Maryland MCAP
Algebra I Practice

Exam Materials
Pages 2 - 37

Answer Key Materials
Pages 38 - 44

Student Name _____

P

MCAP
Maryland Comprehensive Assessment Program

Algebra I

Test Booklet

Practice Test

Section 1
(Non-Calculator)

Directions:

Today, you will take Section 1 of the Algebra I Practice Test. You will not be able to use a calculator.

Read each question. Then, follow the directions to answer each question. Mark your answers by completely filling in the circles in your answer document. Do not make any pencil marks outside of the circles. If you need to change an answer, be sure to erase your first answer completely. If a question asks you to show or explain your work, you must do so to receive full credit. Only responses entered within the space provided will be scored.

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GO ON ▶

Directions for Completing the Answer Grids

1. Work the problem and find an answer.

2. Write your answer in the boxes at the top of the grid.

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5. Do not fill in a circle under an unused box.

6. Fractions cannot be entered into an answer grid and will not be scored. Enter fractions as decimals.

7. See below for examples on how to correctly complete an answer grid.

EXAMPLES

To answer −3 in a question, fill in the answer grid as shown below.

To answer .75 in a question, fill in the answer grid as shown below.

GO ON ▶

1 Function f is defined as $f(x) = x^2 - 6x + 14$.

What is the minimum value of $f(x)$?

A -3

B 3

C 5

D 14

2 What value of x is the solution of the equation $\dfrac{3x - 7}{5} = x + 1$?

Enter your answer in the space provided.

4

GO ON ▶

3 The graph of $y = f(x)$ is shown in the xy-plane.
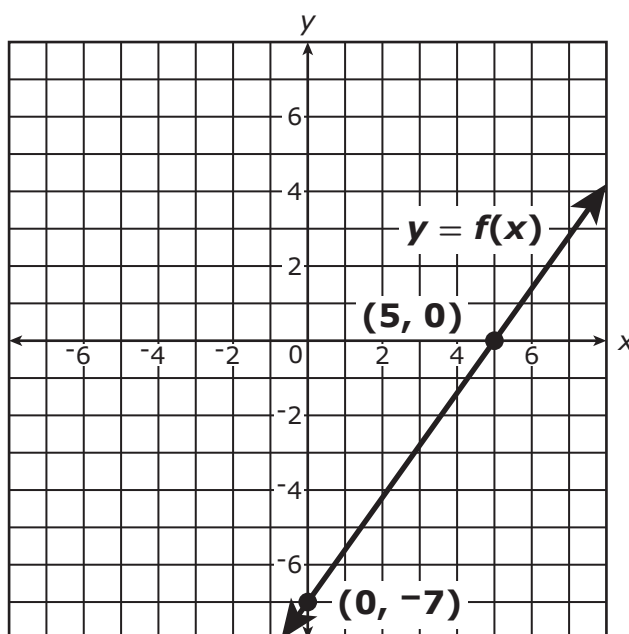
Which equation defines function f?

A $f(x) = \dfrac{7}{5}x - 7$

B $f(x) = \dfrac{7}{5}x + 5$

C $f(x) = \dfrac{5}{7}x - 7$

D $f(x) = \dfrac{5}{7}x + 5$

GO ON ▶

4 Which of the following expressions can be written as $(ax + b)(ax - b)$, where a and b are integers?

Select **all** that apply.

A $x^2 - 9$

B $x^2 - 11$

C $4x^2 - 1$

D $4x^2 - 2$

E $9x^2 - 4$

5 Which of the following sums or products are rational?

Select **all** that apply.

A $-\dfrac{1}{5} + \sqrt{2}$

B $0.\overline{4} + 0.\overline{3}$

C $4 \cdot \sqrt{2}$

D $\sqrt{4} + \sqrt{5}$

E $\sqrt{4} + \sqrt{9}$

F $\left(0.\overline{2}\right)\left(-\dfrac{5}{7}\right)$

GO ON ▶

6 The equation $x^2 - 8x - 5 = 0$ can be transformed into the equation $(x - p)^2 = q$, where p and q are real numbers.

What is the value of q?

Enter your answer in the space provided.

7 Mr. Carnegie will buy pencils and pens for his students for the school year.

- He can spend no more than $30 on pencils and pens.
- Pencils cost $0.15 each, and pens cost $0.75 each.
- He needs to buy at least 3 times as many pencils as pens.

Which of the following systems of inequalities can be used to determine the number of pencils that Mr. Carnegie can buy?

Select one answer.

A $0.15x + 0.75y \geq 30$ and $y \geq 3x$

B $0.15x + 0.75y \leq 30$ and $y \leq 3x$

C $0.15x + 0.75y \geq 30$ and $3y \geq x$

D $0.15x + 0.75y \leq 30$ and $3y \leq x$

GO ON ▶

8 Function f is defined by $f(x) = (x - 5)^2 + 1$. Function g is defined by $g(x) = f(x) - 2$.

The four quadrants are labeled in the xy–plane shown.
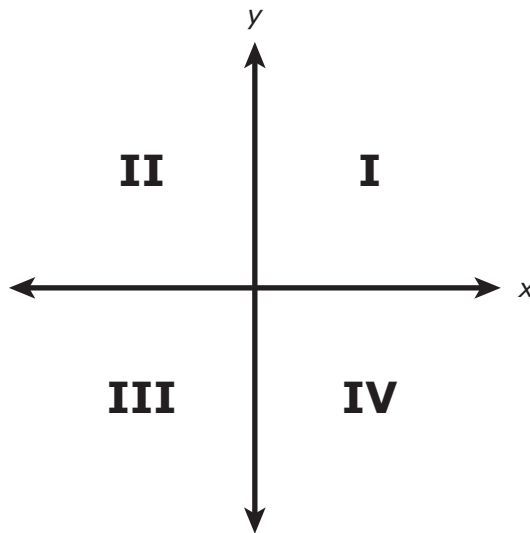
Which quadrants contain points on the graph of $y = g(x)$?

A Quadrants I and II only

B Quadrants I, II, and III only

C Quadrants I, II, and IV only

D Quadrants I, II, III, and IV

GO ON ▶

9 Samantha has $35 in her savings account. At the end of each week, she will add $20 to the account.

Which equation describes the total amount S, in dollars, that Samantha will have in her account at the end of week w?

Select one answer.

A $S = 15w$

B $S = 55w$

C $S = 20 + 35w$

D $S = 35 + 20w$

10 A system of equations is given.

$$\begin{cases} y = 9x - 1 \\ y = 2x + 3 \end{cases}$$

What is the value of x in the solution (x, y) to the system?

A $\dfrac{4}{7}$

B $\dfrac{4}{11}$

C $\dfrac{2}{7}$

D $\dfrac{2}{11}$

GO ON ▶

11 A student is saving money in a bank account to buy a computer. The function $f(w) = 35w + 10$ represents the total amount of money, f, in dollars, in the student's account w weeks after the student started saving for the computer.

What does the number 10 in the function represent in this context?

A the percent interest rate that the account earns

B the increase, in dollars, in the total amount of money in the account each week

C the number of dollars in the account when the student started saving for the computer

D the number of weeks it takes for the student to save enough money in the account to buy the computer

GO ON ▶

12 Two quadratic relationships, J and K, are represented in the following table and graph, respectively.

J

x	y
−4	10
−3	0
−2	−6
−1	−8
0	−6
1	0
2	10

K
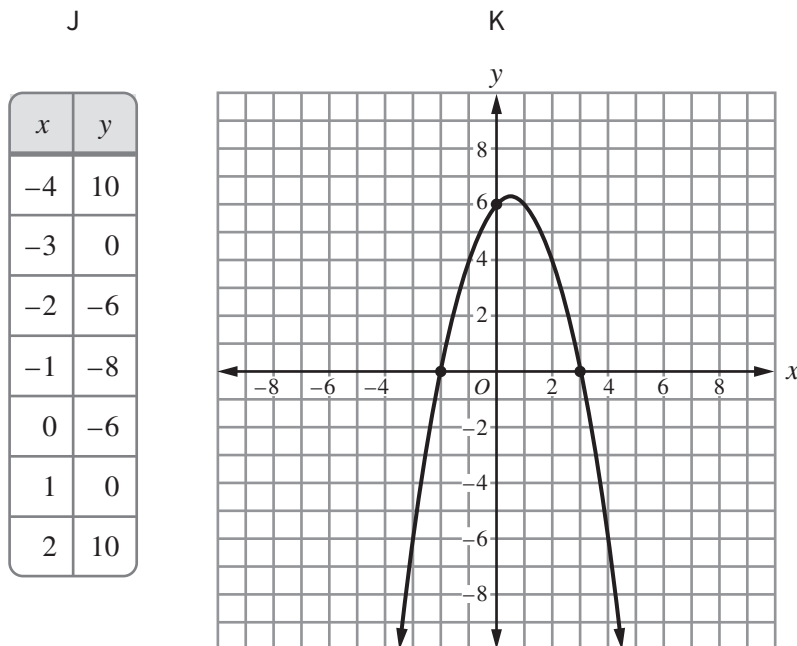
Which of the following statements about the relationships are true?

Select **all** that apply.

A The *x*-intercepts for relationship J are 5 units apart.

B The *x*-intercepts for relationship K are 5 units apart.

C The *y*-intercept for relationship J is 6 units from the origin.

D The *y*-intercept for relationship K is 6 units from the origin.

E Function J has a minimum value.

F Function K has a minimum value.

13 The expression $2x + (x - 7)^2$ is equivalent to $x^2 + bx + 49$ for all values of *x*.

What is the value of *b*?

Enter your answer in the space provided.

STOP

11

Section 2
(Calculator)

Directions:

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GO ON ▶

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7. See below for examples on how to correctly complete an answer grid.

EXAMPLES

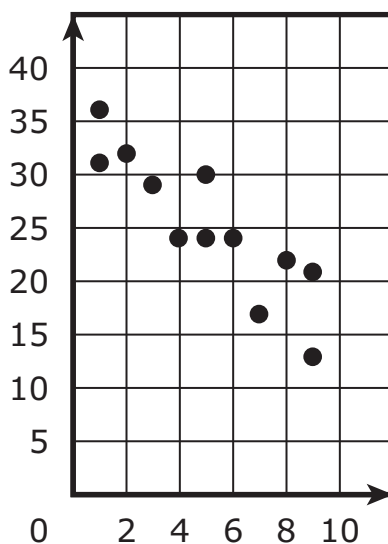To answer −3 in a question, fill in the answer grid as shown below.

To answer .75 in a question, fill in the answer grid as shown below.

15

GO ON ▶

1 A collection of data is shown in the scatterplot.

Which value is the **best** estimate of the correlation coefficient of a line of best fit for the data?

A -0.9

B -0.09

C 0.08

D 0.8

2 A sequence is defined by $a_n = -5 + (n - 1)14$, where n is a positive integer.

What is the value of a_{10}?

Enter your answer in the space provided.

GO ON ▶

3 Consider the equation $(x - a)^2 - b = 0$, where a and b are both positive real numbers.

Which statement about the solution or solutions to the equation must be true?

A The equation has no real solutions.

B The equation has exactly one real solution and the solution is positive.

C The equation has exactly two real solutions and both of the solutions are positive.

D The equation has exactly two real solutions and at least one of the solutions is positive.

4 An office manager is ordering this year's supply of pencils and pens for the office. Each pencil costs $0.10, each pen costs $0.75, and the manager will spend a total of $235 on pencils and pens.

Which additional piece of information is sufficient to determine the number of pencils and the number of pens that the manager will order?

A The number of pencils purchased last year will be equal to the number of pens purchased this year.

B The number of pens purchased this year will be three times the number of pencils purchased this year.

C The total cost of the pens purchased this year will be greater than the total cost of the pencils purchased this year.

D The total cost of the pencils and pens purchased last year will be three times the total cost of the pencils and pens purchased this year.

GO ON ▶

5 The system of equations shown is graphed in the *xy*–plane.

$$\begin{cases} x + y = 1 \\ 2x - 3y = 17 \end{cases}$$

Determine the coordinates of the solutions of the system algebraically. Then show that your solution is valid. Show your work or explain how you found your answer.

Enter your answer and your work or explanation in the space provided.

GO ON ▶

6 The table shows the distance, in miles, that an athlete will run each week for 6 weeks to prepare for a half marathon.

Distance to Run Each Week

Week	Distance (miles)
1	13
2	15.5
3	15.5
4	22.5
5	23
6	30

The equation $y = 3.25x + 8.5$ models the distance, y, in miles, that the athlete will run in week x.

For which weeks is the number of miles given by the equation **greater** than the actual number of miles the athlete will run?

Select **all** that apply.

A week 1

B week 2

C week 3

D week 4

E week 5

F week 6

GO ON ▶

7 The function f is defined by $f(x) = (x - 5)^2 - 20$ for all real numbers x.

What is the range of f?

A all real numbers

B all real numbers greater than or equal to -20

C all real numbers greater than or equal to 5

D all real numbers greater than or equal to 20

GO ON ▶

8 Two functions, f and g, are graphed in the xy–plane shown.
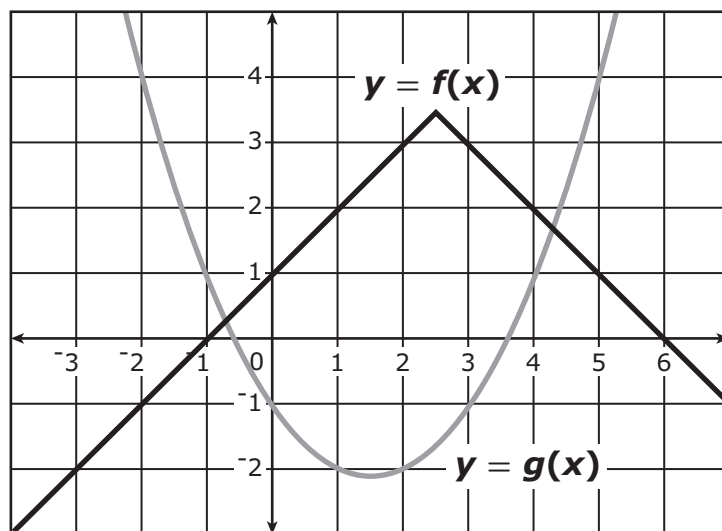
In which intervals do the solutions of the equation $f(x) = g(x)$ exist?

Select **all** that apply.

A between $x = -2$ and $x = -1$

B between $x = -1$ and $x = 0$

C between $x = 0$ and $x = 1$

D between $x = 1$ and $x = 2$

E between $x = 2$ and $x = 3$

F between $x = 3$ and $x = 4$

G between $x = 4$ and $x = 5$

GO ON ▶

9 A student read a 303–page book in 7 days. The table shows the total number of pages the student had read at the end of each day for the 7 days.

Pages Read in a Book

Day	Total Number of Pages Read
1	20
2	45
3	77
4	116
5	166
6	227
7	303

What was the average number of pages the student read per day from the end of day 2 to the end of day 6?

A 37.8

B 43.3

C 45.5

D 56.5

STOP

Section 3
(Calculator)

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GO ON ▶

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EXAMPLES

To answer −3 in a question, fill in the answer grid as shown below.

To answer .75 in a question, fill in the answer grid as shown below.

GO ON ▶

1 John has to type a 2,000-word business research report, and he types at a rate of 40 words per minute. The function $R(m) = \left(\dfrac{2{,}000}{40}\right) - m$ can be used to calculate the number of minutes required to finish after m minutes of typing.

What is the domain for function R in this context?

Select one answer.

A $m < 0$

B $0 \leq m \leq 50$

C $m > 50$

D All real numbers

2 A company sold a total of 150 adult and child tickets to a fundraiser. The company charged \$10 for each adult ticket and \$6 for each child ticket.

Which equation represents the relationship between the number of adult tickets sold, x, and the total amount, y, in dollars, raised from the sale of the tickets?

A $6x + 10y = 150$

B $10x + 6y = 150$

C $y = 6x + 10(150 - x)$

D $y = 10x + 6(150 - x)$

GO ON ▶

3 The quadratic function f is defined as $f(x) = -(x+2)^2 + 3$. Consider the graph of $y = f(x)$ in the xy–plane.

Part A

State whether there is a possible transformation of f in the form $g(x) = f(x) + k$, where k is a constant, for which the graph of $y = g(x)$ will have no x–intercepts. Justify your answer.

Enter your answer and your justification in the space provided.

Part B

State whether there is a possible transformation of f in the form $g(x) = f(x + k)$, where k is a constant, for which the graph of $y = g(x)$ will have no x–intercepts. Justify your answer.

Enter your answer and your justification in the space provided.

GO ON ▶

4 The *xy*–plane shows a graph of the solutions to a system of inequalities.
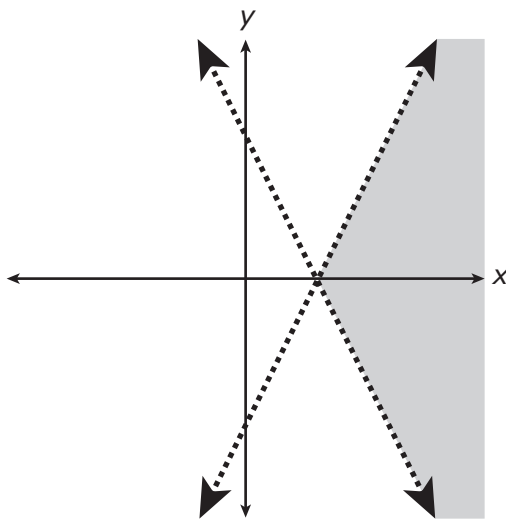
If *a* and *b* are positive integers, the system consists of which inequalities?

Select **all** that apply.

A $y < -ax - b$

B $y > -ax - b$

C $y < -ax + b$

D $y > -ax + b$

E $y < ax - b$

F $y > ax - b$

G $y < ax + b$

H $y > ax + b$

GO ON ▶

5 For each one-year period after a car was purchased, its value at the end of the year was 15% less than its value at the beginning of the year.

Part A

State whether the value of the car as a function of time after it was purchased is best modeled with a linear function, a quadratic function, or an exponential function, and explain why.

Enter your answer and your work or explanation in the space provided.

Part B

If the value of the car 2 years after it was purchased is $17,918, what was the value of the car when it was purchased? Show your work or explain your answer.

Enter your answer and your work or explanation in the space provided.

Section 3

GO ON ▶

6 A ball is hit from the ground. When the ball has traveled a horizontal distance

of d meters, its height, h, in meters, can be modeled by the function

$$h(d) = -\frac{1}{125}d^2 + d.$$

What is the horizontal distance from the point where the ball is hit to the point where the ball lands on the ground?

Enter your answer in the space provided.

STOP

Section 4
(Calculator)

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GO ON ▶

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EXAMPLES

To answer −3 in a question, fill in the answer grid as shown below.

To answer .75 in a question, fill in the answer grid as shown below.

GO ON ▶

1 The functions f and g are defined as follows.

- $f(x) = -x + 2$
- $g(x) = x^2 - 1$

The point (b, c) is on both the graph of f and the graph of g in the xy-plane.

Which of the following inequalities **must** be true?

Select one answer.

A $b > 0$

B $b < 0$

C $c > 0$

D $c < 0$

GO ON ▶

2 The librarian at a local school collected data on the number of students using the library after school each week during the first 22 weeks of school. The librarian counted the number of students in the library each day and then calculated the total for each week. The weekly totals were plotted in a graph and then a trend line was fit to the data.

Students in the Library
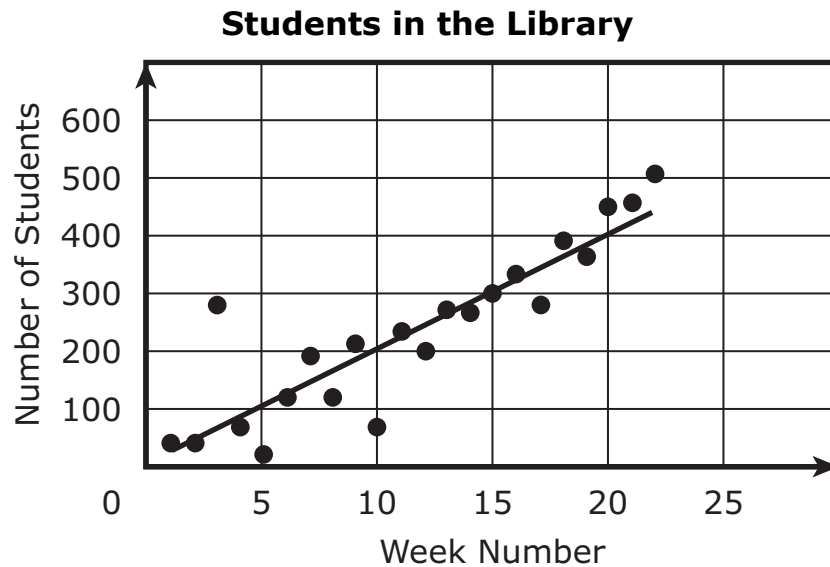
For which week does the trend line **underpredict** the number of students using the library by the **greatest** amount?

A week 3

B week 5

C week 10

D week 22

35

GO ON ▶

3 An object is dropped off the roof of a building. The function $h(x) = -16x^2 + 64$ models the height, $h(x)$, in feet, of the object above the ground x seconds after it is dropped.

What is the **best** description of the meaning of $h(2) = 0$ in terms of the context?

A The object is dropped from an initial height of 2 feet.

B The object hits the ground 2 seconds after it is dropped.

C The object travels at a speed of 2 feet per second after it is dropped.

D The speed of the object increases at a rate of 2 feet per second each second after it is dropped.

4 A student claims that if an equation has no exponents greater than 1, then the equation is linear.

Which equation can be used to show that the student's claim is **false**?

A $y = x$

B $y = |x|$

C $x + y = 1$

D $y - x^2 = 1$

GO ON ▶

5 A nursing student works at a doctor's office for $15 per hour and tutors other students for $25 per hour.

The student cannot work more than 20 hours each week.

The student wants to earn at least $375 each week.

- Define two variables and write a system of inequalities that represents the given constraints.
- Suppose the student wants to work at the doctor's office for as many hours as possible for the experience, and suppose the student can only work a whole number of hours at the doctor's office. How many hours should the student work at the doctor's office each week? Show your work or explain how you found your answer.

Enter your answers and your work or explanation in the space provided.

Section 4

GO ON ▶

6 The quadratic function *f* is graphed in the *xy*–plane shown.
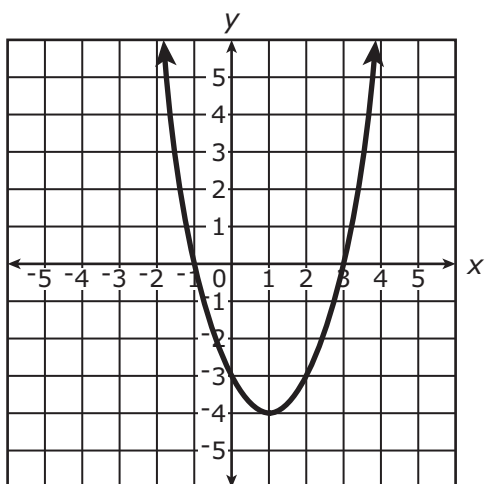
The function will be transformed to form a second function, *g*.

For which transformation of *f* will the equation $f(x) = g(x)$ have **two** solutions?

A $g(x) = f(-x)$

B $g(x) = -f(x)$

C $g(x) = f(x + k)$, where $k \neq 0$

D $g(x) = f(x) + k$, where $k \neq 0$

GO ON ▶

7 What are the solutions of $x^2 + 14x - 32 = 0$?

Select **all** that apply.

A $x = -16$

B $x = -8$

C $x = -4$

D $x = -2$

E $x = 2$

F $x = 4$

G $x = 8$

H $x = 16$

Section 4

GO ON ▶

8 A person deposited $10,000.00 into a bank account and made no other withdrawals or deposits. Each year, interest was added to the account. The table shows the account balance, $f(x)$, in dollars, x years after the person deposited the money for selected values of x.

Bank Account Balance

Years after Deposit, x	Account Balance, $f(x)$
0	$10,000.00
1	$10,130.00
2	$10,261.69

Which function **best** represents this situation?

A $f(x) = 10,000 - 130x$

B $f(x) = 10,000 + 130x$

C $f(x) = 10,000(0.987)^x$

D $f(x) = 10,000(1.013)^x$

STOP

MCAP
Maryland Comprehensive Assessment Program

Practice Test Answer and Alignment Document
Mathematics: Algebra I
Pencil-and-Paper

The following pages include the answer keys for all machine-scored items. A sample student response for the top score is included for all hand-scored constructed response items.

- Some answer keys include one possible sample student response. Other valid methods for solving the problem can earn full credit unless a specific method is required by the item.

- In items where the scores are awarded for full and partial credit, the definition of partial credit will be confirmed during range-finding (reviewing sets of real student work).

- If students make a computation error, they can still earn points for reasoning or modeling.

Section 1

Item Number	Answer Key	Evidence Statement Key/ Content Scope
1.	C	A-SSE.B.3.b
2.	−6	A-REI.B.3-1
3.	A	F-IF.C.7-1.a
4.	A, C, E	A-SSE.A.2
5.	B, E, F	N-RN.B.3
6.	21	A-REI.B.4.a
7.	D	A-CED.A.3
8.	C	F-BF.B.3
9.	D	A-CED.A.2
10.	A	A-REI.C.6
11.	C	F-LE.B.5-1

Item Number	Answer Key	Evidence Statement Key/ Content Scope
12.	B, C, D, E	F-IF.C.9
13.	−12	A-APR.A.1

Section 2

Item Number	Answer Key	Evidence Statement Key/ Content Scope
1.	A	S-ID.C.8
2.	121	F-IF.A.3
3.	D	A1.R.1 A-REI.B.4.b
4.	B	A1.M.7 A-CED.A.3
5.	**<u>Sample Top Score Response</u>** $x + y = 1$ $y = -x + 1$ $2x - 3(-x + 1) = 17$ $2x + 3x - 3 = 17$ $5x = 20$ $x = 4$ $y = -4 + 1 = -3$ Thus, the solution is $(4, -3)$. Confirming that the solution is valid: $4 + (-3) = 1$ $2(4) - 3(-3) = 17$ $8 + 9 = 17$ Since both equations are true, the solution is valid. **Refer to the Holistic Rubric for 4-Point Reasoning Constructed Response Items for score point information.**	A1.R.8 A-REI.A.1 A-REI.C.6
6.	C, E	A1.M.5 S-ID.B.6b
7.	B	F-IF.A.1
8.	B, G	A-REI.D.11
9.	C	F-IF.B.6-2

Section 3

Item Number	Answer Key	Evidence Statement Key/ Content Scope
1.	B	F-IF.B.5
2.	D	A1.M.2 A-CED.A.2
3.	**Sample Top Score Response** **Part A:** The graph of the function *f* is a parabola opening down with a vertex 3 units above the *x*-axis. Shifting the function down by more than 3 units would result in a graph with no *x*-intercepts. The transformation would be of the form $g(x) = f(x) + k$ where $k < -3$. **Part B:** There is no such transformation. The graph of *f* is a parabola with two *x*-intercepts and a domain of all real numbers. No matter how much the parabola is shifted to the left or right, there will always be two *x*-intercepts. **Refer to the Holistic Rubric for 4-Point Reasoning Constructed Response Items for score point information.**	A1.R.10 F-BF.B.3
4.	D, E	A1.R.3 A-REI.D.12

Item Number	Answer Key	Evidence Statement Key/ Content Scope
5.	**Sample Top Score Response** **Part A:** The situation is best modeled with an exponential function, because the resale value is decreasing at a constant percent rate of 15% per year. **Part B:** The situation can be modeled by the function $v(t) = p(0.85)^t$, where p is the value of the car when it was purchased, t is the number of years since it was purchased, and v is the current value of the car. We can use the fact that the value of the car 2 years after it was purchased was $17,918 to find the value of the car when it was purchased by substituting into the function and solving for p. $17{,}918 = p(0.85)^2$ $17{,}918 = 0.7225p$ $p = 24{,}800$ This means that the value of the car when it was purchased was $24,800. **Refer to the Holistic Rubric for 4-Point Modeling Constructed Response Items for score point information.**	A1.M.1 F-LE.A.1c
6.	125	A-SSE.B.3.a

Section 4

Item Number	Answer Key	Evidence Statement Key/Content Scope
1.	C	A-REI.D.10
2.	A	S-ID.B.6b
3.	B	A1.M.4 F-IF.A.2
4.	B	A1.R.4 F-IF.C.9
5.	**Sample Top Score Response** Let x represent the number of hours in one week that the student works at the doctor's office, and let y represent the number of hours the student tutors. The system of inequalities is $$\begin{cases} x + y \leq 20 \\ 15x + 25y \geq 375 \end{cases}$$ Solving for the intersection of the lines: $$x + y = 20 \rightarrow y = 20 - x$$ $$15x + 25(20 - x) = 375$$ $$15x + 500 + 25x = 375$$ $$-10x = -125$$ $$x = 12.5$$ $$y = 20 - 12.5 = 7.5$$ Since the student only works a whole number of hours, the student should work at the office 12 hours each week since $15(12) + 25(8) = 380$ and if the student worked at the office for 13 hours or more, the student would earn less than \$375. **Refer to the Holistic Rubric for 4-Point Modeling Constructed Response Items for score point information.**	A1.M.6 A-CED.A.3

Item Number	Answer Key	Evidence Statement Key/ Content Scope
6.	B	A1.R.10 A-REI.D.11 F-BF.B.3
7.	A, E	A-REI.B.4.b
8.	D	F-LE.A.2