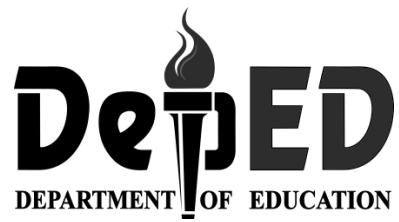


9



Mathematics

Quarter 1-Module 15

Representing Quadratic Function

Through Table of Values and Graphs

Week 6

Learning Code - M9AL-Ig-11.1



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Quarter 1 – Module 15 – New Normal Math for G9

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Published by the Department of Education

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MODULE
15REPRESENTING QUADRATIC FUNCTION THROUGH
TABLE OF VALUES AND GRAPHS

Aside from the equation form $f(x) = ax^2 + bx + c$ or $y = ax^2 + bx + c$, where a, b, c are real numbers and $a \neq 0$, we can also represent quadratic functions in many form. In this module, you will learn how to represent quadratic function through table of values and graphs.

WHAT I NEED TO KNOW

LEARNING COMPETENCY

The learners will be able to:

- represent a quadratic function using: (a) table of values and (b) graph
- M9AL-Ig-11.1**

WHAT I KNOW

Find out how much you already know about representing quadratic function through table of values and graphs. Write the letter that you think is the best answer to each question on your answer sheet. Answer all items. After taking and checking this short test, take note of the items that you were not able to answer correctly and look for the right answer as you go through this module.

1. Complete the given table of values with equation $y = 2x^2 - 12x + 19$.

x	0	1	2	3	4
y					

A.

x	0	1	2	3	4
y	19	33	51	73	97

C.

x	0	1	2	3	4
y	19	9	3	1	3

B.

x	0	1	2	3	4
y	19	33	51	33	19

D.

x	0	1	2	3	4
y	9	3	1	3	9

2. Which of the following table of values does not represent a quadratic function?

A.

x	-2	-1	0	1	2
y	2	1	0	1	2

C.

x	-2	-1	0	1	2
y	4	1	0	1	4

B.

x	-2	-1	0	1	2
y	2	1	0	-1	-2

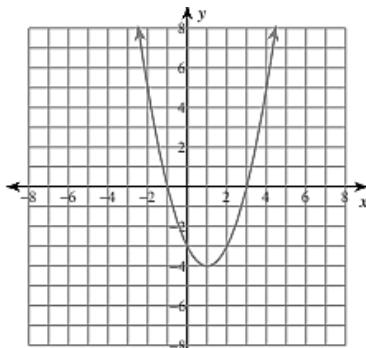
D.

x	-2	-1	0	1	2
y	8	1	0	-1	-8

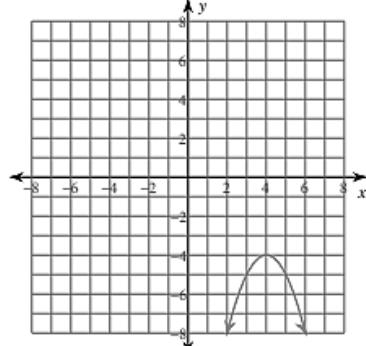
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3. Which of the following graph describes a quadratic function $y = ax^2 + bx + c$ with $a > 0$?

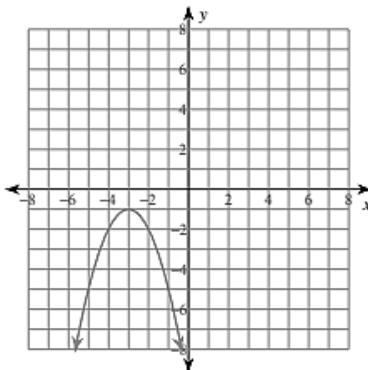
A.



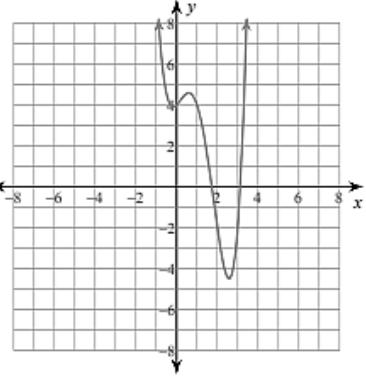
C.



B.



D.



4. Use the coordinates from the table to determine which equation models the table below:

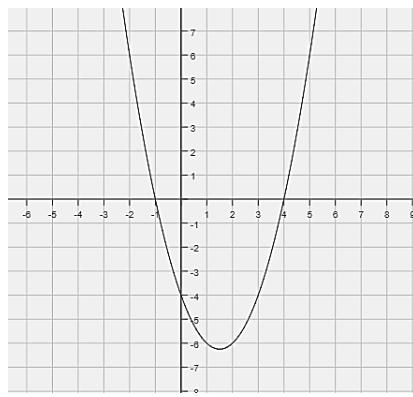
x	-3	-2	-1	0	1	2	3	4
y	28	12	0	-8	-12	-12	-8	0

- A. $f(x) = x^2 - 3x - 4$
 B. $f(x) = 4x^2 - 12x - 16$

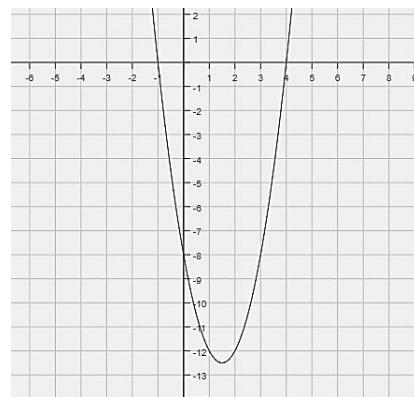
- C. $f(x) = 2x^2 + 6x - 8$
 D. $f(x) = 2x^2 - 6x - 8$

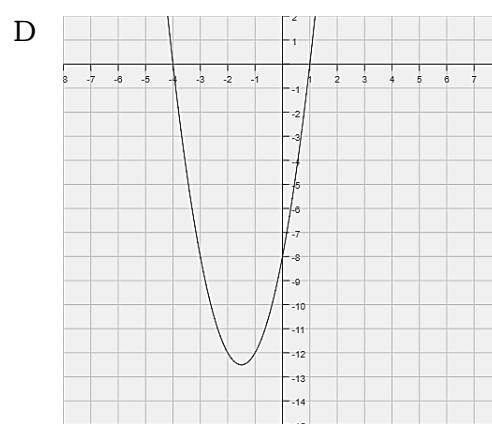
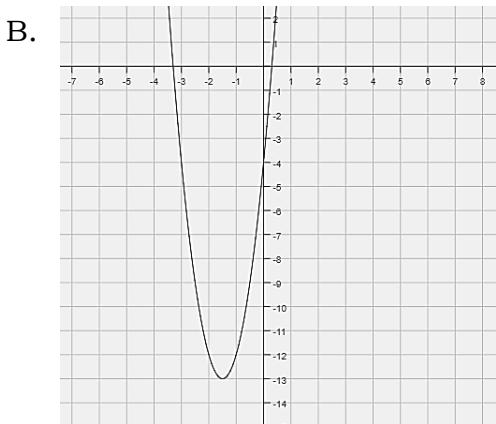
5. Which of the following represents the graph for your answer in number 4?

A.

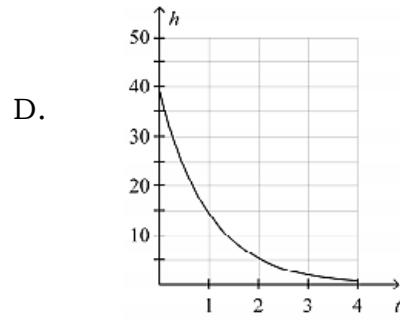
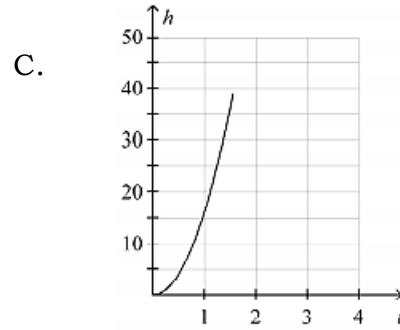
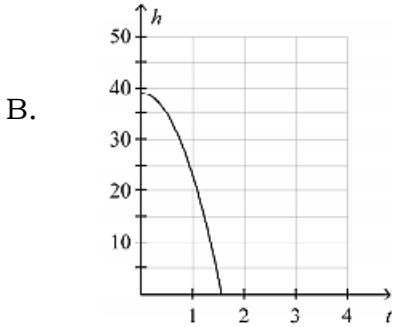
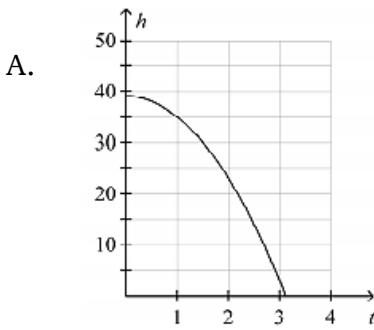


C.





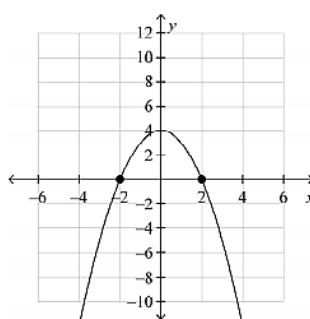
6. Which of the following is true about this given table of values?
- | | | | | | |
|---|---|----|----|----|----|
| x | 1 | 2 | 3 | 4 | 5 |
| y | 5 | 12 | 19 | 26 | 33 |
- A. The y values are all positive. Hence, the table represents a quadratic function.
B. The y values are all positive. Hence, the table does not represent a quadratic function.
C. The first and second differences of the y values are equal. Hence, the table represents a quadratic function.
D. The first differences of the y values are already equal. Hence, the table does not represent a quadratic function
7. If an object is dropped from a height of 39 feet, the function $h(t) = -16t^2 + 39$ gives the height of the object after t seconds. Graph the function.



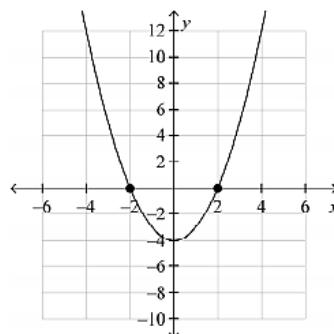
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8. Identify the graph of that best represent the equation $y = x^2 - 4$

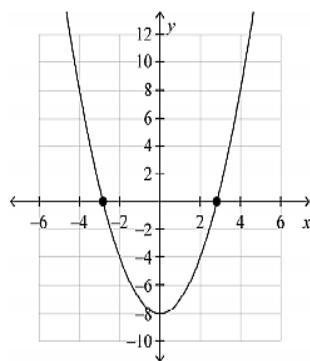
A.



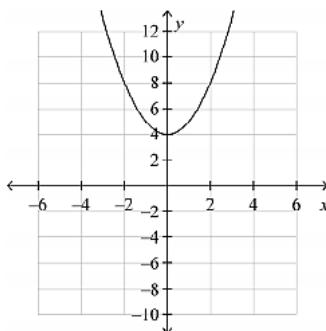
C.



B.



D.



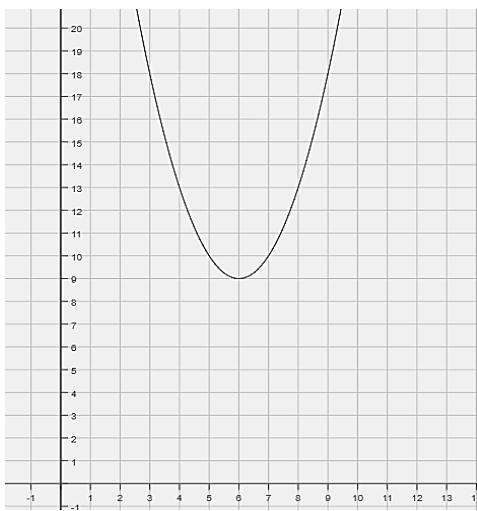
For Items 9 - 10, use the situation below

The equation $y = x^2 - 12x + 45$ models the number of books y sold in a bookstore x days after an award-winning author appeared at an autograph-signing reception.

9. Determine the table and graph that best describes the given situation.

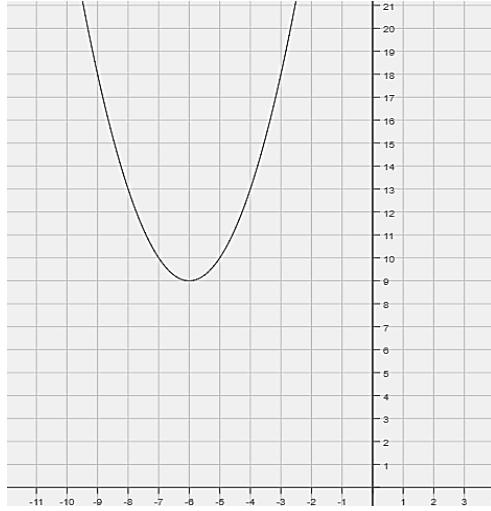
A.

x	1	2	3	4	5	6	7
y	34	25	18	13	10	9	10



C.

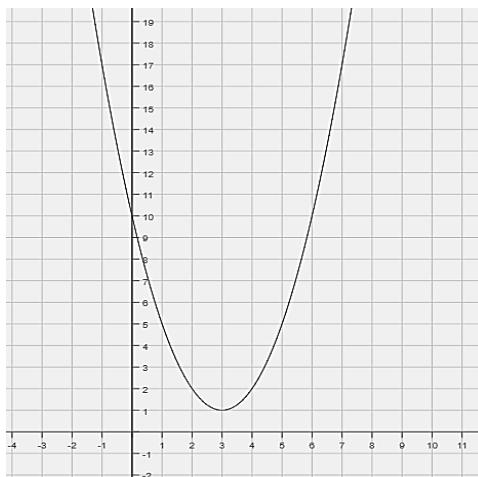
x	1	2	3	4	5	6	7
y	34	25	18	13	10	9	10



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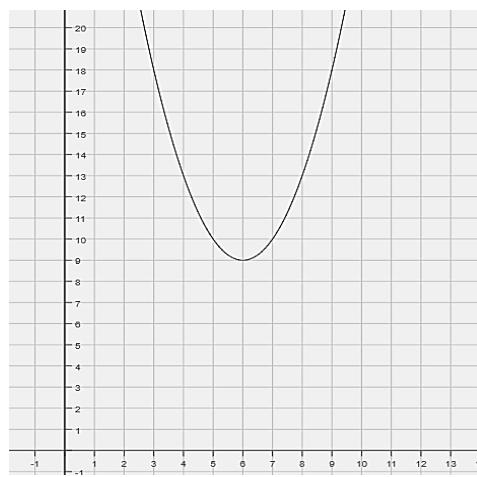
B.

x	1	2	3	4	5	6	7
y	5	2	1	2	5	10	17



D.

x	1	2	3	4	5	6	7
y	5	2	1	2	5	10	17



10. What was the day that exactly 90 copies of the book were sold?

- A. A .12th day
B. B .13th day

- C. C .14th day
D. D .15th day

WHAT'S IN

RECALL: If you are making table of value, just substitute the *x* value to get *y*

COMPLETING TABLE OF VALUES

Complete the following table using the indicated function.

1. $y = 2x - 1$



x	y
-2	
-1	
0	
1	
2	

Solution: Since $y = f(x)$, to get the values of *y* and complete the table we need to do this

if $x = -2$,
 $y = 2x - 1$
 $f(x) = 2x - 1$
 $f(-2) = 2(-2) - 1$
 $f(-2) = -4 - 1$
 $f(-2) = -5$
then $y = -5$

if $x = -1$,
 $y = 2x - 1$
 $f(x) = 2x - 1$
 $f(-1) = 2(-1) - 1$
 $f(-1) = -2 - 1$
 $f(-2) = -3$
then $y = -3$

if $x = 0$
 $y = 2x - 1$
 $f(x) = 2x - 1$
 $f(0) = 2(0) - 1$
 $f(0) = 0 - 1$
 $f(0) = -1$
then $y = -1$

if $x = 1$,
 $y = 2x - 1$
 $f(x) = 2x - 1$
 $f(1) = 2(1) - 1$
 $f(1) = 2 - 1$
 $f(1) = 1$
then $y = 1$

if $x = 2$
 $y = 2x - 1$
 $f(x) = 2x - 1$
 $f(2) = 2(2) - 1$
 $f(2) = 4 - 1$
 $f(2) = 3$
then $y = 3$

2. $y = 2x^2 - 8x + 9$

x	y
0	
1	
2	
3	
4	

Solution: Since $y = f(x)$, to get the values of y and complete the table we need to do this

if $x = 0$,
 $y = 2x^2 - 8x + 9$
 $f(x) = 2x^2 - 8x + 9$
 $f(0) = 2(0)^2 - 8(0) + 9$
 $f(0) = 2(0) - 0 + 9$
 $f(0) = 0 - 0 + 9$
 $f(0) = 9$
then $y = 9$

if $x = 1$,
 $y = 2x^2 - 8x + 9$
 $f(x) = 2x^2 - 8x + 9$
 $f(1) = 2(1)^2 - 8(1) + 9$
 $f(1) = 2(1) - 8 + 9$
 $f(1) = 2 - 8 + 9$
 $f(1) = 3$
then $y = 3$

if $x = 2$,
 $y = 2x^2 - 8x + 9$
 $f(x) = 2x^2 - 8x + 9$
 $f(2) = 2(2)^2 - 8(2) + 9$
 $f(2) = 2(4) - 16 + 9$
 $f(2) = 8 - 16 + 9$
 $f(2) = 1$
then $y = 1$

if $x = 3$,
 $y = 2x^2 - 8x + 9$
 $f(x) = 2x^2 - 8x + 9$
 $f(3) = 2(3)^2 - 8(3) + 9$
 $f(3) = 2(9) - 24 + 9$
 $f(3) = 18 - 24 + 9$
 $f(3) = 3$
then $y = 3$

if $x = 4$,
 $y = 2x^2 - 8x + 9$
 $f(x) = 2x^2 - 8x + 9$
 $f(4) = 2(4)^2 - 8(4) + 9$
 $f(4) = 2(16) - 32 + 9$
 $f(4) = 32 - 32 + 9$
 $f(4) = 9$
then $y = 9$

You try!

Complete the following table using the indicated function

1. $y = 2x + 1$

x	y
-2	
-1	
0	
1	
2	

2. $y = x^2 + 2x - 1$

x	y
-2	
-1	
0	
1	
2	

3. $y = 2x^2 + 4x - 6$

x	y
-2	
-1	
0	
1	
2	

WHAT'S NEW

Communication, Creativity, Critical Thinking and Collaboration

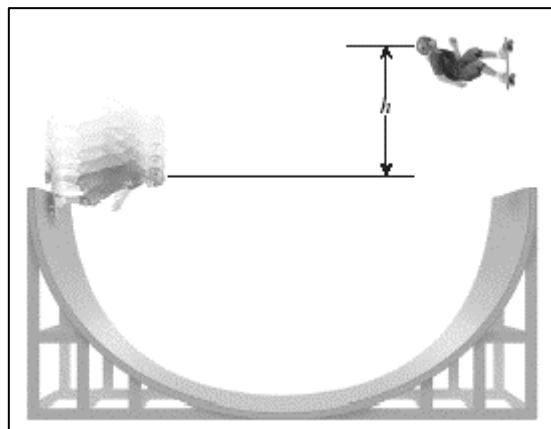
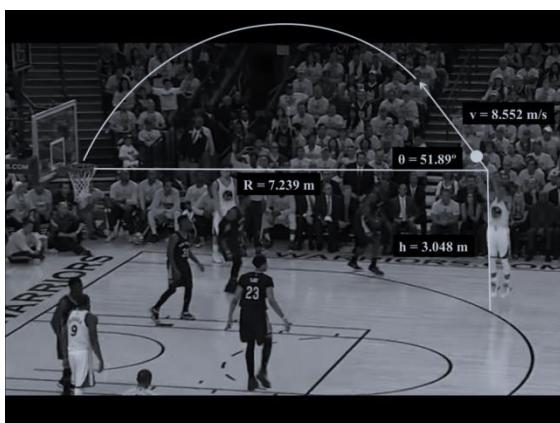
**QUADRATIC OR NOT?****Activity #1: “Let’s Play some Blocks”**

Examine the number of blocks per column. Predict the number of blocks on the last position.. You can share each other’s idea.

		Position (x)				
N U M B E R O f B L O C K S (y)	1	2	3	4	5	

Which of this block patterns represents a Quadratic Function?



Activity #2: “Have you ever Wonder?”

What is common between these two pictures?

Have you ever asked yourself why PBA star players are good in free throws?

Have you ever asked yourself why the ramp of skate boarding is designed like this?



WHAT IS IT

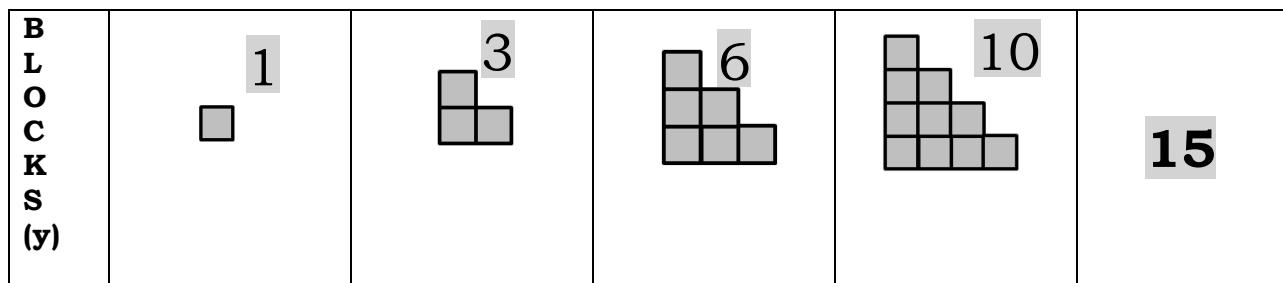
Which of this block patterns represents a Quadratic Function?

QUADRATIC FUNCTION: TABLE OF VALUES***Equal Differences Method***

A function represents a table of values having the differences of the y values. If the second differences of the y values are equal, then the given function is a quadratic function.

Example 1: Here are the answers for activity #1

		Position (x)				
N U M B E R O f	1	2	3	4		
	3	8	15	24		35
	1	3	5	7		9

**Let's Investigate!****Block pattern #1**

Position (x)	1	2	3	4	5
Number of blocks (y)	3	8	15	24	35

The first differences are different

The second differences are equal

The second differences are equal. Hence, this table represents a **quadratic function**

**Block pattern #2**

Position (x)	1	2	3	4	5
Number of blocks (y)	1	3	5	7	9

The first differences are equal

The first differences are already equal. Hence, this table **does not represent a quadratic function**

**Block pattern #3**

Position (x)	1	2	3	4	5
Number of blocks (y)	1	3	6	10	15

The first differences are different

The second differences are equal

The second differences are equal. Hence, this table represents a **quadratic function**



QUADRATIC FUNCTION: GRAPH

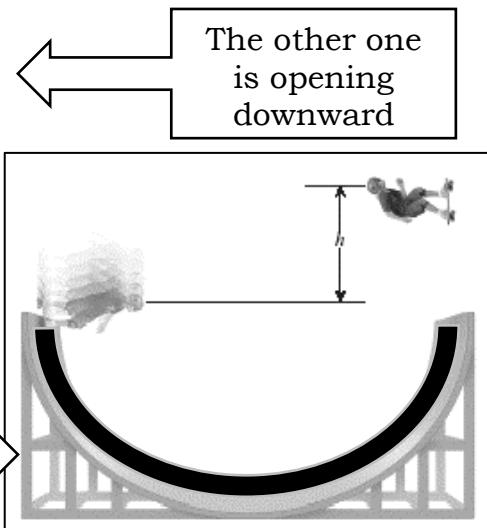
The graph of a quadratic function is called a **parabola**. It is basically a curved shape opening up or down.

When you have a quadratic function in form $y = ax^2 + bx + c$

if $a > 0$, then the parabola opens **upward** 

if $a < 0$, then the parabola opens **down** 

Both pictures on activity #2 shows curved shape like a parabola

**How to represent a graph of a quadratic function?****Example 2:**

Sketch the graph of the given quadratic function in the WHAT'S IN part.

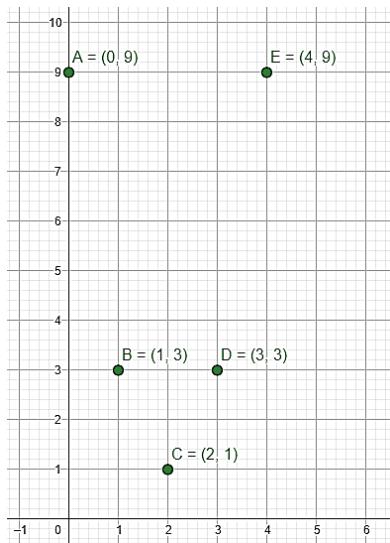
$$y = 2x^2 - 8x + 9$$

Use the filled up table below:

x	y
0	9
1	3
2	1
3	3
4	9

Step 1: Complete the table

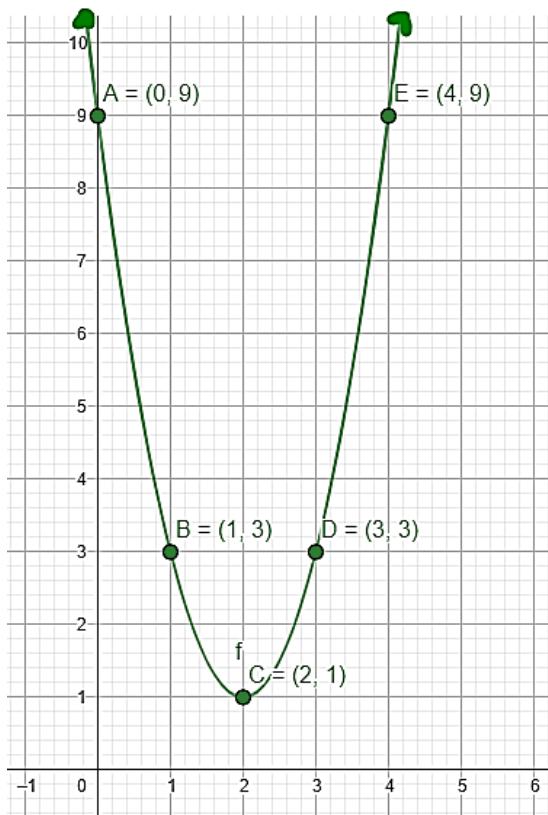
We already have solution in this part. Please see the *WHAT'S IN* part

Step 2: Plot the points on a Cartesian plane

The coordinates are:

(x,y)

- A. (0,9)
- B. (1,3)
- C. (2,1)
- D. (3,3)
- E. (4,9)

Step 3: Connect the plotted points

$$\longleftrightarrow y = 2x^2 - 8x + 9$$

Don't forget to curve
(smooth curve) it
perfectly like a
parabola



WHAT'S MORE

Complete the table of values and sketch the graph of the following quadratic functions:
(Use a separate graphing paper for your solutions and graphs.)

1. $y = -x^2$

x	y
0	
1	
2	
3	
-1	
-2	
-3	

2. $y = 2x^2 - 4x - 3$

x	y
-3	
-2	
0	
1	
2	
3	
4	
5	

3. $y = -2x^2 - 8x + 5$

x	y
-2	
-3	
-1	
-4	
0	
-5	
1	

WHAT I HAVE LEARNED

- A function is represented by a table of values with common differences of the **y** values. If the second differences of the **y** values are equal, then the given function is a quadratic function.
- The graph of a quadratic function is called a **parabola**. It is basically a curved shape opening up or down.
- When you have a quadratic function in the form $y = ax^2 + bx + c$
 - ✓ if $a > 0$, then the parabola opens **upward** 
 - ✓ if $a < 0$, then the parabola opens **down** 

WHAT I CAN DO

- A. Determine which of the following table of values represents a quadratic function.
Write Q if Quadratic Function and NQF if not.
- 1.

x	-2	-1	0	1	2
y	5	2	1	2	5

2.

x	-2	-1	0	1	2
y	-4	-1	2	5	8

4.

x	-2	-1	0	1	2
y	1	0	1	4	9

3.

x	1	2	3	4	5
y	5	10	15	20	25

5.

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

B. Sketch the graph of each function. Use the allocated grids below:

1. $y = 3x^2$

Use this table

x	y
-2	
-1	
0	
1	
2	

2. $y = 2x^2 - 16x + 33$

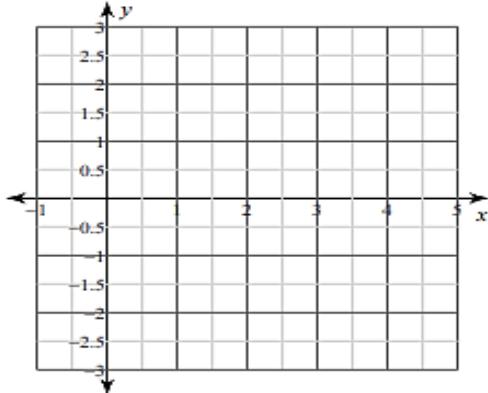
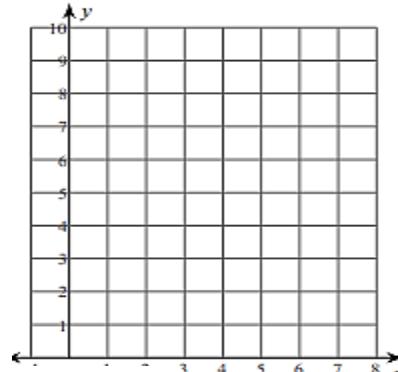
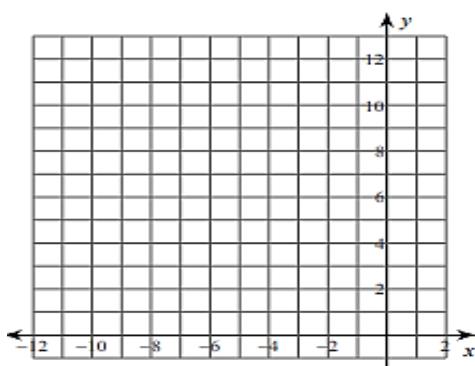
Use this table

x	y
2	
3	
4	
5	
6	

3. $y = -x^2 + 2x + 1$

Use this table

x	y
-1	
0	
1	
2	
3	



ASSESSMENT

Write the letter of the correct answer on your answer sheet. If your answer is not among the choices, write E together with your final answer.

1. Identify the table that represents the graph of quadratic function.

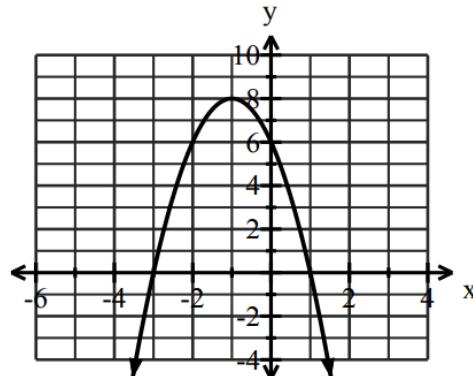
- A.

x	-3	-2	-1	0	1
y	0	4	6	4	0
- B.

x	-3	-2	-1	0	1
y	0	6	8	6	0
- C.

x	-4	-2	0	2	4
y	0	4	6	4	0
- D.

x	-4	-2	0	2	4
y	0	6	8	6	0



2. Which of the following table of values does not represent a quadratic function?

- A.

x	-2	-1	0	1	2
y	-6	-6	-4	0	6
- B.

x	0	1	2	3	4
y	0	1	4	9	16
- C.

x	0	1	2	3	4
y	1	0	3	10	21
- D.

x	-2	-1	0	1	2
y	-4	-1	2	5	8

3. Given the equation $y = -2x^2 + 4x + 7$, what value of **m** and **n** will make the table complete,

x	-3	-2	-1	0	1	2	3	4
y	m	-9	1	7	9	n	1	-9

- A. -23 and 7
B. -13 and 7
C. -23 and 1
D. 1 and 7
4. Which of the following statements is FALSE about this given table of values?

x	0	1	2	3	4
y	-2	-1	2	7	14

- A. The equation represented by the given table of values is $y = x^2 - 2$.
 B. The second differences of the y values of the given table are all equal to 2.
 C. The first differences of the y values of the given table are different. Thus, the given table represents a quadratic function.
 D. The given table represents a quadratic function.

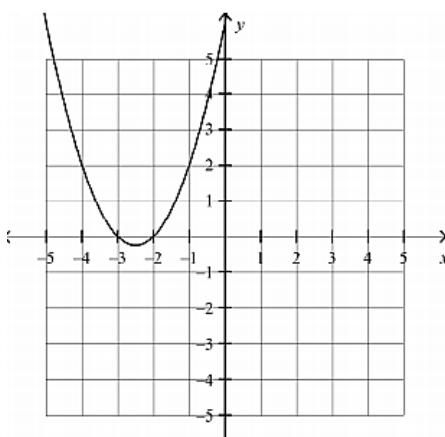
5. Which quadratic function opens downward?

- A. $y = 2x^2 + 3$
- B. $y = x^2 + 4x - 6$
- C. $y = -3x^2 + 3x + 7$
- D. $3y = 2x^2 - 4x + 9$

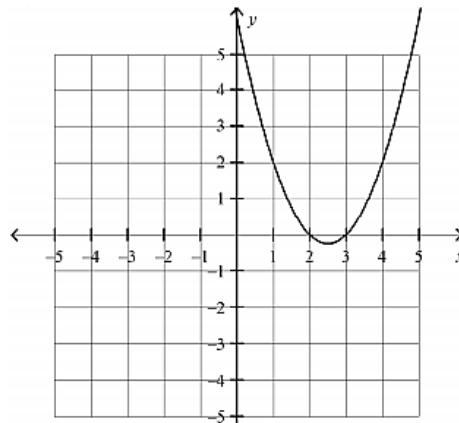
6. Which graph best describe this table of values?

x	-3	-2	-1	0	1
y	18	8	0	-6	-10

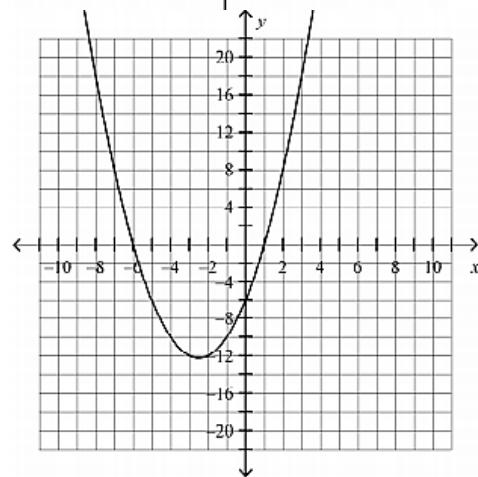
A.



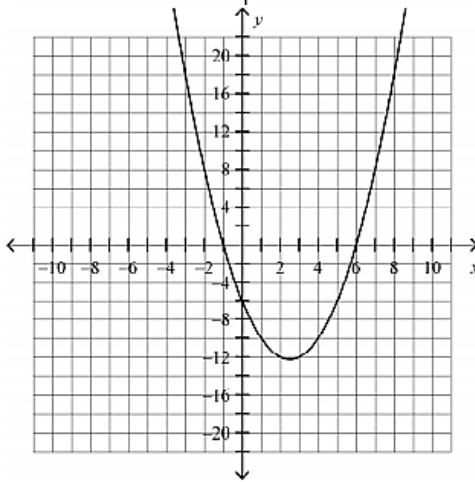
C.



B.

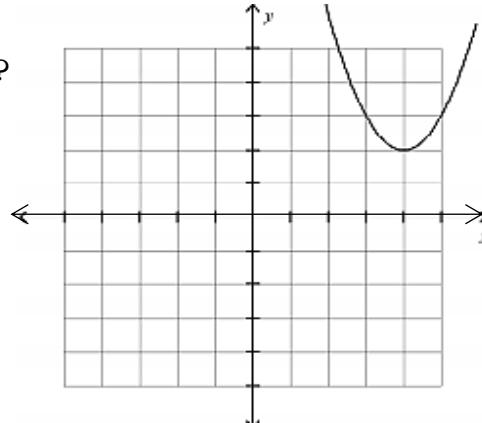


D.



7. What function models the graph on the right?

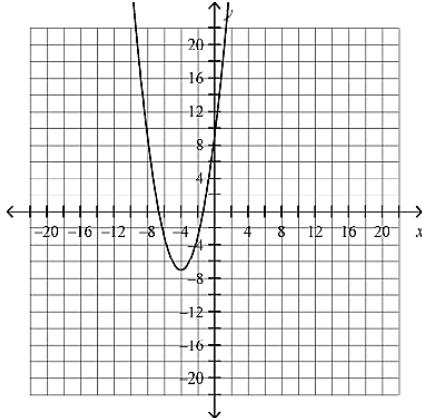
- A. $y = x^2 + 8x + 18$
- B. $y = x^2 + 4x + 8$
- C. $y = x^2 - 8x + 18$
- D. $y = x^2 - 8x + 14$



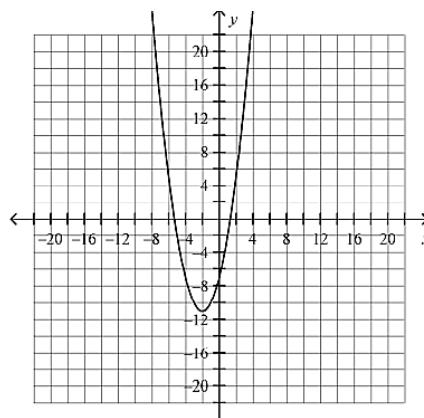
Learning Module for Junior High School Mathematics

8. Identify the graph that best represent the equation $y = x^2 + 4x - 7$.

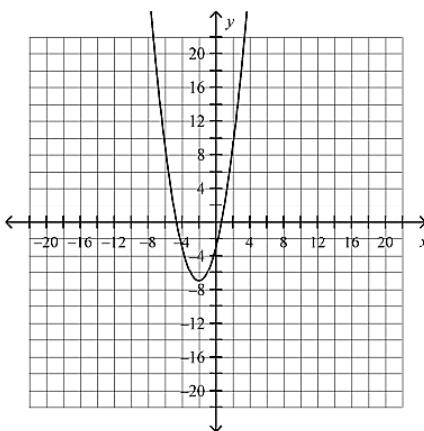
A.



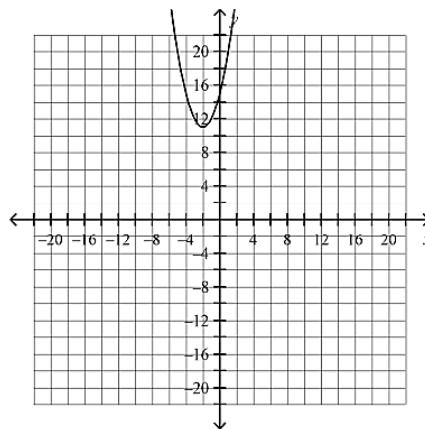
C.



B.



D.



For Items

Suppose you have 56 feet of fencing to enclose a rectangular dog pen. The function $A = 28x - x^2$, where x is the width, gives you the area of the dog pen in square feet.

9. Determine the table that best describes the given situation.

	Width (x)	10	11	12	13	14	15
A.	Area (A)	180	187	192	195	196	195

	Width (x)	10	11	12	13	14	15
B.	Area (A)	280	308	336	364	392	420

	Width (x)	10	11	12	13	14	15
C.	Area (A)	100	121	144	169	196	225

	Width (x)	10	11	12	13	14	15
D.	Area (A)	180	196	195	195	196	180

10. What width gives you the maximum area? What is the maximum area?

- A) width = 28 ft; area = 196 ft²
- B) width = 28 ft; area = 420 ft²
- C) width = 14 ft; area = 588 ft²
- D) width = 14 ft; area = 196 ft

ADDITIONAL ACTIVITIES

Communication, Creativity ,
Critical Thinking and
Character Building

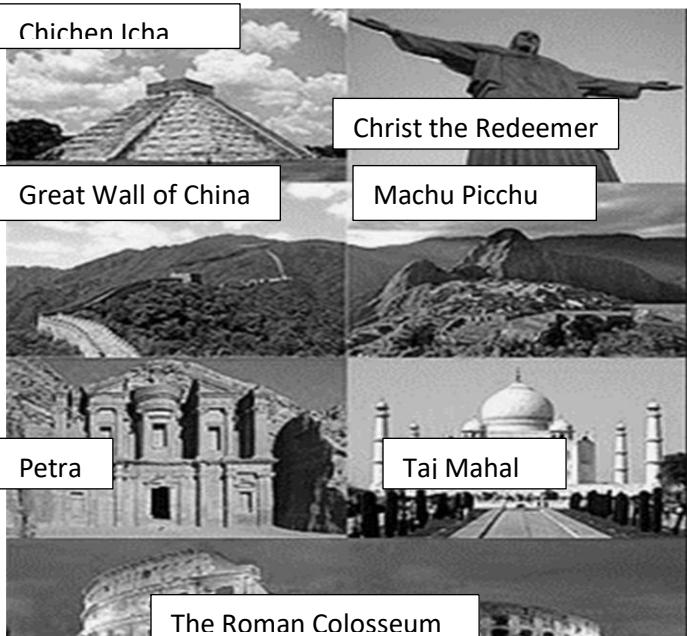
**THINK IT UP!**

Think of an application of quadratic function in your life and perform the following task.

1. Create a quadratic function relating your real-life application
2. State a scenario to create a table if values using your given quadratic function.
3. Graph your quadratic function.

REFLECT!

What are the characteristics of a parabola that adds up to the skills of a basketball player in shooting accurately?

PROBLEM – BASED WORKSHEET**Wonders of the world**

Let's Analyze!

1. How many wonders of the world we have? _____.
2. What do we call the graph of a quadratic function? _____.
3. In which of these wonders of the world you can see a parabola? _____.

E-Search

You may also check the following link for your reference and further learnings on representing quadratic function through table of values and graphs:

- <https://www.youtube.com/watch?v=LCjA3jPDvAs>
- <https://www.youtube.com/watch?v=p0CEGUg8PXU>

REFERENCES

Morgan, F. M., & Paige, B. L. (n.d.). *Algebra 2*. pp 98-102 .America: Henry Holt and Company

<https://cdn.instructables.com/FJI/KOSW/IWQV486H/FJIKOSWIWQV486H.LARGE.jpg?auto=webp&frame=1&width=1024&height=1024&fit=bounds>

<https://i.ytimg.com/vi/fXyuzo0NRvY/maxresdefault.jpg>

<https://www.geogebra.org/graphing?lang=en>

https://www.wtamu.edu/academic/anns/mps/math/mathlab/col_algebra/col_alg_tut34_quadfun.htm

<https://www.coursehero.com/file/37800346/math-9-lm-draft-3242014pdf/>

https://drive.google.com/file/d/1SNis5lXA6VvLmXxsVw29HJ6qHkT_4qol/view

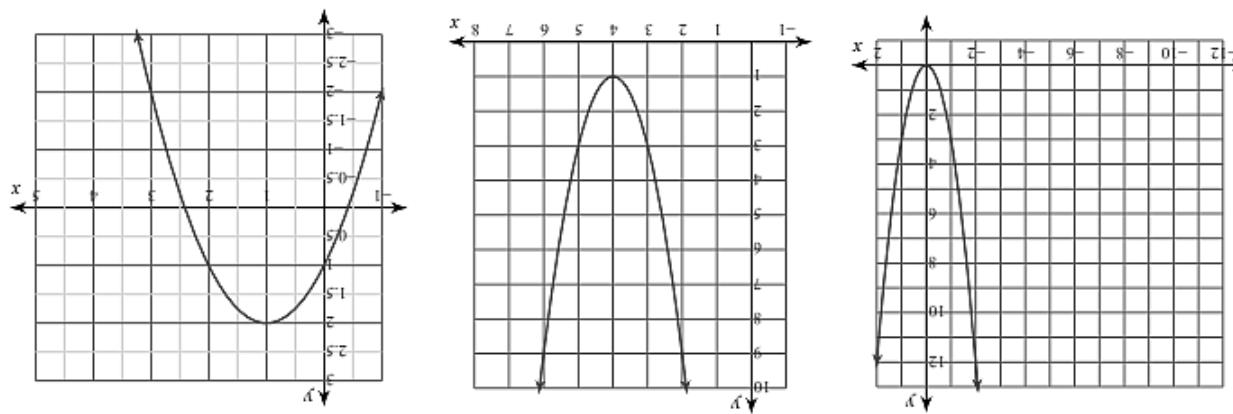
https://drive.google.com/file/d/1P5VkyI_qewDCK8bUCFHeAS-o7TYKGr4c/view

<https://cdn.kutasoftware.com/Worksheets/Alg1/Graphing%20Quadratic%20Functions.pdf>

3. The Roman Colosseum, Taq Mahal,
 2. Parabola
 1. 7

PROBLEM - BASED WORKSHEET

1. B 2. A 3. A 4. C
 5. C 6. D 7. C 8. B
 9. C 10. D

ASSESSMENT

2	3	-2
2	1	1
1	2	1
0	1	1
-1	-2	
x	y	

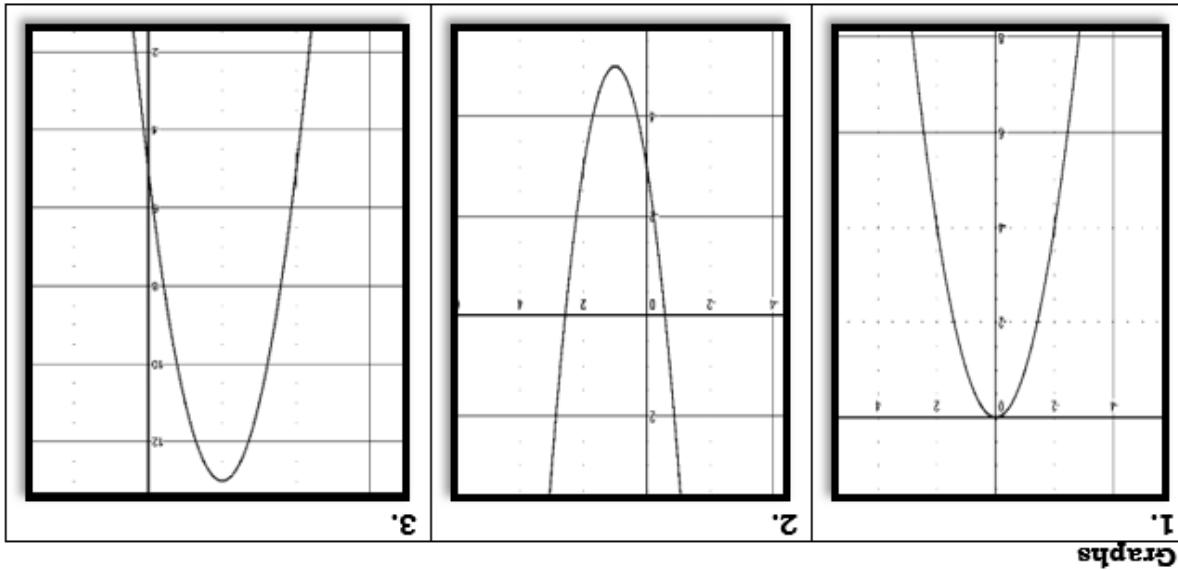
6	9
5	3
4	1
3	3
2	9
x	y

2	12
1	3
0	0
-1	3
-2	12
x	y

1. $y = 3x^2$ 2. $y = 2x^2 - 16x + 33$ 3. $y = -x^2 + 2x + 1$

- A. B.
 1. Q 2. NOF
 3. NOF 4. Q
 5. Q

WHAT I CAN DO



Graphs

-3	-9
-2	-4
-1	-1
3	-9
2	-4
1	-1
0	0

$$1. y = -x^2$$

WHAT'S MORE

5	27
4	13
3	3
2	-3
1	-5
0	5
-1	5
-2	11
-3	11
-2	13
-3	27
x	y

$$2. y = 2x^2 - 4x - 3$$

$$3. y = -2x^2 - 8x + 5$$

2	5
1	3
0	1
-1	-1
-2	-3
x	y

$$1. y = -x^2$$

WHAT'S IN

2	7
1	2
0	-1
-1	-2
-2	-1
x	y

$$2. y = x^2 + 2x - 1$$

$$3. y = 2x^2 + 4x - 6$$

$$1. y = 2x + 1$$

WHAT I KNOW

1. C 2. B 3. A 4. D 5. C 6. D 7. B 8. C 9. A 10. D

ANSWER KEY