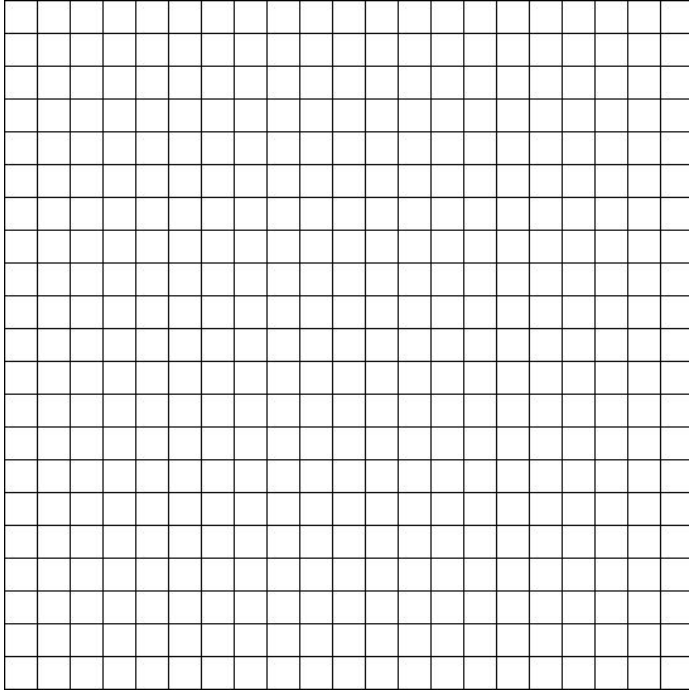


Quadratic function: _____



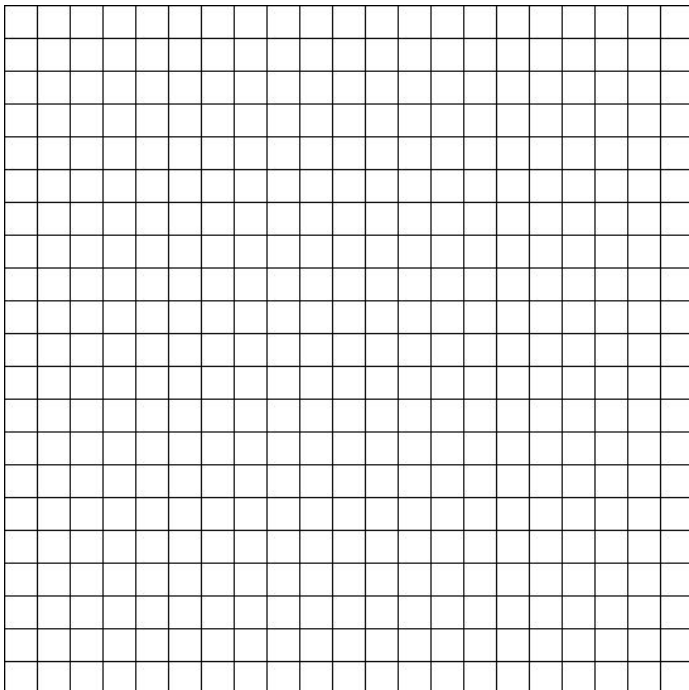
x	y

Attributes:

vertex	
x-intercepts	
y-intercept	
line of symmetry	
Opens up or down?	

What else do you notice?

Quadratic function: _____



x	y

Attributes:

vertex	
x-intercepts	
y-intercept	
line of symmetry	
Opens up or down?	

What else do you notice?

As each team presents, write what they have observed in the table below.

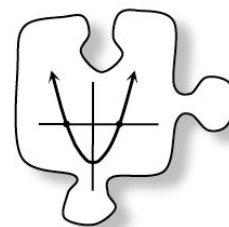
Function	Opens up or down?	vertex	x-intercept(s)	y-intercept	line of symmetry
$y = x^2 - 2x - 8$					
$y = -x^2 + 4$					
$y = x^2 - 4x + 5$					
$y = x^2 - 2x + 1$					
$y = x^2 - 6x + 5$					
$y = -x^2 + 3x + 4$					
$y = -x^2 + 2x - 1$					
$y = x^2 + 5x + 1$					
$y = x^2 - 2x - 15$					
$y = -x^2 + 4x - 5$					

Based on the table, reflect on and answer the following questions from Ms. Frieda Function.

1. How can you tell if an equation opens upwards or downwards from the equation? How can you tell from the x,y table?
2. How do you know the highest and lowest point of the parabola?
3. How do you know for sure that your parabola is symmetrical?
4. Do you recognize any patterns in the tables?
5. Do parabolas end?
6. Do you think all quadratic functions behave in these ways?

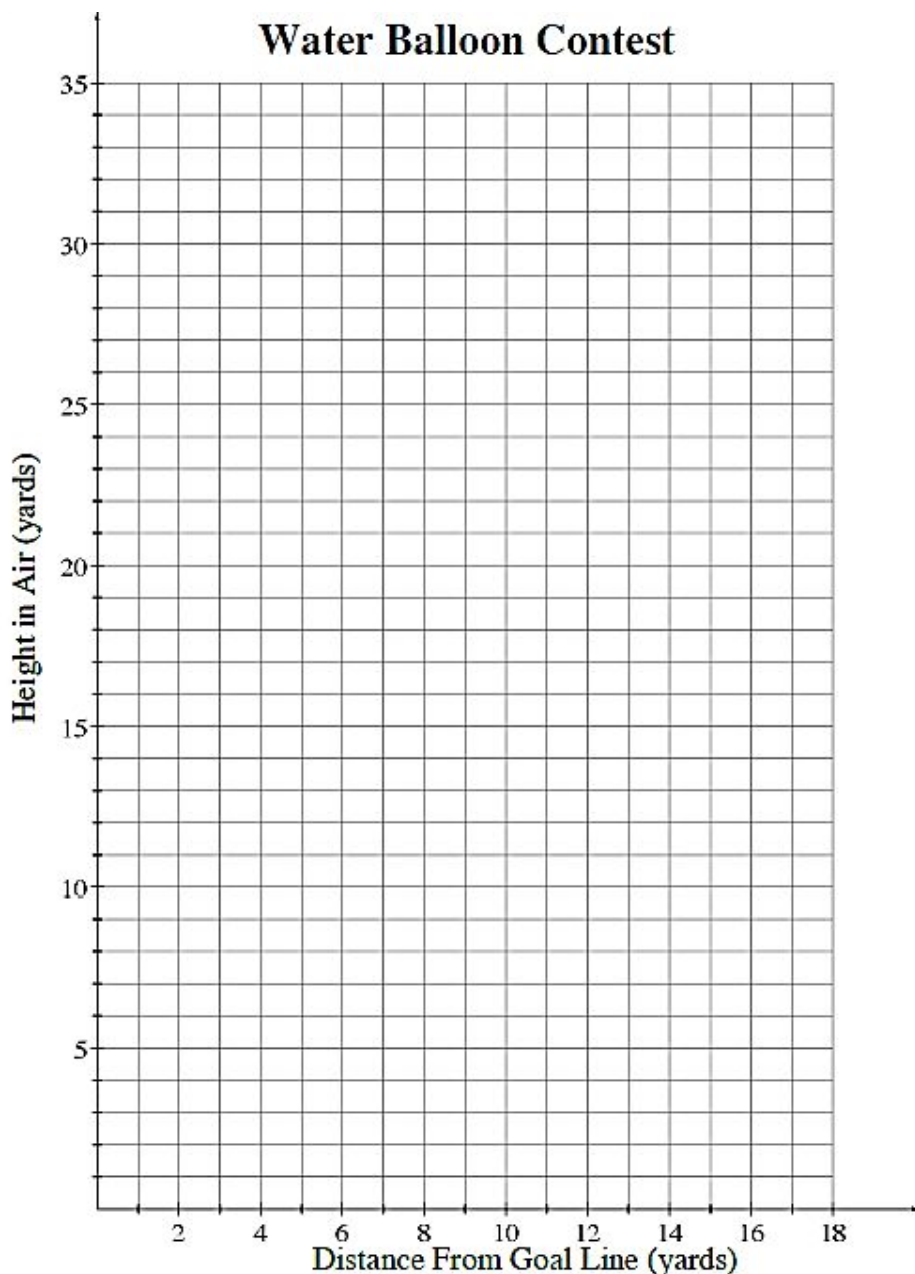
5.1.2 What are the connections?

Multiple Representations of Quadratic Functions



5-16

Make sure to read this problem in your textbook to understand your task!



Name	Height (yards)	Distance (yards)
Maggie		
Jen		
Imp		
Al		

Maggie's Toss		Jen's Toss	
x	y	x	y

Imp's Toss		Al's Toss	
x	y	x	y

a)

Who should win the *Longest Distance* contest? _____

Who should win the *Highest Launch* contest? _____

b)

What are the *x-intercepts* of each parabola?

Maggie: (____, 0), (____, 0) Jen: (____, ____), (____, ____)

Imp: (____, ____), (____, ____) Al: (____, ____), (____, ____)

What do the above *x-intercepts* tell us about each balloon launch? Explain.

c)

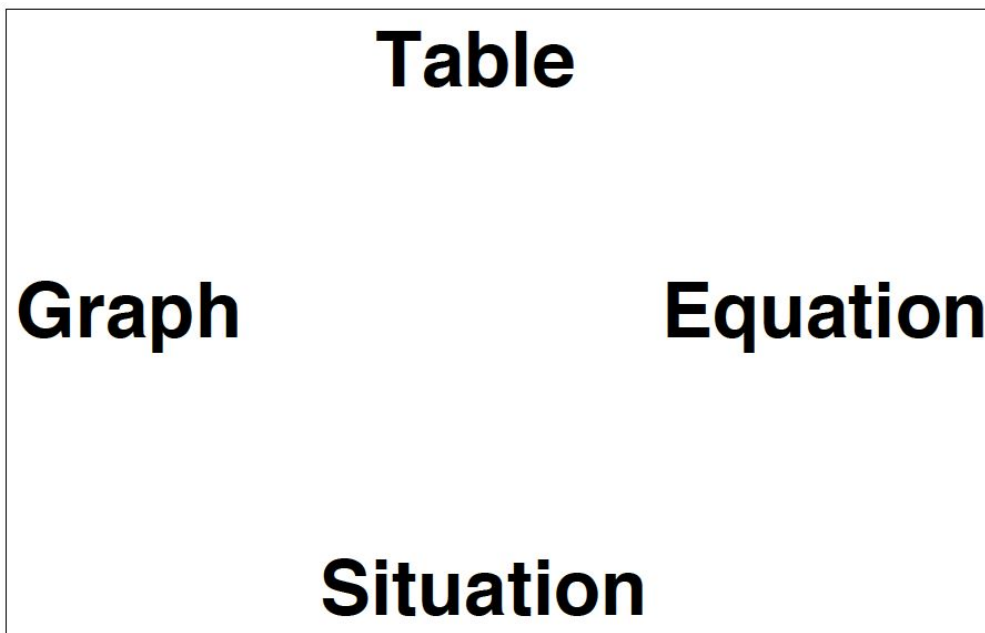
What is the vertex (maximum) of each parabola?

Maggie: _____ Jen: _____ Imp: _____ Al: _____

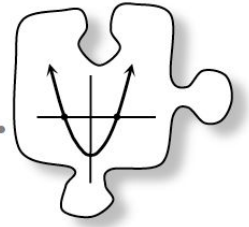
What information does the vertex tell us about each balloon launch? Explain.

5-19

Four representations of quadratic functions: *tables*, *graphs*, *equations*, and *descriptions* of situations. Draw arrows showing the connections that you currently know how to make between different representations.



5.1.3 How can I sketch it without a table?



Zero Product Property

5-26 WHAT DO YOU NEED TO SKETCH A PARABOLA?

Think: How many points do you need to sketch a parabola?

- Can you make a sketch of a parabola if you only know where its y-intercept is? For example, if the y-intercept of a parabola is $(0, -15)$, can you sketch its graph?
- What about two x-intercepts of a parabola? If you only know the x-intercepts, can you sketch the parabola? For example, if the x-intercepts are $(-3, 0)$ and $(5, 0)$, can you sketch the parabola?
- Can you make a sketch of a parabola with only two x-intercepts and the y-intercept? To test this idea, sketch the graph of a parabola that has x-intercepts $(-3, 0)$ and $(5, 0)$ and y-intercept $(0, -15)$. Does this work?

5-27 - Determining the intercepts from an equation

- What is true about the value of y for all x-intercepts? _____
What is true about the value of x for all y-intercepts? _____
- What is the y-intercept of the graph $y = 2x^2 + 5x - 12$? $__(\underline{\hspace{1cm}}, \underline{\hspace{1cm}})_$
- What equation would you need to solve to determine the x-intercepts of the graph of $y = 2x^2 + 5x - 12$? _____
- The solutions to the equation $2x^2 + 5x - 12 = 0$ are called the **zeros** of the function $y = 2x^2 + 5x - 12$.

5-28 - ZERO PRODUCT PROPERTY

Make sure to read this problem in the textbook to understand your task!

Quadratic Equation: A one-variable quadratic equation can be written in standard form $ax^2 + bx + c = 0$, where a , b , and c are real numbers and a is nonzero. For example: $3x^2 - 4x + 7.5 = 0$ Any equation where at least one term has degree 2 and no term has degree higher than 2.

- When they multiply their numbers together, the result is zero. What does this mean about one their numbers? _____
- When the three numbers are multiplied together, the answer is zero. What can Gaston conclude this time? _____
- Does it matter how many numbers are multiplied together? _____

Zero Product Property: When the product of two or more factors is zero, at least one of the factors must equal zero. That is, if $a \cdot b = 0$, then either $a = 0$ or $b = 0$ (or both). This property is used to solve equations in factored form. For example, given the equation $(x - 4)(x + 5) = 0$, $x - 4 = 0$ or $x + 5 = 0$ (or both). You can see that $x = 4$ and $x = -5$ are solutions and that they are the only possible solutions because there are no other numbers that make either factor zero. The Zero Product Property can be used to solve factorable quadratic equations.

5-29 - Apply the Zero Product Property

Use the quadratic equation from problem 5-27: $y = 2x^2 + 5x - 12$

a). Factor the equation completely, and rewrite the equation as a product equal to zero.

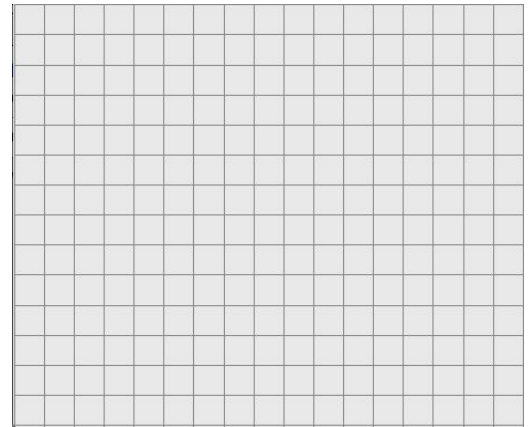
$-(\underline{\hspace{2cm}})(\underline{\hspace{2cm}}) = 0$

b) Use the *Zero Product Property* to solve the equation. Use one factor at a time and determine what x-value makes it equal to zero. These will be the x-intercepts.

$x = \underline{\hspace{2cm}}$ x-intercept: $\underline{\hspace{2cm}}$	$x = \underline{\hspace{2cm}}$ x-intercept: $\underline{\hspace{2cm}}$
---	---

c) Using the y-intercept, sketch the graph of the parabola $y = 2x^2 + 5x - 12$.

y-intercept: $\underline{\hspace{2cm}}$



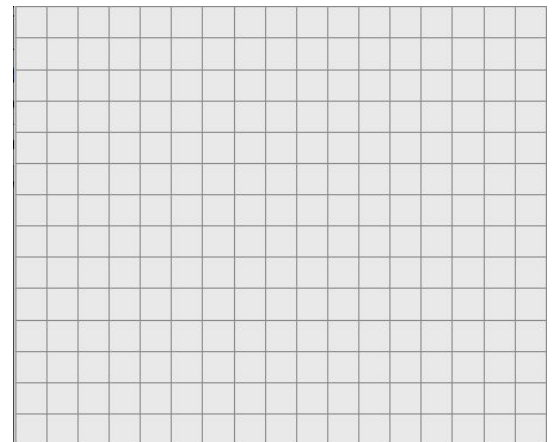
5-30 - How can you use the x-intercepts to help you find the vertex?

vertex: the highest or lowest point on a parabola

a) Use the *Zero Product Property* to determine the x-intercepts of the parabola: $y = x^2 + 4x - 5$

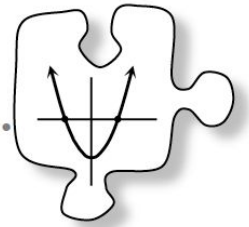
Factor: $y = x^2 + 4x - 5$ $(\underline{\hspace{2cm}})(\underline{\hspace{2cm}})$	$(\underline{\hspace{2cm}})$ $x = \underline{\hspace{2cm}}$ x-intercept: $\underline{\hspace{2cm}}$	$(\underline{\hspace{2cm}})$ $x = \underline{\hspace{2cm}}$ x-intercept: $\underline{\hspace{2cm}}$
--	---	---

b) Figure out how to determine the **vertex** using your x-intercepts. What did you do?



c) Sketch the parabola $y = x^2 + 4x - 5$

5.1.4 What new connection can I make?



Writing Equations for Quadratic Functions

5-38 - Use what you know to solve the quadratic equations below. Before moving on to the next problem, verify your factored form and answers with your teacher.

a) $x^2 + 6x + 8 = 0$ x = _____ or _____	b) $x^2 + 6x = 0$ x = _____ or _____	c) $0 = 3(x - 5)(2x + 3)$ x = _____ or _____	d) $x^2 + 4x - 9 = 3$ x = _____ or _____
---	---	---	---

5-39 - TABLE TO EQUATION

You can make a table for a quadratic equation, and now you will figure out how to create an equation from a table. In the tables below highlight the x-intercepts in one color and the y-intercepts in another color.

a)

x	-4	-3	-2	-1	0	1	2	3	4
y	6	0	-4	-6	-6	-4	0	6	14

Using your x-intercepts and *Zero Product Property* and working in reverse, can you build the equations?

Equation: a) _____

b)

x	-6	-5	-4	-3	-2	-1	0	1	2	3	4
y	7	0	-5	-8	-9	-8	-5	0	7	16	27

Using your x-intercepts and *Zero Product Property* and working in reverse, can you build the equations?

b) _____

Verify your equations are correct using the y-intercept or substituting another point from the table.

5-40 - Gwen & Sadie

“This looks like part (a) of the problem we just did, except the y-values are all doubled! How can that help us?”

Use Sadie’s observation to help you write the equation for the quadratic function in the table below.

x	-4	-3	-2	-1	0	1	2	3	4
y	12	0	-8	-12	-12	-8	0	12	28

Equation: _____

5-41- Water Balloon Revisited

Can you come up with the equation to show the height of Imp’s water balloon launch?

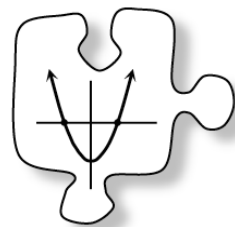


x (yards)	2	3	4	5	6	7	8	9			
y (yards)	0	9	16	21	24	25	24	21			

Equation: _____

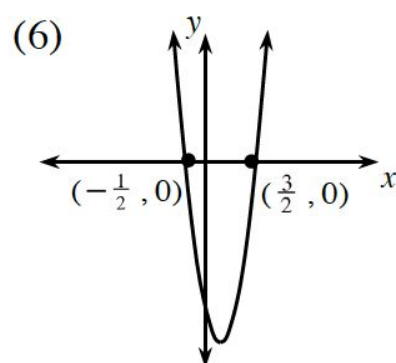
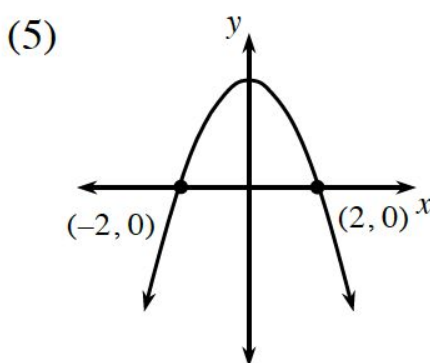
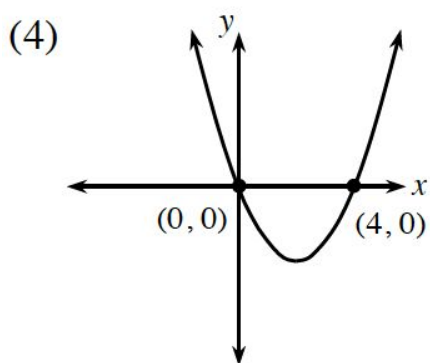
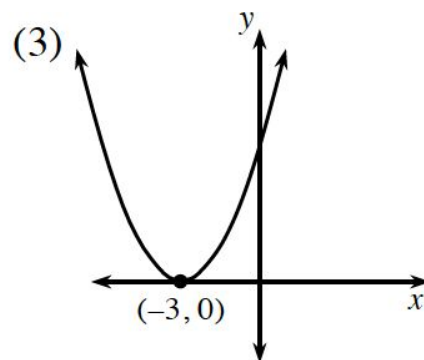
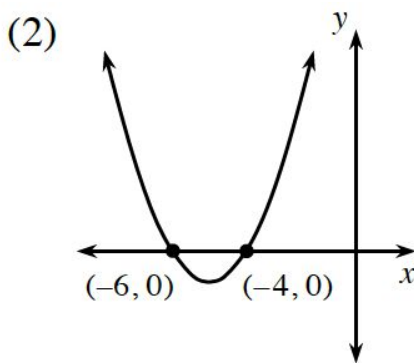
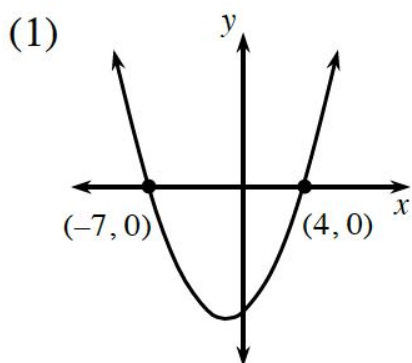
Notes:

5.1.5 What is the connection?



Completing the Quadratic Web

5-49 - Match the parabolas to their equations. (Note: Not every equation has a matching parabola.) You must show your work!



Equations:

A) $y = (x + 3)^2$

B) $y = x^2 + 3x - 28$

C) $y = x^2 - 11x + 28$

D) $y = -x^2 + 4$

E) $y = x^2 + 10x + 24$

F) $y = 2x^2 + 11x + 5$

G) $y = x^2 - 4x$

H) $y = (x - 3)^2$

I) $y = 4x^2 - 4x - 3$

5-50 - QUALITY CONTROL, Part One

You must read this problem in the textbook to understand your task! Can you solve each client's problem? Show all work and explain your reasoning below.

Dear Ms. Quadratic, **A**

I followed all of the directions given in your brochure on how to order a parabola. I tried to order a parabola that passed through the points $(1, 0)$ and $(-6, 0)$ only to have you send me the wrong one!

Please tell me how to order the correct parabola. Your immediate reply is appreciated.

Perturbed in Pennsylvania

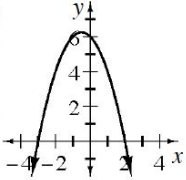
Dear Ms. Quadratic, **B**

I am very disappointed. I want a parabola that hits the x -axis only once at $(5, 0)$, yet I see **NO** mention of this type of parabola in your pamphlet. Your company mission statement assures me that "my needs will be met no matter what." How should I order my special parabola?

Sincerely,
Troubled in Texas

Dear Ms. Quadratic, **C**

Please help! I have searched through your entire brochure and do not see a parabola that will fit my needs. All I want is a parabola that looks like this:



Every time I order this parabola, you send me a different one! I refuse to pay for any parabola but the one shown above. Please tell me how I should find the equation of this parabola or I will take my business elsewhere!

Thank you,
Agitated in Alaska

Letter A:

Letter B:

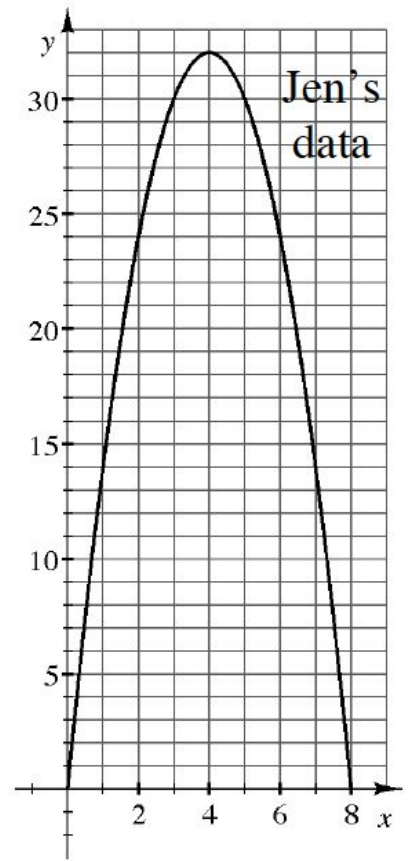
Letter C:

5-51 - EXTRA! EXTRA!

You must read this problem in the textbook to understand your task!

a) Create an equation for the parabola at right.

b) Al releases his balloon from the ten-yard line, and it lands at the 16-yard line. If the balloon reaches a height of 27 yards, what equation represents the path of his launch?



c) The factored form of an equation is $y = a(x - d)(x - f)$. Explain to the journalist how she can determine the values of a , d , and f to write the equation of a quadratic function in factored form. Give examples.