Introduction - Algebra I

The following released test questions are taken from the Algebra I Standards Test. This test is one of the California Standards Tests administered as part of the Standardized Testing and Reporting (STAR) Program under policies set by the State Board of Education.

All questions on the California Standards Tests are evaluated by committees of content experts, including teachers and administrators, to ensure their appropriateness for measuring the California academic content standards in Algebra I. In addition to content, all items are reviewed and approved to ensure their adherence to the principles of fairness and to ensure no bias exists with respect to characteristics such as gender, ethnicity, and language.

This document contains released test questions from the California Standards Test forms in 2003 and 2004. First on the pages that follow are lists of the standards assessed on the Algebra I Test. Next are released test questions. Following the questions is a table that gives the correct answer for each question, the content standard that each question is measuring, and the year each question last appeared on the test.

The following table lists each reporting cluster, the number of items that appear on the exam, and the number of released test questions that appear in this document. Some of the released test questions for Algebra I are the same test questions found in different combinations on the Integrated Mathematics 1 and 2 California Standards Tests and the Summative High School Mathematics California Standards Test.

<table>
<thead>
<tr>
<th>REPORTING CLUSTER</th>
<th>NUMBER OF QUESTIONS ON EXAM</th>
<th>NUMBER OF RELEASED TEST QUESTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Properties, Operations, and Linear Equations</td>
<td>17</td>
<td>8</td>
</tr>
<tr>
<td>Graphing and Systems of Linear Equations</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>Quadratics and Polynomials</td>
<td>21</td>
<td>10</td>
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<tr>
<td>Functions and Rational Expressions</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>65</td>
<td>32</td>
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</table>

In selecting test questions for release, three criteria are used: (1) the questions adequately cover a selection of the academic content standards assessed on the Algebra I Test; (2) the questions demonstrate a range of difficulty; and (3) the questions present a variety of ways standards can be assessed. These released test questions do not reflect all of the ways the standards may be assessed. Released test questions will not appear on future tests.

For more information about the California Standards Tests, visit the California Department of Education’s Web site at http://www.cde.ca.gov/ta/tg/sr/resources.asp.
THE NUMBER PROPERTIES, OPERATIONS, AND LINEAR EQUATIONS
REPORTING CLUSTER

The following 11 California content standards are included in the Number Properties, Operations, and Linear Equations reporting cluster and are represented in this booklet by eight test questions. These questions represent only some ways in which these standards may be assessed on the Algebra I California Mathematics Standards Test.

CALIFORNIA CONTENT STANDARDS IN THIS REPORTING CLUSTER

<table>
<thead>
<tr>
<th>Algebra I</th>
<th>Standard Set 1.0</th>
<th>Students identify and use the arithmetic properties of subsets of integers and rational, irrational, and real numbers, including closure properties for the four basic arithmetic operations where applicable:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.1</td>
<td>Students use properties of numbers to demonstrate whether assertions are true or false.</td>
</tr>
<tr>
<td></td>
<td>2.0*</td>
<td>Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents.</td>
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<tr>
<td></td>
<td>3.0</td>
<td>Students solve equations and inequalities involving absolute values.</td>
</tr>
<tr>
<td></td>
<td>4.0*</td>
<td>Students simplify expressions prior to solving linear equations and inequalities in one variable, such as $3(2x - 5) + 4(x - 2) = 12$.</td>
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<tr>
<td></td>
<td>5.0*</td>
<td>Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.</td>
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</table>

<table>
<thead>
<tr>
<th>Standard Set 24.0</th>
<th>Students use and know simple aspects of a logical argument:</th>
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<tbody>
<tr>
<td>24.1</td>
<td>Students explain the difference between inductive and deductive reasoning and identify and provide examples of each.</td>
</tr>
<tr>
<td>24.2</td>
<td>Students identify the hypothesis and conclusion in logical deduction.</td>
</tr>
<tr>
<td>24.3</td>
<td>Students use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion.</td>
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</table>

<table>
<thead>
<tr>
<th>Standard Set 25.0</th>
<th>Students use properties of the number system to judge the validity of results, to justify each step of a procedure, and to prove or disprove statements:</th>
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</thead>
<tbody>
<tr>
<td>25.1</td>
<td>Students use properties of numbers to construct simple, valid arguments (direct and indirect) for, or formulate counterexamples to, claimed assertions.</td>
</tr>
<tr>
<td>25.2</td>
<td>Students judge the validity of an argument according to whether the properties of the real number system and the order of operations have been applied correctly at each step.</td>
</tr>
<tr>
<td>25.3</td>
<td>Given a specific algebraic statement involving linear, quadratic, or absolute value expressions or equations or inequalities, students determine whether the statement is true sometimes, always, or never.</td>
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</tbody>
</table>

* Denotes key standards
THE GRAPHING AND SYSTEMS OF LINEAR EQUATIONS REPORTING CLUSTER

The following four California content standards are included in the Graphing and Systems of Linear Equations reporting cluster and are represented in this booklet by eight test questions. These questions represent only some ways in which these standards may be assessed on the Algebra I California Mathematics Standards Test.

CALIFORNIA CONTENT STANDARDS IN THIS REPORTING CLUSTER

<table>
<thead>
<tr>
<th>Algebra I</th>
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<tr>
<td>6.0*</td>
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<tr>
<td>7.0*</td>
</tr>
<tr>
<td>8.0</td>
</tr>
<tr>
<td>9.0*</td>
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</tbody>
</table>

* Denotes key standards
THE QUADRATICS AND POLYNOMIALS REPORTING CLUSTER

The following eight California content standards are included in the Quadratics and Polynomials reporting cluster and are represented in this booklet by 10 test questions. These questions represent only some ways in which these standards may be assessed on the Algebra I California Mathematics Standards Test.

CALIFORNIA CONTENT STANDARDS IN THIS REPORTING CLUSTER

<table>
<thead>
<tr>
<th>Algebra I</th>
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<tbody>
<tr>
<td>10.0*</td>
<td>Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.</td>
</tr>
<tr>
<td>11.0</td>
<td>Students apply basic factoring techniques to second- and simple third-degree polynomials. These techniques include finding a common factor for all terms in a polynomial, recognizing the difference of two squares, and recognizing perfect squares of binomials.</td>
</tr>
<tr>
<td>14.0*</td>
<td>Students solve a quadratic equation by factoring or completing the square.</td>
</tr>
<tr>
<td>19.0*</td>
<td>Students know the quadratic formula and are familiar with its proof by completing the square.</td>
</tr>
<tr>
<td>20.0*</td>
<td>Students use the quadratic formula to find the roots of a second-degree polynomial and to solve quadratic equations.</td>
</tr>
<tr>
<td>21.0*</td>
<td>Students graph quadratic functions and know that their roots are the x-intercepts.</td>
</tr>
<tr>
<td>22.0</td>
<td>Students use the quadratic formula or factoring techniques or both to determine whether the graph of a quadratic function will intersect the x-axis in zero, one, or two points.</td>
</tr>
<tr>
<td>23.0*</td>
<td>Students apply quadratic equations to physical problems, such as the motion of an object under the force of gravity.</td>
</tr>
</tbody>
</table>

* Denotes key standards
THE FUNCTIONS AND RATIONAL EXPRESSIONS REPORTING CLUSTER

The following six California content standards are included in the Functions and Rational Expressions reporting cluster and are represented in this booklet by six test questions. These questions represent only some ways in which these standards may be assessed on the Algebra I California Mathematics Standards Test.

| Algebra I |  
|------------|-------------------------------------------------|
| 12.0*      | Students simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms. |
| 13.0*      | Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques. |
| 15.0*      | Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems. |
| 15.0       | Students understand the concepts of a relation and a function, determine whether a given relation defines a function, and give pertinent information about given relations and functions. |
| 17.0       | Students determine the domain of independent variables and the range of dependent variables defined by a graph, a set of ordered pairs, or a symbolic expression. |
| 18.0       | Students determine whether a relation defined by a graph, a set of ordered pairs, or a symbolic expression is a function and justify the conclusion. |

* Denotes key standards
### Algebra I

**1** \[ \sqrt{16} + \sqrt{8} = \]
- A 4
- B 6
- C 9
- D 10

**5** The total cost \((c)\) in dollars of renting a sailboat for \(n\) days is given by the equation
\[
c = 120 + 60n.
\]
If the total cost was $360, for how many days was the sailboat rented?
- A 2
- B 4
- C 6
- D 8

**2** What is the solution for this equation?
\[
|2x - 3| = 5
\]
- A \(x = -4\) or \(x = 4\)
- B \(x = -4\) or \(x = 3\)
- C \(x = -1\) or \(x = 4\)
- D \(x = -1\) or \(x = 3\)

**6** Solve:
\[
3(x + 5) = 2x + 35
\]
Step 1: \(3x + 15 = 2x + 35\)
Step 2: \(5x + 15 = 35\)
Step 3: \(5x = 20\)
Step 4: \(x = 4\)

Which is the first *incorrect* step in the solution shown above?
- A Step 1
- B Step 2
- C Step 3
- D Step 4

**3** What is the solution set of the inequality
\[
5 - |x + 4| \leq -3
\]
- A \(-2 \leq x \leq 6\)
- B \(x \leq -2\) or \(x \geq 6\)
- C \(-12 \leq x \leq 4\)
- D \(x \leq -12\) or \(x \geq 4\)

**7** A 120-foot-long rope is cut into 3 pieces. The first piece of rope is twice as long as the second piece of rope. The third piece of rope is three times longer than the second piece of rope. What is the length of the longest piece of rope?
- A 20 feet
- B 40 feet
- C 60 feet
- D 80 feet
8. Which number serves as a counterexample to the statement below?

All positive integers are divisible by 2 or 3.

A. 100
B. 57
C. 30
D. 25

9. What is the y-intercept of the graph of \(4x + 2y = 12\)?

A. \(-4\)
B. \(-2\)
C. 6
D. 12

10. Which inequality is shown on the graph below?

A. \(y < \frac{1}{2}x - 1\)
B. \(y \leq \frac{1}{2}x - 1\)
C. \(y > \frac{1}{2}x - 1\)
D. \(y \geq \frac{1}{2}x - 1\)
Algebra I

11 Which point lies on the line defined by $3x + 6y = 2$?

A $(0, 2)$

B $(0, 6)$

C $\left(1, -\frac{1}{6}\right)$

D $\left(1, -\frac{1}{3}\right)$

12 What is the equation of the line that has a slope of 4 and passes through the point $(3, -10)$?

A $y = 4x - 22$

B $y = 4x + 22$

C $y = 4x - 43$

D $y = 4x + 43$

13 The equation of line $l$ is $6x + 5y = 3$, and the equation of line $q$ is $5x - 6y = 0$. Which statement about the two lines is true?

A Lines $l$ and $q$ have the same $y$-intercept.

B Lines $l$ and $q$ are parallel.

C Lines $l$ and $q$ have the same $x$-intercept.

D Lines $l$ and $q$ are perpendicular.

14 Which equation represents a line that is parallel to $y = -\frac{5}{4}x + 2$?

A $y = -\frac{5}{4}x + 1$

B $y = -\frac{4}{5}x + 2$

C $y = \frac{4}{5}x + 3$

D $y = \frac{5}{4}x + 4$
15 Which graph best represents the solution to this system of inequalities?

\[
\begin{align*}
2x & \geq y - 1 \\ 2x - 5y & \leq 10
\end{align*}
\]

A

\[
\begin{align*}
y & = -3x - 2 \\ 6x + 2y & = -4
\end{align*}
\]

A (6, 2)

B (1, -5)

C no solution

D infinitely many solutions

17 Which is a factor of \( x^2 - 11x + 24? \)

\[
\begin{align*}
5x^3 & = \frac{10x^7}{5x^4}
\end{align*}
\]

A \( 2x^4 \)

B \( \frac{1}{2x^4} \)

C \( \frac{1}{5x^4} \)

D \( x^4 \)

18 What is the factored form of \( 3a^2 - 24ab + 48b^2? \)

A \( (3a - 8b)(a - 6b) \)

B \( (3a - 16b)(a - 3b) \)

C \( 3(a - 4b)(a - 4b) \)

D \( 3(a - 8b)(a - 8b) \)

19 What is the solution to this system of equations?

\[
\begin{align*}
y & = -3x - 2 \\ 6x + 2y & = -4
\end{align*}
\]

A (6, 2)

B (1, -5)

C no solution

D infinitely many solutions
20 If $x^2$ is added to $x$, the sum is 42. Which of the following could be the value of $x$?

A $-7$
B $-6$
C 14
D 42

21 Toni is solving this equation by completing the square.

$$ax^2 + bx + c = 0 \text{ (where } a \neq 0)$$

Step 1: $ax^2 + bx = -c$
Step 2: $x^2 + \frac{b}{a}x = -\frac{c}{a}$
Step 3: ?

Which should be Step 3 in the solution?

A $x^2 = -\frac{c}{b} - \frac{b}{a}x$
B $x + \frac{b}{a} = -\frac{c}{ax}$
C $x^2 + \frac{b}{a}x + \frac{b}{2a} = -\frac{c}{a} + \frac{b}{2a}$
D $x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2 = -\frac{c}{a} + \left(\frac{b}{2a}\right)^2$

22 Which is one of the solutions to the equation $2x^2 - x - 4 = 0$?

A $\frac{1}{4} - \sqrt{33}$
B $\frac{1}{4} + \sqrt{33}$
C $\frac{1 + \sqrt{33}}{4}$
D $\frac{-1 - \sqrt{33}}{4}$

23 The graph of the equation $y = x^2 - 3x - 4$ is shown below.

For what value or values of $x$ is $y = 0$?

A $x = -1$ only
B $x = -4$ only
C $x = -1$ and $x = 4$
D $x = 1$ and $x = -4$
24. How many times does the graph of $y = 2x^2 - 2x + 3$ intersect the x-axis?
   A. none  
   B. one  
   C. two  
   D. three

25. An object that is projected straight downward with initial velocity $v$ feet per second travels a distance $s = vt + 16t^2$, where $t$ = time in seconds. If Ramón is standing on a balcony 84 feet above the ground and throws a penny straight down with an initial velocity of 10 feet per second, in how many seconds will it reach the ground?
   A. 2 seconds  
   B. 3 seconds  
   C. 6 seconds  
   D. 8 seconds

26. The height of a triangle is 4 inches greater than twice its base. The area of the triangle is 168 square inches. What is the base of the triangle?
   A. 7 in.  
   B. 8 in.  
   C. 12 in.  
   D. 14 in.

27. What is $\frac{x^2 - 4xy + 4y^2}{3xy - 6y^2}$ reduced to lowest terms?
   A. $\frac{x - 2y}{3}$  
   B. $\frac{x - 2y}{3y}$  
   C. $\frac{x + 2y}{3}$  
   D. $\frac{x + 2y}{3y}$

28. $\frac{7z^2 + 7z}{4z + 8} \cdot \frac{z^2 - 4}{z^3 + 2z^2 + z}$
   A. $\frac{7(z - 2)}{4(z + 1)}$  
   B. $\frac{7(z + 2)}{4(z - 1)}$  
   C. $\frac{7z(z + 1)}{4(z + 2)}$  
   D. $\frac{7z(z - 1)}{4(z + 2)}
29 A pharmacist mixed some 10%-saline solution with some 15%-saline solution to obtain 100 mL of a 12%-saline solution. How much of the 10%-saline solution did the pharmacist use in the mixture?
A 60 mL
B 45 mL
C 40 mL
D 25 mL

30 Andy’s average driving speed for a 4-hour trip was 45 miles per hour. During the first 3 hours he drove 40 miles per hour. What was his average speed for the last hour of his trip?
A 50 miles per hour
B 60 miles per hour
C 65 miles per hour
D 70 miles per hour

31 Which relation is a function?
A \{(-1, 3), (-2, 6), (0, 0), (-2, -2)\}
B \{(-2, -2), (0, 0), (1, 1), (2, 2)\}
C \{(4, 0), (4, 1), (4, 2), (4, 3)\}
D \{(7, 4), (8, 8), (10, 8), (10, 10)\}

32 For which equation graphed below are all the y-values negative?
## Released Test Questions

### Algebra I

<table>
<thead>
<tr>
<th>Question Number</th>
<th>Correct Answer</th>
<th>Standard</th>
<th>Year of Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B</td>
<td>2.0</td>
<td>2003</td>
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<tr>
<td>2</td>
<td>C</td>
<td>3.0</td>
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<td>3</td>
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