### BENCHMARK: MA.912.A.2.3
Describe the concept of a function, use function notation, determine whether a given relation is a function, and link equations to functions.

#### Cognitive Complexity
MODERATE

#### Academic Voc
- function
- function notation
- dependent variable
- independent variable
- input
- output

#### SAMPLE ITEMS

Andrew plotted a set of points on the coordinate grid shown below. All of the points have integer coefficients.

![Coordinate Grid](image)

Which of the following points could be removed so that Andrew’s graph represents a function?

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

The function shown below is used to convert a temperature, \( x \), in degrees Fahrenheit (°F), to a temperature, \( f(x) \), in degrees Celsius (°C).

\[
f(x) = \frac{5}{9}(x - 32)
\]

Micah wanted to convert today’s high temperature of 77°F to °C. What is today’s high temperature in °C?

#### HIGH ORDER QUESTION

- **STEMS**
  - How do you know that an equation is a function? Explain.
  - How can you link equations to functions?
  - How can you tell whether a relationship in a table, set of ordered pairs, or graph is a function?
  - How can you represent and describe functions?
  - Based on the table, graph, how would you determine the equation of a function?
  - Is your answer valid/reasonable? How do you know?
  - How can functions help you solve real world problems?

- **STUDENT SCALE QUESTIONS**
  - How have I used this benchmark in my reading/math?
  - How did the benchmark help me better understand ________?
  - Where is my learning on the scale?
    - I can teach someone else.
    - I can do it on my own.
    - I understand, but have questions.

- **STUDENT SUMMATIVE WRITING TASK**
  - After completing ________, the evidence from the lesson that helps me understand and answer the essential question is ________. This relates to the essential question because ________.

- **THINKING MAPS CORRELATION**
  - Cognitive Process: Seeing Analogies
  - Product: Bridge Map

### EOC TEST ITEM SPECIFICATION
This benchmark will be assessed using MC and FR items (Clarification) The student will:
- Students will determine if a given relation is a function.
- Students will evaluate an equation given in function notation.

**Content Limits**
- In items that require students to write a function, only continuous linear or quadratic functions of the form \( y=ax^2 \) should be used.
- In items presenting relations, relations can be given in various forms, including graphs, tables, sets of ordered pairs, and mapping diagrams.
- Items presenting a relation as a set of ordered pairs may not exceed six ordered pairs in the set.
- Items presenting a relation in a table should have no more than 8 rows of values.
- Items presenting a mapping diagram should have no more than 8 arrows.
- In items presenting relations as graphs for the purpose of determining if the relation is a function, the graph need not be continuous. Graphs that contain only ordered pairs should not exceed 10 ordered pairs.
- Items should utilize function notation as appropriate.

Additional Information on page 31-32 of Algebra 1 EOC Item Specification Document
### BENCHMARK: MA.912.A.2.4 Determine the domain and range of a relation.

<table>
<thead>
<tr>
<th>Academic Voc</th>
<th>SAMPLE ITEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>domain</td>
<td>An economics teacher plotted the value of a stock on 11 different days during a 500-day period and used line segments to connect them. In the graph below, the horizontal axis is measured in days and the vertical axis is measured in dollars.</td>
</tr>
<tr>
<td>range</td>
<td>The set of ordered pairs shown below defines a relation. ((0, 0), (1, 5), (2, 8), (3, 9), (4, 8), (5, 5), (6, 0))</td>
</tr>
<tr>
<td>relation</td>
<td>What is the value of the greatest element in the range of this relation?</td>
</tr>
<tr>
<td>vertical line test</td>
<td></td>
</tr>
</tbody>
</table>

Based on the graph, which of the following best describes the range of the value of the stock for this 500-day period?

- **A.** $0 \leq x \leq 500$
- **B.** $1 \leq x \leq 500$
- **C.** $10 \leq y \leq 60$
- **D.** $0 \leq y \leq 80$

### HIGH ORDER QUESTION STEMS

- How can you determine the range/domain based on the table or equation?
- How can you find the range of a function give the domain?
- How can you determine the greatest element in the range?
- How can you determine the smallest element in the range?
- What is a reasonable domain/range of a given real-world function?
- How can you write the domain or range as an inequality?

### STUDENT SCALE QUESTIONS

- How have I used this benchmark in my reading/math?
- How did the benchmark help me better understand __________?
- Where is my learning on the scale?
- ___ I can teach someone else.
- ___ I understand, but have questions.

### STUDENT SUMMATIVE WRITING TASK

After completing __________, the evidence from the lesson that helps me understand and answer the essential question is ____________. This relates to the essential question because ____________.

### THINKING MAPS CORRELATION

**Cognitive Process:** Sequencing  
**Product:** Flow Map

**Cognitive Process:** Classifying  
**Product:** Tree Map

---

**EOC TEST ITEM SPECIFICATION**

Also assesses MA.912.A.2.13 Solve real-world problems involving relations and functions. This benchmark will be assessed using MC and FR items.

(Clarification) The student will:

- Determine the domain and range of relations

**Content Limits**

- In items requiring students to determine either the domain or range of a function, functions are limited to linear and quadratic functions of the form $y = ax^2$. The item should restrict the domain or range.
- In items requiring students to determine the domain and/or range of a graph, the graph can be one of the following:
  - linear function;
  - quadratic function;
  - continuous piecewise function; or
  - ordered pairs.
- Items can require students to determine domain and range from a table, set of ordered pairs, or a mapping diagram.
- Domains and ranges may only be given as inequalities $0 < x \geq 60$ (e.g., for domain) or written as a sentence.
- Items should utilize function notation, as appropriate.

Additional Information on page 33-35 of Algebra 1 EOC Item Specification Document
### Algebra 1 Benchmark Task Cards MA.912.A.3.1

**BENCHMARK:** MA.912.A.3.1 Solve linear equations in one variable that include simplifying algebraic expressions.

<table>
<thead>
<tr>
<th>Cognitive Complexity</th>
<th>SAMPLE ITEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODERATE</td>
<td></td>
</tr>
</tbody>
</table>

**Academic Vocabulary**
- linear equation
- variable

**SAMPLE ITEMS**

Maria needs to cut three bookshelves from a board that is 1.8 meters long. The second shelf is 15 centimeters longer than twice the length of the first shelf. The remaining shelf is 5 centimeters longer than the first shelf. The equation below represents this situation, where \( x \) is the length of the first shelf in meters.

\[
x + (2x + 0.15) + (x + 0.05) = 1.8
\]

Which of the following is the length, in meters, of the first shelf?

- **A.** 0.40
- **B.** 0.45
- **C.** 0.53
- **D.** 0.96

Bill is planning to drive from his house to a baseball stadium and arrive in time for the beginning of the championship game. His arrival time depends on the traffic. If traffic is light, he will travel at an average speed of 50 miles per hour and arrive 1 hour early. If traffic is heavy, he will travel at an average speed of 30 miles per hour and arrive on time. The equation below can be used to model this situation, where \( t \) represents Bill’s driving time, in hours.

\[
50(t - 1) = 30t
\]

What value of \( t \) makes this equation true?

**HIGH ORDER QUESTIONS**

- Describe the steps needed to solve for the variable?
- How can using inverse operations assist in solving for a variable?
- What would happen to the equation if...?
- How could you solve for the variable if it appears on both sides of the equation?

**STUDENT SCALE QUESTIONS**

- ✔️ How have I used this benchmark in my reading/math?
- ✔️ How did the benchmark help me better understand ____________?
- ✔️ Where is my learning on the scale?
  - ___ I can teach someone else.
  - ___ I can do it on my own.
  - ___ I understand, but have questions.

**STUDENT SUMMATIVE WRITING TASK**

After completing ____________, the evidence from the lesson that helps me understand and answer the essential question is ____________. This relates to the essential question because ____________.

**THINKING MAPS CORRELATION**

- Cognitive Process: Sequencing
  - Product: Flow Map

- Cognitive Process: Part/Whole
  - Product: Brace Map

**EOC TEST ITEM SPECIFICATION**

Also assesses MA.912.A.3.2 Identify and apply the distributive, associative, and commutative properties of real numbers and the properties of equality. This benchmark will be assessed using MC and FR items.

*(Clarification) The student will:*

- Solve linear equations in one variable

**Content Limits**

- Equations must be presented in all items.
- Items may include equations with the variable on both sides of the equation.
- Items may include applications of commutative, associative, distributive, and identity properties.

**Additional Information on page 36-37 of Algebra 1 EOC Item Specification Document**
### Benchmark: MA.912.A.3.3

#### Solve literal equations for a specified variable.

**Cognitive Complexity:** MODERATE

### Academic Vocabulary
- **literal equation**
- **variable**

### Benchmark Signal Words and Sample Items

Carol wants to make a sculpture using brass and aluminum, with the dimensions shown below.

![Diagram](image)

The area of the aluminum section can be found using the equation $A = \frac{1}{2}bh = \frac{1}{2}bh$. Which of the following shows the aluminum section's area formula solved for $h$?

- A. $h = 2A(a - b)$
- B. $h = \frac{2A}{a - b}$
- C. $h = \frac{A}{2(a - b)}$
- D. $h = \frac{A(a - b)}{2}$

### High Order Question Stems
- Describe the steps needed to isolate the specified variable
- How can using inverse operations assist in solving for a variable?
- What would happen to the equation/variable if...?

### Student Scale Questions
- How have I used this benchmark in my reading/math?
- How did the benchmark help me better understand ________?
- Where is my learning on the scale?
  - ___ I can teach someone else.
  - ___ I can do it on my own.
  - ___ I understand, but have questions.

### EOC Test Item Specification

This benchmark will be assessed using MC items.

(Clarification) The student will:
- Students will manipulate an equation in order to isolate a specified variable.

**Content Limits**
- Items must contain more than two variables and require two or more procedural steps to complete.
- In items with variables of varying integral powers, the item can only require the isolation of a variable with a power of one.

### Additional Information

Additional Information on page 38-39 of Algebra 1 EOC Item Specification Document
**BENCHMARK**: MA.912.A.3.4 Solve and graph simple and compound inequalities in one variable and be able to justify each step in a solution.  

<table>
<thead>
<tr>
<th>Academic Voc</th>
<th>SAMPLE ITEM</th>
</tr>
</thead>
</table>
| - simple inequality  
- compound inequality | Taylor has a total of $25 to spend on dinner, which includes a 6.5% sales tax and a 20% tip. Taylor used the inequality shown below to calculate the amount in dollars, a, she can spend before tax and tip.  

\[ 1.2(a + 0.065a) \leq 25 \]

Which of the following shows the solution to this inequality?  
A. \( a \leq 22.74 \)  
B. \( a \leq 22.34 \)  
C. \( a \leq 19.76 \)  
★ D. \( a \leq 19.56 \)  

**SAMPLE ITEM**

Which graph shows the solution to the inequality shown below?  

\[ 15 \leq 7n - 2(n - 10) < 35 \]

![Graphs A, B, C, and D]

**HIGH ORDER QUESTION STEMS**

- What are some possible solutions for the inequality? How do you know?  
- How can you determine the smallest/largest solution for the inequality?  
- Explain the steps needed to solve the inequality.  
- How can you graph the solution to an inequality on a number line?  
- Is your solution reasonable/valid? How do you know?  
- What would happen to the solutions if __?  

**STUDENT SCALE QUESTIONS**

- How have I used this benchmark in my reading/math?  
- How did the benchmark help me better understand _______?  
- Where is my learning on the scale?  
- ___ I can do it on my own.  
- ___ I understand, but have questions.  

**EOC TEST ITEM SPECIFICATION**

This benchmark will be assessed using MC items  

(Clarification) The student will:  
- Students will solve simple and compound inequalities and/or graph solutions on a number line.  
- Students will provide statements and/or reasons for each step in solving a simple or compound inequality.  

**Content Limits**

- Items will not include inequalities without a solution.  

**Additional Information on page 40-41 of Algebra 1 EOC Item Specification Document**

**STUDENT SUMMATIVE WRITING TASK**

After completing __________, the evidence from the lesson that helps me understand and answer the essential question is __________. This relates to the essential question because ________.  

**THINKING MAPS CORRELATION**

Cognitive Process: Sequencing  
Product: Flow Map
### BENCHMARK: MA.912.A.3.5 Symbolically represent and solve multi-step and real-world applications that involve linear equations and inequalities.

<table>
<thead>
<tr>
<th>Academic Voc</th>
<th>SAMPLE ITEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>linear equations</td>
<td>The out-of-pocket costs to an employee for health insurance and medical expenses for one year are shown in the table below.</td>
</tr>
<tr>
<td>linear inequalities</td>
<td>If $x$ represents the total medical expenses of an employee on this plan and $x \leq 500$, which of the following equations can be used to determine this employee’s total health care costs for that year?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option</th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>$C = 3.626 - 500 + 0.20(x - 500)$</td>
</tr>
<tr>
<td>B.</td>
<td>$C = 3.626 - 500 + 0.20x$</td>
</tr>
<tr>
<td>★ C.</td>
<td>$C = 3.626 + 500 + 0.20(x - 500)$</td>
</tr>
<tr>
<td>D.</td>
<td>$C = 3.626 + 500 + 0.20x$</td>
</tr>
</tbody>
</table>

Ethan’s job at a local home improvement store is to mix paint to make different colors. For a particular customer, he mixed $p$ liters of blue paint, $0.8p$ liters of yellow paint, and $p - 0.4$ liters of orange paint. He then divided the mixture evenly into two cans. If each can contains 1.9 liters of paint, how many liters of blue paint did he use?

<table>
<thead>
<tr>
<th>High Order Question Stems</th>
<th>Student Scale Questions</th>
<th>EOC Test Item Specification</th>
</tr>
</thead>
</table>
| What types of real world problems involve linear equations or linear inequalities? | ✓ How have I used this benchmark in my reading/math?  
✓ How did the benchmark help me better understand _____?  
✓ Where is my learning on the scale?  
___ I can teach someone else.  
___ I can do it on my own.  
___ I understand, but have questions. | This benchmark will be assessed using MC and FR items.  
(Clarification) The student will:  
• Students will interpret a real-world application and write and/or solve a multi-step linear equation or linear inequality. |
| How do you know what operation to use to solve? | | Content Limits  
• In items where an equation or inequality is presented, all variables should be defined in the context of the problem so that the student is required to interpret the real-world application.  
• Items will not include the use of interval notation, e.g., $(3, \infty)$, or set notation, e.g., $(x | x > 3)$. |
| What strategy did you use to solve? | | Additional Information on page 42-43 of Algebra 1 EOC Item Specification Document |
| Is your answer valid/reasonable? How do you know? | | |

#### THINKING MAPS CORRELATION

- Cognitive Process: Sequencing  
Product: Flow Map

- Cognitive Process: Cause and Effect  
Product: Multi-Flow
BENCHMARK: MA.912.A.3.8 Graph a line given any of the following information: a table of values, the x- and y-intercepts, two points, the slope and a point, the equation of the line in slope-intercept form, standard form, or point-slope form.

Cognitive Complexity MODERATE

<table>
<thead>
<tr>
<th>Academic Voc</th>
</tr>
</thead>
<tbody>
<tr>
<td>X and Y intercepts</td>
</tr>
<tr>
<td>point -slope form</td>
</tr>
<tr>
<td>slope-intercept form</td>
</tr>
<tr>
<td>standard form</td>
</tr>
</tbody>
</table>

SAMPLE ITEMS

Robert goes to a garage sale where hardcover books sell for $5 each and paperback books sell for $2.50 each. He has $20 to spend. The equation below can be used to find how many books of each type Robert can buy, where \( x \) is the number of hardcover books and \( y \) is the number of paperback books.

\[ 5x + 2.5y = 20 \]

Which of the following shows the graph of this equation?

[A] [B] [C] [D]

HIGH ORDER QUESTION STEMS

- How would you graph the equation/ the values/ the points?
- What information helped you select the correct graph?
- Explain how to graph a line if the equation is in standard form; point-slope form; slope-intercept form?
- How would the graph change if...?

STUDENT SCALE QUESTIONS

- ✓ How have I used this benchmark in my reading/math?
- ✓ How did the benchmark help me better understand _______?
- ✓ Where is my learning on the scale?

- ___ I can teach someone else.
- ___ I can do it on my own.
- ___ I understand, but have questions.

EOC TEST ITEM SPECIFICATION

Also assesses MA.912.A.3.12 Graph a linear equation or inequality in two variables with and without graphing technology. Write an equation or inequality represented by a given graph. This benchmark will be assessed using MC items.

(Clarification) The student will:

- Identify graphs given
  - o a table of values;
  - o the x- and y-intercepts;
  - o two points;
  - o the slope and a point; or
  - o the equation of the line in slope-intercept form, standard form, or point-slope form.
- Students will identify graphs of linear inequalities given:
  - o the equation of the linear inequality in slope-intercept form; or
  - o the equation of the linear inequality in standard form.

Content Focus

- Items may include lines that have zero slope or undefined slope

THINKING MAPS CORRELATION

Cognitive Process: Sequencing
Product: Flow Map

Cognitive Process: Part-Whole
Product: Brace Map

Additional Information on page 44-46 of Algebra 1 EOC Item Specification Document
### BENCHMARK: MA.912.A.3.9 Determine the slope, x-intercept, and y-intercept of a line given its graph, its equation, or two points on the line.

<table>
<thead>
<tr>
<th>Academic Voc</th>
<th>SAMPLE ITEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• slope</td>
<td>An architect designed an outdoor staircase for a house. The relationship between the height of the steps and the length of the tread is modeled by the equation $57x - 95y = 0$. Which of the following represents the slope of the equation?</td>
</tr>
<tr>
<td>• x-intercept</td>
<td></td>
</tr>
<tr>
<td>• y-intercept</td>
<td></td>
</tr>
<tr>
<td>• rate of change</td>
<td></td>
</tr>
<tr>
<td>•</td>
<td>B. $\frac{5}{2}$</td>
</tr>
<tr>
<td></td>
<td>C. $\frac{3}{4}$</td>
</tr>
<tr>
<td></td>
<td>✰ D. $\frac{3}{3}$</td>
</tr>
</tbody>
</table>

### High Order Question

<table>
<thead>
<tr>
<th>STEMS</th>
<th>STUDENT SCALE QUESTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>How would you determine the slope/ x-intercept/ y-intercept?</td>
<td>✓ How have I used this benchmark in my reading/math?</td>
</tr>
<tr>
<td>What specific information helped you determine the slope/x-intercept/ y-intercept?</td>
<td>✓ How did the benchmark help me better understand ______?</td>
</tr>
<tr>
<td>What does the slope of a line tell you about the line?</td>
<td>✓ Where is my learning on the scale?</td>
</tr>
<tr>
<td>What is the relationship between rate of change and slope?</td>
<td>___ I can teach someone else.</td>
</tr>
<tr>
<td>How could you identify the x-intercept or y-intercept on a graph?</td>
<td>___ I can do it on my own.</td>
</tr>
<tr>
<td></td>
<td>___ I understand, but have questions.</td>
</tr>
</tbody>
</table>

### Student Summative Writing Task

After completing ____________, the evidence from the lesson that helps me understand and answer the essential question is ____________. This relates to the essential question because ____________.

### Thinking Maps Correlation

Cognitive Process: Part-Whole
Product: Brace Map

Also assesses MA.912.A.3.12 Graph a linear equation or inequality in two variables with and without graphing technology. Write an equation or inequality represented by a given graph. This benchmark will be assessed using MC and FR items.

(Clarification) The student will:

- Determine the slope, x-intercept, and/or y-intercept of a line given its graph, its equation, or two points on the line.

Content Focus

- Items may include lines that have zero slope or undefined slope.

Additional Information on page 47-48 of Algebra 1 EOC Item Specification Document
### Algebra 1 Benchmark Task Cards MA.912.A.3.10

**BENCHMARK:** MA.912.A.3.10 Write an equation of a line given any of the following information: two points on the line, its slope and one point on the line, or its graph. Also, find an equation of a new line parallel to a given line, or perpendicular to a given line, through a given point on the new line.

**Cognitive Complexity:** MODERATE

### Academic Vocab
- parallel
- perpendicular
- negative reciprocal

### SAMPLE ITEMS

In a technical drawing class, students are analyzing the side view of a house that has been positioned on a coordinate grid, as shown below.

The line AB is graphed on the coordinate grid below.

What is the x-intercept of the line that is perpendicular to line AB at point B?

Which of the following equations best represents the line that contains FO?

- A. \( y = \frac{3}{4}x + 14.4 \)
- B. \( y = \frac{2}{3}x + 27 \)
- C. \( y = \frac{3}{4}x + 14.4 \)
- D. \( y = \frac{2}{3}x + 27 \)

### HIGH ORDER QUESTION STEMS

- How could you use the information provided to write an equation?
- Describe how using coordinate geometry can help you find the slope?
- What would happen to the slope/equation if...?
- What are the characteristics of parallel and perpendicular lines?

### STUDENT SCALE QUESTIONS

- How have I used this benchmark in my reading/math?
- How did the benchmark help me better understand _______?
- Where is my learning on the scale?
  - I can teach someone else.
  - I can do it on my own.
  - I understand, but have questions.

### EOC TEST ITEM SPECIFICATION

Also assesses MA.912.A.3.7 Rewrite equations of a line into slope intercept form and standard form. Also assesses MA.912.A.3.12 Graph a linear equation or inequality in two variables with and without graphing technology. Write an equation or inequality represented by a given graph. Also assesses MA.912.G.1.4 Use coordinate geometry to find slopes, parallel lines, perpendicular lines, and equations of lines.

This benchmark will be assessed using MC and FR items.

(Clarification) The student will:
- Students will write linear equations, including lines parallel or perpendicular to a given line.
- Students will rewrite equations of lines from standard form to slope-intercept form, and vice versa.
- Given a graph, students will identify a linear inequality in slope-intercept form.

### CONTENT FOCUS

- Information given to determine equations of lines may include two points, the slope and a point, a graph, or an equation in a different form.
- Items may include lines that have zero slope or undefined slope.
- Given coordinates will be limited to rational numbers.

### THINKING MAPS CORRELATION

Cognitive Process: Part-Whole
Product: Brace Map

### ADDITIONAL INFORMATION

Additional Information on page 49-51 of Algebra 1 EOC Item Specification Document
BENCHMARK: MA.912.A.3.11 Write an equation of a line that models a data set and use the equation or the graph to make predictions. Describe the slope of the line in terms of the data, recognizing that the slope is the rate of change.

<table>
<thead>
<tr>
<th>Academic Vocabulary</th>
<th>SAMPLE ITEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• slope</td>
<td>David is training for a marathon. He writes down the time and distance for each training run and then records the data on a scatter plot. He has drawn a line of best fit on the scatter plot, as shown below.</td>
</tr>
<tr>
<td>• rate of change</td>
<td>A tank containing water is being drained at a constant rate. The points on the grid below represent the volume of water remaining in the tank as a function of time.</td>
</tr>
<tr>
<td>• model</td>
<td>Which statement best expresses the meaning of the slope as a rate of change for this line of best fit?</td>
</tr>
<tr>
<td></td>
<td>A. It represents the number of miles he will have to run to finish the marathon.</td>
</tr>
<tr>
<td></td>
<td>★ B. It represents the average speed, in miles per hour, of his training runs.</td>
</tr>
<tr>
<td></td>
<td>C. It represents the number of hours he will need to finish the marathon.</td>
</tr>
<tr>
<td></td>
<td>D. It represents the distances, in miles, that he ran while he was training.</td>
</tr>
</tbody>
</table>

Which statement best expresses the meaning of the slope as a rate of change for this line of best fit?
A. It represents the number of miles he will have to run to finish the marathon.
★ B. It represents the average speed, in miles per hour, of his training runs.
C. It represents the number of hours he will need to finish the marathon.
D. It represents the distances, in miles, that he ran while he was training.

HIGH ORDER QUESTION STEM
- How could you use the linear equation to make a prediction?
- What does the slope of a line tell you?
- What information helped you find the answer?

STUDENT SCALE QUESTIONS
✓ How have I used this benchmark in my reading/math?
✓ How did the benchmark help me better understand ____________?
✓ Where is my learning on the scale?
   ___ I can teach someone else.
   ___ I can do it on my own.
   ___ I understand, but have questions.

STUDENT SUMMATIVE WRITING TASK
After completing ____________, the evidence from the lesson that helps me understand and answer the essential question is _____________. This relates to the essential question because _________________.

THINKING MAPS CORRELATION
- Cognitive Process: Sequencing
- Product: Flow Map

Also assesses MA.912.A.3.12 Graph a linear equation or inequality in two variables with and without graphing technology. Write an equation or inequality represented by a given graph. This benchmark will be assessed using MC and FR items.

(Clarification) The student will:
- Students will write an equation of a line that models data and/or use it to make predictions.
- Students will recognize slope as a rate of change or describe the slope of the line in terms of the data.

Content Focus
- In items assessing slope as a rate of change, students will not be expected to convert units.
- Graphs may be located in any of the quadrants.

Additional Information on page 52-54 of Algebra 1 EOC Item Specification Document
### Academic Voc

- systems of linear equations
- substitution
- elimination

### SAMPLE ITEMS

Russ bought 3 medium and 2 large submarine sandwiches for a total of $29.95. Stacy bought 4 medium and 1 large submarine sandwiches for a total of $28.45.

Which statement shows the cost of each medium and each large submarine sandwich?

A. Each medium sandwich costs $5.69 and each large sandwich costs $6.89.
B. Each medium sandwich costs $5.69 and each large sandwich costs $6.39.
*C. Each medium sandwich costs $5.39 and each large sandwich costs $6.89.
D. Each medium sandwich costs $5.39 and each large sandwich costs $6.39.

A website that sells songs for downloading increased its price per song from $0.99 to $1.29. Macy spent $15.36 downloading songs during the month of the price increase. She downloaded 4 more songs at $0.99 than at $1.29. The set of equations below represents the situation where \( x \) is the number of songs Macy downloaded at $0.99 and \( y \) is the number of songs she downloaded at $1.29.

\[
\begin{align*}
x &= y + 4 \\
0.99x + 1.29y &= 15.36
\end{align*}
\]

What is the exact number of songs Macy downloaded at the $0.99 price?

### EOC TEST ITEM SPECIFICATION

Also assesses MA.912.A.3.13 Use a graph to approximate the solution of a system of linear equations or inequalities in two variables with and without technology.

Also assesses MA.912.A.3.15 Solve real-world problems involving systems of linear equations and inequalities in two and three variables. This benchmark will be assessed using MC and FR items.

(Clarification) The student will:

- Students will solve systems of linear equations in two variables.

**Content Focus**

- Items will not specify a method for solving systems of linear equations.
- Items may ask students to write and/or solve systems of linear equations in two variables.
- In items that use a graph, one of the two equations should be graphed on the coordinate plane.
- Items will not assess systems of linear inequalities.
- Items will not assess systems of linear equations in three variables.

**Additional Information on page 55-56 of Algebra 1 EOC Item Specification Document**
## Algebra 1 Benchmark Task Cards MA.912.A.4.1

**BENCHMARK:** MA.912.A.4.1 Simplify monomials and monomial expressions using the laws of integral exponents

<table>
<thead>
<tr>
<th>Academic Voc</th>
<th>SAMPLE ITEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• monomial</td>
<td>Mina simplified the expression shown below. $(a^3b^4)(a^2b^5)$</td>
</tr>
<tr>
<td>• exponent/</td>
<td>Her final answer was in the form $a^m b^n$.</td>
</tr>
<tr>
<td>negative</td>
<td>If she simplified the expression correctly, what is the value of $n$, the exponent on $b$?</td>
</tr>
<tr>
<td>exponent</td>
<td>$-4$</td>
</tr>
<tr>
<td>• base</td>
<td></td>
</tr>
<tr>
<td>• power</td>
<td></td>
</tr>
<tr>
<td>• power to a</td>
<td></td>
</tr>
<tr>
<td>power</td>
<td></td>
</tr>
<tr>
<td>• product to</td>
<td></td>
</tr>
<tr>
<td>a power</td>
<td></td>
</tr>
<tr>
<td>• quotient to</td>
<td></td>
</tr>
<tr>
<td>a power</td>
<td></td>
</tr>
<tr>
<td>• degree</td>
<td></td>
</tr>
</tbody>
</table>

**Cognitive Complexity**

LOW

**Academic Vocabulary**

- monomial
- exponent/negative exponent
- base
- power
- power to a power
- product to a power
- quotient to a power
- degree

**High Order Question Stems**

- How would you simplify the monomial?
- How can you simplify expression using exponents?
- What would happen to the monomial if...?

**STUDENT SCALE QUESTIONS**

- How have I used this benchmark in my reading/math?
- How did the benchmark help me better understand...?
- Where is my learning on the scale?
- ___ I can teach someone else.
- ___ I can do it on my own.
- ___ I understand, but have questions.

**EOC TEST ITEM SPECIFICATION**

This benchmark will be assessed using MC and FR items.

(Clarification) The student will:
- Students will simplify monomial expressions by applying the laws of exponents.

**Content Focus**

- Exponents should be integers.
- Items must have a variable base and may include a numerical base.
- Monomials may have no more than three variables.

**STUDENT SUMMATIVE WRITING TASK**

After completing __________, the evidence from the lesson that helps me understand and answer the essential question is __________. This relates to the essential question because __________.

**THINKING MAPS CORRELATION**

- Cognitive Process: Cause and Effect
- Product: Multi-Flow

Additional Information on page 57-58 of Algebra 1 EOC Item Specification Document
### Sample Items

<table>
<thead>
<tr>
<th>Academic Voc</th>
<th>SAMPLE ITEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>polynomial</td>
<td>Which expression is equivalent to the perimeter of the shaded portion of the rectangle?</td>
</tr>
<tr>
<td>binomial</td>
<td>![Image of a rectangle with expressions for its sides: 2(x + 4), x + 3, x + 4]</td>
</tr>
</tbody>
</table>
| trinomial    | **A.** 2x + 10  
**B.** 2x + 12  
**C.** 4x + 14  
**D.** 8x + 28 |
| degree of a polynomial | New photo imaging techniques on computers allow artists to distort an image from its original shape. Figure 1 is a square image. Figure 2 is stretched 4 units wider and shrunk 4 units shorter than Figure 1. |
| standard form of a polynomial | ![Images of Figure 1 and Figure 2] |

### High Order Question Stems

- How did you know which operation to use to solve?
- What information did you use to solve?
- Describe how to add/subtract/multiply polynomials.
- How can you apply the distributive property to multiply polynomials?
- Explain the rule for simplifying like terms when adding/subtracting polynomials.

### Student Scale Questions

- How have I used this benchmark in my reading/math?
- How did the benchmark help me better understand ________?
- Where is my learning on the scale?
  - ___ I can teach someone else.
  - ___ I can do it on my own.
  - ___ I understand, but have questions.

### Student Summative Writing Task

After completing _______, the evidence from the lesson that helps me understand and answer the essential question is __________. This relates to the essential question because __________.

### Thinking Maps Correlation

- Cognitive Process: Part-Whole  
  Product: Brace Map
- Cognitive Process: Sequencing  
  Product: Flow Map

---

This benchmark will be assessed using MC and FR items.

**Clarification** The student will:

- Simplify (add, subtract, and multiply) polynomial expressions.

**Content Focus**

- Items requiring multiplication of polynomials are limited to a product of a monomial and a binomial, a monomial and a trinomial, or two binomials.
- Items requiring addition and subtraction are limited to combining monomials, binomials, and/or trinomials. The simplified sum or difference should contain no more than five terms.

Additional Information on page 59-61 of **Algebra 1 EOC Item Specification Document**
### Algebra 1 Benchmark Task Cards MA.912.A.4.3

**BENCHMARK:** MA.912.A.4.3 Factor polynomial expressions.  
**Cognitive Complexity** MODERATE

<table>
<thead>
<tr>
<th>Academic Voc</th>
<th>SAMPLE ITEMS</th>
</tr>
</thead>
</table>
| • polynomial | The area of a rectangle is $2x^2 - 7x - 15$. Which of the following shows possible dimensions of the rectangle?  
  A. $(2x + 3)$ and $(x - 5)$  
  B. $(2x - 3)$ and $(x + 5)$  
  C. $(2x + 3)$ and $(2x - 10)$  
  D. $(2x - 3)$ and $(2x + 10)$  
| |
| • factor | If $x \neq 3$, which of the following shows the expression below in simplest form?  
  \[ \frac{3x^2 - 27}{x - 3} \]  
  A. $3(x + 3)$  
  B. $3(x - 3)$  
  C. $3(x + 9)$  
  D. $3(x - 9)$ |
| • GCF | |
| • difference of two squares | |

### HIGH ORDER QUESTION ITEMS

<table>
<thead>
<tr>
<th>STUDENT SCALE QUESTIONS</th>
<th>EOC TEST ITEM SPECIFICATION</th>
</tr>
</thead>
</table>
| ✓ How would you factor the polynomial expression?  
  ✓ What factoring method did you use? Why?  
  ✓ How can you check that the factored form is correct?  
  ✓ Summarize the procedure for factoring the difference of two squares.  
  ✓ Explain how to determine whether a binomial is the difference of two squares. | Also assesses MA.912.A.5.1 Simplify algebraic ratios. This benchmark will be assessed using MC items.  
  (Clarification) The student will:  
  • Students will completely factor polynomial expressions, which may include a greatest common factor, difference of two squares, and trinomials.  
  • Students will use factoring methods to simplify rational expressions.  

### STUDENT SUMMATIVE WRITING TASK

After completing ________, the evidence from the lesson that helps me understand and answer the essential question is __________. This relates to the essential question because __________.

### THINKING MAPS CORRELATION

Cognitive Process: Part-Whole  
Product: Brace Map

Cognitive Process: Sequencing  
Product: Flow Map

Additional Information on page 62-63 of Algebra 1 EOC Item Specification Document
### Algebra 1 Benchmark Task Cards MA.912.A.4.4

**BENCHMARK: MA.912.A.4.4** Divide polynomials by monomials and polynomials with various techniques, including synthetic division.

**Cognitive Complexity** MODERATE

### Academic Voc

- polynomial
- monomial

### SAMPLE ITEMS

If \( x \neq 0 \) and \( y \neq 0 \), which expression is equivalent to the expression shown below?

\[
(6x^6y^2 - 12x^4y^3 + 3x^2y) \div (3x^2y)
\]

A. \( 2x^4y - 4x^2y^2 \)

★ B. \( 2x^4y - 4x^2y^2 + 1 \)

C. \( 3x^3y^2 - 9x^2y^3 \)

D. \( 3x^3y^2 - 9x^2y^3 + 1 \)

### HIGH ORDER QUESTION ITEMS

- How would you simplify a polynomial?
- Describe the method you used to divide

### STUDENT SCALE QUESTIONS

- How have I used this benchmark in my reading/math?
- How did the benchmark help me better understand ________?
- Where is my learning on the scale?
  - ___ I can teach someone else.
  - ___ I can do it on my own.
  - ___ I understand, but have questions.

### EOC TEST ITEM SPECIFICATION

This benchmark will be assessed using MC items.

(Clarification) The student will:
- Students will divide polynomials by monomials.

**Content Focus**
- Items will be limited to dividing a polynomial by a monomial.
- Synthetic division will not be assessed.

### ADDITIONAL INFORMATION

Additional Information on page 64 of Algebra 1 EOC Item Specification Document

### STUDENT SUMMATIVE WRITING TASK

After completing ___________, the evidence from the lesson that helps me understand and answer the essential question is ___________. This relates to the essential question because ___________.

### THINKING MAPS CORRELATION

- Cognitive Process: Part-Whole
  - Product: Brace Map

- Cognitive Process: Sequencing
  - Product: Flow Map
**BENCHMARK: MA.912.A.5.4 Solve algebraic proportions.**

**Cognitive Complexity**
LOW

### Academic Voc
- proportion
- ratio
- cross product
- similar figures
- scale model

### SAMPLE ITEMS

**SAMPLE ITEM**
Tammy made similar models of a building, with the dimensions, in inches, shown in the diagram below.

![Diagram of similar models]

What is the solution of the equation below?

\[
\frac{2}{x - 14} = \frac{3}{4x}
\]

- [ ] 4
- [ ] 2
- [ ] 5

Tammy used the information to set up the following proportion.

\[
\frac{x + 5}{16} = \frac{x + 3}{12}
\]

What is the value, in inches, of \(x\)?

- [ ] A. 3
- [ ] B. 4
- [ ] C. 5
- [ ] D. 6

**HIGH ORDER QUESTION STEMS**

- Describe how to set up a proportion and solve.
- How can using proportions help you find solutions?
- What kind of relationships can proportions represent?
- What information would you use to determine the missing side lengths in similar figures?

### STUDENT SCALE QUESTIONS

- How have I used this benchmark in my reading/math?
- How did the benchmark help me better understand ________?
- Where is my learning on the scale?
  - [ ] I can teach someone else.
  - [ ] I can do it on my own.
  - [ ] I understand, but have questions.

### EOC TEST ITEM SPECIFICATION

This benchmark will be assessed using MC and FR items.

(Clarification) The student will:
- Solve algebraic proportions

**Content Focus**
- Products of the means and extremes of proportions cannot exceed degree 1.
- When appropriate, items must state restrictions to the domain.
- In items set in a real-world context, restrictions on the domain need not be noted because the context will naturally set the restrictions.
- Items that are set in the context of similar figures should have the proportion given in the stem.

### STUDENT SUMMATIVE WRITING TASK

After completing _________, the evidence from the lesson that helps me understand and answer the essential question is ___________. This relates to the essential question because ___________.

### THINKING MAPS CORRELATION

**Cognitive Process: Part-Whole**
Product: Brace Map

![Brace Map Diagram]

**Cognitive Process: Sequencing**
Product: Flow Map

![Flow Map Diagram]
### Algebra 1 Benchmark Task Cards MA.912.A.6.2

**BENCHMARK:** MA.912.A.6.2 Add, subtract, multiply and divide radical expressions (square roots and higher).

**Cognitive Complexity**
- MODERATE

### Academic Vocab
- radical expressions
- square root function
- perfect square
- radicand

### Sample Items

In the expression below, \( x > 0 \).

\[
\sqrt{16x^2} \div \sqrt{2x^2}
\]

Which of the following is equivalent to this expression?

- A. \(2\sqrt{x^3}\)
- B. \(2x^2\sqrt{2x}\)
- C. \(4x^3\sqrt{2x}\)
- D. \(8\sqrt{x^3}\)

### High Order Question Items

- How do you add/subtract/multiply/divide radicals?
- What are the characteristics of square root functions?
- Is your answer reasonable? How do you know?

### Student Scale Questions

- How have I used this benchmark in my reading/math?
- How did the benchmark help me better understand ________?
- Where is my learning on the scale?
  - I can teach someone else.
  - I can do it on my own.
  - I understand, but have questions.

### EOC Test Item Specification

Also assesses MA.912.A.6.1 Simplify radical expressions. This benchmark will be assessed using MC items.

- (Clarification) The student will:
  - Add, subtract, multiply and/or divide radical expressions and simplify the results.

**Content Focus**
- Items will assess square roots only.
- Radicands with variables will contain positive integral exponents.
- Items with variables must state restrictions to the domain.

**Additional Information on page 67 of Algebra 1 EOC Item Specification Document**
BENCHMARK: MA.912.A.7.1 Graph quadratic equations with and without graphing technology.

Cognitive Complexity MODERATE

<table>
<thead>
<tr>
<th>Academic Vocab</th>
<th>SAMPLE ITEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>- quadratic equation</td>
<td>- vertex</td>
</tr>
<tr>
<td>- axis of symmetry</td>
<td>- parabola</td>
</tr>
<tr>
<td>- maximum</td>
<td>- minimum</td>
</tr>
</tbody>
</table>

**HIGH ORDER QUESTION STEMS**

- How would you graph a quadratic equation?
- What would happen to the graph if…?
- What are the characteristics of a quadratic equation?

**STUDENT SCALE QUESTIONS**

- How have I used this benchmark in my reading/math?
- How did the benchmark help me better understand ________?
- Where is my learning on the scale?
- ___ I can teach someone else.
- ___ I can do it on my own.
- ___ I understand, but have questions.

**STUDENT SUMMATIVE WRITING TASK**

- After completing __________, the evidence from the lesson that helps me understand and answer the essential question is __________. This relates to the essential question because __________.

**THINKING MAPS CORRELATION**

Cognitive Process: Part-Whole
Product: Brace Map

Cognitive Process: Sequencing
Product: Flow Map

Also assesses MA.912.A.7.8 Use quadratic equations to solve real world problems. This benchmark will be assessed using MC items.

(Clarification) The student will:

- Students will identify the graph of a quadratic function given its equation.
- Students will use the graph of a quadratic function to solve a real-world problem.

**Content Focus**

- In items set in a real-world context, the quadratic equation should be presented. The context of the problem should require the student to interpret which value will be the solution.
- Items must use quadratic equations with integral coefficients except for items set in a real-world context.
- Items whose roots would be nonintegral should have the vertex and at least two other points labeled.
- Quadratic equations will be presented in standard form only.
- Graphics should be used in all of these items.

Additional Information on page 68-70 of Algebra 1 EOC Item Specification Document
### SAMPLE ITEMS

**Jeannie solved the quadratic equation shown below by factoring.**

\[ x^2 + 2x - 8 = 0 \]

Which of the following shows a step in solving the equation shown?

- A. \((x + 2)(x + 4) = 0\)
- B. \((x + 2)(x - 4) = 0\)
- C. \((x - 2)(x + 4) = 0\)
- D. \((x - 2)(x - 4) = 0\)

A ball is kicked from ground level into the air. Its height \(y\), in feet, after \(x\) seconds can be represented by the equation \(y = 40x - 16x^2\). What is the total elapsed time, in seconds, from the time the ball is kicked until it reaches ground level again?

![Answer Choices]

**HIGH ORDER QUESTION ITEMS**

- Describe the steps needed to factor quadratic equations?
- How can you use the quadratic formula to help you find solutions?
- How do you apply the quadratic formula to the quadratic equation?
- What is the connection between the x-intercept, the solutions, and the roots?

**STUDENT SCALE QUESTIONS**

- ✓ How have I used this benchmark in my reading/math?
- ✓ How did the benchmark help me better understand ________?
- ✓ Where is my learning on the scale?
  - I can teach someone else.
  - I can do it on my own.
  - I understand, but have questions.

**STUDENT SUMMATIVE WRITING TASK**

After completing __________, the evidence from the lesson that helps me understand and answer the essential question is __________. This relates to the essential question because __________.

**THINKING MAPS CORRELATION**

Cognitive Process: Sequencing
Product: Flow Map

Also assesses MA.912.A.1.8 Use the zero product property of real numbers in a variety of contexts to identify solutions to equations. Also assesses MA.912.A.7.8 Use quadratic equations to solve real world problems.

This benchmark will be assessed using MC items and FR items.

(Clarification) The student will:
- Solve quadratic equations over the set of real numbers

Content Focus
- Items must have real solutions only.
- Quadratic equations must have integer coefficients only.
- Items may assess special forms, such as the difference of squares and perfect square trinomials.
- Items will not require the use of the “completing the square” method of solving quadratic equations.

Additional Information on page 71-72 of Algebra 1 EOC Item Specification Document
**Algebra 1 Benchmark Task Cards MA.912.D.7.1**

**BENCHMARK**: MA.912.D.7.1 Perform set operations such as union and intersection, complement, and cross product.

<table>
<thead>
<tr>
<th>Sample Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>The set $T$ represents several Taunus breeds of cattle. $T = {\text{Angus, Devon, Shorthorn, Texas Longhorn}}$ The set $Z$ represents several Zebu breeds of cattle. $Z = {\text{Boran, Nelore, Poonwar}}$ What is the total number of elements in the set $T \times Z$?</td>
</tr>
<tr>
<td>A. 7</td>
</tr>
<tr>
<td>B. 9</td>
</tr>
<tr>
<td>★ C. 12</td>
</tr>
<tr>
<td>D. 20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set $D$ lists the ages of Dianna’s grandchildren. $D = {2, 5, 6, 8, 10, 11}$ Set $K$ lists the ages of Karen’s grandchildren. $K = {2, 10, 18}$ Set $P$ lists the ages of Patrick’s grandchildren. $P = {10, 11, 14}$ What is the greatest age in the set $(K \cup P) \cap D$?</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

**HIGH ORDER QUESTION ITEMS**

<table>
<thead>
<tr>
<th>Student Scale Questions</th>
<th>EOC Test Item Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ How would you perform set operations?</td>
<td></td>
</tr>
<tr>
<td>✓ What real life situations would require you to use set operations such as union, intersection, and cross product?</td>
<td></td>
</tr>
<tr>
<td>✓ How have I used this benchmark in my reading/math?</td>
<td></td>
</tr>
<tr>
<td>✓ How did the benchmark help me better understand ____?</td>
<td></td>
</tr>
<tr>
<td>✓ Where is my learning on the scale?</td>
<td></td>
</tr>
<tr>
<td>___ I can teach someone else.</td>
<td></td>
</tr>
<tr>
<td>___ I can do it on my own.</td>
<td></td>
</tr>
<tr>
<td>___ I understand, but have questions.</td>
<td></td>
</tr>
</tbody>
</table>

**STUDENT SUMMATIVE WRITING TASK**

After completing ______________, the evidence from the lesson that helps me understand and answer the essential question is ______________. This relates to the essential question because ______________.

**THINKING MAPS CORRELATION**

Cognitive Process: Sequencing
Product: Flow Map

Additional Information on page 73-74 of Algebra 1 EOC Item Specification Document
### BENCHMARK: MA.912.D.7.2
Use Venn diagrams to explore relationships and patterns, and to make arguments about relationships between sets.

#### Cognitive Complexity
MODERATE

**Academic Voc**
- Venn diagram
- Complement

**SAMPLE ITEMS**

The universal set contains only sets R, S, and T. These sets are related as shown in the Venn diagram below.

![Venn Diagram](image)

Which set represents \((\sim R \cap S) \cup (\sim T \cap S)\)?

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>{d, e, f, j}</td>
</tr>
<tr>
<td>B.</td>
<td>{d, j, k, m, n}</td>
</tr>
<tr>
<td>C.</td>
<td>{d, e, f, j, k, m, n}</td>
</tr>
<tr>
<td>D.</td>
<td>{d, e, f, g, j, k, m, n}</td>
</tr>
</tbody>
</table>

The Venn diagram below shows the number of students who chose to participate in each of the three sports offered at Sports Camp.

![Venn Diagram with Numbers](image)

Based on the diagram, what is the total number of students who did NOT participate in volleyball?

<table>
<thead>
<tr>
<th>Option</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>3</td>
</tr>
<tr>
<td>B.</td>
<td>5</td>
</tr>
</tbody>
</table>

**HIGH ORDER QUESTION STEMS**

- How can using a Venn diagram help you see patterns and relationships?
- What can you conclude from the Venn diagram?
- How can you use a Venn diagram to solve problems?

**STUDENT SCALE QUESTIONS**

- How have I used this benchmark in my reading/math?
- How did the benchmark help me better understand ____________?
- Where is my learning on the scale?
  - I can teach someone else.
  - I can do it on my own.
  - I understand, but have questions.

**EOC TEST ITEM SPECIFICATION**

This benchmark will be assessed using MC and FR items.

(Clarification) The student will:
- Students will use Venn diagrams to explore relationships and patterns and to make arguments about relationships between sets.

**Content Focus**
- Items may include set notation and symbols from set theory.
- Items should contain no more than a total of 15 ordered data points.
- Notation for the complement of set A will be limited to \(A'\) and \(\sim A\).

**STUDENT SUMMATIVE WRITING TASK**

After completing ____________, the evidence from the lesson that helps me understand and answer the essential question is _____________. This relates to the essential question because _____________.

**THINKING MAPS CORRELATION**

Cognitive Process: Classifying
Product: Tree Map