



Arkansas Comprehensive Testing, Assessment, and Accountability Program

**RELEASED ITEM**  
**BOOKLET**  
**Algebra I**  
**End-of-Course Examinations**  
**2013–2014 Administrations**

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**Arkansas Department of Education**



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## PART I OVERVIEW

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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 2014 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*.

This Released Item Booklet for the Algebra I End-of-Course Examinations contains test questions or items that were asked of students during the 2013–2014 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 Mid-Year testing and approximately two hours each day to complete assigned test sessions during the two days of Spring testing. 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 40 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**

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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. Readers are trained to score in only one content area. Qualified readers for Arkansas scoring will be those with a four-year college degree in mathematics, education, or related fields.

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 prescored 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 prescored papers, and, in order to qualify, each reader scoring Algebra I responses must score in exact agreement on at least 80% of 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.

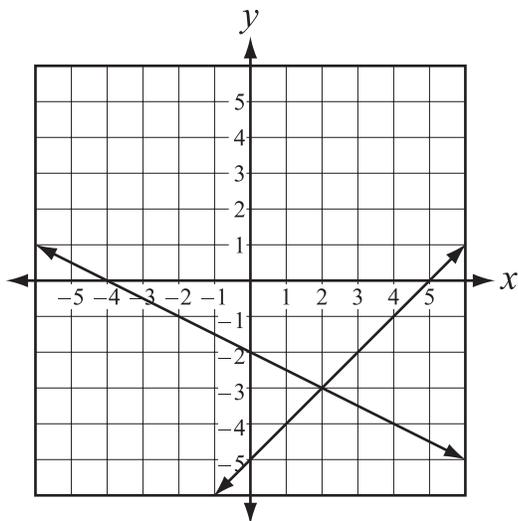
Once scoring of the actual student responses begins, readers are monitored constantly throughout the project to ensure that they are scoring according to the criteria. Daily and cumulative statistics are posted and analyzed, and Scoring Directors or Team Leaders reread selected responses scored by the 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. Which ordered pair is the solution to this system of equations?



- A. (5, 0)  
 \* B. (2, -3)  
 C. (0, -2)  
 D. (-4, 0)
2. Use the matrix to answer the question.

$$A = \begin{bmatrix} 49 & 84 \\ 36 & 52 \end{bmatrix}$$

What is  $3A$ ?

- A.  $\begin{bmatrix} 396 \end{bmatrix}$   
 B.  $\begin{bmatrix} 255 & 408 \end{bmatrix}$   
 C.  $\begin{bmatrix} 52 & 87 \\ 39 & 55 \end{bmatrix}$   
 \* D.  $\begin{bmatrix} 147 & 252 \\ 108 & 156 \end{bmatrix}$

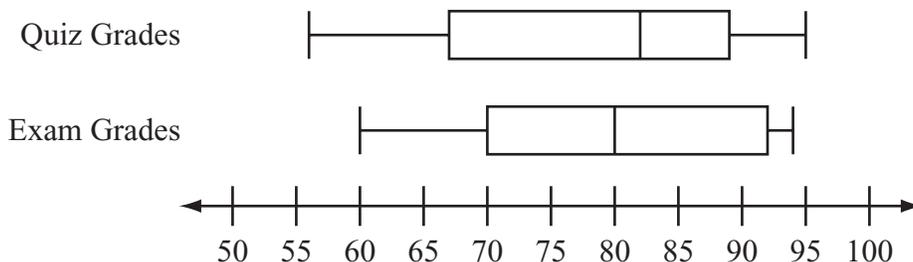
3. What is the simplest form of  $10^{-2}$ ?

- A. -100  
 B. -50  
 C.  $-\frac{1}{100}$   
 \* D.  $\frac{1}{100}$

4. If  $g(b) = 7b + 8$ , what is  $g(-3)$ ?

- A. -29  
 \* B. -13  
 C. 13  
 D. 29

5. The following box-and-whisker plots compare the average quiz grades with the average exam grades for Mrs. Brock's second period class.

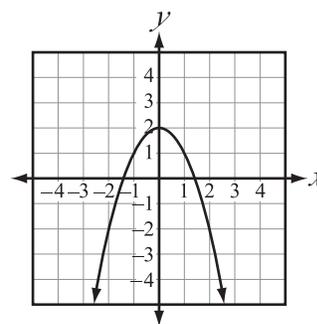


Which correctly describes these data?

- A. The lowest exam grade is lower than the lowest quiz grade.
  - B. The highest exam grade is greater than the highest quiz grade.
  - \* C. The median quiz grade is greater than the median exam grade.
  - D. The first quartile exam grade is lower than the first quartile quiz grade.
- 
6. What is the slope of the line represented by the equation  $y = 2x - 1$ ?

- A. 3
- \* B. 2
- C. -1
- D. -2

7. The equation  $y = -x^2 + 2$  is graphed below.



What are the coordinates of the maximum of the graph?

- \* A. (0, 2)
- B. (2, 0)
- C. (-1, 1)
- D. (-2, -2)

## PART II MID-YEAR RELEASED ALGEBRA I ITEMS

8. What is the greatest common factor of  $49x^3y^2$ ,  $28x^2y^2$ , and  $63x^2y$ ?

A.  $7y$   
B.  $7y^2$   
C.  $7x^2$   
\* D.  $7x^2y$

9. The function  $f(x) = 18x^2$  represents the surface area of a box with width  $x$ , depth  $x$ , and length  $4x$ . If the box has a width of 6 inches, what is the surface area of the box?

A. 108 square inches  
B. 216 square inches  
\* C. 648 square inches  
D. 864 square inches

10. What is the midpoint of the line segment with endpoints  $(-2, 7)$  and  $(5, -3)$ ?

A.  $(3, 4)$   
B.  $(5, 2)$   
\* C.  $(1.5, 2)$   
D.  $(1.5, 5)$

11. Eddie makes a table showing how much he will get paid in terms of the numbers of hours he works.

Number of Hours Worked	Total Pay
1	\$ 12
5	\$ 60
10	\$120
15	\$180
20	\$240

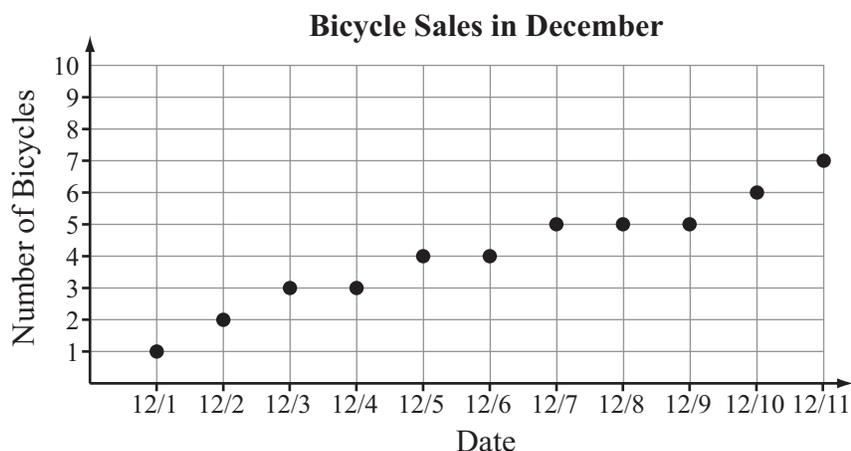
Which statement is true?

- \* A. The number of hours worked is the independent variable.  
B. The independent variable is \$12 per hour.  
C. The dependent variable is \$12 per hour.  
D. The total pay is the independent variable.

12. What is the value of  $3x^2 - (6x \div 2)$  if  $x = 5$ ?

A. 15  
B. 35  
\* C. 60  
D. 210

13. The graph shows bicycle sales during the first 11 days of December.



Which best describes the trend shown in the graph?

- \* A. The number of bicycles sold increases.
- B. The number of bicycles sold decreases.
- C. The number of bicycles sold remains constant.
- D. The number of bicycles sold increases, then decreases.

14. What values of  $x$  satisfy  $2x^2 - 14x = -24$ ?

- A.  $x = -12, x = -17$
- B.  $x = 4, x = -3$
- \* C.  $x = 4, x = 3$
- D.  $x = 2, x = 6$

15. What is the simplest form of the expression below?

$$\sqrt{\frac{125}{36}}$$

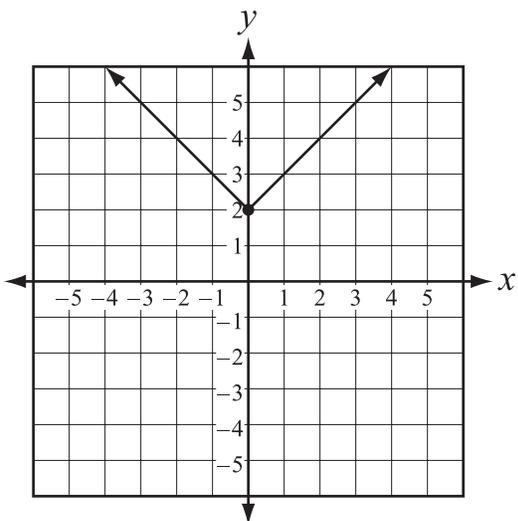
- A.  $\frac{5}{6}$
- \* B.  $\frac{5\sqrt{5}}{6}$
- C.  $\frac{5\sqrt{5}}{18}$
- D.  $\frac{25\sqrt{5}}{6}$

## PART II MID-YEAR RELEASED ALGEBRA I ITEMS

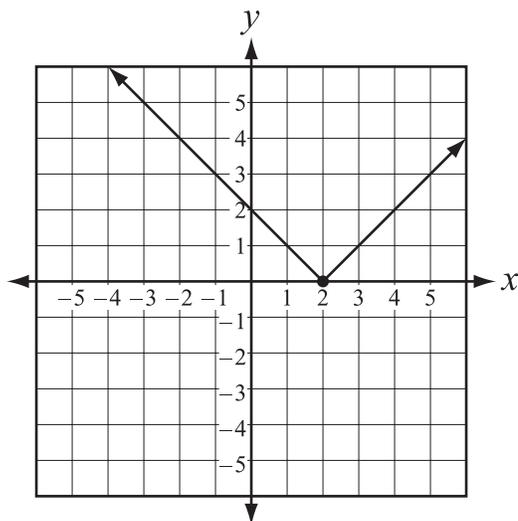
16. Which is the graph of the equation below?

$$y = |x| + 2$$

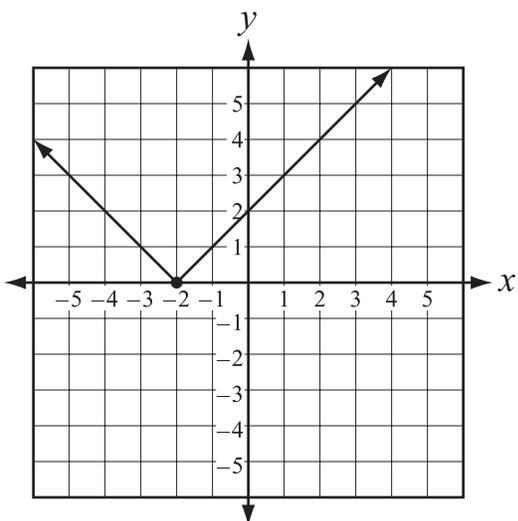
\* A.



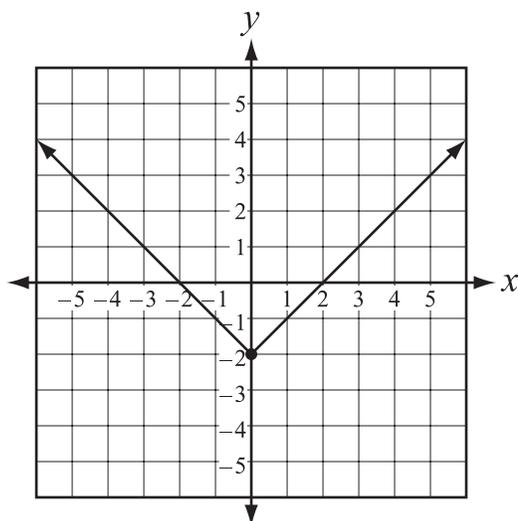
B.



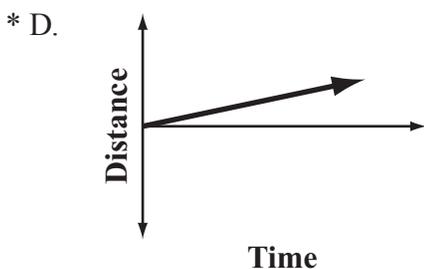
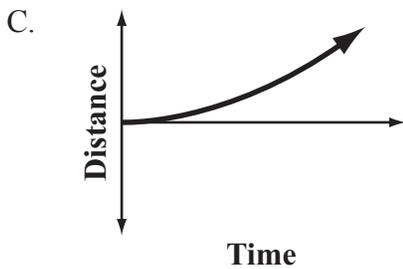
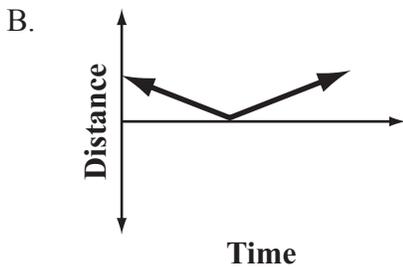
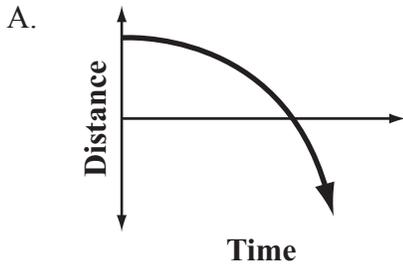
C.



D.



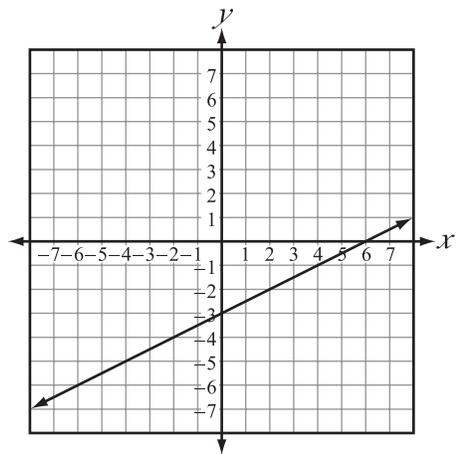
17. Which graph illustrates a linear relationship between distance and time?



18. Alex bought a cell phone for \$200 using money from his savings account. He is replacing the money in his savings account at the rate of \$8 per week. He has already replaced \$80. How many more weeks will he have to put money in his savings account in order to replace the entire amount?

- A. 10 weeks
- \* B. 15 weeks
- C. 25 weeks
- D. 35 weeks

19. Juan graphed the line  $y = -\frac{1}{2}x - 3$ .



What mistake did he make?

- A. Juan graphed the y-intercept as  $-3$ .
- B. Juan graphed the y-intercept as  $3$ .
- C. Juan graphed a slope of  $-\frac{1}{2}$ .
- \* D. Juan graphed a slope of  $\frac{1}{2}$ .

## PART II MID-YEAR RELEASED ALGEBRA I ITEMS

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20. What are the solutions for  $x$  in the quadratic equation  $x^2 - 16x + 64 = 0$ ?

- \* A.  $x = 8, x = 8$
- B.  $x = 16, x = 4$
- C.  $x = 8, x = -8$
- D.  $x = -16, x = -4$

21. A store sells CDs for  $x$  dollars each and DVDs for  $y$  dollars each. The sales for the first three hours on Saturday are represented by the expression below:

$$9x + 7y + 16x + 23y + 19x + 21y$$

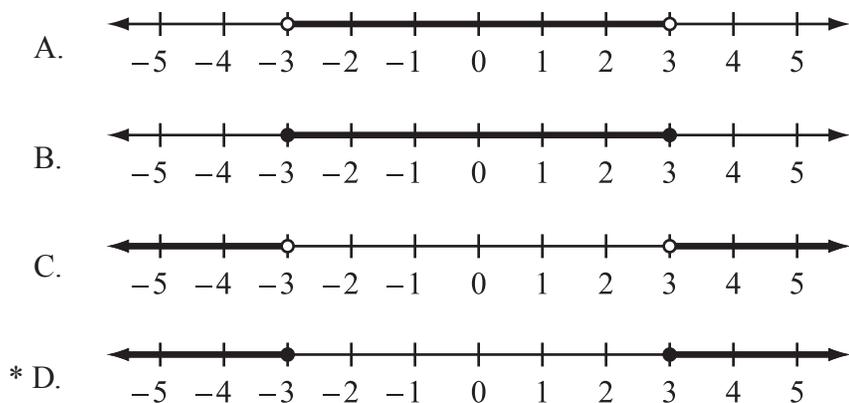
Which is the simplified form of this expression?

- A.  $95xy$
- B.  $95(x + y)$
- \* C.  $44x + 51y$
- D.  $51x + 44y$

22. Which of the following solves the equation  $\frac{a}{b} - c = d$  for  $a$  in terms of  $b, c,$  and  $d$ ?

- A.  $a = \frac{c-d}{b}$
- \* B.  $a = b(c+d)$
- C.  $a = \frac{1}{bc+bd}$
- D.  $a = b(d-c)$

23. Which graph shows the solution to the inequality  $|x| \geq 3$ ?



24. Every time that Bob looks out of his window and sees that the ground is wet, he also notices that many people are carrying umbrellas. Which statement describes the link between Bob's observations?

- \* A. People carry umbrellas and the ground gets wet due to a common cause.
- B. The ground is wet because many people walking outside carry umbrellas.
- C. People should only carry umbrellas when they want the ground to get wet.
- D. People carrying umbrellas and the ground being wet were just a coincidence.

25. There are  $n$  rows of tomato plants for sale in a garden center. Each row has 20 plants. Which expression could be used to find the total number of tomato plants for sale?

- A.  $\frac{n}{20}$
- \* B.  $20n$
- C.  $20 - n$
- D.  $n + 20$

## PART II MID-YEAR RELEASED ALGEBRA I ITEMS

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26. Marley is planting 45 flats of marigolds in a city park. If he plants 12 flats of marigolds in 30 minutes, about how many minutes will it take him to plant all of the marigolds?

A. 18  
B. 83  
\* C. 113  
D. 143

27. The Internet Café charges an initial fee to log on and a fixed rate for each minute of Internet use, as shown in the table below.

Time (min)	Total Cost (\$)
10	4.50
20	6.00
30	7.50
40	9.00
50	10.50
$x$	?

Which function represents the data in the table?

A.  $f(x) = 1.5x$   
B.  $f(x) = 0.15x$   
C.  $f(x) = 3 + 1.5x$   
\* D.  $f(x) = 3 + 0.15x$

28. Which expression is undefined at  $x = 4$ ?

A.  $\frac{x+4}{x+7}$   
B.  $\frac{x-4}{x-2}$   
C.  $\frac{x+5}{x+4}$   
\* D.  $\frac{x-3}{x-4}$

## PART II MID-YEAR RELEASED ALGEBRA I ITEMS

29. The matrix below shows steel and copper bolts, brads, and nails ordered by Hal's Hardware in December.

	Bolts	Brads	Nails
Steel	800	1,100	1,500
Copper	450	550	750

In April, Hal ordered the same number of bolts, twice as many brads, and three times as many nails as he ordered in December. Which matrix represents the April order?

- |   |       |       |       |       |       |     |       |       |        |     |       |       |   |  |       |       |       |       |     |       |       |        |     |       |       |
|---|-------|-------|-------|-------|-------|-----|-------|-------|--------|-----|-------|-------|---|--|-------|-------|-------|-------|-----|-------|-------|--------|-----|-------|-------|
| <p>A.</p> <table style="margin-left: 40px;"> <tr> <td></td> <td style="padding: 0 10px;">Bolts</td> <td style="padding: 0 10px;">Brads</td> <td style="padding: 0 10px;">Nails</td> </tr> <tr> <td style="padding-right: 10px;">Steel</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">800</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">550</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">500</td> </tr> <tr> <td style="padding-right: 10px;">Copper</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">450</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">275</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">250</td> </tr> </table>         |       | Bolts | Brads | Nails | Steel | 800 | 550   | 500   | Copper | 450 | 275   | 250   | <p>* B.</p> <table style="margin-left: 40px;"> <tr> <td></td> <td style="padding: 0 10px;">Bolts</td> <td style="padding: 0 10px;">Brads</td> <td style="padding: 0 10px;">Nails</td> </tr> <tr> <td style="padding-right: 10px;">Steel</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">800</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">2,200</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">4,500</td> </tr> <tr> <td style="padding-right: 10px;">Copper</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">450</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">1,100</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">2,250</td> </tr> </table> |  | Bolts | Brads | Nails | Steel | 800 | 2,200 | 4,500 | Copper | 450 | 1,100 | 2,250 |
|   | Bolts | Brads | Nails |       |       |     |       |       |        |     |       |       |   |  |       |       |       |       |     |       |       |        |     |       |       |
| Steel   | 800   | 550   | 500   |       |       |     |       |       |        |     |       |       |   |  |       |       |       |       |     |       |       |        |     |       |       |
| Copper  | 450   | 275   | 250   |       |       |     |       |       |        |     |       |       |   |  |       |       |       |       |     |       |       |        |     |       |       |
|   | Bolts | Brads | Nails |       |       |     |       |       |        |     |       |       |   |  |       |       |       |       |     |       |       |        |     |       |       |
| Steel   | 800   | 2,200 | 4,500 |       |       |     |       |       |        |     |       |       |   |  |       |       |       |       |     |       |       |        |     |       |       |
| Copper  | 450   | 1,100 | 2,250 |       |       |     |       |       |        |     |       |       |   |  |       |       |       |       |     |       |       |        |     |       |       |
| <p>C.</p> <table style="margin-left: 40px;"> <tr> <td></td> <td style="padding: 0 10px;">Bolts</td> <td style="padding: 0 10px;">Brads</td> <td style="padding: 0 10px;">Nails</td> </tr> <tr> <td style="padding-right: 10px;">Steel</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">800</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">2,200</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">3,000</td> </tr> <tr> <td style="padding-right: 10px;">Copper</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">450</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">1,100</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">1,500</td> </tr> </table> |       | Bolts | Brads | Nails | Steel | 800 | 2,200 | 3,000 | Copper | 450 | 1,100 | 1,500 | <p>D.</p> <table style="margin-left: 40px;"> <tr> <td></td> <td style="padding: 0 10px;">Bolts</td> <td style="padding: 0 10px;">Brads</td> <td style="padding: 0 10px;">Nails</td> </tr> <tr> <td style="padding-right: 10px;">Steel</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">800</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">3,300</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">3,000</td> </tr> <tr> <td style="padding-right: 10px;">Copper</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">450</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">1,650</td> <td style="border-left: 1px solid black; border-right: 1px solid black; padding: 5px 10px;">1,500</td> </tr> </table>   |  | Bolts | Brads | Nails | Steel | 800 | 3,300 | 3,000 | Copper | 450 | 1,650 | 1,500 |
|   | Bolts | Brads | Nails |       |       |     |       |       |        |     |       |       |   |  |       |       |       |       |     |       |       |        |     |       |       |
| Steel   | 800   | 2,200 | 3,000 |       |       |     |       |       |        |     |       |       |   |  |       |       |       |       |     |       |       |        |     |       |       |
| Copper  | 450   | 1,100 | 1,500 |       |       |     |       |       |        |     |       |       |   |  |       |       |       |       |     |       |       |        |     |       |       |
|   | Bolts | Brads | Nails |       |       |     |       |       |        |     |       |       |   |  |       |       |       |       |     |       |       |        |     |       |       |
| Steel   | 800   | 3,300 | 3,000 |       |       |     |       |       |        |     |       |       |   |  |       |       |       |       |     |       |       |        |     |       |       |
| Copper  | 450   | 1,650 | 1,500 |       |       |     |       |       |        |     |       |       |   |  |       |       |       |       |     |       |       |        |     |       |       |

30. A function is defined by the table below.

$x$	$y$
1	0.25
2	0.50
3	0.75
4	1.00
5	1.25

What are the domain and range of this function?

- A. Domain = {1, 2, 3, 4, 5}  
Range = {all real numbers}
- B. Domain = {0.25, 0.50, 0.75, 1.00, 1.25}  
Range = {1, 2, 3, 4, 5}
- \* C. Domain = {1, 2, 3, 4, 5}  
Range = {0.25, 0.50, 0.75, 1.00, 1.25}
- D. Domain = {all real numbers}  
Range = {0.25, 0.50, 0.75, 1.00, 1.25}

## PART II MID-YEAR RELEASED ALGEBRA I ITEMS

---

- A. Ted is 1 year older than twice Kelly's age in years. The sum of Ted and Kelly's ages, in years, is 49.
1. Write a system of equations that can be used to relate Ted's age ( $T$ ) and Kelly's age ( $K$ ).
  2. What are Kelly's and Ted's ages, in years? Show your work or explain your answer.
  3. How many years from now will Kelly's age in years be 75% of Ted's age in years? Show your work or explain your answer.

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

<b>Item A Scoring Rubric—2014 Algebra I</b>
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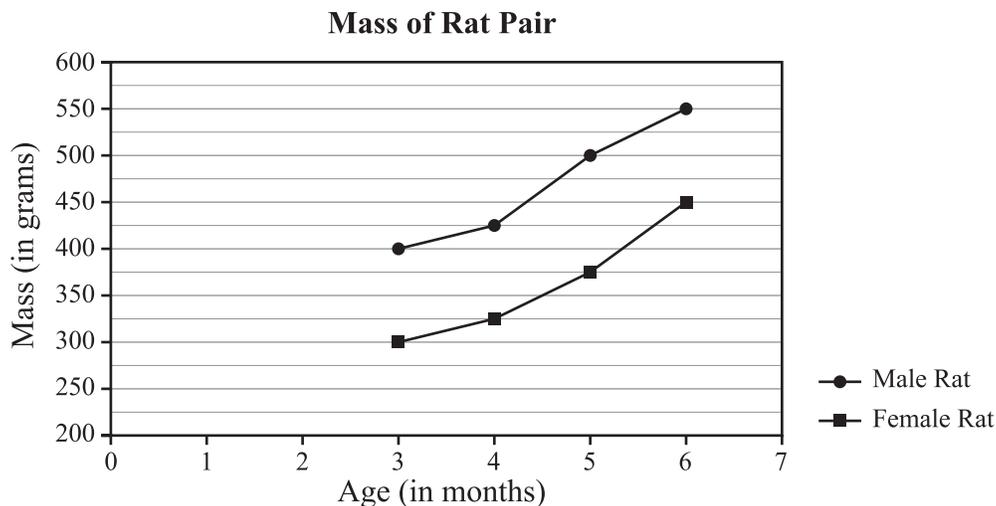
Score	Description
4	The student earns 4 points. The response contains no incorrect work.
3	The student earns 3 – 3½ points.
2	The student earns 2 – 2½ points.
1	The student earns ½ – 1½ points, or some minimal understanding is shown.
0	The student earns 0 points. No understanding is shown.
B	Blank — 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.)



## PART II MID-YEAR RELEASED ALGEBRA I ITEMS

Part	Points
3	<p><b>1 point possible:</b></p> <p>½ point: Correct answer: 35 (years)</p> <p><b>AND</b></p> <p>½ point: Correct and complete procedure shown or explained Give credit for the following or equivalent: <i>If solved <b>algebraically</b>, work may contain 1 calculation error</i></p> <ul style="list-style-type: none"> <li>• Let <math>x = \#</math> of years  <math>16 + x = .75(33 + x)</math>  <math>16 + x = 24.75 + .75x</math>  <math>.25x = 8.75</math>  <math>x = \#</math></li> <li>• Guess and Check:            35 years because...  <math>16 + 35 = 51</math> and <math>33 + 35 = 68</math> (not required)  <math>51 = (.75)(68)</math> (required)</li> <li>• Age difference:            35 years because:  <math>T - K = 17 = \frac{1}{4}T</math>  <math>T = 4 \cdot 17 = 68</math> (required)  <math>K = 68 - 17 = 51</math> (required)  <b>or</b> <math>K = 3 \cdot 17 = 51</math> (required)</li> <li><b>or</b> <math>K = \frac{3}{4}T = \frac{3}{4} \cdot 68 = 51</math> (required)  <math>68 - 33 = 35</math> <b>or</b> <math>51 - 16 = 35</math> (not required)</li> </ul>

**B.** Andrew collected data on a pair of rats about their mass as they aged. He graphed the data as shown below.



- Create a matrix that contains the data in the graph with “Male” and “Female” for the columns and “Age” for the rows. Be sure to label your rows and give the matrix a title.
- Andrew collected data on male rat behavior using tally marks. Organize the data into a single matrix. Be sure to include labels and a title.

**Male Rats, 3 Months Old:**

Grooming *||||*  
 Nesting *|||*  
 Play-fighting *|||| ||||*  
 Feeding *|||| |||*

**Male Rats, 4 Months Old:**

Grooming *|||*  
 Nesting *||*  
 Play-fighting *|||| |||| |||*  
 Feeding *|||| ||||*

**Male Rats, 5 Months Old:**

Grooming *||*  
 Nesting *|||*  
 Play-fighting *|||| ||||*  
 Feeding *|||| |||| ||||*

**Male Rats, 6 Months Old:**

Grooming *||||*  
 Nesting *||||*  
 Play-fighting *|||| |||| ||*  
 Feeding *|||| |||| |||| |*

**BE SURE TO LABEL YOUR RESPONSES 1 AND 2.**

## PART II MID-YEAR RELEASED ALGEBRA I ITEMS

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### Item B Scoring Rubric—2014 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.)

## PART II MID-YEAR RELEASED ALGEBRA I ITEMS

### SOLUTION AND SCORING

4 points possible:

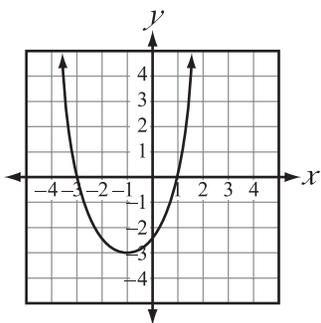
Part	Points																									
1	<p><b>2 points possible:</b></p> <p>2 points: Correct and complete matrix Give credit for the following or equivalent: Ex.</p> <div style="text-align: center;"> <p><b>Mass of Rat Pair</b></p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th style="text-align: center;">Male</th> <th style="text-align: center;">Female</th> </tr> </thead> <tbody> <tr> <td style="text-align: right;">3 months</td> <td style="text-align: center;">400</td> <td style="text-align: center;">300</td> </tr> <tr> <td style="text-align: right;">4 months</td> <td style="text-align: center;">425</td> <td style="text-align: center;">325</td> </tr> <tr> <td style="text-align: right;">5 months</td> <td style="text-align: center;">500</td> <td style="text-align: center;">375</td> </tr> <tr> <td style="text-align: right;">6 months</td> <td style="text-align: center;">550</td> <td style="text-align: center;">450</td> </tr> </tbody> </table> </div> <p style="text-align: center;"><b>OR</b></p> <p>1 point: 1 or more labels (including title) are missing or incorrect but matrix is otherwise correct</p> <p style="text-align: center;">or</p> <p style="text-align: center;">1 element is incorrect but all labels (including title) are correct</p> <p><i>NOTE: The definition of Matrices in the Arkansas Frameworks is “Ordered tables or listings of numerical data,” consequently a specific format is not required.</i></p>		Male	Female	3 months	400	300	4 months	425	325	5 months	500	375	6 months	550	450										
	Male	Female																								
3 months	400	300																								
4 months	425	325																								
5 months	500	375																								
6 months	550	450																								
2	<p><b>2 points possible:</b></p> <p>2 points: Correct and complete matrix Give credit for the following or equivalent: Ex.</p> <div style="text-align: center;"> <p><b>Male Rat Behaviors</b></p> <p>(Age in months)</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">5</th> <th style="text-align: center;">6</th> </tr> </thead> <tbody> <tr> <td style="text-align: right;">Grooming</td> <td style="text-align: center;">5</td> <td style="text-align: center;">3</td> <td style="text-align: center;">2</td> <td style="text-align: center;">5</td> </tr> <tr> <td style="text-align: right;">Nesting</td> <td style="text-align: center;">3</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> </tr> <tr> <td style="text-align: right;">Play-fighting</td> <td style="text-align: center;">10</td> <td style="text-align: center;">13</td> <td style="text-align: center;">10</td> <td style="text-align: center;">12</td> </tr> <tr> <td style="text-align: right;">Feeding</td> <td style="text-align: center;">8</td> <td style="text-align: center;">10</td> <td style="text-align: center;">15</td> <td style="text-align: center;">16</td> </tr> </tbody> </table> </div> <p style="text-align: center;"><b>OR</b></p> <p>1 point: 1 or more labels (including title) are missing or incorrect but matrix is otherwise correct</p> <p style="text-align: center;">or</p> <p style="text-align: center;">1 element is incorrect but all labels (including title) are correct</p>		3	4	5	6	Grooming	5	3	2	5	Nesting	3	2	3	4	Play-fighting	10	13	10	12	Feeding	8	10	15	16
	3	4	5	6																						
Grooming	5	3	2	5																						
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Feeding	8	10	15	16																						

## PART II SPRING RELEASED ALGEBRA I ITEMS

1. If  $f(a) = 4a - 5$ , what is  $f(3)$ ?

- A.  $-8$
- \* B.  $7$
- C.  $17$
- D.  $32$

2. Use the graph below to answer the question.



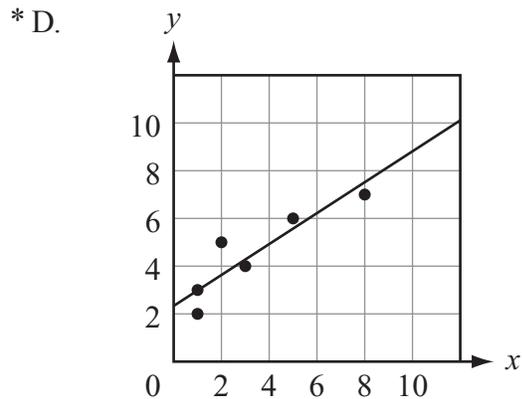
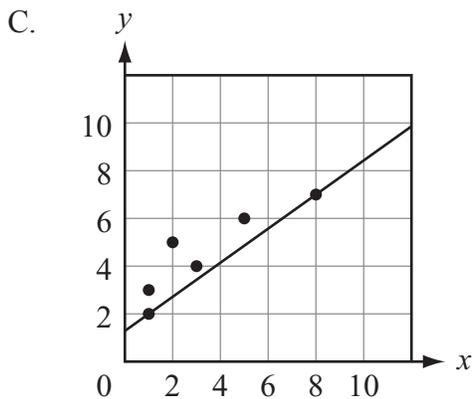
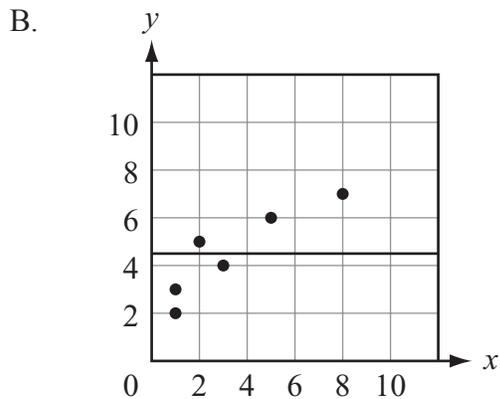
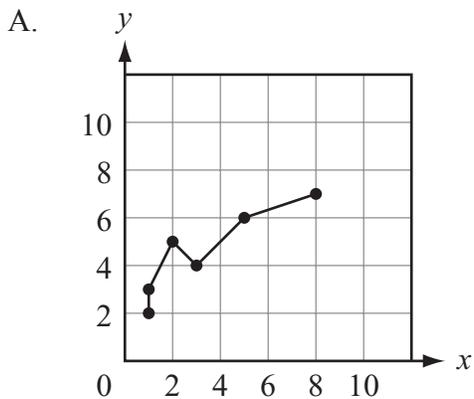
Which statement is true about the function?

- A. The maximum value occurs at  $(3, 5)$ .
- B. The maximum value occurs at  $(-3, 0)$ .
- C. The minimum value occurs at  $(-3, -1)$ .
- \* D. The minimum value occurs at  $(-1, -3)$ .

3. The cost of renting a DVD is \$1.50 per day ( $d$ ). Which function represents the cost of renting the DVD?

- A.  $f(d) = 1.50 + d$
- B.  $f(d) = \frac{d}{1.50}$
- \* C.  $f(d) = 1.50d$
- D.  $f(d) = \frac{1.50}{d}$

4. Which appears to be a correct line of best fit for the data given?



## PART II SPRING RELEASED ALGEBRA I ITEMS

5. Which of the following equations, when graphed on a coordinate plane, has a slope of  $-\frac{2}{3}$ ?

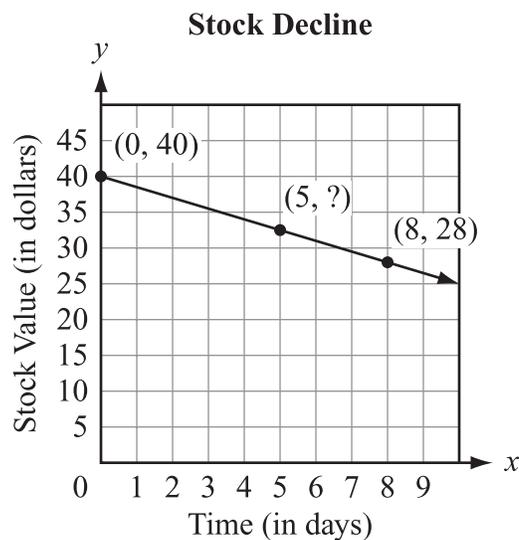
\* A.  $y = -\frac{2}{3}x + \frac{3}{2}$

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

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

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

6. Over the course of 8 days, the value of a stock dropped at a uniform rate from \$40 to \$28 as shown on the graph below.



What was the value of the stock on the fifth day?

- A. \$ 7.50  
B. \$29.50  
C. \$31.00  
\* D. \$32.50

7. Carlos is doing laundry. The table below shows the colors of his T-shirts in the dryer.

Color	Number
White	2
Black	3
Red	1
Blue	5

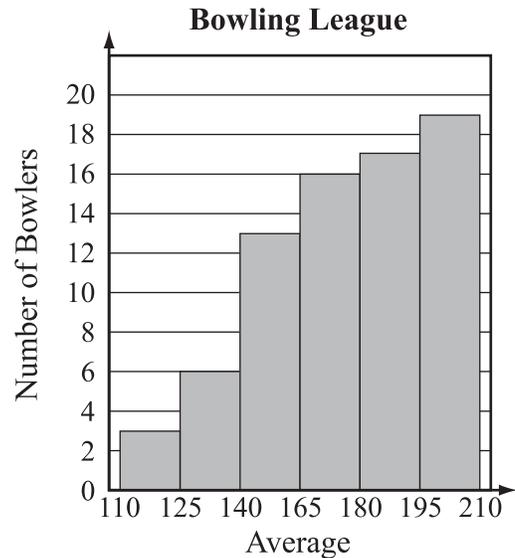
Carlos pulls a white T-shirt out of the dryer. Then he pulls out a second T-shirt at random. What is the probability that the second T-shirt is also white?

- A.  $\frac{1}{11}$
- \* B.  $\frac{1}{10}$
- C.  $\frac{2}{11}$
- D.  $\frac{1}{5}$
8. What is the value of the expression below?

$$12\sqrt{9}(2\sqrt{4})$$

- \* A. 144
- B. 864
- C.  $24\sqrt{6}$
- D.  $24\sqrt{13}$

9. The cumulative frequency histogram below shows the bowling averages of members of a league.

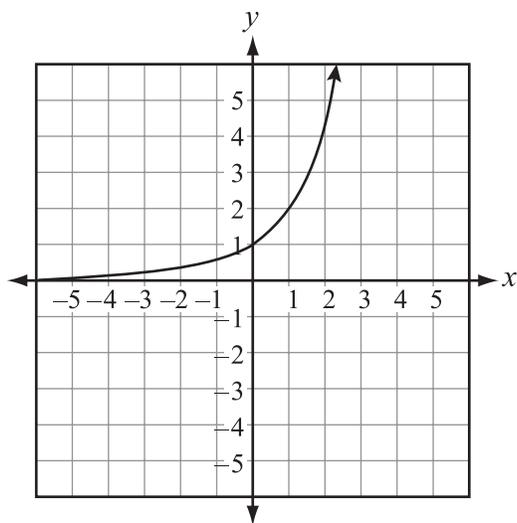


How many bowlers had an average greater than 180?

- A. 1
- B. 2
- \* C. 3
- D. 6

**PART II SPRING RELEASED ALGEBRA I ITEMS**

10. The graph of the function  $y = 2^x$  is shown below.

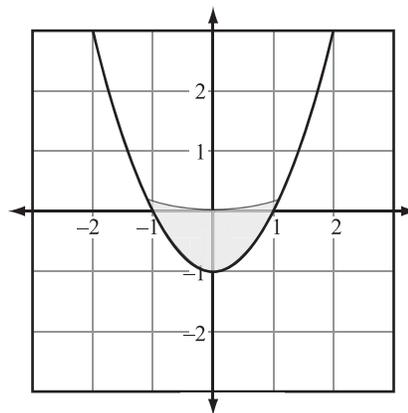


If the graph is translated 3 units downward, what is the resulting function?

- A.  $y = 2^{x-2}$   
 B.  $y = 2^{x-3}$   
 C.  $y = 2^x - 2$   
 \* D.  $y = 2^x - 3$
11. What is the value of  $\frac{a^2 + 28}{4}$  when  $a = 3$ ?

- A. 21  
 \* B.  $\frac{37}{4}$   
 C.  $\frac{17}{2}$   
 D. 7

12. The reflector of a car's headlight is constructed in the shape of a parabola as shown in the diagram below.



Which equation models the outline of the headlight?

- A.  $y = (x-1)^2$   
 B.  $y = (x+1)^2$   
 \* C.  $y = x^2 - 1$   
 D.  $y = x^2 + 1$
13. What is the midpoint of the line segment with endpoints (1, 5) and (9, 17)?

- A. (2, 4)  
 B. (3, 13)  
 C. (4, 6)  
 \* D. (5, 11)

14. A catered party at a local restaurant costs \$250.00 plus \$10.50 per person. Using  $p$  for the number of people at the party, which equation represents the total cost,  $c$ , of the party?
- \* A.  $c = 10.50p + 250.00$
  - B.  $c = 10.50 + 250.00p$
  - C.  $c = 250.00p + 10.50p$
  - D.  $c = 250.00 - 10.50p$
15. Which shows the equation  $P = \frac{W}{t}$ , solved for  $W$ ?
- A.  $W = \frac{P}{t}$
  - B.  $W = \frac{t}{P}$
  - \* C.  $W = Pt$
  - D.  $W = P - t$
16. Sarah's weekly pay varies directly with the number of hours she works. If she works 15 hours, she earns \$127.50. If she works 20 hours, she earns \$170.00. How much does she earn if she works 25 hours?
- A. \$ 8.50
  - \* B. \$212.50
  - C. \$255.00
  - D. \$297.50
17. Paul's first four test scores are 87, 95, 86, and 88. Paul would like to raise his test average to at least a 90. What is the least score he must receive on his next test in order to do this?
- A. 89
  - B. 90
  - C. 91
  - \* D. 94

## PART II SPRING RELEASED ALGEBRA I ITEMS

18. The table below shows the amount of dog food (in cups) that Philip has left after feeding his dog a given number of times.

Feedings, $f$	Food Remaining, $r$
1	20
2	18
3	16
4	14

Which equation represents the data?

- A.  $r = 20f$   
B.  $r = 20 - 2f$   
\* C.  $r = 22 - 2f$   
D.  $f = 22 - 2r$
19. Sam's Sports sells each tennis racket for  $x$  dollars and each basketball for  $y$  dollars. The expression below represents the sales of tennis rackets and basketballs for 3 days.

$$(4x + 21y) + (3x + 15y) + (4x + 18y)$$

Which of the following is the simplified form of this expression?

- A.  $54x + 11y$   
\* B.  $11x + 54y$   
C.  $65(x + y)$   
D.  $65xy$

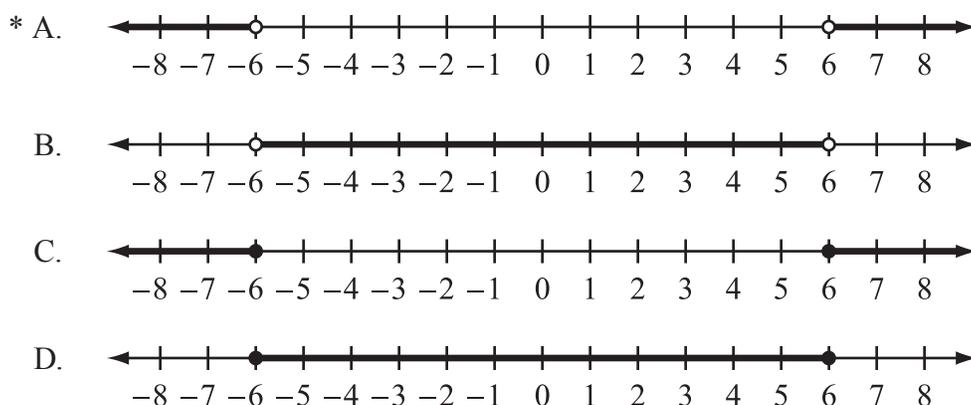
20. The Sun is about  $9.3 \times 10^7$  miles from Earth. If a satellite were traveling from Earth to the Sun at an average speed of 2,400 miles per hour, approximately how many hours would it take for the satellite to reach the Sun?

- A. 39 hours  
B. 390 hours  
C. 3,900 hours  
\* D. 39,000 hours

21. What is the relationship between the lines  $y = \frac{2}{3}x + 5$  and  $y = \frac{2}{3}x - 5$ ?

- \* A. The lines are parallel.  
B. The lines are perpendicular.  
C. The lines are the same line.  
D. The lines are neither parallel nor perpendicular.

22. Which graph represents the solution set of  $|x| > 6$ ?



23. Which set represents a function?

- A.  $\{(-4, 0), (0, 4), (4, 0), (0, -4), (0, 0)\}$
- B.  $\{(-4, 3), (2, 2), (-2, 1), (3, -2), (-4, -4)\}$
- \* C.  $\{(-3, 3), (-2, 0), (0, -1), (2, 0), (3, 3)\}$
- D.  $\{(4, 4), (2, 1), (1, 0), (2, -1), (4, -4)\}$

24. What is the simplest form of  $\frac{2y-6}{4}$ ?

- \* A.  $\frac{y-3}{2}$
- B.  $\frac{y-6}{2}$
- C.  $y-3$
- D.  $y-6$

25. The student council wants to know whether students at the school would attend a semi-formal winter dance. Which sample would give the best results?

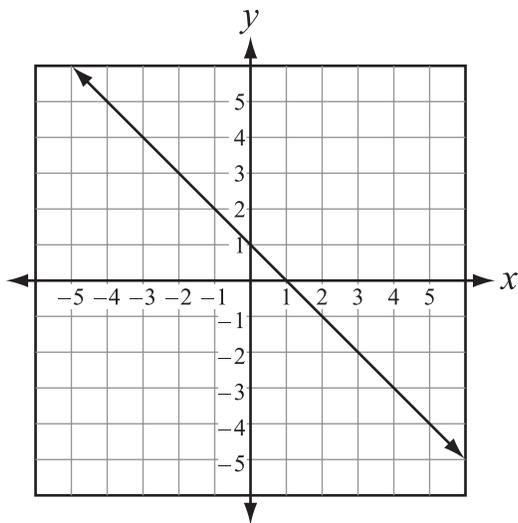
- A. Survey 25 members of the dance team.
- B. Survey 25 students in the student council.
- C. Survey 50 students randomly selected at an athletic event.
- \* D. Survey 50 students randomly selected in the school cafeteria.

26. What are the factors of  $x^2 - 64$ ?

- A.  $(x-8)(x-8)$
- \* B.  $(x-8)(x+8)$
- C.  $(x-4)(x-16)$
- D.  $(x-4)(x+16)$

**PART II SPRING RELEASED ALGEBRA I ITEMS**

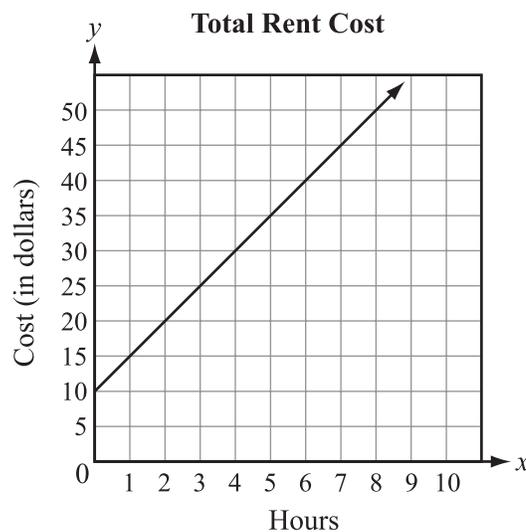
27. What type of function is shown on the graph below?



- \* A. linear
  - B. quadratic
  - C. exponential
  - D. absolute value
28. What are the zeros of the function  $y = 3x^2 - 15x + 14$ ?

- A.  $\frac{15 \pm \sqrt{213}}{6}$
- B.  $\frac{15 \pm \sqrt{183}}{6}$
- \* C.  $\frac{15 \pm \sqrt{57}}{6}$
- D.  $\frac{-15 \pm \sqrt{57}}{6}$

29. A shop rents scooters for a set fee, plus an additional charge per hour. The graph shows the total rental cost.



How much does it cost per hour to rent a scooter?

- A. \$ 1
  - \* B. \$ 5
  - C. \$10
  - D. \$15
30. What is the solution of  $5(x + 2) - x = 2$ ?

- A.  $x = 3$
- B.  $x = 1$
- C.  $x = 0$
- \* D.  $x = -2$

- A.** A cell phone family plan costs \$50 per month for the first person and \$10 per month for each additional person,  $x$ , up to four additional people. The equation  $y = 10x + 50$  represents the cost,  $y$ , of the plan per month.
1. Make a table to find the possible costs for the plan. Show your work and/or explain your answer.
  2. What are the domain and range of the equation?

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

<b>Item A Scoring Rubric—2014 Algebra I</b>
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Score	Description
<b>4</b>	The student earns 4 points. The response contains no incorrect work.
<b>3</b>	The student earns 3 – 3½ points.
<b>2</b>	The student earns 2 – 2½ points.
<b>1</b>	The student earns ½ – 1½ points, or some minimal understanding is shown.
<b>0</b>	The student earns 0 points. No understanding is shown.
<b>B</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.)

## PART II SPRING RELEASED ALGEBRA I ITEMS

### SOLUTION AND SCORING

4 points possible:

Part	Points												
<b>1</b>	<p><b>2 points possible:</b></p> <p>2 points:      Correct table                      Correct procedure shown or explained                      One procedure computation may be missing                      Give credit for the following or equivalent:                      Ex.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Additional Users (<math>x</math>)</th> <th>Plan Cost (<math>y</math>)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;"><math>10(0) + 50 = 50</math></td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;"><math>10(1) + 50 = 60</math></td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;"><math>10(2) + 50 = 70</math></td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;"><math>10(3) + 50 = 80</math></td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;"><math>10(4) + 50 = 90</math></td> </tr> </tbody> </table> <p style="text-align: center;"><b>OR</b></p> <p>1 point:      • Correct table                      Procedure is missing or is missing more than one computation</p> <p>                  • Incomplete table: “<math>x = 0</math>” is missing                      Procedure complete</p> <p>                  • Correct procedure; table is missing or incorrect                      A correct graph is acceptable for procedure</p> <p>                  • Correct procedure based on an incorrect table</p> <p>                  • Table has 1 incorrect value due to a calculation or copy error  <i>Subsequent values may be based on that 1 error</i>                      Correct and complete procedure shown</p> <p style="text-align: center;"><b>OR</b></p> <p>½ point:      • Incomplete table: “<math>x = 0</math>” is missing;                      Procedure is missing or incomplete</p> <p>                  • Incomplete table: “<math>x = 0</math>” is missing                      One incorrect value due to a calculation or copy error</p>	Additional Users ( $x$ )	Plan Cost ( $y$ )	0	$10(0) + 50 = 50$	1	$10(1) + 50 = 60$	2	$10(2) + 50 = 70$	3	$10(3) + 50 = 80$	4	$10(4) + 50 = 90$
Additional Users ( $x$ )	Plan Cost ( $y$ )												
0	$10(0) + 50 = 50$												
1	$10(1) + 50 = 60$												
2	$10(2) + 50 = 70$												
3	$10(3) + 50 = 80$												
4	$10(4) + 50 = 90$												

## PART II SPRING RELEASED ALGEBRA I ITEMS

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Part	Points
2	<p><b>2 points possible:</b></p> <p>1 point:           Correct domain:           Domain = {0, 1, 2, 3, 4} Other protocols accepted: 0, 1, 2, 3, 4; (0, 1, 2, 3, 4); [0, 1, 2, 3, 4] <i>Or correct answer based on Part 1</i></p> <p><b>AND</b></p> <p>1 point:           Correct range:           Range = {50, 60, 70, 80, 90} Other protocols accepted: 50, 60, 70, 80, 90; (50, 60, 70, 80, 90); [50, 60, 70, 80, 90] <i>Or correct answer based on Part 1</i></p>

## PART II SPRING RELEASED ALGEBRA I ITEMS

- B. A certain square pyramid has a ratio of base length to height of 2:3. The volume and surface area of this pyramid can be found using the formulas

$$\text{Volume} = \frac{1}{3}(x)^2\left(\frac{3}{2}x\right) \text{ and}$$
$$\text{Surface area} = (x)^2 + \frac{1}{2}(4x)\left(\frac{x}{2}\sqrt{10}\right)$$

where  $x$  = the length of a side of the base.

1. Simplify the volume formula. Find the volume of this type of pyramid if the length of the side of the base is 10 feet. Show your work or explain your answer.
2. What is the surface area of this type of pyramid if the length of a side of the base is 16 feet? Show your work and round your answer to the nearest square foot.

BE SURE TO LABEL YOUR RESPONSES 1 AND 2.

### Item B Scoring Rubric—2014 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**

**Do not deduct for early rounding or truncating in internal work that results in the correct answer. Students may write these values for brevity, using the exact calculator value to find their answer.**

**Missing units are acceptable.  
Incorrect units are a 4/3 issue.**

**4 points possible:**

Part	Points
<b>1</b>	<p><b>2 points possible:</b></p> <p style="margin-left: 40px;">½ point:      Correct formula: Volume = <math>\frac{1}{2}x^3</math> or = <math>\frac{x^3}{2}</math></p> <p style="text-align: center; margin-left: 40px;"><b>AND</b></p> <p style="margin-left: 40px;">½ point:      Correct and complete procedure shown or explained Work may contain a calculation or copy error Give credit for the following or equivalent: Ex.</p> <div style="margin-left: 100px; text-align: center;"> <math display="block">\begin{aligned} \text{Volume} &amp;= \frac{1}{3}(x)^2\left(\frac{3}{2}x\right) \\ &amp;= \frac{1}{\cancel{3}}(x)^2\left(\frac{\cancel{3}}{2}x\right) \\ &amp;= \frac{1}{2}x^3 \text{ or } = \frac{x^3}{2} \end{aligned}</math> </div> <p style="text-align: center; margin-left: 40px;"><b>AND</b></p> <p style="margin-left: 40px;">½ point:      Correct volume: 500 ft<sup>3</sup> <i>Or correct answer based on incorrectly simplified formula</i> Note: If label exponent is attached to the numerical value, deduct ½ point from Part 1 point total.</p> <p style="text-align: center; margin-left: 40px;"><b>AND</b></p> <p style="margin-left: 40px;">½ point:      Correct and complete procedure shown or explained Work may contain a calculation, copy, or rounding error, or early rounding(s) Give credit for the following or equivalent: Ex.      Volume = <math>\frac{1}{2}(10)^3 = \frac{1}{2}(1000) = 500 \text{ ft}^3</math></p>

## PART II SPRING RELEASED ALGEBRA I ITEMS

Part	Points
2	<p><b>2 points possible:</b></p> <p>1 point: Correct area: 1066 (ft<sup>2</sup>) rounded to the nearest square foot</p> <p style="text-align: center;"><b>OR</b></p> <p>½ point: Answer correctly rounded or truncated to a place other than the nearest square foot or label exponent is attached to the numerical value</p> <p style="text-align: center;"><b>AND</b></p> <p>1 point: Correct and complete procedure shown or explained Work may contain a calculation, copy, or rounding error, early rounding(s), or truncation Give credit for the following or equivalent: Ex.</p> $\begin{aligned} \text{Surface area} &= (16)^2 + \frac{1}{2}(4 \times 16)\left(\frac{16}{2}\sqrt{10}\right) \\ &= 256 + \frac{1}{2}(64)(8\sqrt{10}) \\ &= 256 + 32(8\sqrt{10}) \\ &= 256 + 256\sqrt{10} \quad \text{acceptable answer} \\ &= 256(1 + \sqrt{10}) \quad \text{acceptable answer} \\ &= 1065.54308\dots \\ &\approx 1066 \text{ ft}^2 \quad \text{acceptable answer} \end{aligned}$

- C.** A small company that makes stuffed bears uses the equation  $B = 57p + p^2$  to show the relation between the total number of bears sold,  $B$ , and the selling price in dollars,  $p$ , of a stuffed bear.
1. The company has a goal to sell 180 stuffed bears. Rewrite the equation using 180 stuffed bears.
  2. Solve the equation from Part 1 to find the price(s) the company could charge to reach their goal. Show your work and/or explain your answer.
  3. Explain why the prices you obtained in Part 2 may or may not be reasonable.

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

<b>Item C Scoring Rubric—2014 Algebra I</b>
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Score	Description
<b>4</b>	The student earns 4 points. The response contains no incorrect work.
<b>3</b>	The student earns 3 – 3½ points.
<b>2</b>	The student earns 2 – 2½ points.
<b>1</b>	The student earns ½ – 1½ points, or some minimal understanding is shown.
<b>0</b>	The student earns 0 points. No understanding is shown.
<b>B</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.)

# PART II SPRING RELEASED ALGEBRA I ITEMS

## SOLUTION AND SCORING

4 points possible:

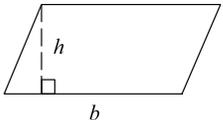
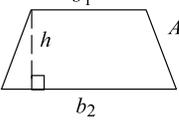
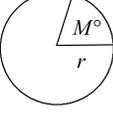
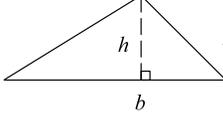
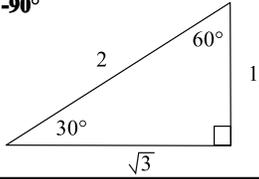
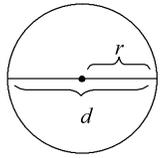
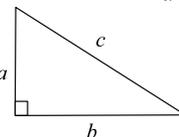
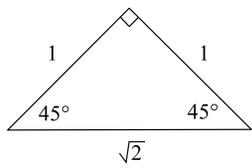
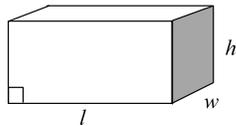
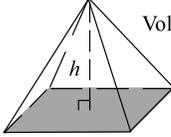
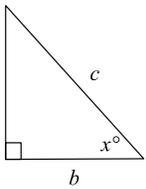
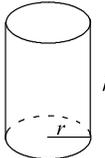
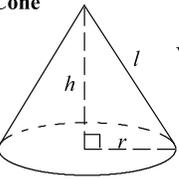
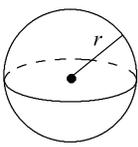
Part	Points
1	<p><b>1 point possible:</b></p> <p>1 point: Correct equation: <math>180 = 57p + p^2</math> or equivalent</p>
2	<p><b>2 points possible:</b></p> <p>1 point: Two correct prices: <math>p = -60</math> or <math>p = 3</math> (\$) <b>or</b>            One correct price of <math>p = 3</math> with a correct and complete procedure  <i>Or correct answer(s) based on an incorrect <b>quadratic</b> equation in Part 1</i></p> <p><b>OR</b></p> <p>½ point: One correct price  <i>Or correct price based on incorrect <b>quadratic</b> equation in Part 1</i></p> <p><b>AND</b></p> <p>1 point: Correct and complete procedure shown or explained  <i>Work may contain 1 calculation or copy error</i>            Give credit for the following or equivalent:            Ex. Using factoring:  <math display="block">180 = 57p + p^2</math> <math display="block">p^2 + 57p - 180 = 0</math> <math display="block">(p + 60)(p - 3) = 0</math> <math display="block">p = -60 \text{ or } p = 3</math>           Ex. Using quadratic formula:  <math display="block">p^2 + 57p - 180 = 0</math> <math display="block">p = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}</math> <math display="block">= \frac{-57 \pm \sqrt{(57)^2 - 4(1)(-180)}}{2(1)}</math> <math display="block">= \frac{-57 \pm \sqrt{3249 + 720}}{2}</math> <math display="block">= \frac{-57 \pm \sqrt{3969}}{2}</math> <math display="block">= \frac{-57 \pm 63}{2}</math> <math display="block">= \frac{-120}{2}, \frac{6}{2}</math> <math display="block">p = -60 \text{ or } p = 3</math> <p><b>OR</b></p> <p>½ point: Correct procedure shown or explained for one correct price  <i>Work may contain 1 calculation or copy error</i></p> </p>

## PART II SPRING RELEASED ALGEBRA I ITEMS

Part	Points
3	<p><b>1 point possible:</b></p> <p>1 point: Correct explanation, based on Part 2, for two prices <b>or</b> for one price of <math>p = 3</math> with a correct and complete procedure in Part 2 Give credit for the following or equivalent: Ex. “A price of \$3 for a stuffed bear is reasonable, but a negative value would be losing money (you give somebody \$60 to take a bear) so that’s not reasonable.”</p> <p><b>OR</b></p> <p>½ point: Correct explanation, based on Part 2 calculations, for one price</p>

# PART II END-OF-COURSE MATHEMATICS REFERENCE SHEET

## End-of-Course Mathematics Reference Sheet

<b>Parallelogram</b>  $P =$ sum of all sides $A = bh$	<b>Trapezoid</b>  $A = \frac{h(b_1 + b_2)}{2}$	<b>Arc and Sector</b>  Arc Length = $\left(\frac{M}{360}\right) \times 2\pi r$ Sector area = $\left(\frac{M}{360}\right) \times \pi r^2$
<b>Triangle</b>  $P =$ sum of all sides $A = \frac{bh}{2}$	<b>Rectangle</b>  $P = 2l + 2w$ $A = lw$	<b>30° -60° -90°</b> 
<b>Circle</b>  $C = 2\pi r$ $C = \pi d$ $A = \pi r^2$ $\pi \approx 3.14$	<b>Pythagorean Theorem</b> $a^2 + b^2 = c^2$ 	<b>45° -45° -90°</b> 
<b>Rectangular Solid</b>  Volume = $lwh$ Surface area = $2lw + 2lh + 2wh$	<b>Pyramid</b> $B =$ area of base (shaded) Volume = $\frac{Bh}{3}$ 	<b>Trigonometric Ratios</b>  $\sin x^\circ = \frac{a}{c}$ $\cos x^\circ = \frac{b}{c}$ $\tan x^\circ = \frac{a}{b}$
<b>Cylinder</b>  Volume = $\pi r^2 h$ Surface area = $2\pi rh + 2\pi r^2$	<b>Cone</b> $l =$ slant height Volume = $\frac{\pi r^2 h}{3}$ Surface area = $\pi rl + \pi r^2$ 	<b>Sphere</b>  Volume = $\frac{4\pi r^3}{3}$ Surface area = $4\pi r^2$

<b>Miscellaneous Formulas</b>	Area of an equilateral triangle	$A = \frac{s^2\sqrt{3}}{4}$ $s =$ length of a side
	Distance	rate $\times$ time
	Interest	principal $\times$ rate $\times$ time in years
	Sum of the angles of a polygon having $n$ sides	$(n - 2)180^\circ$
	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	$a_n = a + (n - 1)d$
	Last term of a geometric series (where $n \geq 1$ )	$a_n = ar^{n-1}$
	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\***

<b>Strands</b>	<b>Content Standards</b>	<b>Student Learning Expectations</b>
1. LANGUAGE OF ALGEBRA (LA)	1. Students will develop the language of algebra including specialized vocabulary, symbols, and operations.	<ol style="list-style-type: none"> <li>1. Evaluate algebraic expressions, including radicals, by applying the order of operations.</li> <li>2. Translate word phrases and sentences into expressions, equations, and inequalities, and vice versa.</li> <li>3. Apply the laws of (integral) exponents and roots.</li> <li>4. Solve problems involving scientific notation, including multiplication and division.</li> <li>5. Perform polynomial operations (addition, subtraction, multiplication) with and without manipulatives.</li> <li>6. Simplify algebraic fractions by factoring.</li> <li>7. Recognize when an expression is undefined.</li> <li>8. Simplify radical expressions such as <math>\frac{3}{\sqrt{7}}</math>.</li> <li>9. Add, subtract, and multiply simple radical expressions like <math>3\sqrt{20} + 7\sqrt{5}</math> and <math>4\sqrt{5} \cdot 2\sqrt{3}</math>.</li> </ol>
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.	<ol style="list-style-type: none"> <li>1. Solve multi-step equations and inequalities with rational coefficients                             <ul style="list-style-type: none"> <li>• numerically (from a table or guess and check)</li> <li>• algebraically (including the use of manipulatives)</li> <li>• graphically</li> <li>• technologically</li> </ul> </li> <li>2. Solve systems of two linear equations                             <ul style="list-style-type: none"> <li>• numerically (from a table or guess and check)</li> <li>• algebraically (including the use of manipulatives)</li> <li>• graphically</li> <li>• technologically</li> </ul> </li> <li>3. Solve linear formulas and literal equations for a specified variable (Ex. Solve for p in <math>I = prt</math>.)</li> <li>4. Solve and graph simple absolute value equations and inequalities. Ex. <math> x  = 5</math>, <math> x  \leq 5</math>, <math> x  &gt; 5</math></li> <li>5. Solve real-world problems that involve a combination of rates, proportions, and percents.</li> <li>6. Solve problems involving direct variation and indirect (inverse) variation to model rates of change.</li> <li>7. Use coordinate geometry to represent and/or solve problems (midpoint, length of a line segment, and Pythagorean Theorem).</li> <li>8. Communicate real-world problems graphically, algebraically, numerically, and verbally.</li> </ol>

\*The Content Standards and Student Learning Expectations listed are those that specifically relate to the items in the 2014 Mid-Year and Spring End-of-Course Algebra I Examinations.

## PART III CURRICULUM FRAMEWORK

### 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.	<ol style="list-style-type: none"> <li>1. Distinguish between functions and nonfunctions/relations by inspecting graphs, ordered pairs, mapping diagrams, and/or tables of data.</li> <li>2. Determine domain and range of a relation from an algebraic expression, graphs, set of ordered pairs, or table of data.</li> <li>3. Know and/or use function notation, including evaluating functions for given values in their domain.</li> <li>4. Identify independent variables and dependent variables in various representational modes: words, symbols, and/or graphs.</li> <li>5. Interpret the rate of change/slope and intercepts within the context of everyday life. Ex. telephone charges based on base rate (<math>y</math>-intercept) plus rate per minute (slope)</li> <li>6. Calculate the slope given.               <ul style="list-style-type: none"> <li>• two points</li> <li>• the graph of a line</li> <li>• the equation of a line</li> </ul> </li> <li>7. Determine by using slope whether a pair of lines are parallel, perpendicular, or neither.</li> <li>8. Write an equation in slope-intercept, point-slope, and standard forms, given               <ul style="list-style-type: none"> <li>• two points</li> <li>• a point and <math>y</math>-intercept</li> <li>• <math>x</math>-intercept and <math>y</math>-intercept</li> <li>• a point and slope</li> <li>• a table of data</li> <li>• the graph of a line</li> </ul> </li> <li>9. Describe the effects of parameter changes, slope, and/or <math>y</math>-intercepts, on graphs of linear functions and vice versa.</li> </ol>
4. NON-LINEAR FUNCTIONS (NLF)	4. Students will compare the properties in the family of functions.	<ol style="list-style-type: none"> <li>1. Factor polynomials.               <ul style="list-style-type: none"> <li>• greatest common factor</li> <li>• binomials (difference of squares)</li> <li>• trinomials</li> </ul> </li> <li>2. Determine minimum, maximum, vertex, and zeros, given the graph.</li> <li>3. Solve quadratic equations using the appropriate methods with and without technology.               <ul style="list-style-type: none"> <li>• factoring</li> <li>• quadratic formula with real-number solutions</li> </ul> </li> <li>4. Recognize function families and their connections, including vertical shift and reflection over the <math>x</math>-axis.               <ul style="list-style-type: none"> <li>• quadratics (with rational coefficients)</li> <li>• absolute value</li> <li>• exponential functions</li> </ul> </li> <li>5. Communicate real-world problems graphically, algebraically, numerically, and verbally.</li> </ol>

\*The Content Standards and Student Learning Expectations listed are those that specifically relate to the items in the 2014 Mid-Year and Spring End-of-Course Algebra I Examinations.

**The Arkansas Algebra I Mathematics Curriculum Framework\***

<b>Strands</b>	<b>Content Standards</b>	<b>Student Learning Expectations</b>
5. DATA INTERPRETATION AND PROBABILITY (DIP)	5. Students will compare various methods of reporting data to make inferences or predictions.	<ol style="list-style-type: none"> <li>1. Construct and use scatterplots and line of best fit to make inferences in real-life situations.</li> <li>2. Use simple matrices in addition, subtraction, and scalar multiplication.</li> <li>3. Construct simple matrices for real-life situations.</li> <li>4. Determine the effects of changes in the data set on the measures of central tendency.</li> <li>5. Use two or more graphs (i.e., box-and-whisker, histograms, scatter plots) to compare data.</li> <li>6. Construct and interpret a cumulative frequency histogram in real-life situations.</li> <li>7. Recognize linear functions and non-linear functions by using a table or a graph.</li> <li>8. Compute simple probability with and without replacement.</li> <li>9. Recognize patterns using explicitly defined and recursively defined linear functions.</li> <li>10. Communicate real-world problems graphically, algebraically, numerically, and verbally.</li> <li>11. Explain how sampling methods, bias, and phrasing of questions in data collection impact the conclusions.</li> <li>12. Recognize when arguments based on data confuse correlation with causation.</li> </ol>

\*The Content Standards and Student Learning Expectations listed are those that specifically relate to the items in the 2014 Mid-Year and Spring End-of-Course Algebra I Examinations.

## PART IV ITEM CORRELATION WITH CURRICULUM FRAMEWORK

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

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

## PART IV ITEM CORRELATION WITH CURRICULUM FRAMEWORK

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

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

## PART IV ITEM CORRELATION WITH CURRICULUM FRAMEWORK

### 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.

Strand	Content Standard	Student Learning Expectation
LA	1	5
NLF	4	1
DIP	5	1
LF	3	7
SEI	2	3
LF	3	1
DIP	5	8
NLF	4	4
LA	1	2
LA	1	6
SEI	2	1
LF	3	8
SEI	2	6
DIP	5	9
SEI	2	4
LA	1	2
LA	1	9
LA	1	4
NLF	4	1
LA	1	1
LF	3	5
DIP	5	4
NLF	4	4
DIP	5	6
SEI	2	5
NLF	4	5
NLF	4	2
LF	3	6
SEI	2	1
LF	3	3
DIP	5	11
NLF	4	2
LF	3	5

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

## PART IV ITEM CORRELATION WITH CURRICULUM FRAMEWORK

### 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.

Strand	Content Standard	Student Learning Expectation
DIP	5	12
SEI	2	4
LA	1	7
LA	1	5
NLF	4	1
LF	3	2
SEI	2	2
SEI	2	1
DIP	5	3
NLF	4	2
LF	3	8
SEI	2	8
NLF	4	4
DIP	5	5
LF	3	9
NLF	4	3
LA	1	3
NLF	4	1
LF	3	4
DIP	5	7
LA	1	2
LA	1	1
SEI	2	5
LF	3	6
DIP	5	2
LA	1	8
SEI	2	3
NLF	4	5
LF	3	3
DIP	5	10
DIP	5	4
SEI	2	8

\*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-13268 Alg-RIB AR1404



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