Eureka Math™
Exit Ticket Packet

Algebra I
Module 4

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Lesson 1: Multiplying and Factoring Polynomial Expressions

Exit Ticket

When you multiply two terms by two terms, you should get four terms. Why is the final result when you multiply two binomials sometimes only three terms? Give an example of how your final result can end up with only two terms.

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Lesson 2: Multiplying and Factoring Polynomial Expressions

Exit Ticket

1. Factor completely: $2a^2 + 6a + 18$

2. Factor completely: $5x^2 - 5$

3. Factor completely: $3t^3 + 18t^2 - 48t$

4. Factor completely: $4n - n^3$

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Lesson 3: Advanced Factoring Strategies for Quadratic Expressions

Exit Ticket

1. Use algebra to explain how you know that a rectangle with side lengths one less and one more than a square will always be 1 square unit smaller than the square.

2. What is the difference in the areas of a square and rectangle if the rectangle has side lengths 2 less and 2 more than a square? Use algebra or a geometric model to compare the areas and justify your answer.

3. Explain why the method for factoring shown in this lesson is called the product-sum method.

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Lesson 4: Advanced Factoring Strategies for Quadratic Expressions

Exit Ticket

1. Explain the importance of recognizing common factors when factoring complicated quadratic expressions.

2. Factor: $8x^2 + 6x + 1$.

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Lesson 5: The Zero Product Property

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1. Factor completely: $3d^2 + d - 10.$

2. Solve for d: $3d^2 + d - 10 = 0.$

3. In what ways are Problems 1 and 2 similar? In what ways are they different?

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Lesson 5:   The Zero Product Property

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Lesson 6: Solving Basic One-Variable Quadratic Equations

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1. Solve the equations.

    a. $4a^2 = 16$

    b. $5b^2 - 25 = 0$

    c. $8 - c^2 = 5$

2. Solve the equations.

    a. $(x - 2)^2 = 9$

    b. $3(x - 2)^2 = 9$

    c. $6 = 24(x + 1)^2$

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Lesson 7: Creating and Solving Quadratic Equations in One Variable

Exit Ticket

1. The perimeter of a rectangle is 54 cm. If the length is 2 cm more than a number, and the width is 5 cm less than twice the same number, what is the number?

2. A plot of land for sale has a width of x ft. and a length that is 8 ft. less than its width. A farmer will only purchase the land if it measures 240 ft^2. What value for x causes the farmer to purchase the land?

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Lesson 8: Exploring the Symmetry in Graphs of Quadratic Functions

Exit Ticket

1. If possible, find the equation for the axis of symmetry for the graph of a quadratic function with the given pair of coordinates. If not possible, explain why.

    a. $(3, 10)$ $(15, 10)$

    b. $(-2, 6)$ $(6, 4)$

2. The point $(4, -2)$ is the vertex of the graph of a quadratic function. The points $(8, 6)$ and $(2, 0)$ also fall on the graph of the function. Complete the graph of this quadratic function by first finding two additional points on the graph. (If needed, make a table of values on your own paper.) Then, answer the questions on the right.
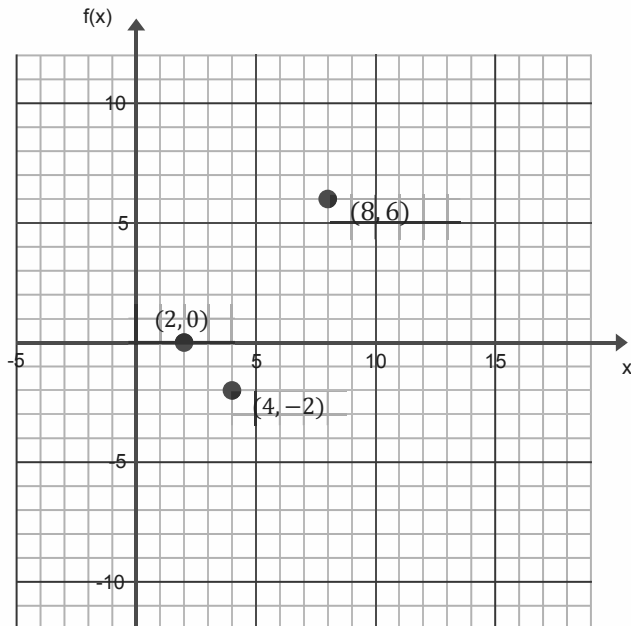
a. Find the y-intercept.

b. Find the x-intercept(s).

c. Find the interval on which the rate of change is always positive.

d. What is the sign of the leading coefficient for this quadratic function? Explain how you know.

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Lesson 9: Graphing Quadratic Functions from Factored Form,

$$f(x) = a(x - m)(x - n)$$

Exit Ticket

Graph the following function, and identify the key features of the graph: $t(x) = x^2 + 8x - 20$.
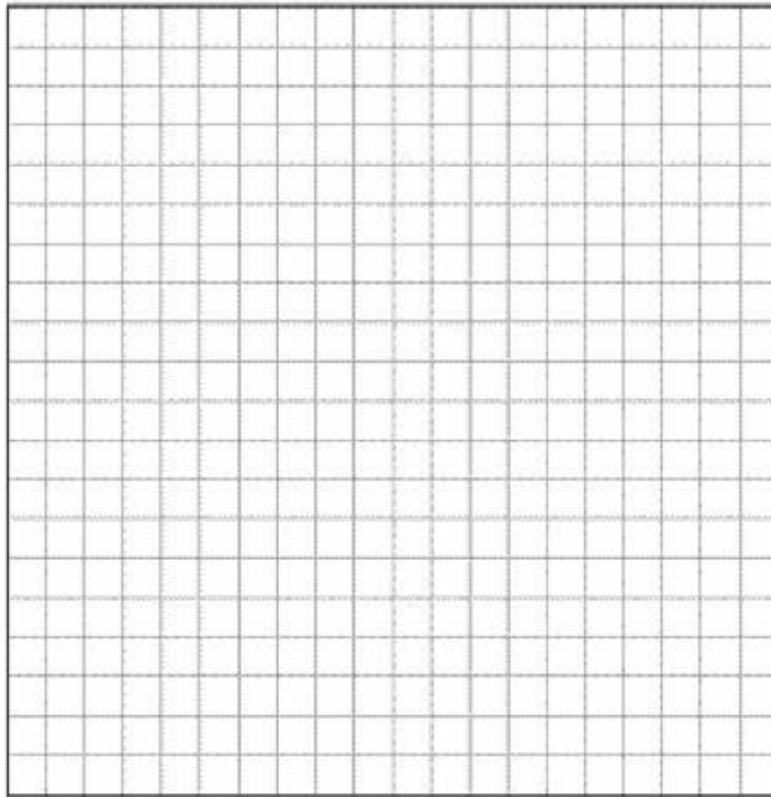
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Lesson 10: Interpreting Quadratic Functions from Graphs and Tables

Exit Ticket

A toy company is manufacturing a new toy and trying to decide on a price that maximizes profit. The graph below represents profit (P) generated by each price of a toy (x). Answer the questions based on the graph of the quadratic function model.
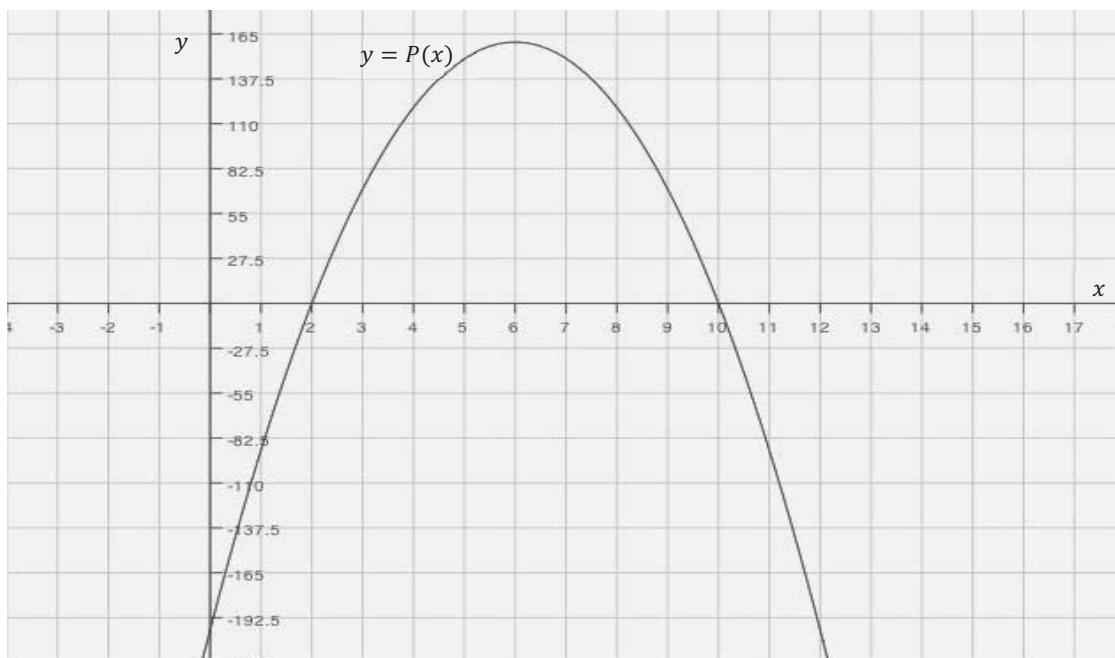
a.   If the company wants to make a maximum profit, what should the price of a new toy be?

b.   What is the minimum price of a toy that produces profit for the company? Explain your answer.

c. Estimate the value of $P(0)$, and explain what the value means in the problem and how this may be possible.

d. If the company wants to make a profit of $137, for how much should the toy be sold?

e. Find the domain that only results in a profit for the company, and find its corresponding range of profit.

f. Choose the interval where the profit is increasing the fastest: $[2, 3]$, $[4, 5]$, $[5.5, 6.5]$, $[6, 7]$. Explain your reasoning.

g. The company owner believes that selling the toy at a higher price results in a greater profit. Explain to the owner how selling the toy at a higher price affects the profit.

Name _____   Date_____

Lesson 11: Completing the Square

Exit Ticket

Rewrite the expression $r^2 + 4r + 3$, first by factoring and then by completing the square. Which way is easier?
Explain why you think so.

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Lesson 12: Completing the Square

Exit Ticket

1. Complete the square: $ax^2 + x + 3$.

2. Write the expression for the profit, P, in terms of q, the quantity sold, and s, the selling price, based on the data collected below on sales and prices. Use the examples and your notes from class to then determine the function that represents yearly profit, P, in terms of the sales, s, given the production cost per item is \$30.

Selling Price, $ (s)	Quantity Sold (q)
100	7000
200	6000
500	3000
600	2000
800	0

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Lesson 13: Solving Quadratic Equations by Completing the Square

Exit Ticket

1. Solve the following quadratic equation both by factoring and by completing the square: $\frac{1}{4}x^2 - x = 3$.

2. Which method do you prefer to solve this equation? Justify your answer using algebraic reasoning.

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Lesson 14: Deriving the Quadratic Formula

Exit Ticket

Solve for R using any method. Show your work.

$$\frac{3}{2}R^2 - 2R = 2$$

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Lesson 15: Using the Quadratic Formula

Exit Ticket

1. Solve the following equation using the quadratic formula: $3x^2 + 6x + 8 = 6$.

2. Is the quadratic formula the most efficient way to solve this equation? Why or why not?

3. How many zeros does the function $f(x) = 3x^2 + 6x + 2$ have? Explain how you know.

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Lesson 16: Graphing Quadratic Equations from the Vertex Form, $y = a(x - h)^2 + k$

Exit Ticket

1. Compare the graphs of the function, $f(x) = -2(x + 3)^2 + 2$ and $g(x) = 5(x + 3)^2 + 2$. What do the graphs have in common? How are they different?

2. Write two different equations representing quadratic functions whose graphs have vertices at $(4.5, -8)$.

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Lesson 16:   Graphing Quadratic Equations from the Vertex Form,
            $y = a(x - h)^2 + k$

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Lesson 17: Graphing Quadratic Functions from the Standard Form, $f(x) = ax^2 + bx + c$

Exit Ticket

Graph $g(x) = x^2 + 10x - 7$, and identify the key features (e.g., vertex, axis of symmetry, x- and y-intercepts).
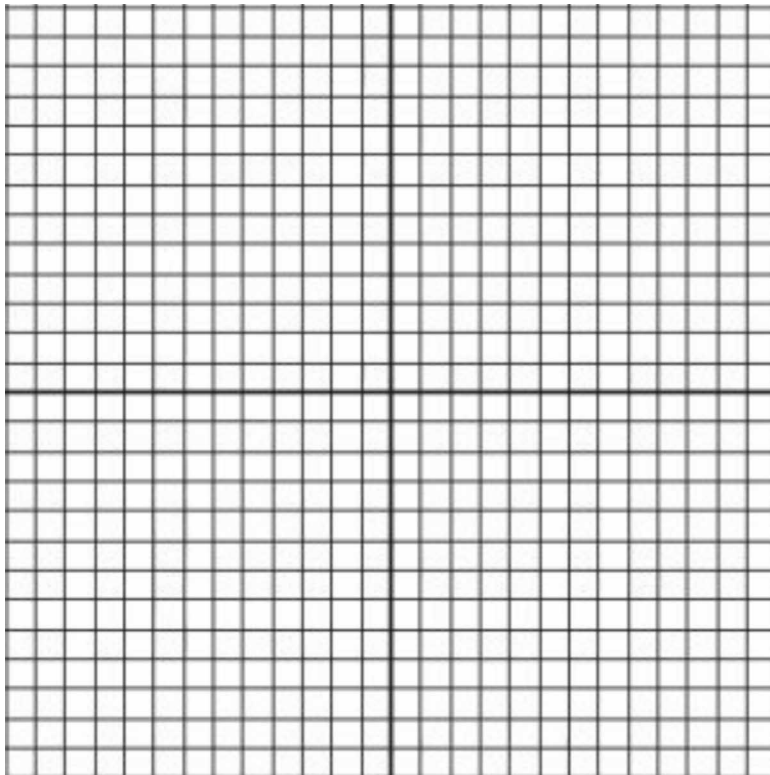
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Lesson 18: Graphing Cubic, Square Root, and Cube Root Functions

Exit Ticket

1. Describe the relationship between the graphs of $y = x^2$ and $y = \sqrt{x}$. How are they alike? How are they different?

2. Describe the relationship between the graphs of $y = x^3$ and $y = \sqrt[3]{x}$. How are they alike? How are they different?

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Lesson 19: Translating Graphs of Functions

Exit Ticket

1. Ana sketched the graphs of $f(x) = x^2$ and $g(x) = x^2 - 6$ as shown below. Did she graph both of the functions correctly? Explain how you know.
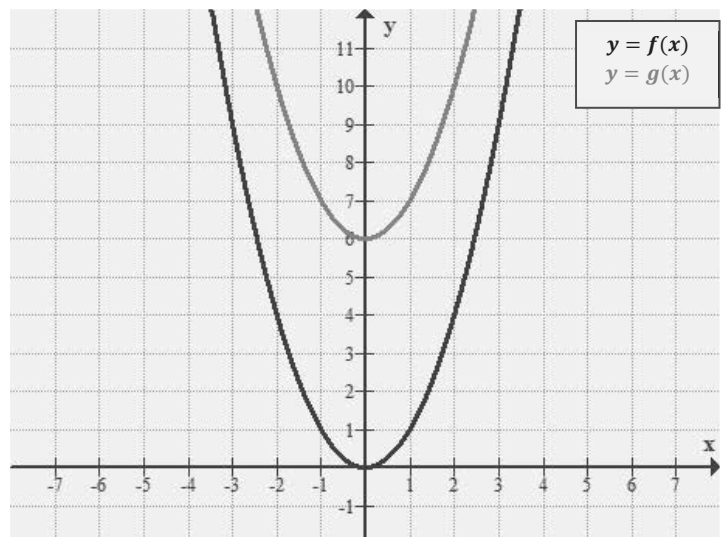
2. Use transformations of the graph of $f(x) = \sqrt{x}$ to sketch the graph of $f(x) = \sqrt{x - 1} + 3$.
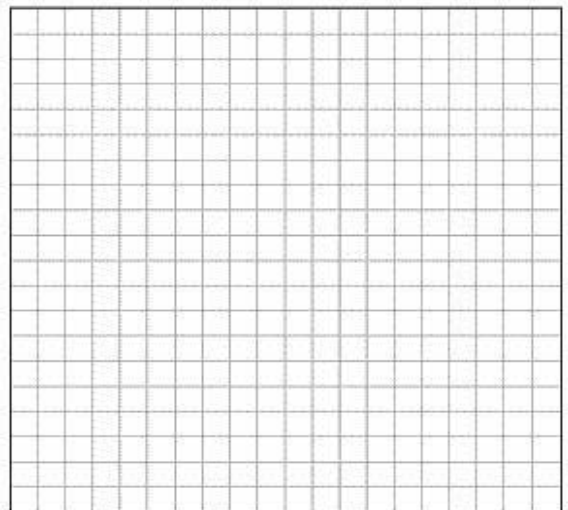
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Lesson 20: Stretching and Shrinking Graphs of Functions

Exit Ticket

1. How would the graph of $f(x) = \sqrt{x}$ be affected if it were changed to $g(x) = -2\sqrt{x}$?

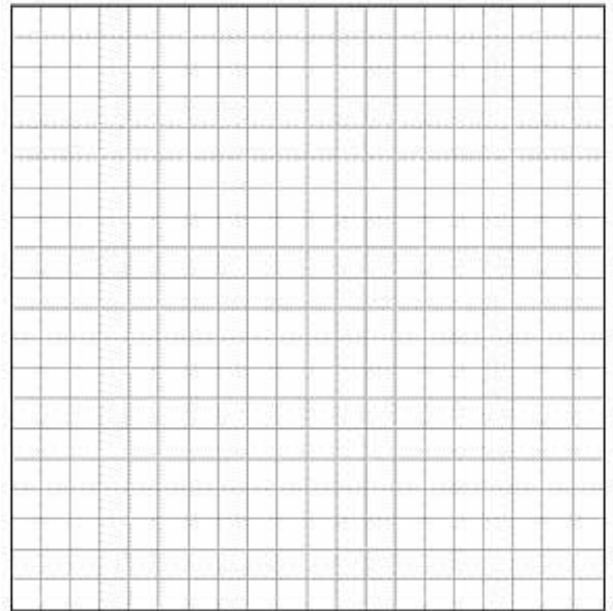2. Sketch and label the graphs of both f and g on the grid below.
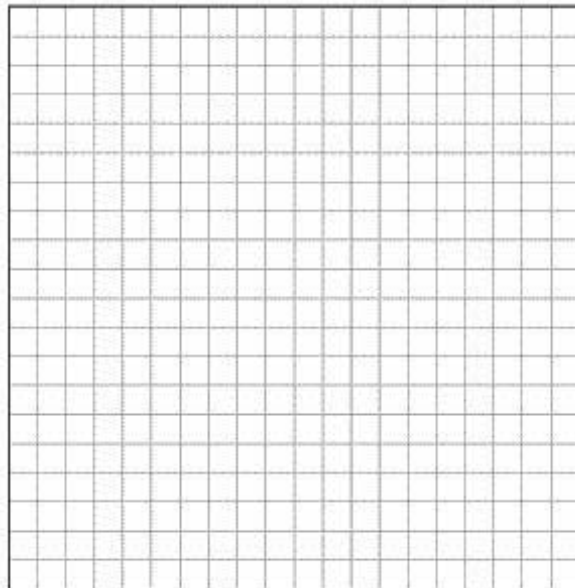
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Lesson 21: Transformations of the Quadratic Parent Function, $f(x) = x^2$

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Describe in words the transformations of the graph of the parent function $f(x) = x^2$ that would result in the graph of $g(x) = (x + 4)^2 - 5$. Graph the equation $y = g(x)$.

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Lesson 22: Comparing Quadratic, Square Root, and Cube Root Functions Represented in Different Ways

Exit Ticket

Two people, each in a different apartment building, have buzzers that don't work. They both must throw their apartment keys out of the window to their guests, who will then use the keys to enter.

Tenant 1 throws the keys such that the height-time relationship can be modeled by the graph below. On the graph, time is measured in seconds, and height is measured in feet.
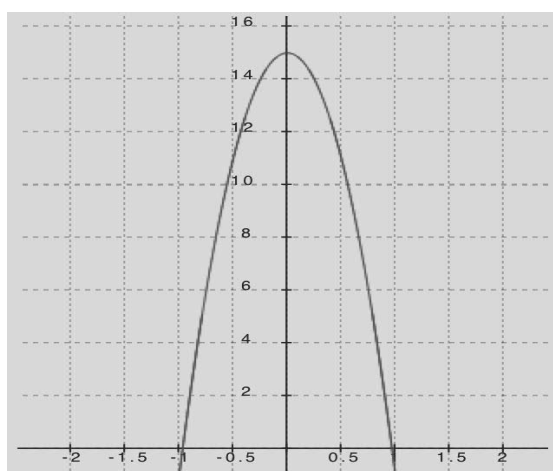
Tenant 2 throws the keys such that the relationship between the height of the keys (in feet) and the time that has passed (in seconds) can be modeled by $h(t) = -16t^2 + 18t + 9$.

a.   Whose window is higher? Explain how you know.

b.   Compare the motion of Tenant 1's keys to that of Tenant 2's keys.

c.   In this context, what would be a sensible domain for these functions?

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Lesson 23: Modeling with Quadratic Functions

Exit Ticket

What is the relevance of the vertex in physics and business applications?

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Lesson 24: Modeling with Quadratic Functions

Exit Ticket

Write a quadratic function from the following table of data.

Fertilizer Impact on Corn Yields					
Fertilizer, x (kg/m^2)	0	100	200	300	400
Corn Yield, y (1000 bushels)	4.7	8.7	10.7	10.7	8.7