 0$.

f. See graph above

g. See graph above; $y = x$

Unit Assessment

1. $\sqrt{a} = 12$; $(\sqrt{a})^2 = 12^2$. $a = 144$

$\sqrt{144} = 12$

$12 = 12^2$

2. $\sqrt{k} + 2 = 0$; $\sqrt{k} = -2$. no solution

$\sqrt{(-2)} = 2$

$\sqrt{(-2)^2} = 2$

$-2 \neq 4$

3. $\sqrt{d-15} - 5 = 0$; $\sqrt{d-15} = 5$

$(\sqrt{d-15})^2 = 5^2$ $d - 15 = 25$ $d = 40$

$\sqrt{40 - 15} - 5 = 0$

$\sqrt{25} - 5 = 0$

$5 - 5 = 0$

4. $z = \sqrt{z+7} + 5$

$z - 5 = \sqrt{z+7}$

$(z - 5)^2 = (\sqrt{z+7})^2$

$z^2 - 10z + 25 = z + 7$

$z^2 - 11z + 18 = 0$

$(z - 2)(z - 9) = 0$

$z - 2 = 0$ or $z - 9 = 0$

$3 = 2$ or $3 = 9$

9 is a solution, and 2 is an extraneous root.

$2 = (\sqrt{2+7} + 5$

$2 = \sqrt{9} + 5$

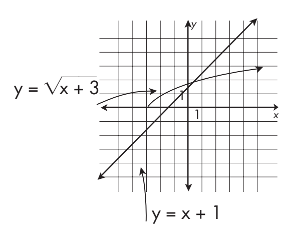
$2 = 3 + 5$

$9 = \sqrt{9+7} + 5$

$9 = \sqrt{16} + 5$

$9 = 4 + 5$

5. one solution; $x = 1$



6. $\sqrt{x} - 1 - 1 = \frac{x}{5}$

$\sqrt{x} - 1 = \frac{x}{5} + 1$

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

$(x - 1) = \frac{x^2}{25} + \frac{24}{5} + 1$

$25 - 25 = x + 10x + 25$

$0 = x^2 - 15x + 50$

$0 + (x - 5)(x - 10)$

$0 = x - 5$ or $0 = x - 10$

$5 = x$ or $10 = y$

7. No; It is not a one-to-one function because each non-zero value of y is paired with one value of x.

8. a. The domain is $x \geq -2$.

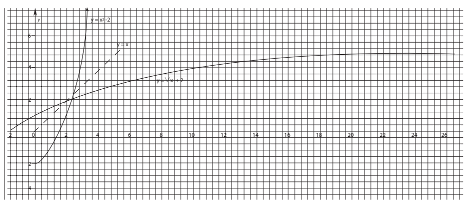
b. The range is $y \geq 0$.

c. $f^{-1}(x) = x^2 - 2$

d. $x \geq 0$

e. $f^{-1}(x) \geq -2$

f.



Investigating Gravity

Student Investigation

1. The rock is 192 feet above the ground.

$t = \sqrt{16 - \frac{1}{16}d}$ $\quad 2 = \sqrt{16 - \frac{1}{16}d}$

$(2)^2 = \sqrt{16 - \frac{1}{16}d}^{\,2}$

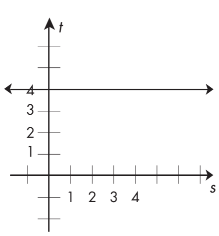
$4 = 16 - \frac{1}{16}d$

$-12 = -\frac{1}{16}d$

$192 = d$

2. No. After 3 seconds the rock is 112 feet above the ground. Since the bird is flying at a height of 120 feet, it will be above the rock.

3.



4. $0 \geq d \geq 256$

5. 2.8 seconds

$d = \frac{256}{2} = 128$

$t = \sqrt{16 - \frac{1}{16}(128)}$

$= \sqrt{16 - \frac{128}{16}}$

$= \sqrt{16 - 8}$

$= \sqrt{8}$

$= 2.82 \ldots \approx 2.8$

6. The rock hits the ground when $d = 0$:

$t = \sqrt{16 - \frac{1}{16}d}$

$= \sqrt{16 - \frac{1}{16}(0)}$

$= \sqrt{16} = 4$

So, the rock hits the ground after 4 seconds.

7. Since the domain of the function is $0 \leq s \leq 256$, the range of the function is $0 \leq t \leq 4$.

8. Yes. Answers may vary, but students should indicate that the function is a one-to-one function because in this domain, for every value of d there is one and only one value for t.

4.2 Rational Expressions, Equations & Functions

Rational Operations

Student Logbook

1. rational expression; one

2. $\frac{a}{c} \times \frac{b}{d}$

3. $\frac{a}{0}$

4. excluded value

5. Yes; the quotient of two rational expressions can be expressed as the product of two rational expressions.

6. $\frac{a + c}{b}$

7. $\frac{ad \pm cb}{bd}$

8. denominator; x

9. $\frac{d}{b}$

Your Turn

1. a. -2 **b.** 0 **c.** -1 **d.** ± 2

2. a. $b \neq -2, 0, 2$; $\frac{5}{b(b - 2)}$

b. $c \neq 0$; $\frac{4c + 12}{c}$

c. $d \neq 0$; $\frac{2 - 5d}{4d^2}$

d. $h \neq 0, 6$; $\frac{h + 6}{h(h - 6)}$

e. $k \neq 0, 2$; $\frac{5k - 14k + 2}{k(k - 2)}$

Rational Functions

Student Logbook

1. rational equation

2. hyperbola

3. vertical axis, horizontal axis

4. $\rightarrow +\infty$ $\rightarrow -\infty$

$\rightarrow 0^+$ $\rightarrow 0^-$

5. asymptote

6. discontinuous

7. excluded value, vertical asymptote

8. horizontally

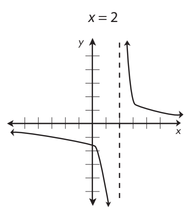
9. asymptotes

Your Turn

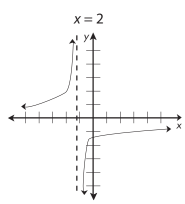
1. a. > **b.** < **c.** > **d.** <

2. x = 1

3. a.



b.



Rational Equations

Student Logbook

1. common denominator

2. $x = 3$

3. 3

4. rate, time, work

5. 7x

6. $t = \frac{d}{r}$

7. extraneous root

8. excluded values

9. rational equation

Your Turn

1. a. $2k^2 + 8k$ or $2k(k + 4)$

b. $12w^2 - 36w$ or $12w(w - 3)$

c. $p^2 - 5p + 6$ or $(p - 3)(p - 2)$

2. $p = 2.8$

3. $b = 3$

4. $3\frac{1}{3}$ hours

5. a. $\frac{rt}{t - 30}$

b. 8:10am

6. $3\frac{1}{3}$ minutes

Unit Assessment

1. a. $h \neq 0$ **b.** $g \neq -3$ **c.** $d \neq 2$

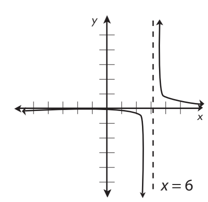
2. a. $\frac{2(w + 3)}{w - 2}$ **b.** $\frac{2z^2 + 5z - 3}{6yz^2 + 12}$

c. $\frac{4 - u}{36}$ **d.** $-y^2 - 5y + 42$

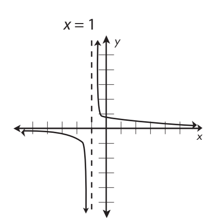
3.

x	f(x)
– 4	– 2
– 3	undefined
– 2	2
– 1	1
0	$\frac{2}{3}$
1	$\frac{2}{4}$ or $\frac{1}{2}$
2	$\frac{2}{5}$
3	$\frac{2}{6}$ or $\frac{1}{3}$
4	$\frac{2}{7}$

4. a.



b.

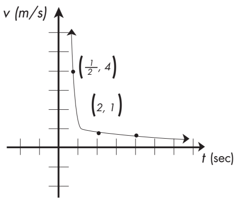


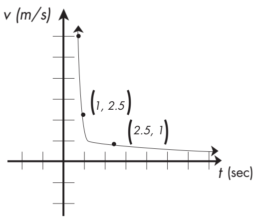
5. $\frac{t}{6} + \frac{t}{h} = 1$, so if t = 4, h = 12 hours

6. a. 5 miles **b.** 18 mph **a.** 1.5 hours

Unit Investigation

1.





2. It decreases.

3. It decreases.

4. $\frac{1}{2}$ swing per second

5. $\frac{1}{4}$ seconds

6. The graph is the part of the hyperbola in quadrant 1, and translated farther from the y – axis than the other 2 graphs

7. Increasing the wavelength of a wave causes the period of a wave to increase for a given speed.

5.1 Graphical Displays

Stem & Leaf Plots & Box Plots

Student Logbook

1. collection; display; analysis

2. histogram; intervals

3. stem; leaf

4. difference

5. skewed

6. median

7. four

8. second quartile

9. box plot or box-and-whisker plot

10. third; first

11. outlier

Your Turn

1.

stem	leaf
3	3
4	2 9
6	5 7
10	5 7
28	7
29	7
53	4

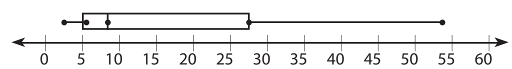
Key: 3/3 = 3.3%

2. a. 3.3 **b.** 53.4 **c.** 15.86 **d.** 8.6

3. 4.9; 8.6; 28.7

4. 23.8

5.



6. 53.4

Scatter Plots & Linear Best-Fit Graphs

Student Logbook

1. two

2. best-fit

3. median-median

4. No; the line M_1M_3 does not represent the data in the center group because most of the data points in the center group lie below the line M_1M_3

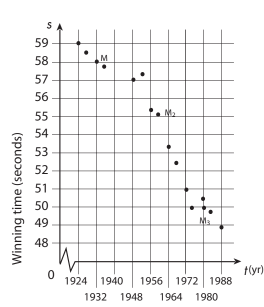
5. parallel; $\frac{1}{3}$; $\frac{2}{3}$

6. trend

7. predictions

Your Turn

1.



2. $M_1 = (1932, 58.2)$
$M_2 = (1960, 55.2)$
$M_3 = (1980, 49.99)$

3. a. $y = -0.171t + 388.57$

b. $y = -0.171t + 390.36$

c. $y = -0.171t + 389.167$

4. $s = 48.535$

Unit Assessment

1. 2 | 5 = 25mph

stem	leaf
2	5
3	0 2 2
4	0 2 3 5
5	0
7	0

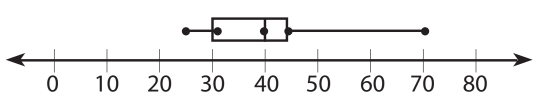
a. 40.9mph

b. 70mph

c. 41

d. Yes; because the mean is nearly equal to the median.

2. a. 32, 41, 45



b. 13

c. The interquartile range shows that approximately 50% of the animals listed in the table have speeds between 32mph and 45mph.

3. a. one-dimensional

b. one-dimensional

c. two-dimensional

4. a. $M_1 = (1937.5, 64.55)$
$M_2 = (1960, 73.1)$, $M_3 = (1982.5, 77.8)$

b. $m = 0.294$

c. $y = 0.294x - 504.43$

d. 82.1 years

Unit Investigation

1. A box plot is te best way to display the desired information. The range of years that the middle 50% of the parks have been established is the interquartile range. To find this range, each quartile must be found.

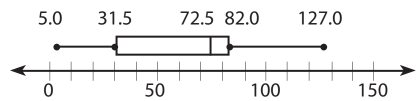
$Q_1 = \frac{28 + 35}{2} = 31.5$

$Q_2 = \frac{70 + 75}{2} = 72.5$

$Q_3 = \frac{80 + 84}{2} = 82.0$

The interquartile range is $Q_3 - Q_1$ or $82.0 - 31.5 = 50.5$.

Outliers include Saguaro (5 years) and Yellowstone (127 years).

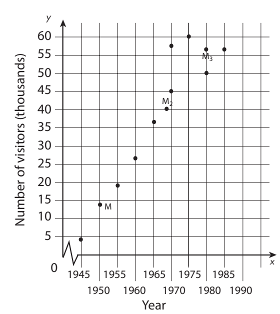


2. A stem-and-leaf plot is the best way to display the desired information. The maximum is 127 years, and the minimum is 5 years. The mean of the data is 61.8. There are 5 values below the mean and 7 values above the mean. Thus, the data are only slightly skewed, and the mean does represent a good measure of central tendency.

2 | 8 = 28 years

stem	leaf
0	5
2	8 8
3	5 7
7	0 5
8	0 0 4
9	3
12	7

3. A scatter plot is the best way to see if there is a general trend in the data. Accept all reasonable predictions for 2000. Sample: The prediction may not be reasonable because during the last ten years, the number of visitors has fluctuated.



Equation of MM line is
$y = 1,030.9x - 1,993,229.8$

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Rev March, 2004