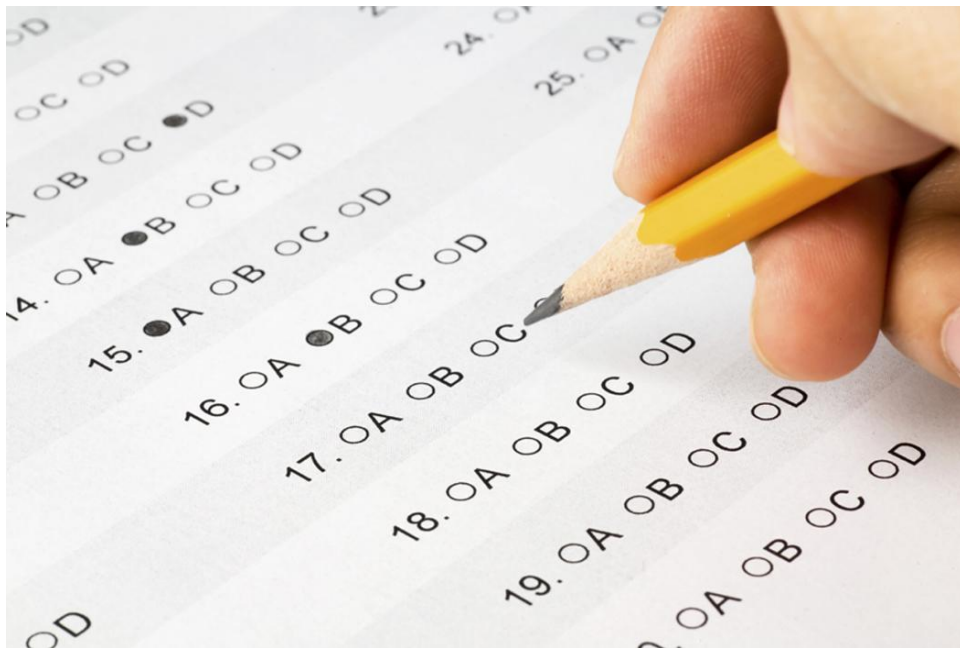


# ***Algebra/Data Analysis High School Assessment***

## **Review**



Dear Parent and/or Student,

All students who have not yet taken and passed the Maryland High School Assessment Test in Algebra/Data Analysis will be required to take the state-mandated test. The test is about two and one half hours in length and is composed of Selected Response (multiple choice) and Student-Produced Response (grid-in) questions. The test stresses key content in the areas of Algebra and Data Analysis. In addition to content, students are required to apply important skills and processes that demonstrate critical thinking and understanding of the content in a real-world setting.

All students starting high school after 2004 must pass the Algebra/Data Analysis High School Assessment for graduation. Scores earned by our students are very important to them individually and are used to evaluate our schools. The minimum passing score is 412.

In order to promote the best possible result on the test, parents can assist in the following areas:

- Talk with your son or daughter about the importance of doing their best
- Encourage good attendance until the test
- Encourage participation in all review sessions that are offered by the school

A review guide has been prepared to support students as they prepare for the assessment. The review utilizes the Maryland State Department Online Algebra/Data Analysis course as a learning tool. In order to access the MSDE Online Algebra course, the following information is provided:

Website: <http://mdk12online.org/>

Username: Algebra

Password: Student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

You will see the Table of Contents, which lists each unit and its lessons.

Please click on the hyperlinked topic page to get started. Use the blue right arrow to advance to the next topic.

In addition, other resources are listed on the important websites page. Individual high schools are also providing review session that can be attended. Contact you child's high school for specific information.

If further information is needed, please contact the secondary mathematics office at 410-222-5464.

Good luck with this important endeavor!

# School Improvement in MARYLAND

ASSESSMENTS

DATA ANALYSIS

INSTRUCTION

SCHOOL IMPROVEMENT

USER GUIDES

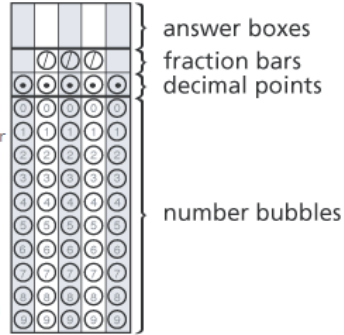
## Student Response Grid: Algebra/Data Analysis

Functions & Algebra | Data Analysis & Probability

Several questions in this test require you to enter your answer on a special grid like the one shown below.

### Directions for Completing the Response Grids

1. Find the answer to the problem.
2. Write your answer in the boxes at the top of the grid.
  - Print your answer with the first digit (or symbol) in the left answer box, or with the last digit in the right answer box.
  - Print no more than one digit or symbol in each answer box. Do **not** leave a blank answer box in the middle of an answer.
  - Be sure to write a decimal point or fraction bar in the answer box if it is part of the answer.
3. Fill in the appropriate bubble under each box in which you wrote your answer.
  - Fill in only one bubble for each answer box used in your answer. Do **not** fill in a bubble under an unused answer box.
  - You must fill in the bubbles accurately to receive credit for your answer.



# Algebra/Data Analysis High School Assessment Review

## Goal 1

The student will demonstrate the ability to investigate, interpret, and communicate solutions to mathematical and real-world problems using patterns, functions and algebra.

### **EXPECTATION 1.1**

The student will analyze a wide variety of patterns and functional relationships using the language of mathematics and appropriate technology.

#### **Skill Statements**

- Given a narrative, numeric, algebraic, or geometric representation description of a pattern or functional relationship, the student will give a verbal description, or predict the next term or a specific term in a pattern or functional relationship.
- Given a numerical or graphical representation of a relation, the student will identify if the relation is a function and/or describe it.

Algebra/Data Analysis Online Course Module 3

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 3 – Expressions, Equations and Inequalities – all sections

Algebra/Data Analysis Online Course Module 4

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 4 – Patterns of Change – all sections

### Skill Statements

Given a narrative description, algebraic expression, graph or table, the student will produce a graph, table, algebraic expression of the form  $mx + b$  (linear) or  $x^2$  (simple quadratic), or equation.

Algebra/Data Analysis Online Course Module 4

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 4 – Patterns of Change – all sections

### Skill Statements

The student will represent a situation as a sum, difference, product, and/or quotient in one variable.

Algebra/Data Analysis Online Course Module 4

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 4 – Patterns of Change – all sections

Algebra/Data Analysis Online Course Module 5

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 5 –Linear Functions– all sections

## Skill Statements

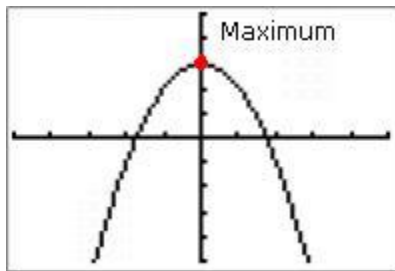
Given the graph of a non-linear function, the student will identify maxima/minima, zeros, rate of change over a given interval (increasing/decreasing), domain and range, or continuity.

### Maximum and Minimum

The highest point on a graph is called the **maximum**.

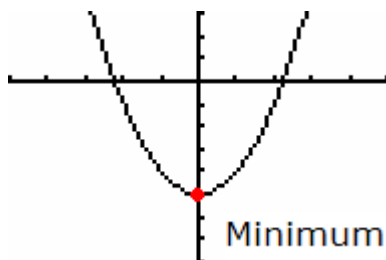
The lowest point on a graph is called the **minimum**.

A function has a maximum when there is one point on the graph that has the greatest **y-coordinate**.



The maximum **y-coordinate** for the graph is 3.  
The maximum point for the graph is (0, 3).

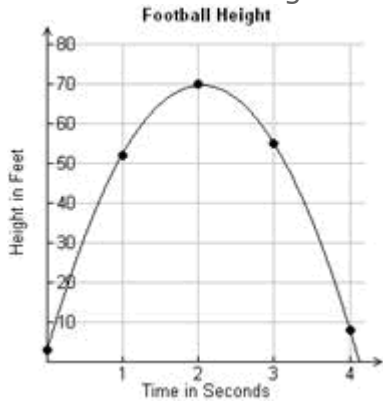
A function has a minimum when there is one point on the graph that has the least **y-coordinate**.



The minimum **y-coordinate** for the graph is -5. The minimum point for the graph is (0, -5).

Real-World Example:

Bill kicked a football into the air. The graph below shows the relationship between the number of seconds that the ball was in the air and the height of the ball above the ground.



The ball reached a maximum height of 70 feet before it started to fall to the ground.

A zero of a function is the value of the x-coordinate of the point where the graph of the function crosses the x-axis.

A root refers to a solution of an equation in the form  $p(x) = 0$ .

The y-coordinate of the point on the graph is 0. That is why it is called a zero of the function.

The table below contains some of the values represented by the function  $y = x^2 - 4$ .

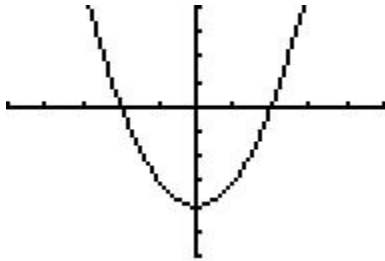
What are the x-coordinates of the points on the graph when the y-coordinate equals 0?

<b>x</b>	-5	-4	-3	-2	-1	0	1	2	3	4	5
<b>y</b>	21	12	5	0	-3	-4	-3	0	5	12	21

There are two points at which the y-coordinate is 0.

One occurs when  $x = -2$ ,  
and the other when  $x = 2$ .

The zeros of this function are -2 and 2. The zeros of the function can be seen in the graph below.



The two zeros are the x-intercepts,  $(-2, 0)$  and  $(2, 0)$ .

If the equation  $y = x^2 - 4$  was written in functional notation, its form would be:

$$f(x) = x^2 - 4.$$

If  $x = 2$ , we find

$$f(2) = (2)^2 - 4$$

$$f(2) = 4 - 4$$

$$f(2) = 0$$

and if  $x = -2$ , we find

$$f(-2) = (-2)^2 - 4$$

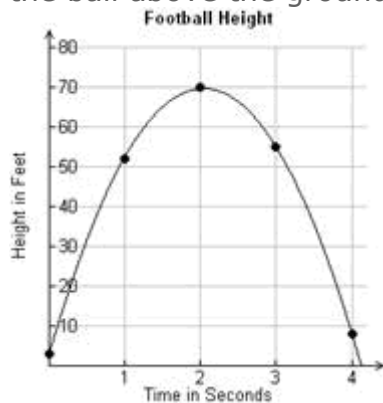
$$f(-2) = 4 - 4$$

$$f(-2) = 0$$

Note that -2 and 2 are the x-intercepts of the graph, the zeros of the function and the roots of the quadratic equation.

### Real-World Examples:

Bill kicked a football into the air. The graph below shows the relationship between the number of seconds that the ball was in the air and the height of the ball above the ground.



It takes the ball about 4.1 seconds to hit the ground (which is a height of 0 feet,) so 4.1 is a zero of the function.

Suppose you have \$100 in your checking account. How many checks for \$25 can you write before your balance will be equal to zero? The answer of course is 4 checks.

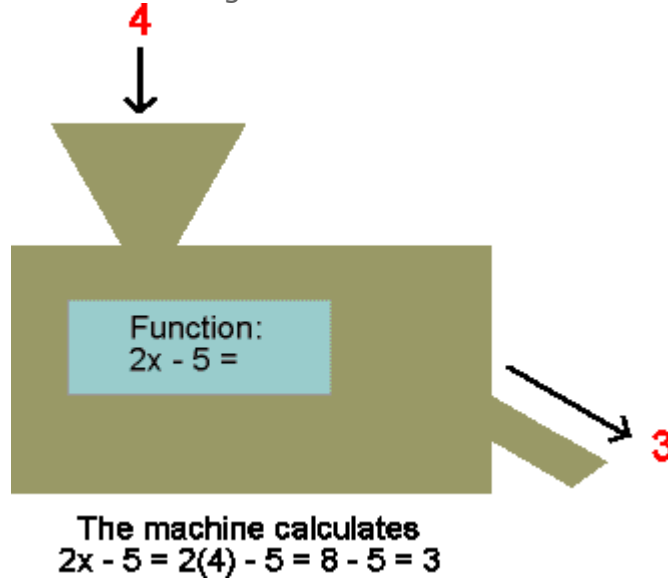
$$100-25x= 0$$

$$100-25(4) = 0$$

so 4 is a zero of the function and a root of the equation.

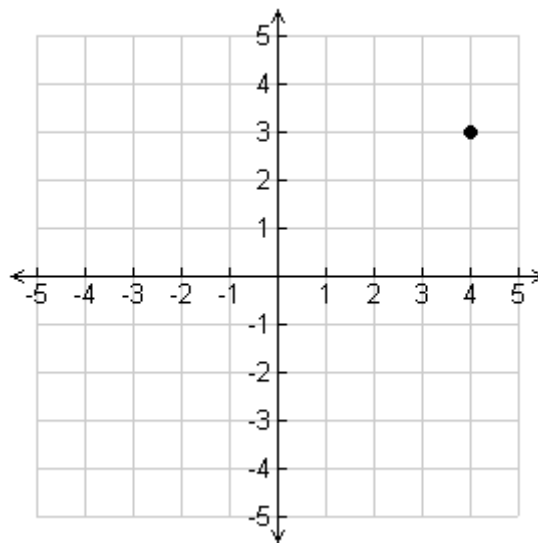
The **Domain** is the set of all possible x-values of a relation.  
The **Range** is the set of all possible y-values of a relation.

A model that is used in mathematics to help students to understand the terminology of domain and range is a function machine.

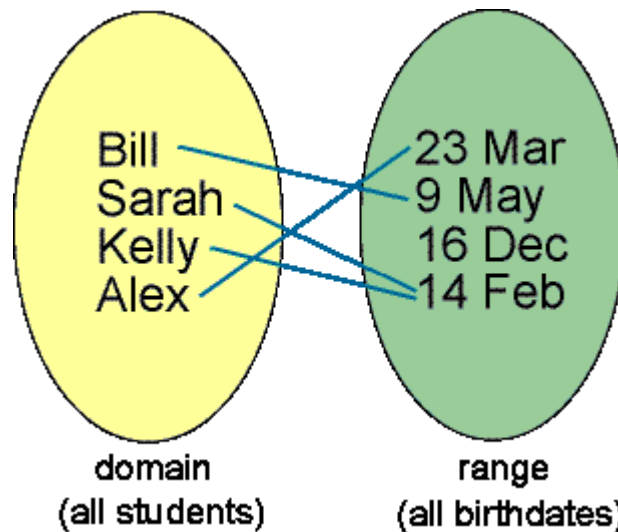


The domain is 4 because it is the input in the relation or function.  
The range is 3 because it is the output.

The ordered pair generated is (4, 3). Its graph is shown on the coordinate plane below.



Each element of the first set, all students (domain) corresponds to one element of the second set, all birthdates (range).



Some of the ordered pairs would be: (Bill, May 9), (Sarah, Feb. 14), (Kelly, Feb. 14), (Alex, Mar. 23)

Many algebra students confuse these two words because the terminology is new, and domain and range are introduced at the same time. Just remember that alphabetically domain is before range and  $x$  is before  $y$ . The domain is the set of  $x$ -values and the range is the set of  $y$ -values.

## **EXPECTATION**

**2.** The student will model and interpret real-world situations using the language of mathematics and appropriate technology.

### **Skill Statements**

#### **Given one or more of the following:**

- the graph of a line
- written description of a situation that can be modeled by a linear function
- two or more collinear points
- a point and slope

#### **the student will do one or more of the following:**

- write the equation
- solve a one-variable equation for the unknown
- solve a two-variable equation for one of the variables
- graph the resulting equation
- interpret the solution in light of the context
- evaluate the equation for a given value
- create a table of values
- find and/or interpret the slope (rate of change) and/or intercepts in relation to the context.

Any correct form of a linear equation will be acceptable as a response.

#### Algebra/Data Analysis Online Course Module 3

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 3 – Expressions, Equations and Inequalities – all sections

#### Algebra/Data Analysis Online Course Module 4

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 4 –Patterns of Change – all sections

### Algebra/Data Analysis Online Course Module 5

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 5 –Linear Functions– all sections

#### **Skill Statements**

- Given a linear inequality in narrative, algebraic, or graphical form, the student will graph the inequality, write an inequality and/or solve it, or interpret an inequality in the context of the problem.

Any correct form of a linear inequality will be an acceptable response.

### Algebra/Data Analysis Online Course Module 3

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 3 – Expressions, Equations and Inequalities – all sections

### Algebra/Data Analysis Online Course Module 4

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 4 –Patterns of Change– all sections

### Algebra/Data Analysis Online Course Module 5

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 5 –Linear Functions – all sections

## Skill Statements

### Given one or more of the following:

- a narrative description
- the graph of two lines
- equations for two lines

### the student will do one or more of the following:

- determine the system of equations and/or its solution
- describe the relationship of the points on one line with points on the other line
- give the meaning of the point of intersection in the context of the problem
- graph the system, determine the solution and interpret the solution in the context of the problem
- use slope to recognize the relationship between parallel lines.

Any correct form of a linear equation will be acceptable as a response.

Algebra/Data Analysis Online Course Module 6

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 6 –Linear Systems – all sections

## Skill Statements

Given a graph which represents a real-world situation, the student will describe the graph and/or explain how the graph represents the problem or solution and/or estimate a solution.

Algebra/Data Analysis Online Course Module 4

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 4 –Patterns of Change – all sections

#### Algebra/Data Analysis Online Course Module 5

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 5 – Linear Functions – all sections

#### Algebra/Data Analysis Online Course Module 6

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 6 – Linear Systems – all sections

#### **Skill Statements**

- Given a formula, students will substitute values, solve, and interpret solutions in the context of a problem.
- Given matrices, the students will perform operations and interpret solutions in real-world contexts.

#### Algebra/Data Analysis Online Course Module 4

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 4 –Patterns of Change– all sections

#### Algebra/Data Analysis Online Course Module 5

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 5 – Linear Functions – all sections

#### Algebra/Data Analysis Online Course Module 6

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 6 – Linear Systems – all sections

### Goal 3

The student will demonstrate the ability to apply probability and statistical methods for representing and interpreting data and communicating results, using technology when needed.

#### EXPECTATION

1. The student will collect, organize, analyze, and present data.

#### Skill Statements

- The student will design an investigation and justify their design.
- The students will describe how they would do an investigation, select a sampling technique and justify their choice.
- The student will demonstrate an understanding of the concepts of bias, sample size, randomness, representative samples, and simple random sampling techniques.

#### Algebra/Data Analysis Online Course Module 7

<http://mdk12online.org/>  
User Name: algebra Password: student  
Course: HSA Algebra/Data Analysis  
Click content on the Gold Banner  
Module 7 – Understanding Data – all sections

#### Algebra/Data Analysis Online Course Module 8

<http://mdk12online.org/>  
User Name: algebra Password: student  
Course: HSA Algebra/Data Analysis  
Click content on the Gold Banner  
Module 8 –Matrices – all sections

#### Algebra/Data Analysis Online Course Module 9

<http://mdk12online.org/>  
User Name: algebra Password: student  
Course: HSA Algebra/Data Analysis  
Click content on the Gold Banner  
Module 9 – Probability Through Data – all sections

### **Skill Statements**

- The student uses measures of central tendency and variability to solve problems, make informed conclusions and/or display data.
- The student will recognize and apply the effect of the distribution of the data on the measures of central tendency and variability.

Algebra/Data Analysis Online Course Module 7

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 7 – Understanding Data – all sections

### **Skill Statements**

- Using given data, the student determines the experimental probability of an event.
- Given a situation involving chance, the student will determine the theoretical probability of an event.

Algebra/Data Analysis Online Course Module 8

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 8 – Matrices – all sections

**EXPECTATION**

2. The student will apply the basic concepts of statistics and probability to predict possible outcomes of real-world situations

**Skill Statements**

Given data from a simulation or research, the student makes informed decisions and predictions.

Algebra/Data Analysis Online Course Module 8

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 8 – Matrices – all sections

**Skill Statements**

- The students will find a line of best fit, use it to interpolate and extrapolate, and/or interpret slope and intercepts.
- The student will use a curve of best fit to interpolate and extrapolate.
- The student's response will be in the context of the problem.

Algebra/Data Analysis Online Course Module 5

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 5 – Linear Functions – all sections

1. The student will communicate the use and misuse of statistics.

### **Skill Statements**

The student will analyze and identify proper and improper use of statistical data and/or statistical methods.

Algebra/Data Analysis Online Course Module 7

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 7 – Understanding Data – all sections

Algebra/Data Analysis Online Course Module 9

<http://mdk12online.org/>

User Name: algebra Password: student

Course: HSA Algebra/Data Analysis

Click content on the Gold Banner

Module 9 – Probability Through Data – all sections

## **Important Websites For Algebra/Data Analysis Students**

1. Online course that covers the entire HSA Algebra/Data Analysis course

<http://msde.mdk12online.org/>

**user name: algebra**

**password: student**

2. Sample HSA Algebra/Data Analysis Tests and Answers:

**[http://www.mdk12.org/assessments/high\\_school/look\\_like/algebra/intro.html](http://www.mdk12.org/assessments/high_school/look_like/algebra/intro.html)**

3. Practice Mini Tests (the web site will grade each test for you)

**[http://www.mdk12.org/assessments/high\\_school/look\\_like/algebra/intro.html](http://www.mdk12.org/assessments/high_school/look_like/algebra/intro.html)**

4. Rubric for writing Constructed Response Questions (April, 2009 only)

**[http://www.mdk12.org/assessments/high\\_school/look\\_like/algebra/rubric.html](http://www.mdk12.org/assessments/high_school/look_like/algebra/rubric.html)**