ACTAAP

Arkansas Comprehensive Testing, Assessment, and Accountability Program

Released Item Booklet

Algebra I End-of-Course Examinations

2011–2012 Administrations

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Arkansas Department of Education

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PART I Overview

The criterion-referenced tests implemented as part of the **Arkansas Comprehensive Testing, Assessment, and Accountability Program** (ACTAAP) are being developed in response to Arkansas Legislative Act 35, which requires the State Board of Education to develop a comprehensive testing program that includes assessment of the challenging academic content standards defined by the Arkansas Curriculum Frameworks.

As part of this program, students in Arkansas public schools in 2012 who had completed or were completing Algebra I by the end of first semester participated in the Mid-Year Algebra I End-of-Course Examination. Students in Arkansas public schools who had completed or were completing Algebra I by the end of the spring semester participated in the Spring Algebra I End-of-Course Examination. In addition to the Mid-Year and Spring administrations, a Fall Algebra I End-of-Course Examination and Fall and Spring administrations of the Online Alternative Test for Algebra I were offered for students retesting in Algebra I.

This Released Item Booklet for the Algebra I End-of-Course Examinations contains test questions or items that were asked of students during the 2011–2012 operational administrations. The test items included in Part II of this booklet are some of the items that contributed to the student performance results for these administrations.

Students were given approximately an hour and a half each day to complete assigned test sessions during the two days of Fall and Mid-Year testing, approximately two hours each day to complete assigned test sessions during the two days of Spring testing, and one hour to complete each of the two sessions for the Online Alternative Test for Algebra I. Students were permitted to use a calculator for both multiple-choice and open-response items. Students were also supplied with a reference sheet to be used so that all students would have equal access to this information during testing. (See the reference sheet on page 84 of this booklet.) All of the multiple-choice items within this booklet have the correct response marked with an asterisk (*).

The development of the Algebra I End-of-Course Examinations was based on the *Arkansas Algebra I Mathematics Curriculum Framework*. This framework has distinct levels: Strands to be taught in concert, Content Standards within each Strand, and Student Learning Expectations within each Content Standard. An abridged version of the *Arkansas Algebra I Mathematics Curriculum Framework* can be found in Part III of this booklet. It is important to note that this abridged version lists only the predominant Strand, Content Standard, and Student Learning Expectation associated with each item. However, since many key concepts within the *Arkansas Algebra I Mathematics Curriculum Framework* are interrelated, there may be many cases in which there are other item correlations or associations across Strands, Content Standards, and Student Learning Expectations.

Part IV of the Released Item Booklet contains a tabular listing of the Strand, Content Standard, and Student Learning Expectation that each question was designed to assess. The multiple-choice and open-response items found on the Algebra I End-of-Course Examinations were developed in close association with the Arkansas education community. Arkansas teachers participated as members of the Algebra I Content Advisory Committee, providing routine feedback and recommendations for all items. The number of items associated with specific Strands, Content Standards, and Student Learning Expectations was based on approximate proportions suggested by the Content Advisory Committee, and their recommendations were accommodated to the greatest extent possible given the overall test design. Part IV of the Released Item Booklet provides Arkansas educators with specific information on how Algebra I End-of-Course Examination items align or correlate with the *Arkansas Algebra I Mathematics Curriculum Framework* to provide models for classroom instruction.

PART I Scoring Student Responses to Algebra I Open-Response Items

While multiple-choice items are scored by machine to determine if the student chose the correct answer from four options, responses to open-response items must be scored by trained "readers" using a pre-established set of scoring criteria.

The Arkansas Algebra I Rangefinding Committee assisted in the development of the scoring criteria. The committee comprises active Arkansas educators with expertise in mathematics education.

Reader Training

Before readers are allowed to begin assigning scores to any student responses, they go through intensive training. The first step in that training is for the readers to read the Algebra I open-response items as they appear in the test booklet and to respond—just as the student test takers are required to do. This step gives the readers some insight into how the students might have responded. The next step is the readers' introduction to the scoring rubric. All of the specific requirements of the rubric are explained by the Scoring Director who has been specifically trained to lead the scoring group. Then responses (anchor papers) that illustrate the score points of the rubric are presented to the readers and discussed. The goal of this discussion is for the readers to understand why a particular response (or type of response) receives a particular score. After discussion of the rubric and anchor papers, readers practice scoring sets of responses that have been pre-scored and selected for use as training papers. Detailed discussion of the responses and the scores they receive follows.

After three or four of these practice sets, readers are given "qualifying rounds." These are additional sets of pre-scored papers, and, in order to qualify, each reader must score in exact agreement on at least 80% of the responses and have no more than 5% non-adjacent agreement on the responses. Readers who do not score within the required rate of agreement are not allowed to score the Algebra I End-of-Course Examination responses.

Once scoring of the actual student responses begins, readers are monitored constantly throughout the project to ensure that they are scoring according to the criteria. Daily and cumulative statistics are posted and analyzed, and Scoring Directors or Team Leaders reread selected responses scored by the readers. These procedures promote reliable and consistent scoring. Any reader who does not maintain an acceptable level of agreement is dismissed from the project.

Scoring Procedures

All student responses to the Algebra I End-of-Course Examination open-response test items are scored independently by two readers. Those two scores are compared, and responses that receive scores that are non-adjacent (a "1" and a "3," for example) are scored a third time by a Team Leader or the Scoring Director for resolution.

PART II MID-YEAR RELEASED ALGEBRA I ITEMS

1. What is the value of x if $x = (7+9) \div (4-2)^2$?

A. 1
* B. 4
C. 12
D. 16

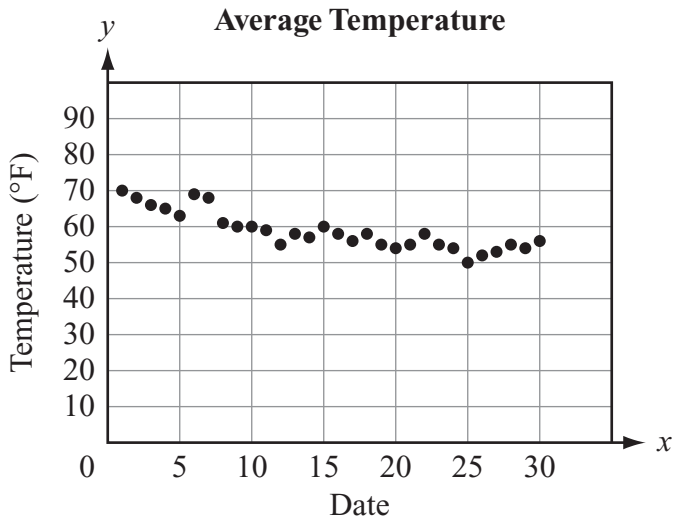
2. Adele's lawn has an area of $(x^2 - 5x - 6)$ square feet and a length of $(x+1)$ feet. What is the width of the lawn in feet?

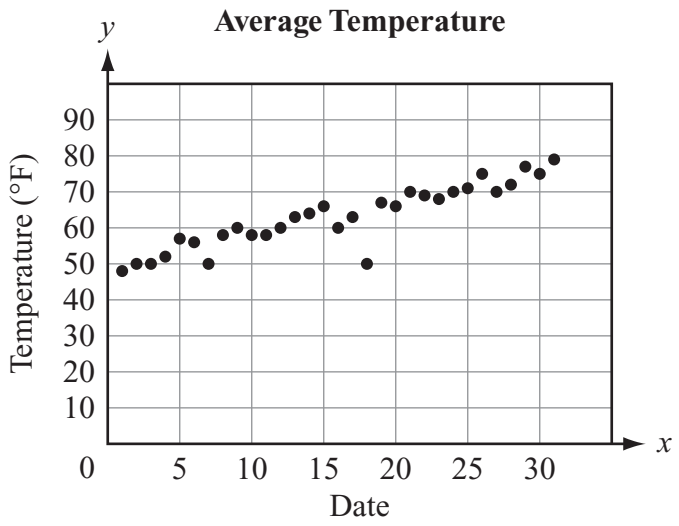
* A. $(x-6)$
B. $(x+6)$
C. $(x^2 - 4x - 5)$
D. $(x^2 - 6x - 7)$

3. Ana made a pizza with a circumference of 16π in. What is the radius, in inches, of the pizza?

A. 0.13
* B. 8
C. 16
D. 32

4. The scatter plots below show the average daily temperature for two **different** months.





Which statement about the data shown is true?

A. The data for each graph will have a positive correlation.

B. The data in the first graph was collected over a much greater time period.

* C. The range of the data for the second graph is greater than the first graph.

D. The median temperature for the first graph is higher than the second graph.

5. Which equation represents a line that passes through the points $(4, 12)$ and $(8, 9)$?

A. $y = \frac{3}{4}x + 3$

B. $y = -\frac{3}{4}x + 6$

C. $y = \frac{3}{4}x + 9$

* D. $y = -\frac{3}{4}x + 15$

6. If $a_n = 3n - 2$, what is the 15th term in the sequence?

A. 39

* B. 43

C. 45

D. 47

7. Which is the factored form of the polynomial $6x^2 + 7x - 5$?

* A. $(3x + 5)(2x - 1)$

B. $(2x + 5)(3x - 1)$

C. $(3x - 5)(2x + 1)$

D. $(2x - 1)(3x - 5)$

8. Consider these two events:

Event 1 — Devin sleeps through his alarm in the morning.

Event 2 — Devin misses the school bus.

Which of the following **best** describes the relationship between Event 1 and Event 2?

* A. causation

B. condition

C. correlation

D. combination

9. Which expression is equivalent to $\sqrt{\frac{81}{72-8}}$?

* A. $\frac{9}{8}$

B. $\frac{9}{64}$

C. $\frac{8}{9}$

D. $\frac{72}{64}$

10. What are the solutions of the equation $3x^2 - 12 = 16x$?

A. $x = 4, 1$

B. $x = -2, 2$

C. $x = \frac{2}{3}, -6$

* D. $x = -\frac{2}{3}, 6$

11. Which expression is equivalent to 2^{-3}?

A. -8

B. $-\frac{1}{8}$

* C. $\frac{1}{8}$

D. 8

12. The object of a certain puzzle is to move rings off a post in the fewest number of steps. Moving the rings requires at least $2^n - 1$ steps, where n is the number of rings on the post. If the post contains 7 rings, what is the **fewest** number of moves that can be made?

A. 13 moves

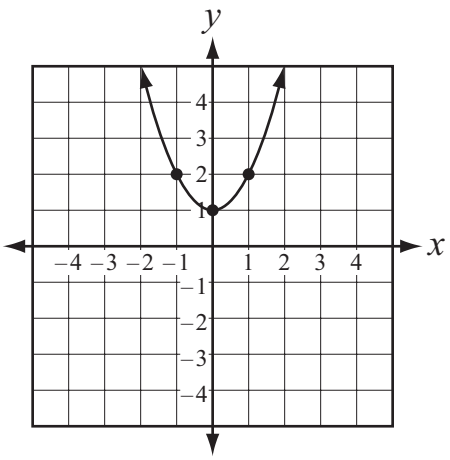
B. 64 moves

* C. 127 moves

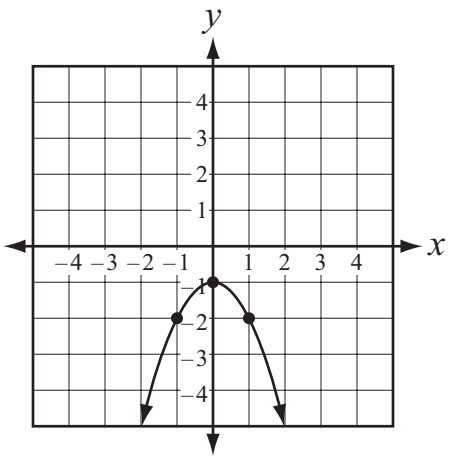
D. 128 moves

13. Which of the following is the graph of $y = x^2 + 1$ after a reflection over the x-axis?

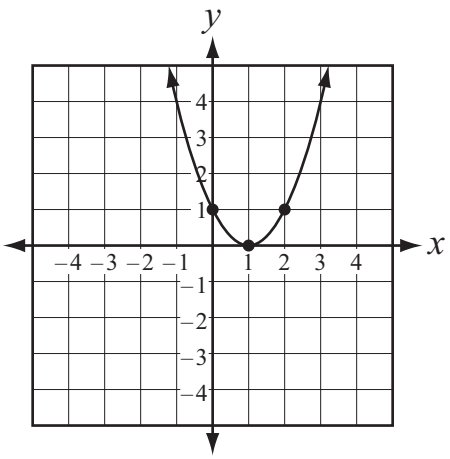
A.



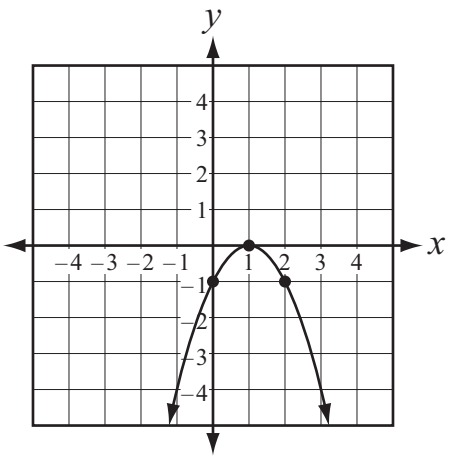
* B.



C.



D.



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14. What value of p satisfies the equation
$5p - 3 = 8(p - 1) + 7p$?

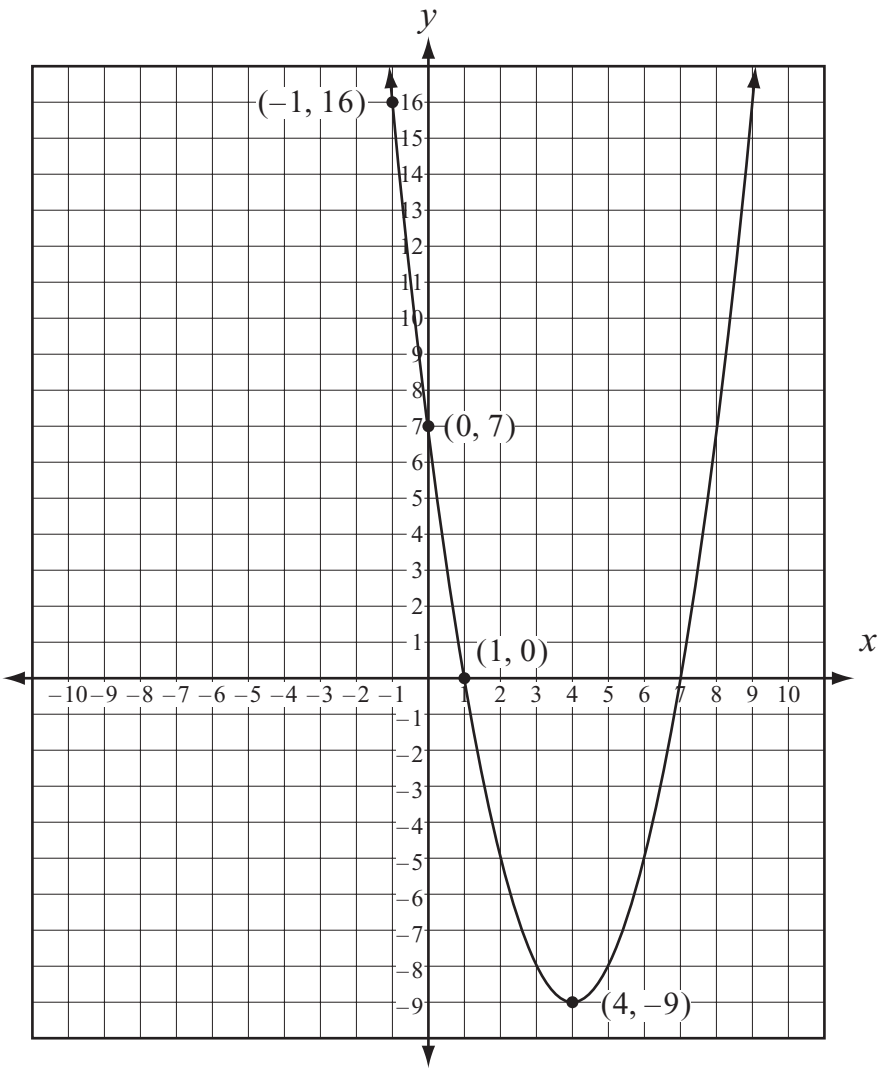
A. $p = -\frac{2}{5}$

B. $p = -\frac{1}{5}$

* C. $p = \frac{1}{2}$

D. $p = \frac{11}{10}$

15. A function is graphed below.



What are the coordinates of the minimum of this function?

A. (−1, 16)
B. (0, 7)
C. (1, 0)
* D. (4, −9)

16. Which data set has a domain of 0, 1, 2, 4?

A.

x	y
1	–3
–1	4
0	2
–5	–8

B.

x	y
–2	2
–1	1
0	0
–4	4

C.

x	y
–4	–3
–2	–1
–1	0
0	1

* D.

x	y
0	1
1	2
2	4
4	8

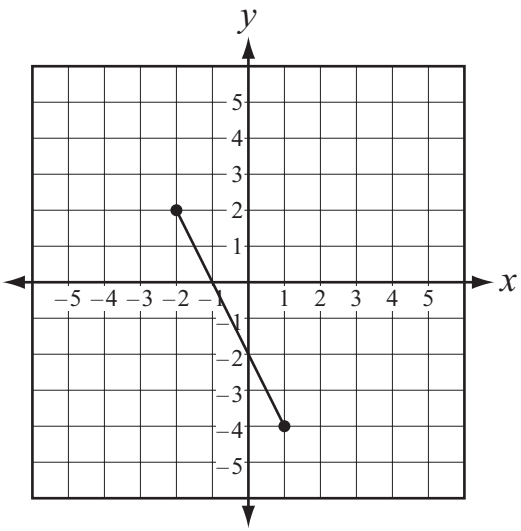
17. Lee is painting a fence. If Lee can paint 6 boards every 15 minutes, how many boards can Lee paint in 3 hours?

A. 1.2
* B. 72
C. 360
D. 450

18. Consider the graph of $y = 2x + b$. If the constant, b, is decreased by 2, in which direction will the graph shift?

A. up
* B. down
C. left
D. right

19. Look at the line segment graphed below.



What is the midpoint of the line segment?

A. $\left(\frac{1}{2}, 1\right)$

B. $\left(-\frac{3}{2}, 3\right)$

C. $(-1, -2)$

* D. $\left(-\frac{1}{2}, -1\right)$

20. A system of equations is shown below.

$$2x + y = 7$$
$$3x - 2y = 0$$

What is the solution to this system?

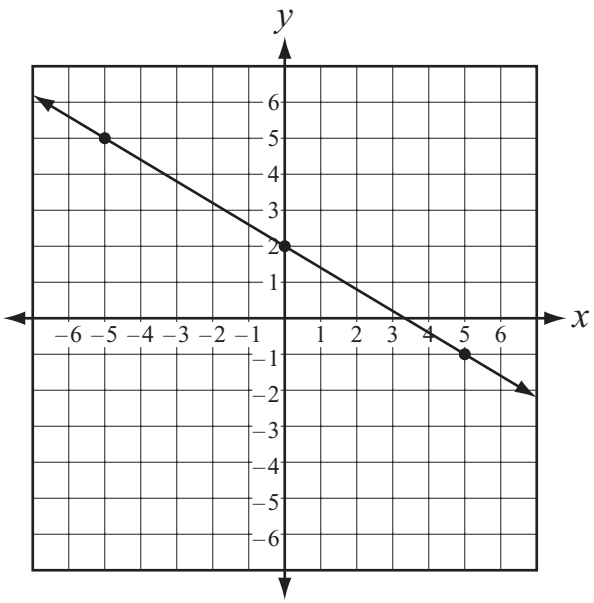
* A. $(2, 3)$

B. $(2, -3)$

C. $(-7, 21)$

D. $(7, -21)$

21. Look at the graph below.



What is the slope of the line shown above?

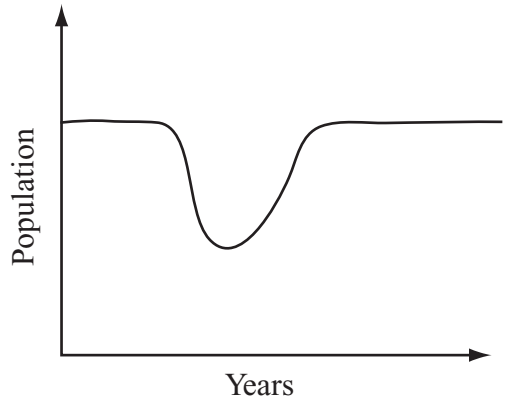
* A. $-\frac{3}{5}$

B. $-\frac{5}{3}$

C. $-\frac{1}{3}$

D. -3

22. The graph below shows the population of deer over several years.



This graph best represents which of the following statements?

A. The deer population remained stable over the years.

B. Once a predator was removed, the deer population increased.

C. Over the years the habitat area decreased, causing the deer population to decrease.

* D. An extremely cold winter killed off a large portion of the population. Afterward, the population recovered and stabilized.

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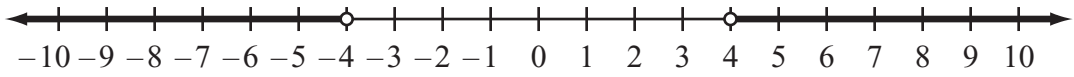
23. Look at the graph below.



Which inequality **best** describes the graph above?

A. $|x| < 4$

B. $|x| \leq 4$

* C. $|x| > 4$

D. $|x| \geq 4$

24. The matrices below show the number of T-shirts sold by day and by size and the price of each size.

Number of T-shirts sold

$$\begin{array}{c} \\ \text{Monday} \\ \text{Tuesday} \end{array} \begin{array}{c} \begin{array}{ccc} \text{S} & \text{M} & \text{L} \end{array} \\ \begin{bmatrix} 12 & 15 & 22 \\ 14 & 24 & 18 \end{bmatrix} \end{array}$$

Price of T-shirts sold

$$\begin{array}{ccc} \text{S} & \text{M} & \text{L} \\ \end{array}$$
$$\begin{bmatrix} \$6.00 & \$8.00 & \$10.00 \end{bmatrix}$$

How much money was collected on Tuesday from medium (M) T-shirt sales?

A. $120
* B. $192
C. $240
D. $312

---

25. Why is $\frac{(\sqrt{x}-\sqrt{11})^2}{x-11}$ undefined when $x = 11$?

A. The square root of 11 is undefined.
B. The value of 0 squared is undefined.
C. A fraction with a numerator of 0 is undefined.
* D. A fraction with a denominator of 0 is undefined.

26. Gaspar's Internet provider charges $0.04 per minute each month for web service plus a monthly flat fee for a modem. If Gaspar paid $67 last month and used 1,500 minutes of web service, how much does the modem cost per month?

A. $ 1.17
B. $ 2.68
* C. $ 7.00
D. $60.00

27. A classroom has 30 chairs of various colors; 5 yellow, 10 red, 4 blue, and the rest green. The first student in the room sits in a green chair. If the second student coming into the room chooses a chair at random, what is the probability the chair will be green?

A. $\frac{11}{30}$
B. $\frac{19}{30}$
* C. $\frac{10}{29}$
D. $\frac{18}{29}$

28. Which is the simplified form of the expression $10z - 4 + 8(z - 1)$?

A. $6z$
B. $11z - 12$
C. $18z - 5$
* D. $18z - 12$

29. Before driving to her grandmother's house, Paula buys 10 gallons of gasoline for $23.00. She drives 300 miles over 6 hours. At the end of each hour, she records how many miles she has driven. In a graph of her distance over time, what would be the dependent variable?

* A. miles
B. hours
C. dollars
D. gallons

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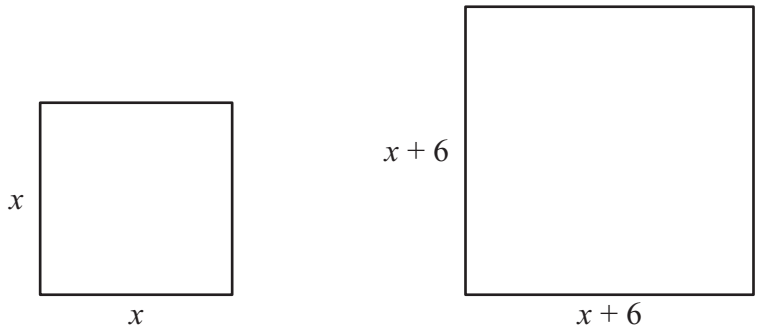
30. Jan has a deck in the shape of a square. Jan extends each side of the deck by 6 feet. The area of the extended deck is 324 square feet. What was the side-length of the original deck in feet?



A. 6
* B. 12
C. 18
D. 24

A. Roger has a lawn care business and charges a flat fee of $20 dollars plus x dollars per hour to mow yards. It takes Roger 3 hours to mow one yard, 2 hours to mow a second yard, 1 hour to mow a third yard, and 4 hours to mow a fourth yard.

1. Write four different expressions, each expression representing Roger's charge for one of the yards.

2. Using the four different expressions from Part 1, write an expression that represents the sum of the charges for the four different yards. Show your work.

3. If Roger earns $175 mowing the four yards, how much does he charge per hour?

BE SURE TO LABEL YOUR RESPONSES 1, 2, AND 3.

Item A Scoring Rubric—2012 Algebra I

Score	Description
4	The student earns 4 points. The response contains no incorrect work. Label of "$" is given with answer in Part 3
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns ½ – 1½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — No Response. A score of "B" will be reported as "NA." (No attempt to answer the item. Score of "0" is assigned for the item.)

SOLUTION AND SCORING

4 points possible:

Part	Points
1	**2 points possible:** 2 points: 4 Correct expressions: $20+3x$ for 1st yard $20+2x$ for 2nd yard $20+x$ for 3rd yard $20+4x$ for 4th yard **OR** 1 point: 3 Correct expressions or 4 Correct equations or The correct expression for 1 specific yard written correctly 4 different ways
2	**1 point possible:** ½ point: Correct answer: $80+10x$ *or correct answer based on all 4 expressions or equations in Part 1* *Note: Do not give credit for an equation, if expressions are used in Part 1* **AND** ½ point: Correct procedure is shown and/or explained Give credit for the following or equivalent: Work may contain one calculation or copy error • $20+3x+20+2x+20+x+20+4x=80+10x$
3	**1 point possible:** 1 point: Correct answer: ($) 9.50 *or correct answer based on an incorrect expression or equation in Part 2 truncated or rounded to the cent.*

B. The nutrition facts for three different brands of chocolate cookies are listed below.

Nutrition Facts Serving Size 2 cookies	
Amount Per Serving	
Calories	130
Calories from Fat	50
Total Fat	6 g
Sodium	80 mg

Cookie #1

Nutrition Facts Serving Size 2 cookies	
Amount Per Serving	
Calories	130
Calories from Fat	40
Total Fat	4.5 g
Sodium	80 mg

Cookie #2

Nutrition Facts Serving Size 2 cookies	
Amount Per Serving	
Calories	160
Calories from Fat	63
Total Fat	7 g
Sodium	190 mg

Cookie #3

A marketing company wants to create a matrix that will compare the calories, calories from fat, total fat, and the sodium per serving for the three brands of cookies.

1. Construct one matrix that includes the data from all three nutrition tables. Be sure to include all labels.

2. The marketing company decides to compare Cookie #2 with Cookie #3. The company wants a matrix that shows the differences in calories, calories from fat, total fat, and the sodium per serving. Construct a matrix that displays these data. Be sure to include all labels.

3. The marketing company decides to also compare Cookie #2 with Cookie #3 for the differences in calories, calories from fat, total fat, and the sodium per cookie. Construct a matrix that displays these data. Be sure to include all labels.

BE SURE TO LABEL YOUR RESPONSES 1, 2, AND 3.

Item B Scoring Rubric—2012 Algebra I

Score	Description
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns ½ – 1½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — No Response. A score of "B" will be reported as "NA." (No attempt to answer the item. Score of "0" is assigned for the item.)

SOLUTION AND SCORING

4 points possible:

<table>
<tr><th>Part</th><th>Points</th></tr>
<tr><td>1</td><td>

2 points possible:

2 points: Correct and complete matrix:

	#1	#2	#3
Calories	130	130	160
Calories from Fat	50	40	63
Total Fat	6	4.5	7
Sodium	80	80	190

or

	Calories	Cal. from Fat	Total Fat	Sodium
#1	130	50	6	80
#2	130	40	4.5	80
#3	160	63	7	190

OR

1 point: Matrix contains 1 copy error but is otherwise correct

or

1 or more labels are missing, but matrix is otherwise correct

</td></tr>
<tr><td>2</td><td>

1 point possible:

1 point: Correct and complete matrix:

	Diff. per Serving
Calories	30
Cal. From Fat	23
Total Fat	2.5
Sodium	110

or

	Calories	Cal. from Fat	Total Fat	Sodium
Diff. per Serving	30	23	2.5	110

or

	Diff. per Serving	
	#2	**#3**
Calories	130	160
Cal. from Fat	40	63
Total Fat	4.5	7
Sodium	80	190

</td></tr>
</table>

Part	Points
	or **Diff. per Serving** **Calories** / **Cal. from Fat** / **Total Fat** / **Sodium** **#2** 130 40 4.5 80 **#3** 160 63 7 190 **OR** ½ point: 1 or more labels are missing, but matrix is otherwise correct or 1 element in matrix is incorrect but labels are correct
3	**1 point possible:** 1 point: Correct and complete matrix: *or correct matrix based on matrix given in Part 2* **Diff. per Cookie** **Calories** 15 **Cal. From Fat** 11.5 **Total Fat** 1.25 **Sodium** 55 or **Calories** / **Cal. From Fat** / **Total Fat** / **Sodium** **Diff. per Cookie** 15 11.5 1.25 55 or **Diff. per Cookie** **#2** / **#3** **Calories** 65 80 **Cal. from Fat** 20 31.5 **Total Fat** 2.25 3.5 **Sodium** 40 95 or **Diff. per Cookie** **Calories** / **Cal. from Fat** / **Total Fat** / **Sodium** **#2** 65 20 2.25 40 **#3** 80 31.5 3.5 95 **OR** ½ point: 1 or more labels are missing, but matrix is otherwise correct or 1 element in matrix is incorrect but labels are correct

C. Copy the table below into your answer document.

x	y
–2	
–1	
0	
1	
2	

1. Complete the table in your answer document using values from the equation $y = -x^2 + 1$.

2. On the grid provided in your answer document, graph the function containing the points in the table.

3. What is the vertex of the function? Show your work or explain your answer.

4. If the function were reflected over the x-axis, what would be the coordinates of the new vertex? Show your work or explain your answer.

BE SURE TO LABEL YOUR RESPONSES 1, 2, 3, AND 4.

Item C Scoring Rubric—2012 Algebra I

Score	Description
4	The student earns 5 points. The response contains no incorrect work.
3	The student earns 3½ – 4½ points.
2	The student earns 2 – 3 points.
1	The student earns ½ – 1½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — No Response. A score of "B" will be reported as "NA." (No attempt to answer the item. Score of "0" is assigned for the item.)

SOLUTION AND SCORING

5 points possible:

<table>
<tr><th>Part</th><th>Points</th></tr>
<tr><td>1</td><td>

1 point possible:

1 point: Correct table, as shown below:

x	y
–2	–3
–1	0
0	1
1	0
2	–3

OR

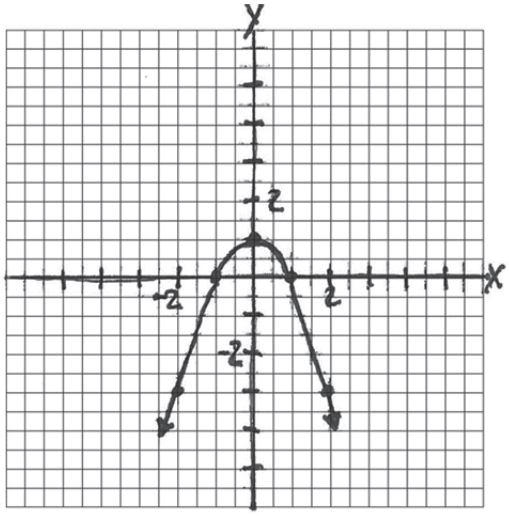
½ point: Table contains 4 correct values of y and 1 incorrect value of y

</td></tr>
<tr><td>2</td><td>

2 points possible:

2 points: Correct graph, as shown below:

Graph must include:
- Arrows on the parabola
- Consistent intervals on both axes
- All points (from table) are correctly plotted and connected by a curve



OR

1 point: A partially correct graph with 1 or 2 errors
Ex: 1 point plotted incorrectly and arrows missing. (2 errors)
Inconsistent interval on 1 axis. (1 error)

</td></tr>
</table>

Part	Points
	or A non-linear graph of Part 1 table points correctly plotted and connected, no other errors *Note: No credit is given for the graph of a line, line segment, or plotted linear points.*
3	**1 point possible:** 1 point: Correct answer: (0,1) *or correct answer based on the graph in Part 2* Correct explanation is given: Give credit for the following or equivalent: ● "It's the highest point on the graph." ● "Because there is no "x" term, in the function, the y value is whatever the constant in the function is." **OR** ½ point: Correct answer: (0,1) *or correct answer based on the graph in Part 2* Work or explanation is incorrect, incomplete, vague or missing Ex: "It's the center of the parabola"
4	**1 point possible:** 1 point: Correct answer: (0,-1) *or correct answer based on the graph in Part 2* Correct explanation is given: Give credit for the following or equivalent: ● "I just changed the sign on the y value" ● "The x-coordinate stays the same but the sign of the y value changes." **OR** ½ point: Correct answer: (0,-1) *or correct answer based on the graph in Part 2* Work or explanation is incorrect, incomplete, vague or missing Ex: "I just flipped it over."

1. Nico puts $250 into a savings account that earns 6% per year simple interest. How long will it take for Nico to earn $90 interest?

A. 0.02 years
B. 0.17 years
* C. 6 years
D. 46 years

2. A nursery records the weights of 6 newborn babies in pounds. The weights are shown below.

7.7, 8.3, 7.5, 6.7, 9.0, 8.1

After the next baby is born, the mean weight of the 7 babies becomes 7.8 pounds. What is the weight of the seventh baby in pounds?

* A. 7.3
B. 7.8
C. 7.9
D. 8.1

3. Lupe wants to survey a group of people to find out which three pop songs are the most popular. Which of the following groups would provide the **best** random sample?

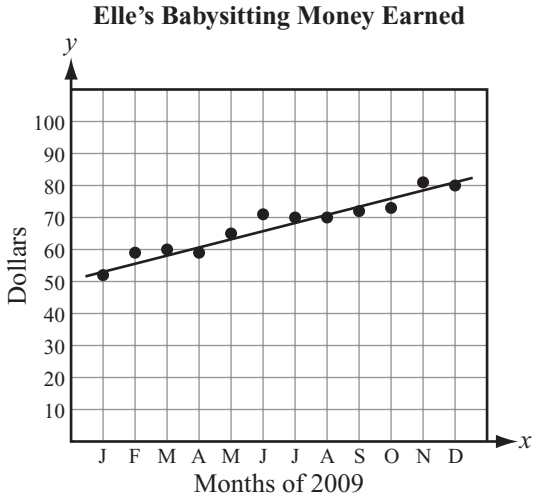
A. her group of friends
B. the DJs at the local country radio station
* C. every 10th person entering the shopping mall
D. the members of the town symphony orchestra

4. What are the solutions to the equation $0 = 6x^2 + 13x - 5$?

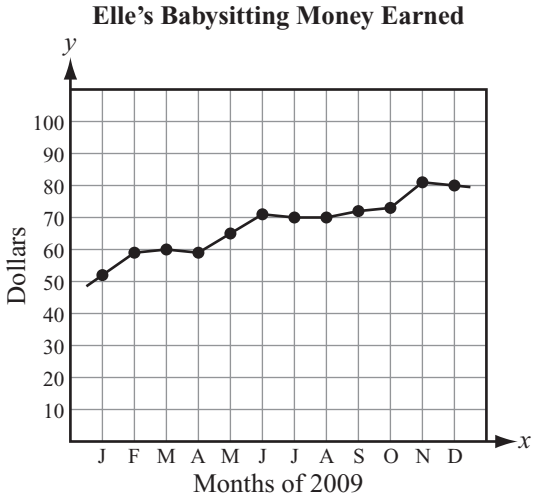
A. $-\frac{5}{3}$ or $\frac{1}{2}$
B. $\frac{5}{6}$ or -1
* C. $\frac{1}{3}$ or $-\frac{5}{2}$
D. $\frac{1}{3}$ or $\frac{5}{2}$

5. Elle babysits every month for a year and uses a scatterplot to show how much money she made. Which of the graphs below shows the line of best fit drawn correctly?

* A.



B.



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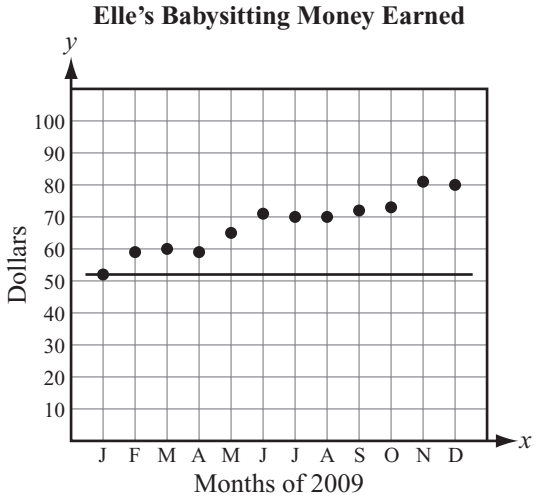
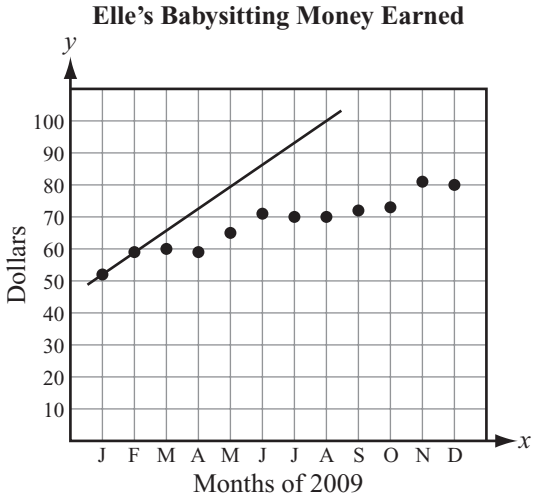


D.



6. The verbal expression "the difference between three times a number x and 12, increased by the quotient of 5 and the number x" is equivalent to which algebraic expression?

A. $3(x-12)+\frac{x}{5}$

* B. $(3x-12)+\frac{5}{x}$

C. $3(x-12)+5+x$

D. $(3x-12)+5+x$

7. Below is a list of coordinate pairs with the variable x listed in place of one of the domain values.

$\{(2, 6),\ (x, 6),\ (5, 7),\ (6, 8),\ (8, 9)\}$

Which value of x will make the relation above a function?

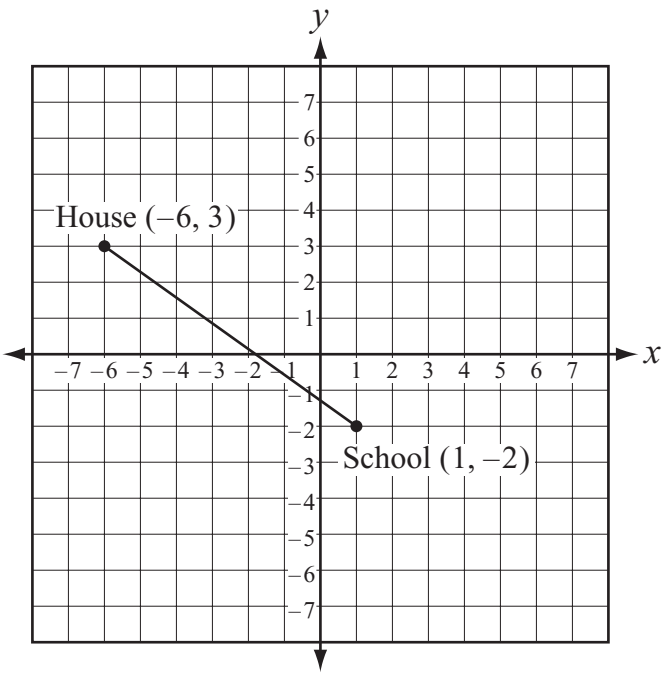
* A. 3

B. 5

C. 6

D. 8

8. Tim maps his neighborhood on a grid, as shown below.



If the fountain is located at the midpoint of the segment that connects Tim's house and the school, what are the coordinates of the fountain?

A. $\left(-\frac{3}{2}, \frac{1}{2}\right)$

B. $\left(-2\frac{1}{2}, -1\right)$

* C. $\left(-2\frac{1}{2}, \frac{1}{2}\right)$

D. $\left(-4, \frac{1}{2}\right)$

9. If $f(x) = -4x + 2$, what is $f(-3)$?

A. -10
B. -5
C. 12
* D. 14

10. What is the expression equivalent to $\frac{8}{\sqrt{3}}$?

A. $8\frac{2}{3}$
B. 24
C. $8\sqrt{3}$
* D. $\frac{8\sqrt{3}}{3}$

11. What are the factors of $81x^2 + 36x + 4$?

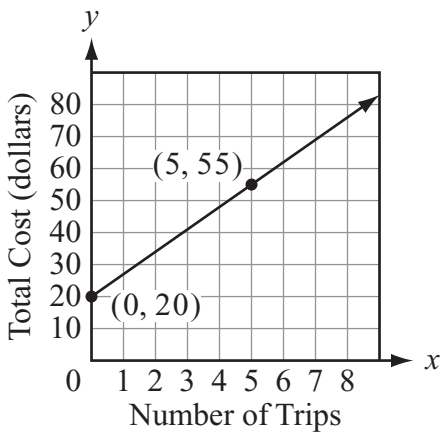
A. $(9x+2)(x+2)$
* B. $(9x+2)(9x+2)$
C. $(9x-2)(9x-2)$
D. $(9x+2)(9x-2)$

12. If $3b + 12 = 5(b-4)$, what is b?

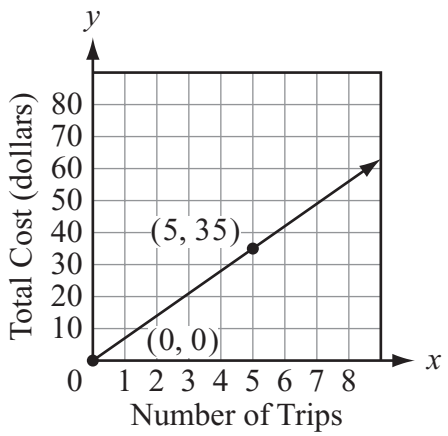
A. 4
B. 6
C. 8
* D. 16

13. A travel club arranges bus trips for its members. The club charges \$20 to become a member and \$7 for each bus trip taken. Which graph represents the cost of taking bus trips with the club?

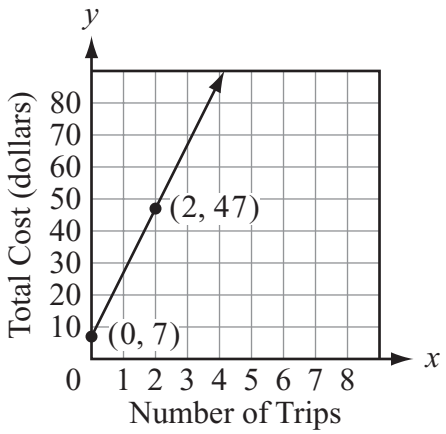
* A.



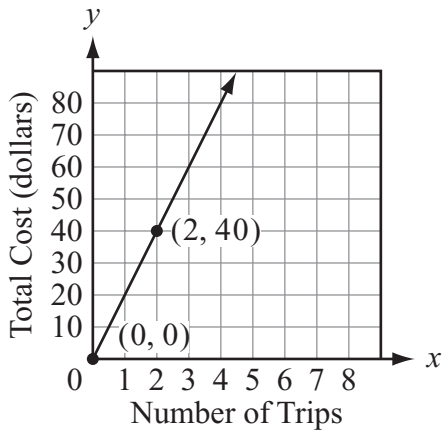
B.



C.



D.



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14. Which expression is equivalent to $\sqrt{27} - \sqrt{12}$?

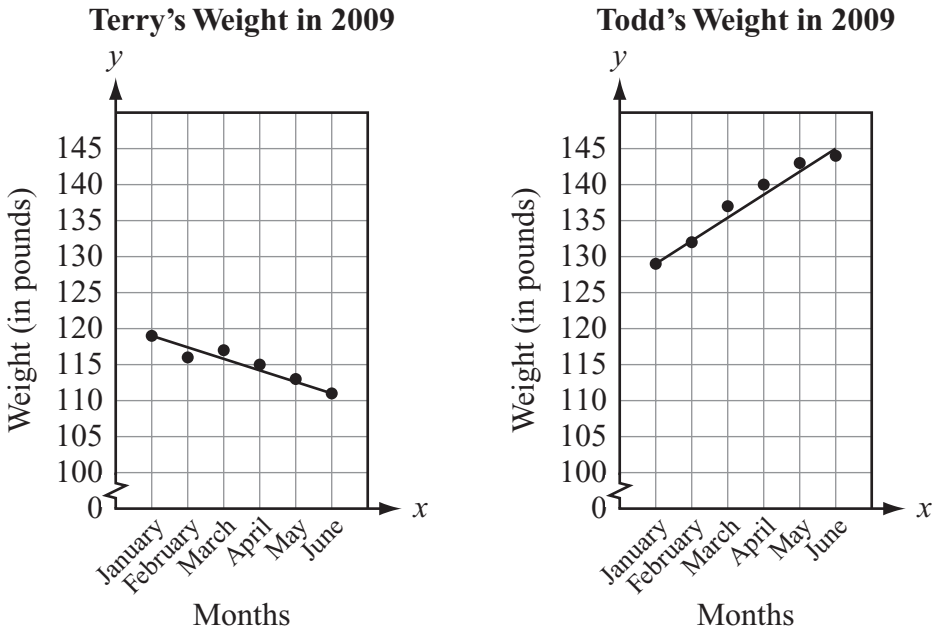
A. 1

* B. $\sqrt{3}$

C. $\sqrt{15}$

D. $3\sqrt{3} - 2$

15. Terry and Todd each plot their weights from January to June on separate scatter plots shown below.



Which of the following is true based on these scatter plots?

* A. Todd is gaining weight at a faster rate than Terry is losing weight.

B. Terry is losing weight at the same rate that Todd is gaining weight.

C. Todd's weight is increasing while Terry's weight remains constant.

D. At these rates, Terry and Todd will be the same weight in December.

---

16. What are the solutions to the equation $3x^2 + 11x - 4 = 0$?

A. $x = -4,\ 1$

B. $x = 2,\ -2$

C. $x = \frac{2}{3},\ -2$

* D. $x = \frac{1}{3},\ -4$

17. What is the value of the expression $\sqrt{(x+y)^2 + (3z+2)}$ when $x = 5$, $y = 6$, and $z = 7$?

A. $\sqrt{34}$

B. 11

* C. 12

D. $2\sqrt{37}$

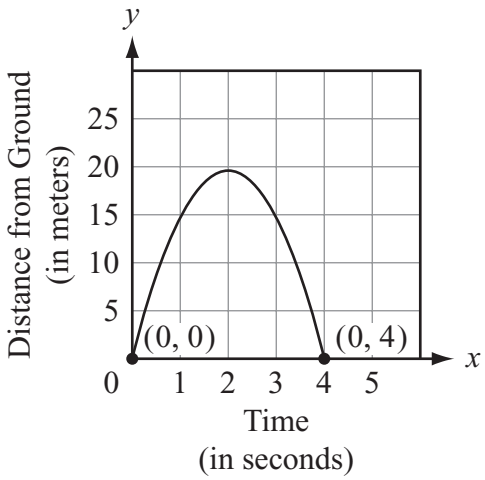
18. Which is equivalent to $(5^3)(5^9)$?

* A. 5^{12}
B. 5^{27}
C. 10^{12}
D. 25^{27}

19. The function $f(C) = \frac{9}{5}C + 32$ is used to convert the temperature from degrees Celsius to degrees Fahrenheit. If the temperature is currently $-4°$ Celsius, what is the temperature in degrees Fahrenheit?

A. $-20°$
* B. $24.8°$
C. $17.77°$
D. $50.4°$

20. A toy rocket is launched from the ground. The graph below shows the height of the rocket over time, x.



At what time, x, does the rocket reach its maximum height?

A. $x = 0$ seconds
* B. $x = 2$ seconds
C. $x = 4$ seconds
D. $x = 20$ seconds

21. An equation has been derived to estimate a person's maximum heart rate. Using that equation, the maximum heart rate of a 60-year-old is 160 beats per minute and the maximum heart rate of a 35-year-old is 185 beats per minute. If x represents age and y represents heart rate, which of the following could be the equation in point-slope form?

A. $y - 35 = 25(x - 185)$
B. $y - 60 = 1(x - 185)$
* C. $y - 160 = -1(x - 60)$
D. $y - 35 = 25(x - 160)$

22. Look at the function table shown below.

x	y
–4	16
2	–8
4	–16
8	–32

What is the domain of the function?

A. {2, 4, 8}
* B. {–4, 2, 4, 8}
C. {2, 4, 8, 16}
D. {16, –8, –16, –32}

23. A ball is thrown straight up into the air with an initial velocity of 64 feet per second. The equation modeling the ball's motion is $h = -16t^2 + 64t$ where h is the ball's height and t is time in seconds. What is the ball's height in feet after 3 seconds?

* A. 48
B. 67
C. 144
D. 336

24. A store manager pays his sales associates \$29 for every shift worked. The manager also offers a bonus of \$1.50 for each item sold. The manager creates a graph that plots x, the number of items an employee sells, versus y, the amount of money each employee can earn per shift. What is the y-intercept for this graph?

A. $(0, 1\frac{1}{2})$
B. $(0, 27\frac{1}{2})$
* C. $(0, 29)$
D. $(0, 30\frac{1}{2})$

25. Which of the following shows causation with the statement, "Derek won the cross-country state championship."?

A. Derek trained every day.
* B. Derek ran faster than the other racers.
C. Derek was in better shape than the other racers.
D. Derek was well rested the day of the state championship.

26. The function $y = 2x^2$ is graphed on a coordinate plane. Which change in the function will result in a vertical shift up 3 units?

A. $y = 5x^2$
B. $y = 6x^2$
* C. $y = 2x^2 + 3$
D. $y = 2x^2 - 3$

27. Which of the following is true of the lines given by the equations $y = 4x - 4$ and $y = -\frac{1}{4}x + 4$?

A. They never intersect each other.
B. They are identical to each other.
C. They are parallel to each other.
* D. They are perpendicular to each other.

28. Which pattern of numbers can be produced by the formula $a_n = 3n + 4$?

A. $\{3, \ 10, \ 17, \ 24\}$
B. $\{4, \ 8, \ 12, \ 16\}$
* C. $\{7, \ 10, \ 13, \ 16\}$
D. $\{7, \ 11, \ 15, \ 19\}$

29. If x and y vary directly, and $y = -20$ when $x = 5$, what is the value of y when $x = 12$?

A. -80
* B. -48
C. 48
D. 80

30. Which expression is equivalent to $\frac{x^2 - 4}{x + 2}$, if $x \neq -2$?

* A. $(x - 2)$
B. $(x + 2)$
C. $(x - 6)$
D. $(x^3 - 2)$

A. A restaurant charges a reservation fee of $15 for its party room, plus $21.50 per person.

1. Write an equation in slope-intercept form showing what the total cost, y, would be for a group of x number of people to hold a party there.

2. On the grid in your answer document, graph the equation from Part 1.

3. If the bill was $445, how many people were at the party? Show your work or explain your answer.

4. Describe how the graph from Part 2 would change if the reservation fee were raised to $25.

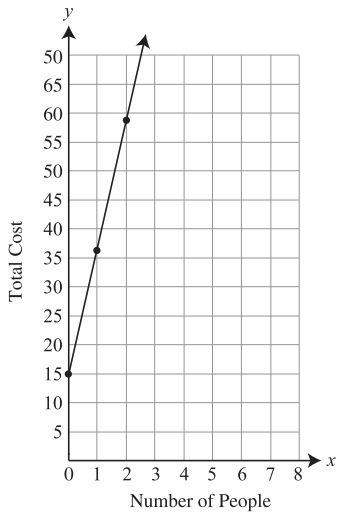
BE SURE TO LABEL YOUR RESPONSES 1, 2, 3, AND 4.

Item A Scoring Rubric—2012 Algebra I

Score	Description
4	The student earns 4 points. The response contains no incorrect work. Graph is titled in Part 2.
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns ½ – 1½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — No Response. A score of "B" will be reported as "NA." (No attempt to answer the item. Score of "0" is assigned for the item.)

SOLUTION AND SCORING

4 points possible:

Part	Points
1	**1 point possible:** 1 point: Correct equation: $y = 21.50x + 15$ *or equivalent* **OR** ½ point: Correct expression in terms of *x:* $21.50x + 15$
2	**1 point possible:** 1 point: Correct graph *or correct graph of incorrect linear equation in Part 1*  Graph must include: ● Consistent intervals on both axes ● Points plotted in the appropriate interval ● Ray or segment is drawn, or discreet points are plotted ● All points must be in the 1st quadrant *Note: Graph title is required to a receive a score of "4"* **OR** ½ point: Graph contains 1 or 2 errors but is otherwise correct Ex. Points or arrow extending line into 2nd or other quadrants 1 point plotted incorrectly Inconsistent interval(s) on 1 axis (1 error) or both axes (2)

Part	Points
3	**1 point possible:** ½ point: Correct answer: 20 *or correct answer based on an incorrect linear equation in Part 1* **AND** ½ point: Correct procedure shown and/or explained Work may contain a calculation or copy error Give credit for the following or equivalent: • $21.5x + 15 = 445$ $21.5x = 430$ $x = \#$
4	**1 point possible:** 1 point: Correct explanation Give credit for the following or equivalent: ● "The graph with shift up 10 units." ● "The y-intercept would now be $(0, 25)$ instead of $(0,15)$" **OR** ½ point: Incomplete explanation Ex. "The graph will shift up" "The graph would be farther over to the left"

B. The formula $s = \sqrt{30df}$ is used to find how fast a car was traveling before an accident, where s = speed (in mph), d = the length (in feet) of the skid mark left by the car, and f = the coefficient of friction (road condition). Sophie, a police officer, must decide if the driver in a car accident was speeding in a 35 mph speed zone. The car's skid-mark length (d) is 76 feet. The coefficient of friction (f) is 0.80.

1. Write the equation Sophie needs to use, substituting in the values of d and f, to determine the speed of the car before the accident.

2. Solve the equation in Part 1. Round your answer to the nearest tenth.

3. Was the driver speeding in the 35 mph speed zone? Show your work and/or explain your answer.

4. If the skid mark had been 4 times longer, how many times as fast would the driver have been going as compared to the speed found in Part 2? Show your work and/or explain your answer.

BE SURE TO LABEL YOUR RESPONSES 1, 2, 3, AND 4.

Item B Scoring Rubric—2012 Algebra I

Score	Description
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns ½ – 1½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — No Response. A score of "B" will be reported as "NA." (No attempt to answer the item. Score of "0" is assigned for the item.)

SOLUTION AND SCORING

4 points possible:

Part	Points
1	**½ point possible:** ½ point: Correct equation: $s = \sqrt{(30)(76)(0.80)}$ *or equivalent*
2	**1 point possible:** 1 point: Correct solution: 42.7 *Or correct solution to Part 1 equation that is incorrect due to* ***1 copy error*** **OR** ½ point: Solution is correct but is not rounded to nearest tenth or is left in radical form
3	**½ point possible:** *Note: Only give credit in Part 3 if some credit is received in Part 2* ½ point: Correct answer of "Yes," stated or implied with correct explanation Ex. 42.7>35 so yes the driver was speeding
4	**2 points possible:** 1 point: Correct answer: 2 times as fast or twice as fast *or correct answer based on incorrect speed from Part 2* **AND** 1 point: Correct procedure shown and/or explained Work may contain a calculation or copy error Give credit for the following: ● $\sqrt{(30)(4)(76)(.8)} = 2\sqrt{(30)(76)(.8)}$ or ● "Since he would leave a skid mark 4 times as long, I can take the square root of 4 to get my answer." or ● $\sqrt{(30)(4x76)(.8)} = \sqrt{7296} \doteq 85.4$ $\frac{85.4}{42.7} = \#$

1. Which expression has the factors $(x+5)$ and $(x-5)$?

* A. $x^2 - 25$

B. $x^2 + 25$

C. $x^2 - 10x + 25$

D. $x^2 + 10x + 25$

2. The formula $C = WTR$ is sometimes used to calculate the cost of running an electrical appliance. Which shows this formula **correctly** solved for T?

* A. $T = \frac{C}{WR}$

B. $T = CWR$

C. $T = \frac{C}{W} - R$

D. $T = \frac{C}{R} - W$

3. Ming likes to ride her bike on the weekends. Sometimes she rides to raise money for charity. The distance she rides is equal to her speed multiplied by the amount of time she rides. Which represents the dependent variable?

A. time

B. speed

C. money

* D. distance

4. Kelly is building a scale model of her house. The width of her house is 42 feet. The width of the model is 4 feet. If the width of the door to her house is 3 feet wide, how many feet wide should the door be on the model?

* A. $\frac{2}{7}$

B. $\frac{3}{4}$

C. $31\frac{1}{2}$

D. 41

5. Which table shows a linear relationship?

A.

x	y
1	2
2	4
3	8
4	16
5	32

* B.

x	y
1	2
2	4
3	6
4	8
5	10

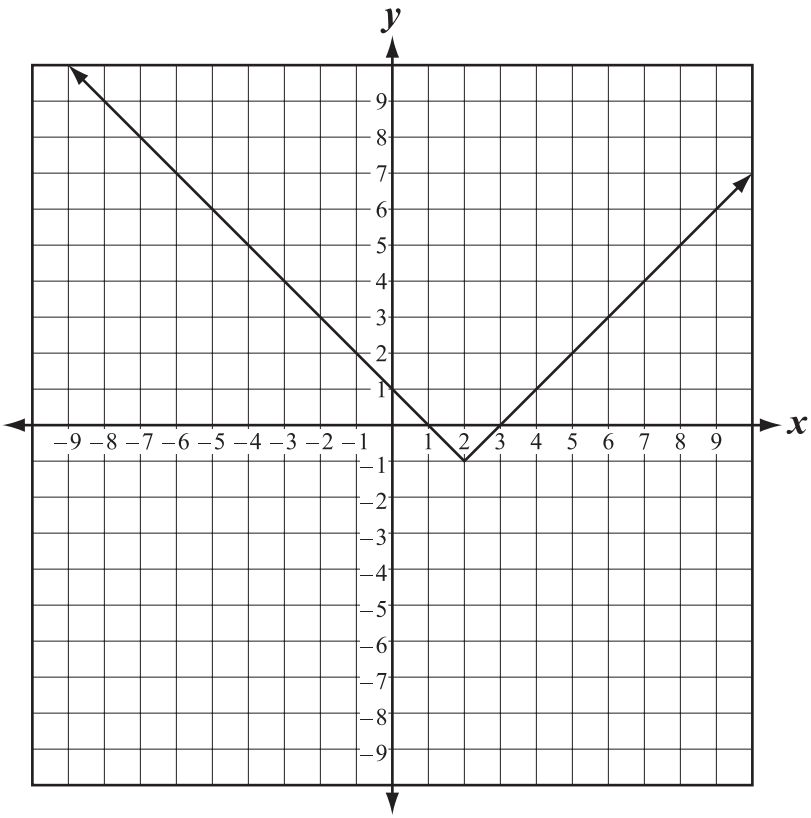
C.

x	y
1	2
2	3
3	5
4	8
5	12

D.

x	y
1	1
2	4
3	9
4	16
5	25

6. The equation $y = |x| + 1$ is graphed and then transformed. The transformation is shown on the graph below.



Which of the following describes this transformation?

A. up 1 unit

B. down 1 unit

C. right 2 units, down 1 unit

* D. right 2 units, down 2 units

7. Fourteen less than three times a number is thirty-seven.

Which equation could be used to find the number that would satisfy the condition above?

A. $3(x-14) = 37$

B. $14-3x = 37$

* C. $3x-14 = 37$

D. $37-3x = 14$

8. A jug contains 4 quarts or 3.78 liters of milk. How many liters are in 9 quarts, to the nearest hundredth of a liter?

A. 0.60 liters

B. 1.68 liters

* C. 8.51 liters

D. 9.52 liters

9. Lori deposits $9000 into an account that has a 5% annual simple interest rate. How many years will it take for the account to earn $3150 in interest?

A. 0.35

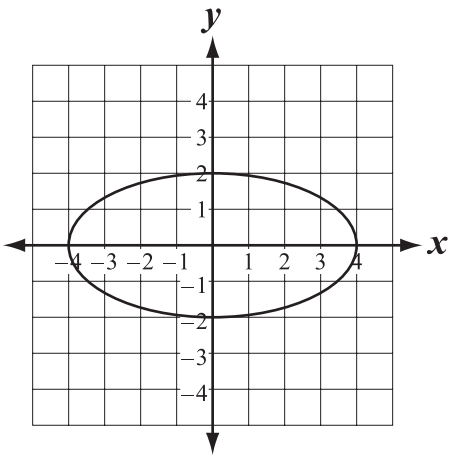
B. 0.7

C. 2.9

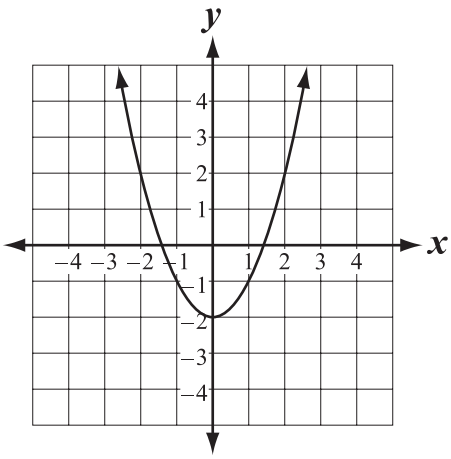
* D. 7.0

10. Which of the following is a graph of a function?

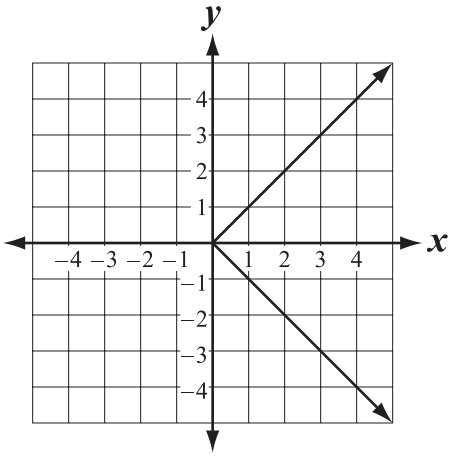
A.



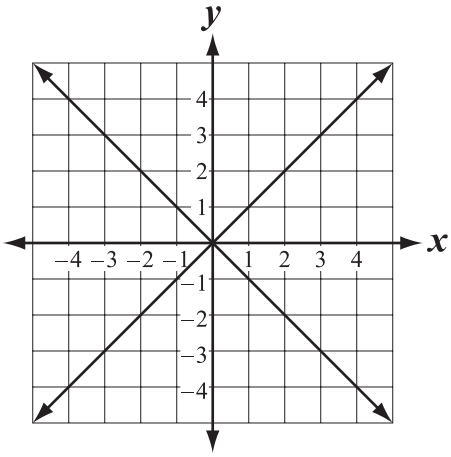
* B.



C.



D.



11. Kaya has a sock drawer with 10 white socks and 6 black socks. What is the probability that Kaya will pick two black socks in a row if she selects at random and does **not** replace the first sock?

* A. $\frac{1}{8}$

B. $\frac{9}{64}$

C. $\frac{15}{128}$

D. $\frac{17}{24}$

12. Consider the expression below.

$$a + 6(b + 4) \div a - 2$$

What is the value of this expression when $a = 3$ and $b = 5$?

A. 17

* B. 19

C. 25

D. 57

13. If $f(c) = 2c - 4$, what is $f(-2)$?

* A. -8
B. -4
C. 0
D. 16

14. Which expression is equivalent to $2x^3y^2(x^2 + 3y^3)$?

A. $2x^5y^2 + 3y^3$
B. $2x^6y^2 + 3y^3$
* C. $2x^5y^2 + 6x^3y^5$
D. $2x^6y^2 + 6x^3y^6$

15. Which of the following is a solution to $|x - 3| = 8$?

A. -11
* B. -5
C. $\frac{8}{3}$
D. 5

16. What is the factored form of the polynomial below?

$$y^2 + 8y + 12$$

A. $(y-6)(y-2)$
B. $(y+3)(y+4)$
C. $(y+4)(y+2)$
* D. $(y+6)(y+2)$

17. Which expression is undefined when $x = 0$?

* A. $\frac{12}{x}$
B. 25^x
C. $\frac{7x}{x-5}$
D. $\frac{-20}{10+x}$

18. Which equation produces the same line as the equation $y = \frac{1}{2}x$?

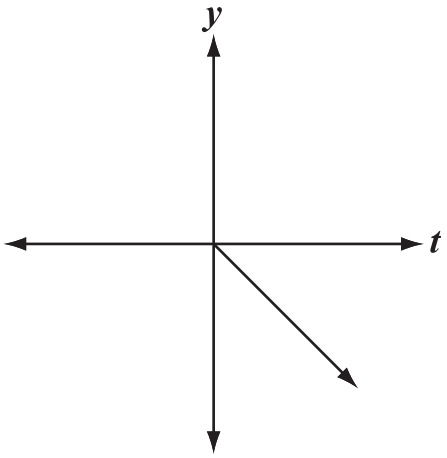
A. $y = 2x$
* B. $y = \frac{2}{4}x$
C. $y = -2x$
D. $y = -\frac{1}{2}x$

19. Which expression is equivalent to $4\sqrt{8} + 5\sqrt{8}$?

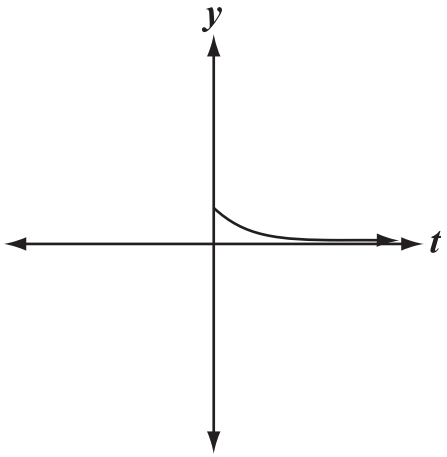
A. 13
* B. $18\sqrt{2}$
C. 36
D. $36\sqrt{2}$

20. The half-life of a radioactive substance is the amount of time it takes for half of the substance to decay. If y is the amount of a radioactive substance, which graph represents the amount of the radioactive substance over time?

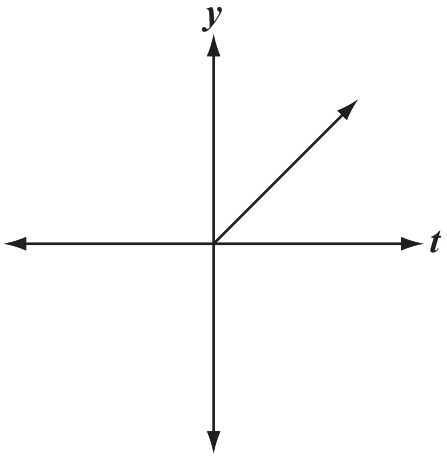
A.



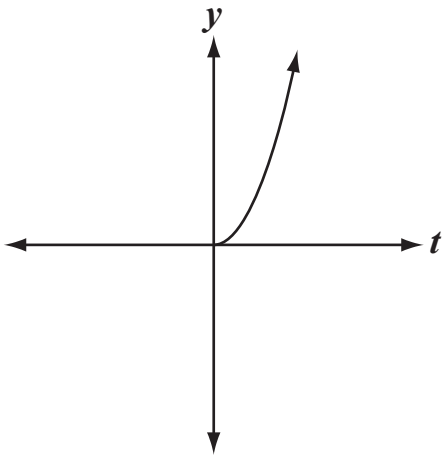
* B.



C.



D.



21. A sandwich shop charges \$4.95 for a sandwich, plus \$0.65 for each topping. If the total charge for a sandwich is on the y-axis and the number of toppings is on the x-axis of a graph, what would be the y-intercept of the graph of the line representing this situation?

A. \$0.65

B. \$4.30

* C. \$4.95

D. \$5.60

22. What values of x satisfy the equation $0 = x^2 - 5x - 24$?

A. $x = 3$ and $x = 8$

B. $x = -3$ and $x = -8$

* C. $x = -3$ and $x = 8$

D. $x = 3$ and $x = -8$

23. What is the slope of a line that passes through the points (–2, 4) and (1, 5)?

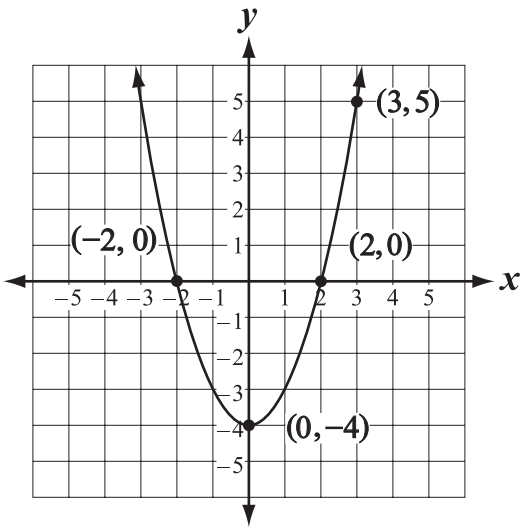
* A. $\frac{1}{3}$

B. $\frac{2}{3}$

C. $\frac{3}{2}$

D. $\frac{3}{1}$

24. The function $f(x)$ is graphed below.



Which point is the vertex of the graph of $f(x)$?

A. (–4, 0)

B. (–2, 2)

* C. (0, –4)

D. (0, 0)

25. Students at a new school must choose the school colors. The principal wants to find out which school colors students would prefer. Which survey question is **most** appropriate for the principal to ask?

A. What are your favorite colors?

* B. What two colors should be our school colors?

C. Don't you think red and gold would be good school colors?

D. Don't you think three school colors are better than two colors?

26. Simplify the expression below in scientific notation.

$$\frac{8.761 \times 10^7}{0.0002}$$

A. 4.3805×10^3

B. 4.3805×10^7

C. 4.3805×10^{10}

* D. 4.3805×10^{11}

27. Which of the following is **best** represented using a cumulative frequency histogram?

A. The median score for a final exam.

B. The rate of growth of two types of plants.

* C. The total amount of precipitation fallen over a period of months.

D. The percentage of people that like cats, dogs, birds, or fish as pets.

28. A T-shirt shop carries short-sleeved and long-sleeved shirts in sizes small (S), medium (M), large (L), and extra large (XL). The shop receives a shipment that includes 10 long-sleeved shirts in each size, 5 short-sleeved smalls, and 7 short-sleeved larges. Which matrix represents the shipment?

* A.

T-Shirt Shipment

$$\begin{array}{l} \\ \text{Long-Sleeved} \\ \text{Short-Sleeved} \end{array} \begin{array}{c} \begin{array}{cccc} \text{S} & \text{M} & \text{L} & \text{XL} \end{array} \\ \begin{bmatrix} 10 & 10 & 10 & 10 \\ 5 & 0 & 7 & 0 \end{bmatrix} \end{array}$$

B.

T-Shirt Shipment

$$\begin{array}{l} \\ \text{Long-Sleeved} \\ \text{Short-Sleeved} \end{array} \begin{array}{c} \begin{array}{cccc} \text{S} & \text{M} & \text{L} & \text{XL} \end{array} \\ \begin{bmatrix} 10 & 0 & 0 & 0 \\ 5 & 0 & 7 & 0 \end{bmatrix} \end{array}$$

C.

T-Shirt Shipment

$$\begin{array}{l} \\ \text{Long-Sleeved} \\ \text{Short-Sleeved} \end{array} \begin{array}{c} \begin{array}{cccc} \text{S} & \text{M} & \text{L} & \text{XL} \end{array} \\ \begin{bmatrix} 10 & 5 & 7 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

D.

T-Shirt Shipment

$$\begin{array}{l} \\ \text{Long-Sleeved} \\ \text{Short-Sleeved} \end{array} \begin{array}{c} \begin{array}{cccc} \text{S} & \text{M} & \text{L} & \text{XL} \end{array} \\ \begin{bmatrix} 10 & 10 & 10 & 10 \\ 15 & 10 & 17 & 10 \end{bmatrix} \end{array}$$

29. A bicycle shop sells 32 bicycles per month at an average price of \$178. The owner decides to lower prices. He discovers that for every \$8 decrease in the average price, the shop sells 3 more bicycles per month. If this trend continues, how many bicycles **per month** will be sold at \$146?

A. 4

B. 12

C. 36

* D. 44

30. What is the value of x in the equation below?

$$10 = \frac{3}{5}x - 5$$

A. $x = \frac{25}{3}$

B. $x = 9$

C. $x = 11$

* D. $x = 25$

31. Omar scores 3 points for every field goal he makes. What is the dependent variable in this situation?

* A. the number of points Omar scores
B. the number of games Omar plays
C. the number of field goals Omar tries
D. the number of field goals Omar makes

32. Which expression is equivalent to $\left(\frac{x^5y^4}{(xy)^3}\right)^2$?

A. x^2y
* B. x^4y^2
C. x^7y^5
D. x^8y^6

33. Use the information below to answer the question.

- Rob and Tom are paid different hourly wages.
- Tom receives a $10 bonus at the end of a 40-hour work week.
- Rob also works 40 hours but receives a larger salary at the end of the week.

Which inequality represents possible values of Tom's hourly wage, t, compared to Rob's hourly wage, r?

* A. $40t + 10 < 40r$
B. $40t - 10 > 40r$
C. $40t < 40r + 10$
D. $40t > 40r - 10$

34. A train leaves its home station at 6:00 A.M. It passes a station 75 miles away at 7:30 A.M. If it continues to travel at the same average rate, how far will it have traveled by noon?

A. 112.50 miles
* B. 300 miles
C. 450 miles
D. 675 miles

35. Which table represents a linear function?

A.

x	1	2	3	4	5	6
$f(x)$	1	4	9	16	25	36

B.

x	1	2	3	4	5	6
$f(x)$	2	1	$\frac{2}{3}$	$\frac{2}{4}$	$\frac{2}{5}$	$\frac{2}{6}$

* C.

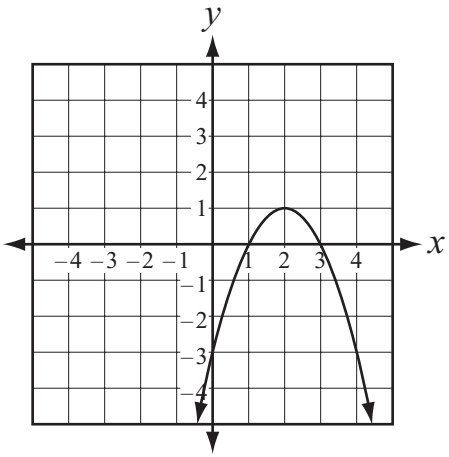
x	1	2	3	4	5	6
$f(x)$	2	4	6	8	10	12

D.

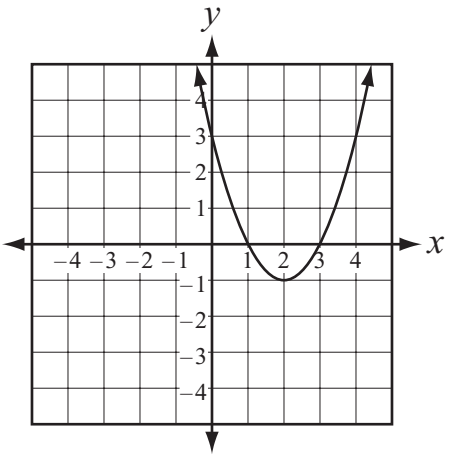
x	1	2	3	4	5	6
$f(x)$	2	4	8	16	32	64

36. Which graph has a maximum of 3?

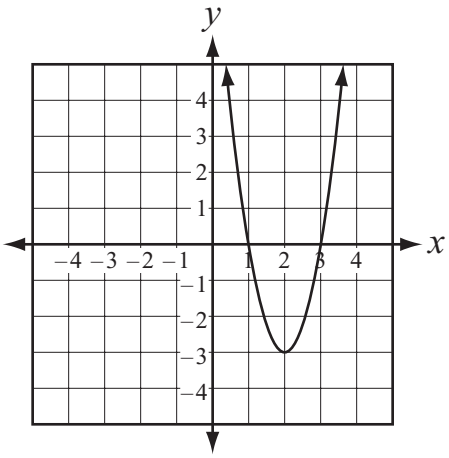
A.



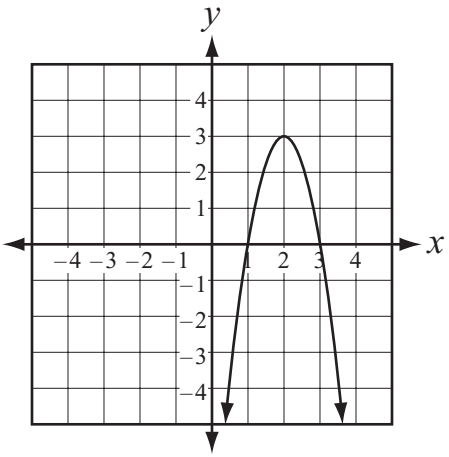
B.



C.



*D.



37. A box of cookies must have 3 peanut butter cookies for every 5 shortbread cookies. If Leah puts 12 peanut butter cookies in a box, which proportion could she use to find x, the number of shortbread cookies to put in the box?

* A. $\frac{3}{5} = \frac{12}{x}$

B. $\frac{3}{5} = \frac{x}{12}$

C. $\frac{3}{17} = \frac{5}{x}$

D. $\frac{3}{17} = \frac{x}{5}$

38. What is the simplified form of $\frac{35}{\sqrt{7}}$?

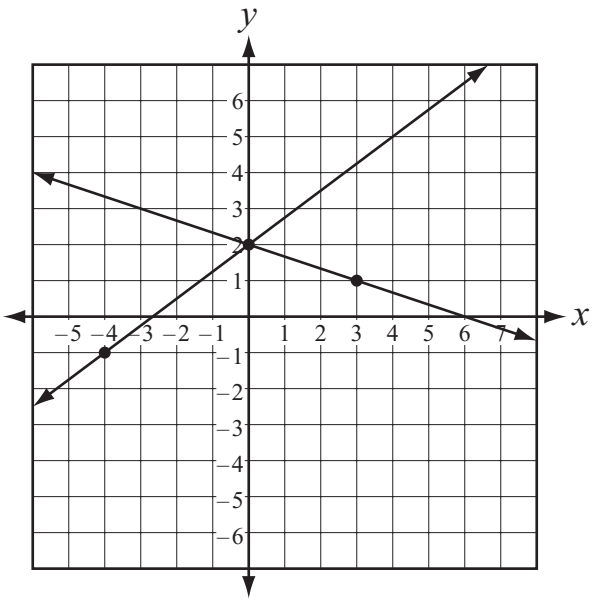
A. 5

* B. $5\sqrt{7}$

C. $35\sqrt{7}$

D. 175

39. The system of equations $\begin{cases} 3y = -x + 6 \\ 4y = 3x + 8 \end{cases}$ is shown on the graph below.



What is the solution to this system of equations?

* A. (0, 2)

B. (3, 1)

C. (6, 0)

D. (−4, −1)

40. Which equation represents a line that is steeper than the line represented by the equation $y = 2x + 1$?

A. $y = -2x + 1$

B. $y = \frac{1}{2}x + 1$

C. $y = 1x + 1$

* D. $y = 3x + 1$

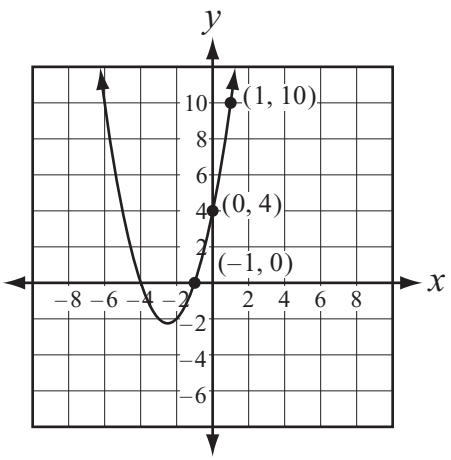
41. If $f(x) = 3x + 2$, what is $f(5)$?

A. -13
B. 1
C. 3
* D. 17

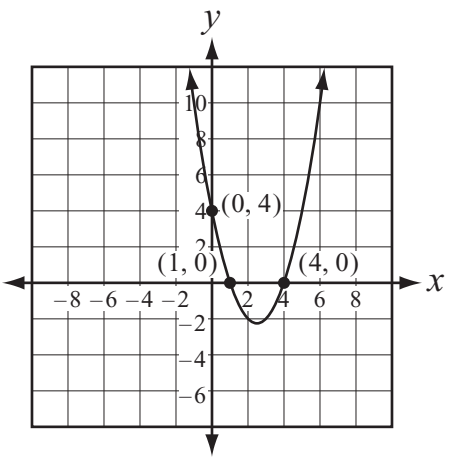
---

42. Which function has zeros of 1 and 4?

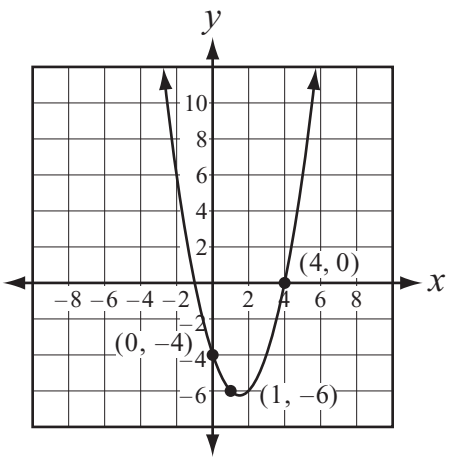
A.



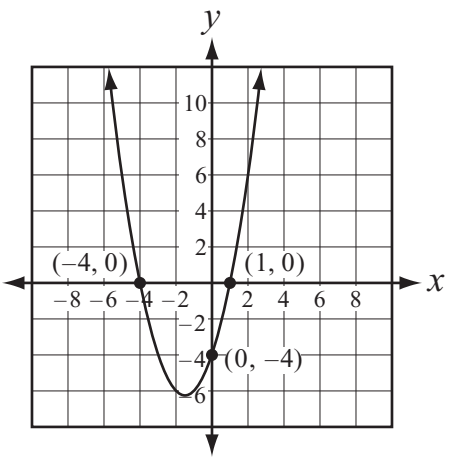
* B.



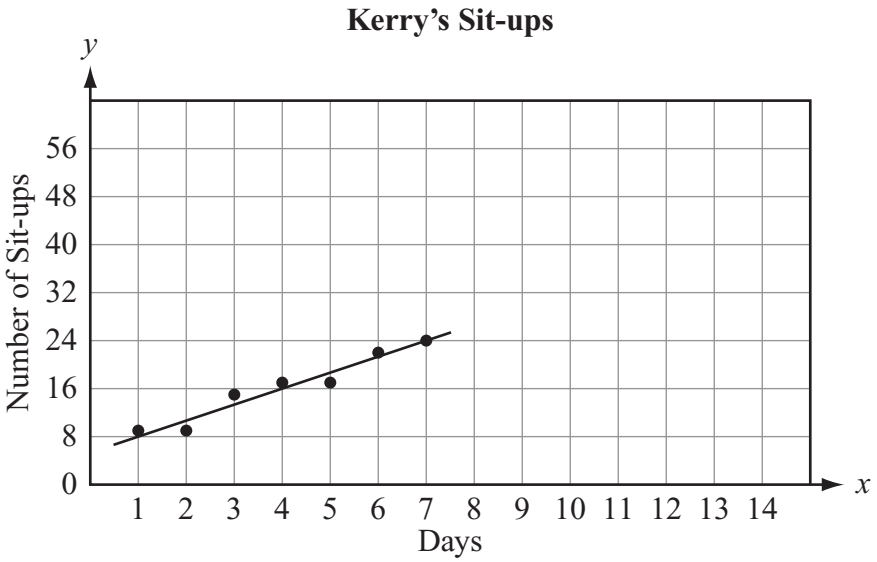
C.



D.



43. Kerry plots the number of sit-ups she does every day for a week on the graph below.



Based on the line of best fit, **approximately** how many sit-ups will Kerry do on Day 14 if she continues at the same rate?

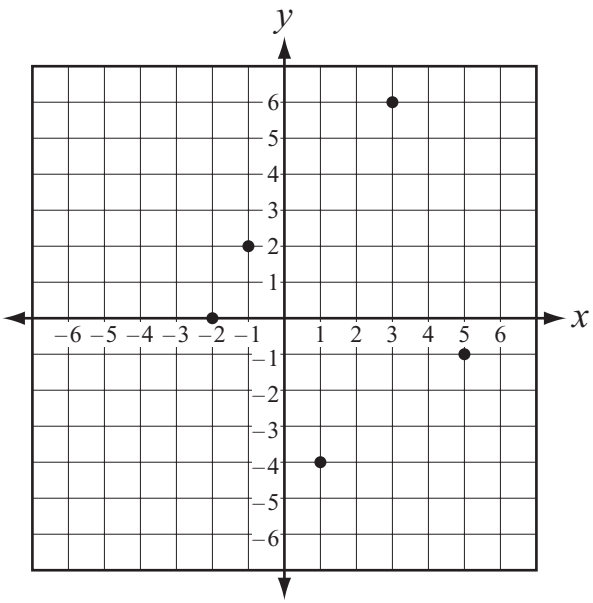
A. 16
B. 24
C. 27
* D. 42

---

44. Terry can do 5 more math problems per minute than Erin. Erin can do twice as many math problems per minute as Julie. If Julie can do x math problems per minute, which expression shows how many math problems per minute Terry can do?

A. $x+5$
* B. $2x+5$
C. $2(x+5)$
D. $\frac{x+5}{2}$

45. Look at the graph below.



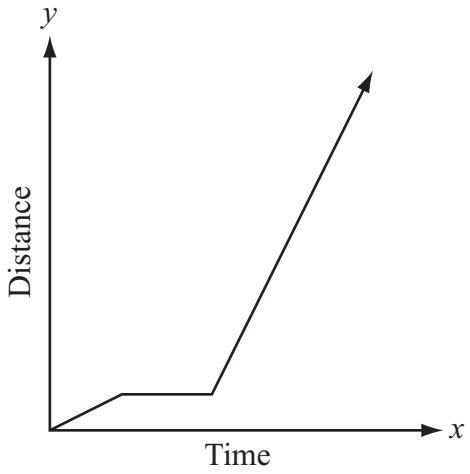
What is the domain of the relation shown in the graph above?

A. {1, 2, 3, 5}
B. {0, 1, 2, 3, 5, 6}
* C. {−2, −1, 1, 3, 5}
D. {−4, −1, 0, 2, 6}

46. Which expression is equivalent to $2x^2 - 3x - 35$?

* A. $(2x+7)(x-5)$
B. $(2x-7)(x+5)$
C. $(2x-5)(x+7)$
D. $(2x+5)(x-7)$

47. The graph below represents the distance Mrs. Shaw walks on a treadmill over time.



This graph is **best** represented by which of the following statements?

A. Mrs. Shaw took two rest breaks during the session.
B. Mrs. Shaw walked at a constant rate the entire time.
C. Mrs. Shaw walked quickly, took a rest break, and then walked slowly.
* D. Mrs. Shaw walked for a period, stopped to stretch and then walked faster.

48. One of the largest known ant colonies is estimated to contain 3.06×10^8 worker ants in an area of 2.70×10^6 square meters. If the ants were spread out evenly within this area, about how many worker ants would be in 1 square meter?

A. 8.82×10^{-3}
B. 3.60×10^1
* C. 1.13×10^2
D. 3.03×10^8

49. What are the solutions to the equation $0 = 2x^2 - 7x - 15$?

A. 5 or -3

B. -5 or $\frac{3}{2}$

C. 15 or 11

* D. 5 or $-\frac{3}{2}$

---

50. Greg, Tina, and Jeff all have jobs in their neighborhood doing yard work. Below are the amounts they have made in the first three weeks this month.

- Greg earned \$40 in week 1, \$30 in week 2, and \$25 in week 3.
- Tina earned \$45 in week 1, \$50 in week 2, and \$20 in week 3.
- Jeff earned \$60 in week 1, \$30 in week 2, and \$45 in week 3.

Which matrix **best** displays this data?

A. $\begin{array}{c} \\ W1 \\ W2 \\ W3 \end{array}\begin{array}{c} \begin{array}{ccc} G & T & J \end{array} \\ \begin{bmatrix} 25 & 20 & 30 \\ 30 & 45 & 45 \\ 40 & 50 & 60 \end{bmatrix} \end{array}$

*B. $\begin{array}{c} \\ W1 \\ W2 \\ W3 \end{array}\begin{array}{c} \begin{array}{ccc} G & T & J \end{array} \\ \begin{bmatrix} 40 & 45 & 60 \\ 30 & 50 & 30 \\ 25 & 20 & 45 \end{bmatrix} \end{array}$

C. $\begin{array}{c} W1 \\ W2 \\ W3 \end{array}\begin{bmatrix} 40 \\ 50 \\ 60 \end{bmatrix}$

D. $\begin{array}{c} \begin{array}{ccc} G & T & J \end{array} \\ \begin{bmatrix} 60 & 50 & 45 \end{bmatrix} \end{array}$

51. Which expression is the sum of $5\sqrt{7}+\sqrt{7}-2\sqrt{7}$?

A. $\sqrt{7}$
B. $2\sqrt{7}$
C. $3\sqrt{7}$
* D. $4\sqrt{7}$

52. Which shows the formula $S=\pi dh$ solved for d?

A. $d=S\pi h$
B. $d=S-\pi h$
* C. $d=\dfrac{S}{\pi h}$
D. $d=\dfrac{\pi h}{S}$

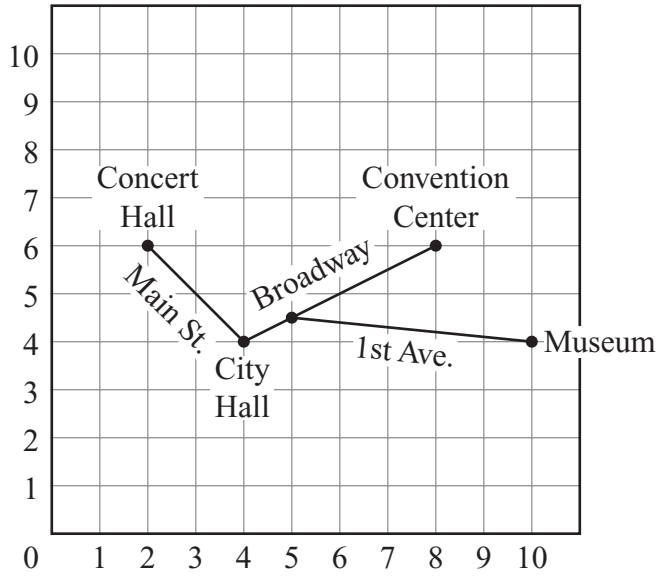
53. Use the data set below to answer the question.

14, 18, 9, 12, 13, 11

Which of the following values, if added to the data set, will affect the mode?

A. 8
B. 10
* C. 14
D. 25

54. An architect is using the map below to help her plan the location of a new building.



She wants to construct a hotel at the midpoint between City Hall and the Convention Center on Broadway. What will be the coordinates of the new hotel on the map?

A. (3, 5)
B. (5, 5)
C. (5, 6)
* D. (6, 5)

---

55. Which equation represents a line parallel to the line given by the equation $y = \frac{2}{3}x + 1$?

A. $y + \frac{3}{2}x = 3$

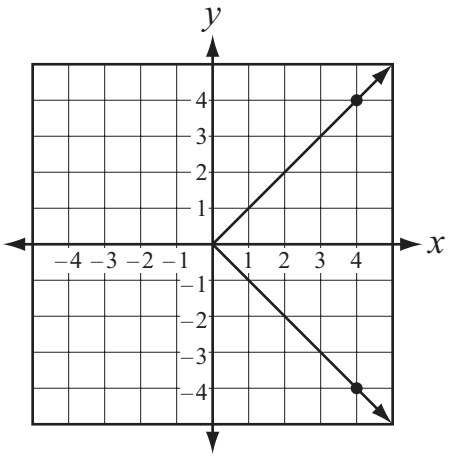
B. $y - 3x = -1$

* C. $y - \frac{2}{3}x = 5$

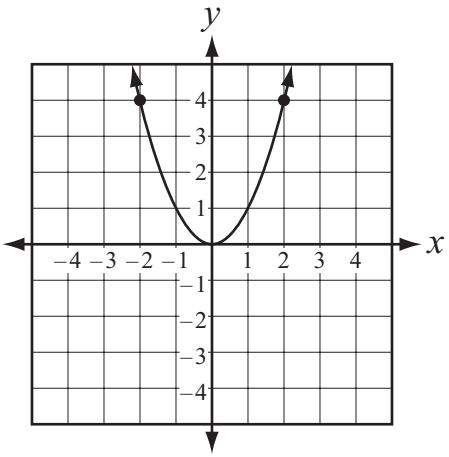
D. $y - \frac{1}{3}x = -2$

56. Which graph represents a function?

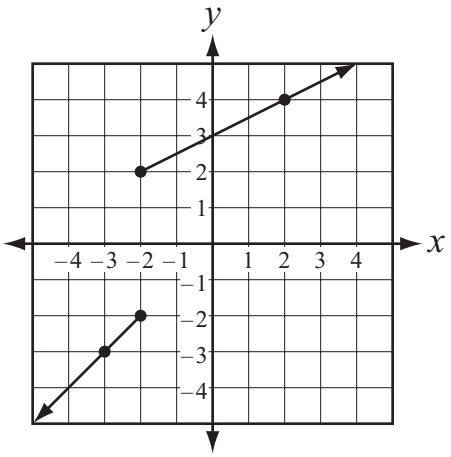
A.



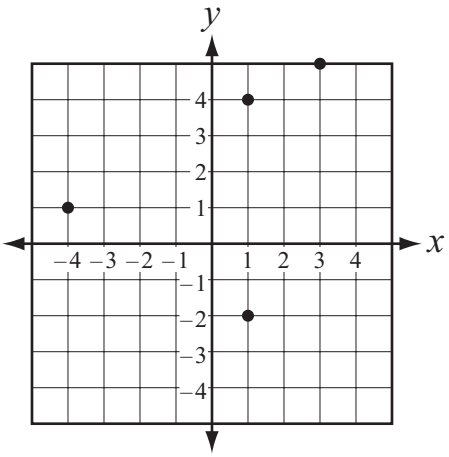
* B.



C.



D.



57. The cumulative frequency histogram below shows the number of tables served by waiters at Star Diner.

Based on the cumulative frequency histogram, how many waiters served more than 16 tables?

* A. 3 waiters

B. 7 waiters

C. 10 waiters

D. 17 waiters

58. Which expression is equivalent to $3x(x-6)+5(x-2)$?

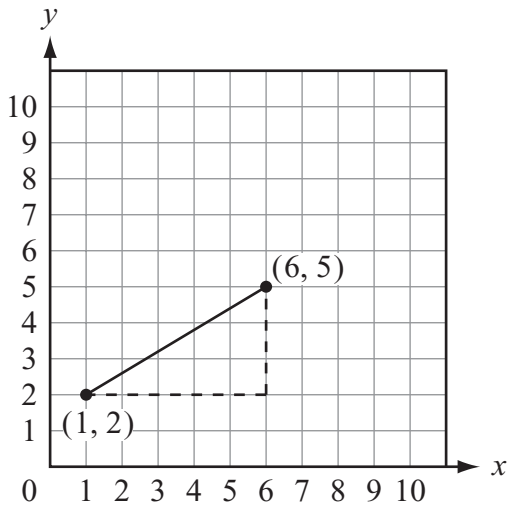
A. $3x^2+5x-8$

B. $3x^2-13x+10$

C. $3x^2-23x-10$

* D. $3x^2-13x-10$

59. Before building a skateboard ramp, Jeff drew a sketch of the ramp on a piece of graph paper, as shown below.



Based on the information in this graph, what is the slope of Jeff's ramp?

* A. $\frac{3}{5}$

B. 1

C. $\frac{5}{3}$

D. $\sqrt{34}$

60. The accumulated balance of a savings account that is compounded annually can be found using the formula $A = P(1+r)^t$ where A is the accumulated balance, P is the principal, r is the interest rate, and t is the time in years.

Jo puts $250 in her savings account which earns 5% interest compounded annually. How much money will she have in the account after 4 years if she makes no other deposits or withdrawals?

A. $ 205.68
B. $ 267.94
* C. $ 303.88
D. $1,265.63

61. The cheerleaders at Eastside High School sell spirit poms to raise money for charity. Each spirit pom sold raises $2.50 for the charity. Which equation represents the amount of money raised (m) as a function of the number of spirit poms sold (p)?

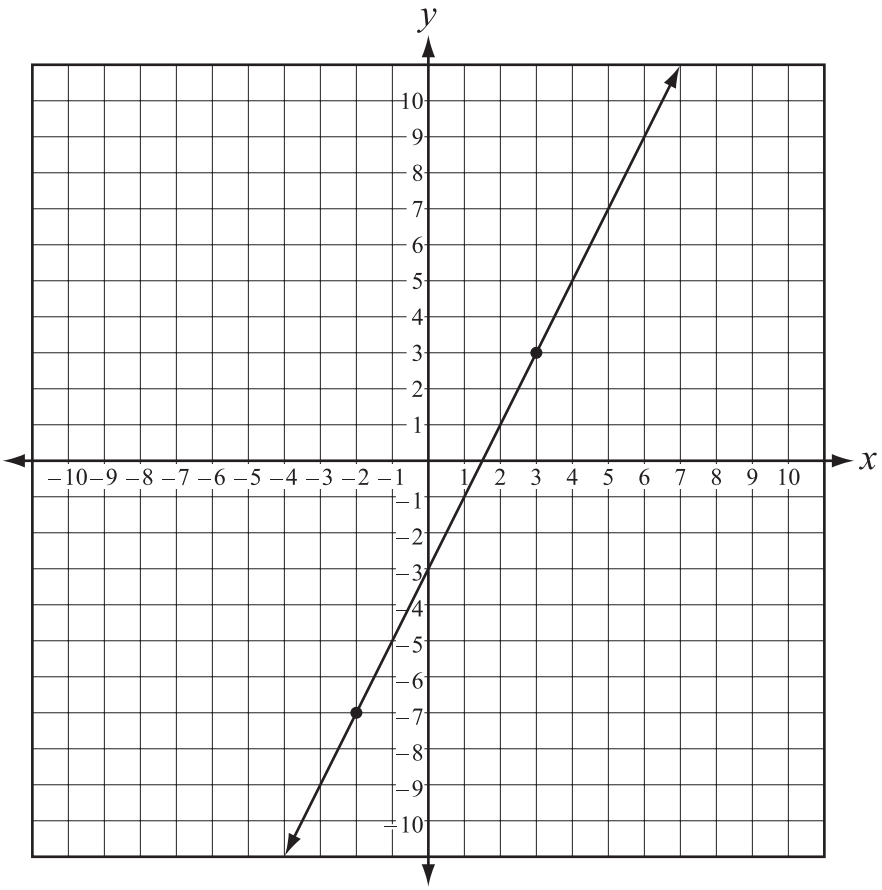
A. $m = \frac{2.50}{p}$

B. $m = \frac{p}{2.50}$

C. $p = 2.50m$

* D. $m = 2.50p$

62. Consider the graph below.



Which of the following equations has a graph that is parallel to the line above?

A. $y = x - 3$

B. $y = -\frac{1}{2}x + 1$

* C. $y = 2x + 1$

D. $y = -2x + 3$

63. Which of the following represents the least biased sample?

A. To find out which professional football team is most popular, you survey your high school football players.

B. To find out how many students are in favor of your school building a new gym, you survey the basketball team.

C. To find out which pizza topping is most popular in the city, you interview all the people eating at Pizza Barn.

* D. To find out what is the most popular Olympic event to watch on TV, you survey every 10th person entering the mall.

64. Use the table below to answer the following question.

x	y
1	–1
2	2
3	5
4	8
5	11
6	14

What type of function is represented by the data in the table?

* A. linear

B. quadratic

C. exponential

D. absolute value

65. Deb has a rectangular picture frame with an area of $42x^5y^3z^6$ square inches. If the frame's width is $7xyz^2$ inches, what is the length of the frame in inches?

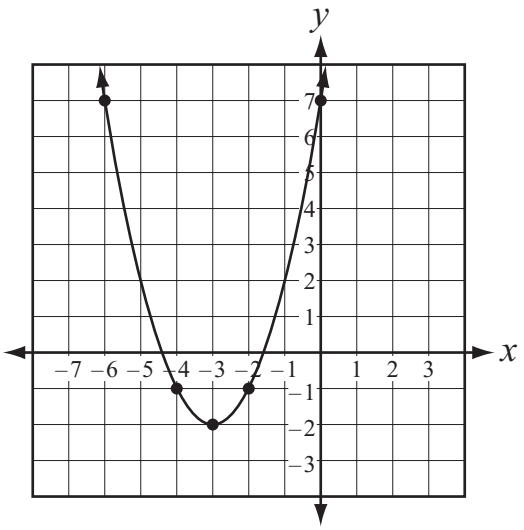
* A. $6x^4y^2z^4$

B. $7x^4y^2z^4$

C. $6x^5y^2z^3$

D. $35x^4y^2z^4$

66. The graph of $f(x) = x^2 + 6x + 7$ is shown below.



What is the vertex of this function?

A. (0, 7)

B. $\left(-\frac{3}{2}, 0\right)$

C. (–2, –3)

* D. (–3, –2)

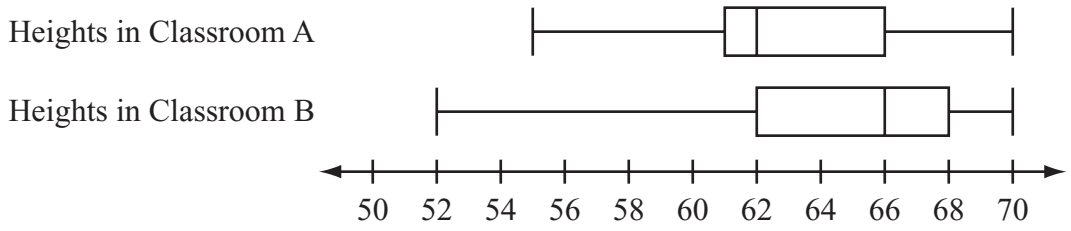
67. Given the function $f(x) = 3x - 7$, what is $f(-4)$?

* A. -19
B. -9
C. -8
D. -5

68. Below are factored forms of the expression $12x^3 - 36x^2$. Which expression has the greatest common factor as the first term?

A. $3x(4x^2 - 12x)$
B. $4x^2(3x - 9)$
* C. $12x^2(x - 3)$
D. $12x(x^2 - 3x)$

69. The box-and-whisker plots below show the data for student heights in two classrooms.

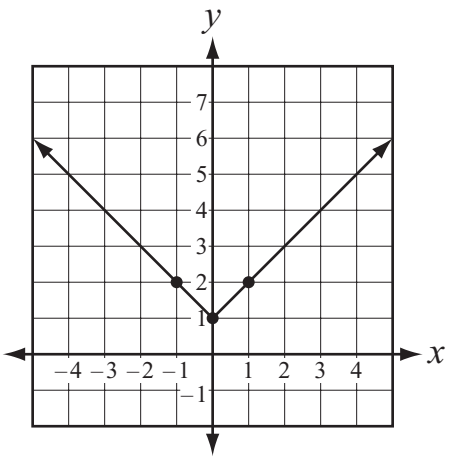


Which data value is the same for both sets of data?

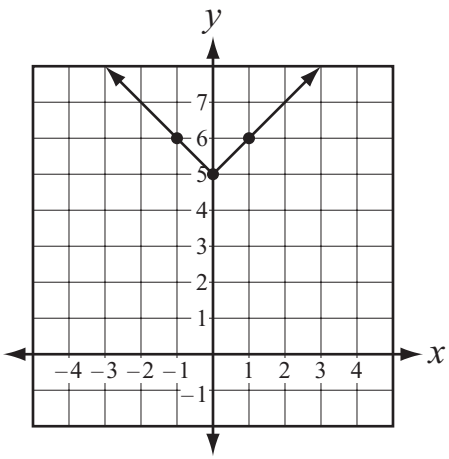
A. mean
B. range
C. median
* D. maximum

70. Which graph shows $y = |x| + 3$ after a downward vertical shift of 2 units?

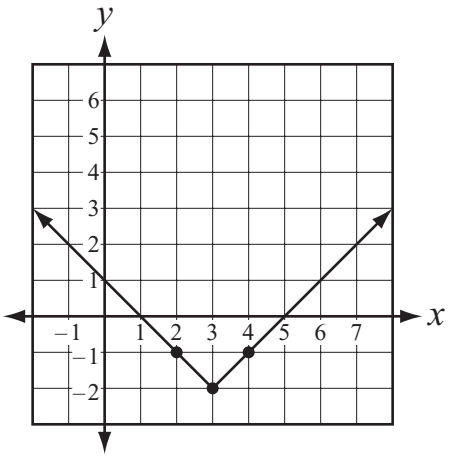
* A.



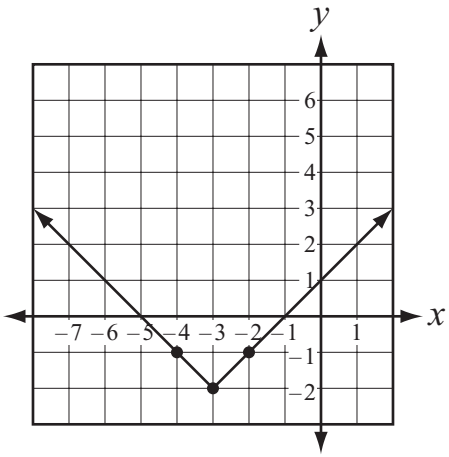
B.



C.



D.



71. Which expression is equivalent to $\frac{2}{\sqrt{3}}$?

A. $\sqrt{6}$

B. $2\sqrt{3}$

* C. $\frac{2\sqrt{3}}{3}$

D. $\frac{\sqrt{6}}{3}$

72. What value of x satisfies the equation $6 + x(-4+2)^2 = -3(3-x)$?

* A. -15

B. -5

C. -3

D. 3

73. Which is the equation of the line written in slope-intercept form that passes through the point (0, 5) and has a slope of –2?

A. $y = 2x + 5$

* B. $y = -2x + 5$

C. $y = -2x + 10$

D. $y - 5 = -2(x - 0)$

74. The function $f(x) = 7.48x^3$ represents the approximate gallons of water needed to fill a cubical container that is x feet on a side. How many gallons of water, to the nearest gallon, will Rob need to fill a container that is 6 feet on a side?

A. 135

B. 269

C. 419

* D. 1616

75. The matrices below show the number of students with a particular eye color in two different math classes.

First Period

$$\begin{array}{c} \\ \text{Boys} \\ \text{Girls} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Blue} & \text{Brown} & \text{Green} \end{array} \\ \begin{bmatrix} 4 & 6 & 2 \\ 3 & 4 & 5 \end{bmatrix} \end{array}$$

Second Period

$$\begin{array}{c} \\ \text{Boys} \\ \text{Girls} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Blue} & \text{Brown} & \text{Green} \end{array} \\ \begin{bmatrix} 2 & 7 & 2 \\ 3 & 5 & 5 \end{bmatrix} \end{array}$$

Which matrix shows the sum of the two classes?

* A.
$$\begin{array}{c} \\ \text{Boys} \\ \text{Girls} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Blue} & \text{Brown} & \text{Green} \end{array} \\ \begin{bmatrix} 6 & 13 & 4 \\ 6 & 9 & 10 \end{bmatrix} \end{array}$$

B.
$$\begin{array}{c} \\ \text{Boys} \\ \text{Girls} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Blue} & \text{Brown} & \text{Green} \end{array} \\ \begin{bmatrix} 8 & 42 & 4 \\ 9 & 20 & 25 \end{bmatrix} \end{array}$$

C.
$$\begin{array}{c} \\ \text{Boys} \\ \text{Girls} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Blue} & \text{Brown} & \text{Green} \end{array} \\ \begin{bmatrix} 12 & 24 & 10 \\ 6 & 35 & 10 \end{bmatrix} \end{array}$$

D.
$$\begin{array}{c} \\ \text{Boys} \\ \text{Girls} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Blue} & \text{Brown} & \text{Green} \end{array} \\ \begin{bmatrix} 7 & 10 & 7 \\ 5 & 12 & 7 \end{bmatrix} \end{array}$$

---

76. If $f(x) = \dfrac{6x}{-x+2}$, what is $f(8)$?

A. 6

B. -6

C. 8

* D. -8

77. What values of x will satisfy the equation $x^2 - x - 20 = 0$?

A. $x = 4$
$x = -5$

* B. $x = -4$
$x = 5$

C. $x = 10$
$x = -8$

D. $x = -10$
$x = 8$

78. Bill is comparing the price rates of two airport shuttles. He wants to know which has the lowest total cost from his house to the airport. The two rates are listed below.

Sam's Vans: $2.00 plus 50 cents per mile

Rick's Rides: $1.00 plus 75 cents per mile

Which describes the rates of these two shuttle services?

A. Rick's Rides is always less expensive.

B. Rick's Rides is always more expensive.

C. Rick's Rides is more expensive when the distance is less than 4 miles.

* D. Rick's Rides is more expensive when the distance is greater than 4 miles.

79. There are 400 boxes in a warehouse. For every hour, x, 120 boxes are delivered to the warehouse. The total number of boxes, y, is equal to $120x + 400$. Which of the statements below is true for the equation $y = 120x + 400$?

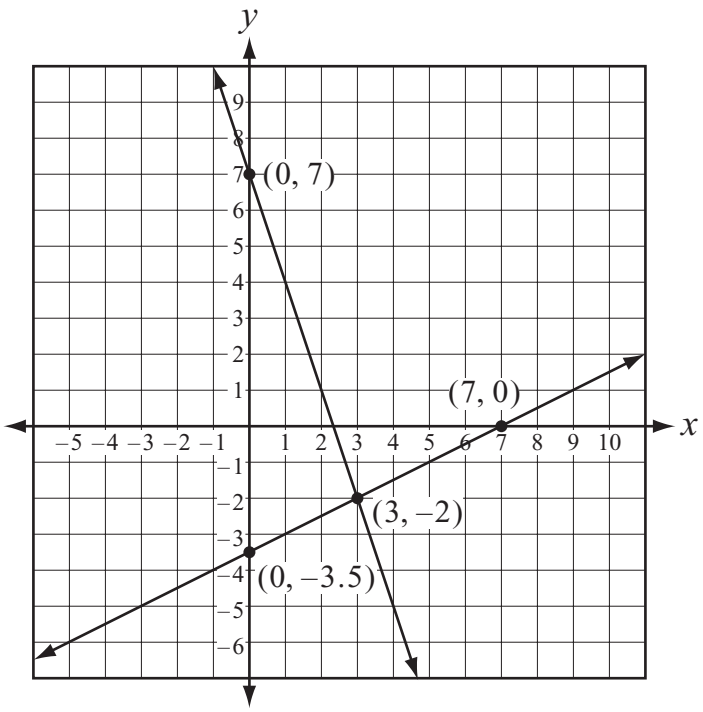
A. x and y are both dependent variables

B. x and y are both independent variables

C. x is the dependent variable and y is the independent variable

* D. x is the independent variable and y is the dependent variable

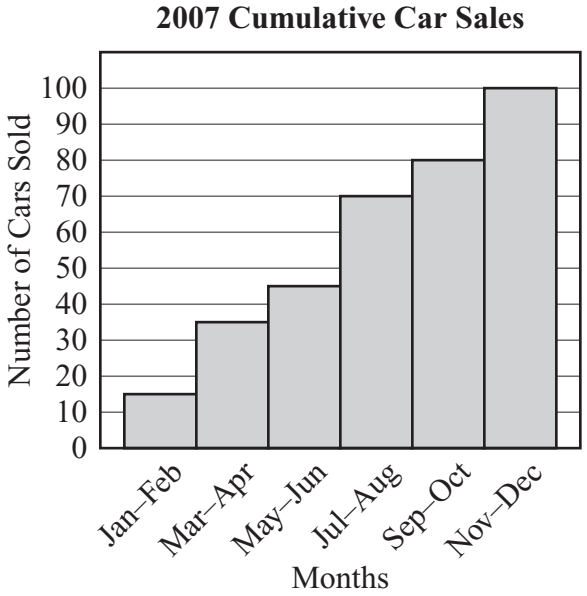
80. Two equations are graphed on the grid below.

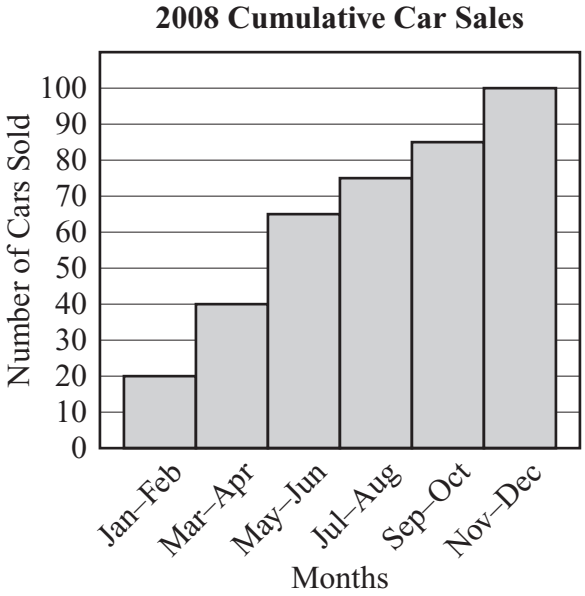


Which point represents the solution set to this system of equations?

A. (0, 3.5)
B. (0, 7)
* C. (3, –2)
D. (7, 0)

81. Use the cumulative frequency histograms shown below to answer the question.





Which statement accurately describes the car sales for the two years?

A. More cars were sold in the months of May and June in 2007 than in 2008.
B. More cars were sold in the months of July and August in 2008 than in 2007.
* C. More cars were sold in the months of January through June in 2008 than in 2007.
D. More cars were sold in the months of January through April in 2007 than in 2008.

---

82. Avogadro's number is defined as 6.02×10^{23}. What is 300.0 times Avogadro's number?

A. 1.81×10^{23}
* B. 1.81×10^{26}
C. 18.1×10^{27}
D. $1{,}810\times10^{29}$

83. Which value, when substituted for x, makes the inequality $|-4x|+3<23$ true?

A. -5
* B. 1
C. 5
D. 6

84. What is the slope of the line that would pass through the points (4, 50) and (6, 75)?

A. 0.08
B. 2
* C. 12.5
D. 25

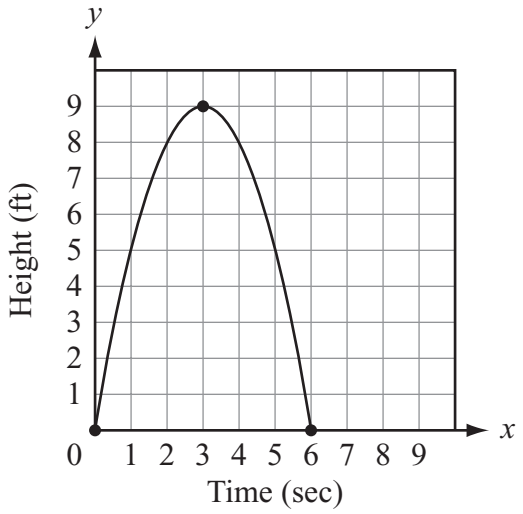
85. Tom has been travelling at a rate of 65 miles per hour for an hour and a half. **Approximately** what percent of his 800 mile trip has he completed?

A. 2.5%
* B. 12%
C. 88%
D. 97.5%

86. For which value of x is the expression $\frac{x-1}{\sqrt{x}}$ undefined?

A. $\frac{1}{4}$
* B. 0
C. 1
D. 3

87. The graph below models a ball being launched from the ground into the air.



Which of the following shifts models the ball being thrown into the air from a height of 5 feet?

* A. up 5 units
B. left 5 units
C. right 5 units
D. down 5 units

88. Chris has a bag with 30 marbles. Ten marbles are blue, ten are red, and ten are green. Chris wants to use the red marbles to play a game. He reaches into the bag without looking and selects marbles. If he gets a red one, he keeps it out of the bag. If he selects a blue or green marble, he puts it back. On the first four tries, Chris selects a blue marble, a red marble, and then two green marbles.

Which expression represents the probability of selecting a red marble on the next try?

A. $\frac{9}{26}$

* B. $\frac{9}{29}$

C. $\frac{10}{30}$

D. $\frac{26}{30}$

89. What is the domain (D) and the range (R) of the ordered pairs below?

$$\{(2, 3), (4, 9), (-1, -3)\}$$

* A. $D = \{2, 4, -1\}$, $R = \{3, 9, -3\}$

B. $D = \{-3, -1, 2\}$, $R = \{3, 4, 9\}$

C. $D = \{3, 9, -3\}$, $R = \{2, 4, -1\}$

D. $D = \{2, 3, 4\}$, $R = \{9, -1, -3\}$

90. What is the product of $\sqrt{54}$ and $\sqrt{9}$?

A. $\sqrt{6}$

B. $3\sqrt{6}$

* C. $9\sqrt{6}$

D. $81\sqrt{6}$

A. Dave has the following quiz grades in his math class:

Dave's Quiz Grades

Quiz #	1	2	3	4	5
Grade	84	74	82	90	80

Dave's teacher is allowing students to retake any one quiz to earn up to 5 more points. Dave can earn the full 5 points on any quiz.

1. Will an increase of 5 points on any of these grades have a greater effect on the mean than an increase of 5 points on one of the others? Explain your answer.

2. By how much will Dave's mean grade change if he earns 10 more points on one of the quizzes? Show your work or explain your answer.

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

Item A Scoring Rubric—2012 Algebra I

Score	Description
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3 points.
2	The student earns 2 points.
1	The student earns 1 point, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — No Response. A score of "B" will be reported as "NA." (No attempt to answer the item. Score of "0" is assigned for the item.)

SOLUTION AND SCORING

4 points possible:

Part	Points
1	**1 point possible:** 1 point: Correct answer with correct explanation Give credit for the following or equivalent: *Note: The answer "No" may be stated or implied.* *Note: Examples may or may not be included. If examples are included, they must be correct.* *Note: No credit is given for "No" with vague or missing explanation.* Ex: "No. Five points on any quiz will increase the sum of the scores by 5 points and therefore have the same effect on the mean." Ex: "I'll increase the 1st score by 5: $89+74+82+90+80=415$ $415\div 5=83$ I'll increase the last score by 5: $84+74+82+90+85=415$ $415\div 5=83$ So the effect is the same." Ex: "If I add 5 points to the 1st score, I get 415 when I add up the 5 scores. If I add 5 points to the 2nd score, I still get 415, so I know that the mean will be the same for both."
2	**3 points possible:** 3 points: Correct change in mean: 2 Correct procedure is shown and/or explained: Give credit for the following or equivalent: ● Change is found by calculating both means: Ex: $\frac{84+74+82+90+80}{5}=82$ $\frac{84+74+82+90+90}{5}=84$ "So the change is 2 points." $(84-82=2)$ is not required *Note: "10" may be added to any score or added individually.* *Note: Work for the mean of 82 may be in Part 1.* ● Change is found by finding the difference of the means: Ex: $\left[\frac{(84+74+82+90+80+10)}{5}-\frac{(84+74+82+90+80)}{5}\right]=2$ ● Change is found by finding the average of the increase: Ex: "The only difference in the total is 10, so I can average the increase to find the amount that the mean will change. $10\div 5=2$." **OR**

Part	Points
	2 points: Amount of change is incorrect or not specified Correct and complete work is shown and/or explained Ex: $\frac{84+74+82+90+80}{5}=82$ $\frac{84+74+82+90+90}{5}=84$ Or Amount of change is incorrect due to 1 calculation or copy error Correct and complete procedure is shown and/or explained Or Correct change in mean: 2 Correct and complete procedure is shown and/or explained for one mean. For the other mean, procedure is missing or is incomplete, but not incorrect. Ex: 84+74+82+90+80 = 410, 410÷5, mean = 82, 84+74+82+90+80+10 = 420, mean = 84 (divide by 5 not shown). **OR** 1 point: Correct change is given Procedure is missing for both means or is incomplete for both means. *Note: If Part 2 is done using 5 more points instead of 10 more points, give credit. (The prompt header states "the teacher is allowing … up to 5 more points".)* *Note: If Part 2 is done using 15 more points instead of 10 more points, give credit. (The prompt in Part 2 states "10 more points". This could be interpreted as 10 more than Part 1.)*

B. Use the quadratic equation below to answer the following questions.

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

1. Express the equation in factored form.

2. For which values of x does the equation equal zero?

3. Copy the table below in your answer document. Complete the table.

x	y
–2	
–1	
0	
1	
2	

4. Using the grid provided, sketch a graph of this equation. Use all appropriate graphing techniques.

BE SURE TO LABEL YOUR RESPONSES 1, 2, 3, AND 4.

Item B Scoring Rubric—2012 Algebra I

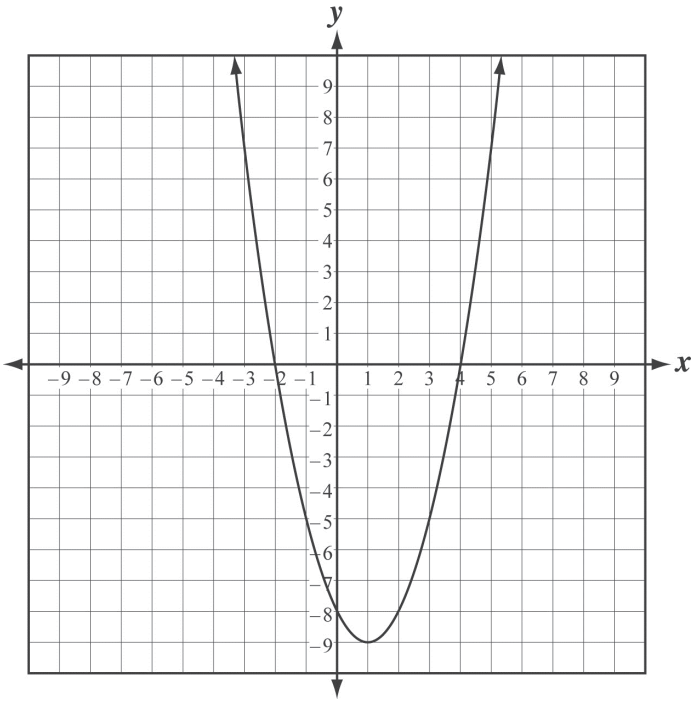
Score	Description
4	The student earns 5 points. The response contains no incorrect work.
3	The student earns 3½ – 4½ points.
2	The student earns 2 – 3 points.
1	The student earns ½ – 1½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — No Response. A score of "B" will be reported as "NA." (No attempt to answer the item. Score of "0" is assigned for the item.)

SOLUTION AND SCORING

5 points possible:

1	**1 point possible:** 1 point: Correct equation: $y = (x+2)(x-4)$ **OR** ½ point: 2 correct factors: (x + 2) *and* (x – 4) Give credit for expression '(x+2)(x-4)' or expression '(x-4)(x+2)'.
2	**1 point possible:** 1 point: 2 correct values: -2 *and* 4 (with no incorrect values included) (or correct values based on an incorrectly factored quadratic equation in Part 1) **OR** ½ point: 1 correct value (with no incorrect values included)
3	**1 point possible:** 1 point: Correct and complete table, as shown below: (or correct values based on an incorrect quadratic equation in Part 1) (5 correct values for *y*.) **OR** ½ point: Partially correct table with 4 correct values for *y*

x	***y***
-2	0
-1	-5
0	-8
1	-9
2	-8

Part	Points
4	**2 points possible:** 2 points: Correct and complete parabolic graph, as shown below: Graph may be based on Parts 1,2,3.  **OR** 1½ points: A partially correct parabolic graph with one error: Ex: Missing arrows on the parabola Ex: One point plotted incorrectly Ex: Inconsistent intervals on <u>one</u> axis **OR** 1 point: A partially correct parabolic graph with two errors: Ex: One point plotted incorrectly and inconsistent intervals on one axis. or A non-parabolic graph with the Part 3 table points correctly plotted and with the points connected.

C. Meg paid $26.00 for 2 books and 2 games.

Meg's sister paid $28.00 for 4 books and 1 game.

Each book cost the same amount. Each game cost the same amount.

1. Write two equations that represent the situation stated above. Remember to define your variables.

2. Solve your system of equations from Part 1 using elimination or substitution. Show all of your work or explain how you found your answer.

3. Tyrone wants to buy 3 books and 2 games. What would be the **total** cost? Show all of your work or explain how you found your answer.

BE SURE TO LABEL YOUR RESPONSES 1, 2, AND 3.

Item C Scoring Rubric—2012 Algebra I

Score	Description
4	The student earns 4 points. The response contains no incorrect work. The label of "$" is included with Part 3 answer.
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns ½ – 1½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — No Response. A score of "B" will be reported as "NA." (No attempt to answer the item. Score of "0" is assigned for the item.)

SOLUTION AND SCORING

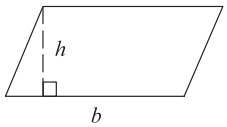
4 points possible:

Part	Points
1	**1 point possible:** 1 point: Correct and Complete Answer: 2 correct equations with variables defined Give credit for the following or equivalent: ● x = cost of a book y = cost of a game $2x + 2y = 26$ $4x + 1y = 28$ **OR** ½ point: Incomplete Answer: ● 2 correct equations Variables are not defined or ● 1 equation is correct 1 equation is missing or incorrect due to a copy error Variables are defined
2	**2 points possible:** 2 points: Correct solution: $x = 5$ and $y = 8$ (or correct solution based on incorrect linear equation(s) in Part 1) Correct procedure shown and/or explained Give credit for the following or equivalent: ● Using Elimination: $2[26 = 2x + 2y] \rightarrow 52 = 4x + 4y$ $52 = 4x + 4y$ $-(28 = 4x + y)$ $24 = 3y$ $8 = y$ x: $26 = 2x + 2(8)$ $10 = 2x$ $5 = x$ ● Using Substitution: $2x = 26 - 2y$ $x = 13 - y$ $28 = 4(13 - y) + y$ $28 = 52 - 4y + y$ $3y = 24$ $y = 8$ $26 = 2x + 2(8)$ $10 = 2x$ $5 = x$

Part	Points
	OR 1 point: ● Correct solution: $x = 5$ and $y = 8$ Work is incomplete or missing or ● Solution is incorrect due to 1 calculation or copy error Correct procedure is shown and/or explained
3	**1 point possible:** 1 point: Correct cost: $31.00 (or correct cost based on incorrect *x and/or y* values in Part 2) Correct procedure is shown and/or explained Give credit for the following or equivalent: ● $3(\$5.00) + 2(\$8.00) = \$31.00 **OR** ½ point: ● Correct cost: $31.00 Work is incomplete or missing or ● Cost is incorrect due to 1 calculation, copy or rounding error Correct procedure is shown and/or explained

End-of-Course Mathematics Reference Sheet

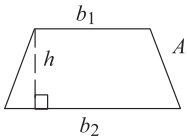
Parallelogram



$P =$ sum of all sides

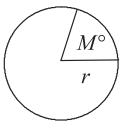
$A = bh$

Trapezoid



$A = \frac{h(b_1 + b_2)}{2}$

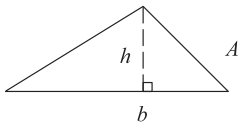
Arc and Sector



Arc Length $= \left(\frac{M}{360}\right) \times 2\pi r$

Sector area $= \left(\frac{M}{360}\right) \times \pi r^2$

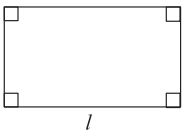
Triangle



$P =$ sum of all sides

$A = \frac{bh}{2}$

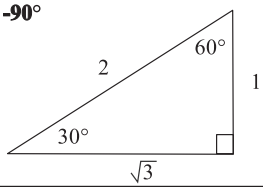
Rectangle



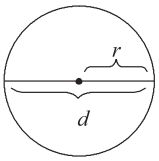
$P = 2l + 2w$

$A = l\,w$

30° -60° -90°



Circle



$C = 2\pi r$

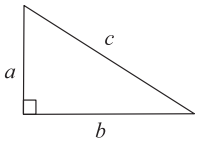
$C = \pi d$

$A = \pi r^2$

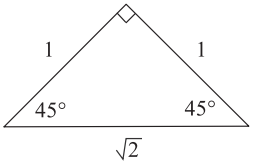
$\pi \approx 3.14$

Pythagorean Theorem

$a^2 + b^2 = c^2$

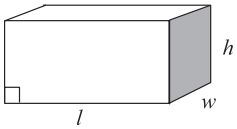


45° -45° -90°



Rectangular Solid

Volume $= lwh$

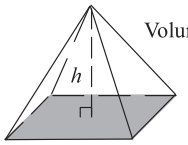


Surface area $= 2lw + 2lh + 2wh$

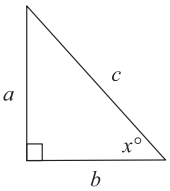
Pyramid

$B =$ *area of base (shaded)*

Volume $= \frac{Bh}{3}$



Trigonometric Ratios

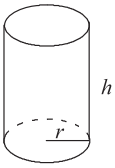


$\sin x° = \frac{a}{c}$

$\cos x° = \frac{b}{c}$

$\tan x° = \frac{a}{b}$

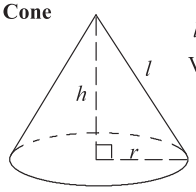
Cylinder



Volume $= \pi r^2 h$

Surface area $= 2\pi rh + 2\pi r^2$

Cone

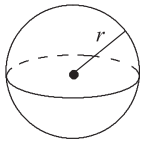


$l =$ slant height

Volume $= \frac{\pi r^2 h}{3}$

Surface area $= \pi rl + \pi r^2$

Sphere



Volume $= \frac{4\pi r^3}{3}$

Surface area $= 4\pi r^2$

Miscellaneous Formulas

Area of an equilateral triangle	$A = \frac{s^2\sqrt{3}}{4}$ $s =$ length of a side
Distance	rate × time
Interest	principal × rate × time in years
Sum of the angles of a polygon having n sides	$(n-2)180°$
Distance between points on a coordinate plane	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Midpoint	$\left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}\right)$
Slope of a nonvertical line (where $x_2 \neq x_1$)	$m = \frac{y_2 - y_1}{x_2 - x_1}$
Slope intercept (where $m =$ slope, $b =$ intercept)	$y = mx + b$
Last term of an arithmetic series Last term of a geometric series (where $n \geq 1$)	$a_n = a + (n-1)d$ $a_n = ar^{n-1}$
Quadratic formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Area of a square	$A = s^2$
Volume of a cube	$V = s^3$
Area of a regular polygon	$A = \frac{1}{2}ap$ $a =$ apothem, $p =$ perimeter

The Arkansas Algebra I Mathematics Curriculum Framework*

Strands	Content Standards	Student Learning Expectations
1. LANGUAGE OF ALGEBRA (LA)	1. Students will develop the language of algebra including specialized vocabulary, symbols, and operations.	1. Evaluate algebraic expressions, including radicals, by applying the order of operations. 2. Translate word phrases and sentences into expressions, equations, and inequalities, and vice versa. 3. Apply the laws of (integral) exponents and roots. 4. Solve problems involving scientific notation, including multiplication and division. 5. Perform polynomial operations (addition, subtraction, multiplication) with and without manipulatives. 6. Simplify algebraic fractions by factoring. 7. Recognize when an expression is undefined. 8. Simplify radical expressions such as $\frac{3}{\sqrt{7}}$. 9. Add, subtract, and multiply simple radical expressions like $3\sqrt{20} + 7\sqrt{5}$ and $4\sqrt{5} \bullet 2\sqrt{3}$.
2. SOLVING EQUATIONS AND INEQUALITIES (SEI)	2. Students will write, with and without appropriate technology, equivalent forms of equations, inequalities, and systems of equations, and solve with fluency.	1. Solve multi-step equations and inequalities with rational coefficients • numerically (from a table or guess and check) • algebraically (including the use of manipulatives) • graphically • technologically 2. Solve systems of two linear equations • numerically (from a table or guess and check) • algebraically (including the use of manipulatives) • graphically • technologically 3. Solve linear formulas and literal equations for a specified variable (Ex. Solve for p in I = prt.) 4. Solve and graph simple absolute value equations and inequalities. Ex. $\lvert x \rvert = 5$, $\lvert x \rvert \leq 5$, $\lvert x \rvert > 5$ 5. Solve real-world problems that involve a combination of rates, proportions, and percents. 6. Solve problems involving direct variation and indirect (inverse) variation to model rates of change. 7. Use coordinate geometry to represent and/or solve problems (midpoint, length of a line segment, and Pythagorean Theorem). 8. Communicate real-world problems graphically, algebraically, numerically, and verbally.

*The Content Standards and Student Learning Expectations listed are those that specifically relate to the items in the *2011–2012 Mid-Year, Spring, and Retest End-of-Course Algebra I Examinations.*

The Arkansas Algebra I Mathematics Curriculum Framework*

Strands	Content Standards	Student Learning Expectations
3. LINEAR FUNCTIONS (LF)	3. Students will analyze functions by investigating rates of change, intercepts, and zeros.	1. Distinguish between functions and nonfunctions/relations by inspecting graphs, ordered pairs, mapping diagrams, and/or tables of data. 2. Determine domain and range of a relation from an algebraic expression, graphs, set of ordered pairs, or table of data. 3. Know and/or use function notation, including evaluating functions for given values in their domain. 4. Identify independent variables and dependent variables in various representational modes: words, symbols, and/or graphs. 5. Interpret the rate of change/slope and intercepts within the context of everyday life. Ex. telephone charges based on base rate (*y*-intercept) plus rate per minute (slope) 6. Calculate the slope given. • two points • the graph of a line • the equation of a line 7. Determine by using slope whether a pair of lines are parallel, perpendicular, or neither. 8. Write an equation in slope-intercept, point-slope, and standard forms, given • two points • a point and *y*-intercept • *x*-intercept and *y*-intercept • a point and slope • a table of data • the graph of a line 9. Describe the effects of parameter changes, slope, and/or *y*-intercepts, on graphs of linear functions and vice versa.
4. NON-LINEAR FUNCTIONS (NLF)	4. Students will compare the properties in the family of functions.	1. Factor polynomials. • greatest common factor • binomials (difference of squares) • trinomials 2. Determine minimum, maximum, vertex, and zeros, given the graph. 3. Solve quadratic equations using the appropriate methods with and without technology. • factoring • quadratic formula with real-number solutions 4. Recognize function families and their connections, including vertical shift and reflection over the *x*-axis. • quadratics (with rational coefficients) • absolute value • exponential functions 5. Communicate real-world problems graphically, algebraically, numerically, and verbally.

*The Content Standards and Student Learning Expectations listed are those that specifically relate to the items in the 2011–*2012 Mid-Year, Spring, and Retest End-of-Course Algebra I Examinations.*

The Arkansas Algebra I Mathematics Curriculum Framework*

Strands	Content Standards	Student Learning Expectations
5. DATA INTERPRETATION AND PROBABILITY (DIP)	5. Students will compare various methods of reporting data to make inferences or predictions.	1. Construct and use scatterplots and line of best fit to make inferences in real-life situations. 2. Use simple matrices in addition, subtraction, and scalar multiplication. 3. Construct simple matrices for real-life situations. 4. Determine the effects of changes in the data set on the measures of central tendency. 5. Use two or more graphs (i.e., box-and-whisker, histograms, scatter plots) to compare data. 6. Construct and interpret a cumulative frequency histogram in real-life situations. 7. Recognize linear functions and non-linear functions by using a table or a graph. 8. Compute simple probability with and without replacement. 9. Recognize patterns using explicitly defined and recursively defined linear functions. 10. Communicate real-world problems graphically, algebraically, numerically, and verbally. 11. Explain how sampling methods, bias, and phrasing of questions in data collection impact the conclusions. 12. Recognize when arguments based on data confuse correlation with causation.

*The Content Standards and Student Learning Expectations listed are those that specifically relate to the items in the 2011–*2012 Mid-Year, Spring, and Retest End-of-Course Algebra I Examinations.*

Mid-Year Released Algebra I Items*

Strands	Content Standards
1— LANGUAGE OF ALGEBRA (LA)	1. Students will develop the language of algebra including specialized vocabulary, symbols, and operations.
2— SOLVING EQUATIONS AND INEQUALITIES (SEI)	2. Students will write, with and without appropriate technology, equivalent forms of equations, inequalities, and systems of equations, and solve with fluency.
3— LINEAR FUNCTIONS (LF)	3. Students will analyze functions by investigating rates of change, intercepts, and zeros.
4— NON-LINEAR FUNCTIONS (NLF)	4. Students will compare the properties in the family of functions.
5— DATA INTERPRETATION AND PROBABILITY (DIP)	5. Students will compare various methods of reporting data to make inferences or predictions.

Item	Strand	Content Standard	Student Learning Expectation
1	LA	1	1
2	LA	1	6
3	SEI	2	3
4	DIP	5	5
5	LF	3	8
6	DIP	5	9
7	NLF	4	1
8	DIP	5	12
9	LA	1	8
10	NLF	4	3
11	LA	1	3
12	NLF	4	5
13	NLF	4	4
14	SEI	2	1
15	NLF	4	2
16	LF	3	2
17	SEI	2	5
18	LF	3	9
19	SEI	2	7
20	SEI	2	2
21	LF	3	6
22	DIP	5	10
23	SEI	2	4
24	DIP	5	2
25	LA	1	7
26	LF	3	5
27	DIP	5	8
28	LA	1	5
29	LF	3	4
30	NLF	4	5
A	LA	1	5
B	DIP	5	3
C	NLF	4	2

*Only the predominant Strand, Content Standard, and Student Learning Expectation are listed for the Algebra I items.

Spring Released Algebra I Items*

Strands	Content Standards
1— LANGUAGE OF ALGEBRA (LA)	1. Students will develop the language of algebra including specialized vocabulary, symbols, and operations.
2— SOLVING EQUATIONS AND INEQUALITIES (SEI)	2. Students will write, with and without appropriate technology, equivalent forms of equations, inequalities, and systems of equations, and solve with fluency.
3— LINEAR FUNCTIONS (LF)	3. Students will analyze functions by investigating rates of change, intercepts, and zeros.
4— NON-LINEAR FUNCTIONS (NLF)	4. Students will compare the properties in the family of functions.
5— DATA INTERPRETATION AND PROBABILITY (DIP)	5. Students will compare various methods of reporting data to make inferences or predictions.

Item	Strand	Content Standard	Student Learning Expectation
1	SEI	2	3
2	DIP	5	4
3	DIP	5	11
4	NLF	4	3
5	DIP	5	1
6	LA	1	2
7	LF	3	1
8	SEI	2	7
9	LF	3	3
10	LA	1	8
11	NLF	4	1
12	SEI	2	1
13	SEI	2	8
14	LA	1	9
15	DIP	5	5
16	NLF	4	3
17	LA	1	1
18	LA	1	3
19	LF	3	3
20	NLF	4	2
21	LF	3	8
22	LF	3	2
23	NLF	4	5
24	LF	3	5
25	DIP	5	12
26	NLF	4	4
27	LF	3	7
28	DIP	5	9
29	SEI	2	6
30	LA	1	6
A	LF	3	9
B	LA	1	1

*Only the predominant Strand, Content Standard, and Student Learning Expectation are listed for the Algebra I items.

Retest Released Algebra I Items*

Strands	Content Standards
1— LANGUAGE OF ALGEBRA (LA)	1. Students will develop the language of algebra including specialized vocabulary, symbols, and operations.
2— SOLVING EQUATIONS AND INEQUALITIES (SEI)	2. Students will write, with and without appropriate technology, equivalent forms of equations, inequalities, and systems of equations, and solve with fluency.
3— LINEAR FUNCTIONS (LF)	3. Students will analyze functions by investigating rates of change, intercepts, and zeros.
4— NON-LINEAR FUNCTIONS (NLF)	4. Students will compare the properties in the family of functions.
5— DATA INTERPRETATION AND PROBABILITY (DIP)	5. Students will compare various methods of reporting data to make inferences or predictions.

Item	Strand	Content Standard	Student Learning Expectation
1	NLF	4	1
2	SEI	2	3
3	LF	3	4
4	SEI	2	5
5	DIP	5	7
6	NLF	4	4
7	LA	1	2
8	SEI	2	6
9	SEI	2	8
10	LF	3	1
11	DIP	5	8
12	LA	1	1
13	LF	3	3
14	LA	1	5
15	SEI	2	4
16	NLF	4	1
17	LA	1	7
18	LF	3	7
19	LA	1	9
20	NLF	4	5
21	LF	3	5
22	NLF	4	3
23	LF	3	6
24	NLF	4	2
25	DIP	5	11
26	LA	1	4
27	DIP	5	6
28	DIP	5	3
29	DIP	5	9
30	SEI	2	1

*Only the predominant Strand, Content Standard, and Student Learning Expectation are listed for the Algebra I items.

continued on next page

Retest Released Algebra I Items* (continued)

Strands	Content Standards
1— LANGUAGE OF ALGEBRA (LA)	1. Students will develop the language of algebra including specialized vocabulary, symbols, and operations.
2— SOLVING EQUATIONS AND INEQUALITIES (SEI)	2. Students will write, with and without appropriate technology, equivalent forms of equations, inequalities, and systems of equations, and solve with fluency.
3— LINEAR FUNCTIONS (LF)	3. Students will analyze functions by investigating rates of change, intercepts, and zeros.
4— NON-LINEAR FUNCTIONS (NLF)	4. Students will compare the properties in the family of functions.
5— DATA INTERPRETATION AND PROBABILITY (DIP)	5. Students will compare various methods of reporting data to make inferences or predictions.

Item	Strand	Content Standard	Student Learning Expectation
31	LF	3	4
32	LA	1	3
33	LA	1	2
34	SEI	2	6
35	DIP	5	7
36	NLF	4	2
37	SEI	2	5
38	LA	1	8
39	SEI	2	2
40	LF	3	9
41	LF	3	3
42	NLF	4	2
43	DIP	5	1
44	SEI	2	8
45	LF	3	2
46	NLF	4	1
47	DIP	5	10
48	LA	1	4
49	NLF	4	3
50	DIP	5	3
51	LA	1	9
52	SEI	2	3
53	DIP	5	4
54	SEI	2	7
55	LF	3	7
56	NLF	4	4
57	DIP	5	6
58	LA	1	5
59	LF	3	6
60	NLF	4	5

*Only the predominant Strand, Content Standard, and Student Learning Expectation are listed for the Algebra I items.

continued on next page

Retest Released Algebra I Items* (continued)

Strands	Content Standards
1— LANGUAGE OF ALGEBRA (LA)	1. Students will develop the language of algebra including specialized vocabulary, symbols, and operations.
2— SOLVING EQUATIONS AND INEQUALITIES (SEI)	2. Students will write, with and without appropriate technology, equivalent forms of equations, inequalities, and systems of equations, and solve with fluency.
3— LINEAR FUNCTIONS (LF)	3. Students will analyze functions by investigating rates of change, intercepts, and zeros.
4— NON-LINEAR FUNCTIONS (NLF)	4. Students will compare the properties in the family of functions.
5— DATA INTERPRETATION AND PROBABILITY (DIP)	5. Students will compare various methods of reporting data to make inferences or predictions.

Item	Strand	Content Standard	Student Learning Expectation
61	SEI	2	6
62	LF	3	7
63	DIP	5	11
64	DIP	5	7
65	LA	1	6
66	NLF	4	2
67	LF	3	3
68	NLF	4	1
69	DIP	5	5
70	NLF	4	4
71	LA	1	8
72	SEI	2	1
73	LF	3	8
74	NLF	4	5
75	DIP	5	2
76	LA	1	1
77	NLF	4	3
78	SEI	2	8
79	LF	3	4
80	SEI	2	2
81	DIP	5	6
82	LA	1	4
83	SEI	2	4
84	LF	3	6
85	SEI	2	5
86	LA	1	7
87	NLF	4	4
88	DIP	5	10
89	LF	3	2
90	LA	1	9
A	DIP	5	4
B	NLF	4	3
C	SEI	2	2

*Only the predominant Strand, Content Standard, and Student Learning Expectation are listed for the Algebra I items.

Mid-Year Non-Released Algebra I Items*

Strands	Content Standards
1— LANGUAGE OF ALGEBRA (LA)	1. Students will develop the language of algebra including specialized vocabulary, symbols, and operations.
2— SOLVING EQUATIONS AND INEQUALITIES (SEI)	2. Students will write, with and without appropriate technology, equivalent forms of equations, inequalities, and systems of equations, and solve with fluency.
3— LINEAR FUNCTIONS (LF)	3. Students will analyze functions by investigating rates of change, intercepts, and zeros.
4— NON-LINEAR FUNCTIONS (NLF)	4. Students will compare the properties in the family of functions.
5— DATA INTERPRETATION AND PROBABILITY (DIP)	5. Students will compare various methods of reporting data to make inferences or predictions.

Item	Strand	Content Standard	Student Learning Expectation
1	SEI	2	5
2	LF	3	5
3	LF	3	3
4	DIP	5	7
5	LF	3	7
6	LF	3	1
7	SEI	2	6
8	SEI	2	4
9	SEI	2	8
10	DIP	5	1
11	NLF	4	1
12	LA	1	5
13	LF	3	6
14	DIP	5	3
15	LA	1	2
16	LA	1	1
17	NLF	4	2
18	LA	1	4
19	NLF	4	1
20	DIP	5	11
21	LA	1	9
22	NLF	4	2
23	NLF	4	3
24	LA	1	2
25	DIP	5	4
26	SEI	2	1
27	DIP	5	6
28	SEI	2	8
29	NLF	4	4
30	LF	3	8
A	LF	3	5
B	SEI	2	6

*Only the predominant Strand, Content Standard, and Student Learning Expectation are listed for the Algebra I items.

Spring Non-Released Algebra I Items*

Strands	Content Standards
1— LANGUAGE OF ALGEBRA (LA)	1. Students will develop the language of algebra including specialized vocabulary, symbols, and operations.
2— SOLVING EQUATIONS AND INEQUALITIES (SEI)	2. Students will write, with and without appropriate technology, equivalent forms of equations, inequalities, and systems of equations, and solve with fluency.
3— LINEAR FUNCTIONS (LF)	3. Students will analyze functions by investigating rates of change, intercepts, and zeros.
4— NON-LINEAR FUNCTIONS (NLF)	4. Students will compare the properties in the family of functions.
5— DATA INTERPRETATION AND PROBABILITY (DIP)	5. Students will compare various methods of reporting data to make inferences or predictions.

Item	Strand	Content Standard	Student Learning Expectation
1	LF	3	6
2	SEI	2	1
3	NLF	4	4
4	DIP	5	10
5	NLF	4	2
6	LA	1	5
7	LA	1	1
8	NLF	4	1
9	DIP	5	7
10	SEI	2	5
11	LF	3	8
12	DIP	5	3
13	NLF	4	5
14	LF	3	6
15	LA	1	5
16	LF	3	5
17	SEI	2	4
18	SEI	2	5
19	DIP	5	8
20	SEI	2	8
21	DIP	5	6
22	DIP	5	2
23	NLF	4	1
24	SEI	2	4
25	LA	1	2
26	SEI	2	2
27	NLF	4	2
28	LA	1	7
29	LA	1	4
30	LF	3	9
A	DIP	5	4
B	SEI	2	5
C	NLF	4	2

*Only the predominant Strand, Content Standard, and Student Learning Expectation are listed for the Algebra I items.

Retest Non-Released Algebra I Items*

Strands	Content Standards
1— LANGUAGE OF ALGEBRA (LA)	1. Students will develop the language of algebra including specialized vocabulary, symbols, and operations.
2— SOLVING EQUATIONS AND INEQUALITIES (SEI)	2. Students will write, with and without appropriate technology, equivalent forms of equations, inequalities, and systems of equations, and solve with fluency.
3— LINEAR FUNCTIONS (LF)	3. Students will analyze functions by investigating rates of change, intercepts, and zeros.
4— NON-LINEAR FUNCTIONS (NLF)	4. Students will compare the properties in the family of functions.
5— DATA INTERPRETATION AND PROBABILITY (DIP)	5. Students will compare various methods of reporting data to make inferences or predictions.

Item	Strand	Content Standard	Student Learning Expectation
1	LA	1	8
2	DIP	5	10
3	LA	1	6
4	LA	1	5
5	DIP	5	5
6	DIP	5	2
7	SEI	2	1
8	NLF	4	3
9	LF	3	6
10	NLF	4	2
11	LF	3	9
12	NLF	4	4
13	DIP	5	12
14	LA	1	3
15	LF	3	8
16	NLF	4	1
17	SEI	2	7
18	LF	3	5
19	LF	3	2
20	SEI	2	8
21	SEI	2	4
22	LF	3	8
23	SEI	2	2
24	NLF	4	5
25	LA	1	2
26	NLF	4	3
27	DIP	5	4
28	LA	1	1
29	SEI	2	5
30	DIP	5	1

*Only the predominant Strand, Content Standard, and Student Learning Expectation are listed for the Algebra I items.

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Retest Non-Released Algebra I Items* (continued)

Strands	Content Standards
1— LANGUAGE OF ALGEBRA (LA)	1. Students will develop the language of algebra including specialized vocabulary, symbols, and operations.
2— SOLVING EQUATIONS AND INEQUALITIES (SEI)	2. Students will write, with and without appropriate technology, equivalent forms of equations, inequalities, and systems of equations, and solve with fluency.
3— LINEAR FUNCTIONS (LF)	3. Students will analyze functions by investigating rates of change, intercepts, and zeros.
4— NON-LINEAR FUNCTIONS (NLF)	4. Students will compare the properties in the family of functions.
5— DATA INTERPRETATION AND PROBABILITY (DIP)	5. Students will compare various methods of reporting data to make inferences or predictions.

Item	Strand	Content Standard	Student Learning Expectation
31	LA	1	1
32	NLF	4	1
33	SEI	2	1
34	DIP	5	2
35	NLF	4	3
36	SEI	2	8
37	LF	3	1
38	DIP	5	9
39	NLF	4	4
40	SEI	2	4
41	LF	3	6
42	DIP	5	12
43	LA	1	5
44	NLF	4	1
45	LF	3	8
46	LA	1	6
47	LF	3	5
48	DIP	5	5
49	NLF	4	5
50	DIP	5	11
51	LA	1	1
52	SEI	2	1
53	LA	1	2
54	SEI	2	4
55	LF	3	5
56	LF	3	9
57	NLF	4	3
58	LA	1	7
59	SEI	2	5
60	DIP	5	8

*Only the predominant Strand, Content Standard, and Student Learning Expectation are listed for the Algebra I items.

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Retest Non-Released Algebra I Items* (continued)

Strands	Content Standards
1— LANGUAGE OF ALGEBRA (LA)	1. Students will develop the language of algebra including specialized vocabulary, symbols, and operations.
2— SOLVING EQUATIONS AND INEQUALITIES (SEI)	2. Students will write, with and without appropriate technology, equivalent forms of equations, inequalities, and systems of equations, and solve with fluency.
3— LINEAR FUNCTIONS (LF)	3. Students will analyze functions by investigating rates of change, intercepts, and zeros.
4— NON-LINEAR FUNCTIONS (NLF)	4. Students will compare the properties in the family of functions.
5— DATA INTERPRETATION AND PROBABILITY (DIP)	5. Students will compare various methods of reporting data to make inferences or predictions.

Item	Strand	Content Standard	Student Learning Expectation
61	LA	1	1
62	NLF	4	1
63	LA	1	2
64	SEI	2	5
65	LF	3	6
66	NLF	4	3
67	SEI	2	8
68	LF	3	1
69	DIP	5	1
70	LA	1	5
71	SEI	2	3
72	LA	1	3
73	SEI	2	4
74	LF	3	5
75	DIP	5	3
76	DIP	5	8
77	LF	3	8
78	DIP	5	4
79	LA	1	2
80	NLF	4	2
81	LF	3	5
82	NLF	4	1
83	DIP	5	9
84	LA	1	5
85	NLF	4	3
86	DIP	5	12
87	LF	3	9
88	SEI	2	7
89	NLF	4	5
90	SEI	2	1
A	LF	3	9
B	LA	1	2

*Only the predominant Strand, Content Standard, and Student Learning Expectation are listed for the Algebra I items.

ACTAAP

Arkansas Comprehensive Testing, Assessment, and Accountability Program

DEVELOPED FOR THE ARKANSAS DEPARTMENT OF EDUCATION, LITTLE ROCK, AR 72201

QAI-09718 Alg-RIB AR1204

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