Introduction - Algebra II

The following released test questions are taken from the Algebra II 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 II. 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 II 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 II are the same test questions found in different combinations on the Integrated Mathematics 2 and 3 California Standards Tests and the Summative High School Mathematics California Standards Test.

REPORTING CLUSTER	NUMBER OF QUESTIONS ON EXAM	NUMBER OF RELEASED TEST QUESTIONS
Polynomials and Rational Expressions	19	8
Quadratics, Conics, and Complex Numbers	17	10
Exponents and Logarithms	15	10
Series, Combinatorics, and Probability and Statistics	14	4
TOTAL	65	32

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 II 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 POLYNOMIALS AND RATIONAL EXPRESSIONS REPORTING CLUSTER

The following five California content standards are included in the Polynomials and Rational Expressions 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 II California Mathematics Standards Test.

CALIFORNIA CONTENT STANDARDS IN THIS REPORTING CLUSTER

Algebra II	
1.0*	Students solve equations and inequalities involving absolute value.
2.0*	Students solve systems of linear equations and inequalities (in two or three variables) by substitution, with graphs, or with matrices.
3.0*	Students are adept at operations on polynomials, including long division.
4.0*	Students factor polynomials representing the difference of squares, perfect square trinomials, and the sum and difference of two cubes.
7.0*	Students add, subtract, multiply, divide, reduce, and evaluate rational expressions with monomial and polynomial denominators and simplify complicated rational expressions, including those with negative exponents in the denominator.

* Denotes key standards

THE QUADRATICS, CONICS, AND COMPLEX NUMBERS REPORTING CLUSTER

The following seven California content standards are included in the Quadratics, Conics, and Complex Numbers 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 II California Mathematics Standards Test.

CALIFORNIA CONTENT STANDARDS IN THIS REPORTING CLUSTER

Algebra II	
5.0*	Students demonstrate knowledge of how real and complex numbers are related both arithmetically and graphically. In particular, they can plot complex numbers as points in the plane.
6.0*	Students add, subtract, multiply, and divide complex numbers.
8.0*	Students solve and graph quadratic equations by factoring, completing the square, or using the quadratic formula. Students apply these techniques in solving word problems. They also solve quadratic equations in the complex number system.
9.0*	Students demonstrate and explain the effect that changing a coefficient has on the graph of quadratic functions; that is, students can determine how the graph of a parabola changes as a, b, and c vary in the equation $y = a(x - b)^2 + c$.
10.0*	Students graph quadratic functions and determine the maxima, minima, and zeros of the function.
16.0	Students demonstrate and explain how the geometry of the graph of a conic section (e.g., asymptotes, foci, eccentricity) depends on the coefficients of the quadratic equation representing it.
17.0	Given a quadratic equation of the form $ax^2 + by^2 + cx + dy + e = 0$, students can use the method for completing the square to put the equation into standard form and can recognize whether the graph of the equation is a circle, ellipse, parabola, or hyperbola. Students can then graph the equation.

* Denotes key standards

THE EXPONENTS AND LOGARITHMS REPORTING CLUSTER

The following six California content standards are included in the Exponents and Logarithms 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 II California Mathematics Standards Test.

CALIFORNIA CONTENT STANDARDS IN THIS REPORTING CLUSTER

Algebra II	
Standard Set 11.0*	**Students prove simple laws of logarithms.**
11.1*	Students understand the inverse relationship between exponents and logarithms, and use this relationship to solve problems involving logarithms and exponents.
11.2*	Students judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step.
12.0*	Students know the laws of fractional exponents, understand exponential functions, and use these functions in problems involving exponential growth and decay.
13.0	Students use the definition of logarithms to translate between logarithms in any base.
14.0	Students understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values.
15.0*	Students determine whether a specific algebraic statement involving rational expressions, radical expressions, or logarithmic or exponential functions is sometimes true, always true, or never true.

* Denotes key standards

THE SERIES, COMBINATORICS, AND PROBABILITY AND STATISTICS REPORTING CLUSTER

The following 10 California content standards are included in the Series, Combinatorics, and Probability and Statistics reporting cluster and are represented in this booklet by four test questions. These questions represent only some ways in which these standards may be assessed on the Algebra II California Mathematics Standards Test.

CALIFORNIA CONTENT STANDARDS IN THIS REPORTING CLUSTER

Algebra II	
18.0*	Students use fundamental counting principles to compute combinations and permutations.
19.0*	Students use combinations and permutations to compute probabilities.
20.0*	Students know the binomial theorem and use it to expand binomial expressions that are raised to positive integer powers.
21.0	Students apply the method of mathematical induction to prove general statements about the positive integers.
22.0	Students find the general term and the sums of arithmetic series and of both finite and infinite geometric series.
24.0	Students solve problems involving functional concepts, such as composition, defining the inverse function and performing arithmetic operations on functions.
25.0	Students use properties from number systems to justify steps in combining and simplifying functions.
Probability and Statistics	
PS1.0	Students know the definition of the notion of *independent events* and can use the rules for addition, multiplication, and complementation to solve for probabilities of particular events in finite sample spaces.
PS2.0	Students know the definition of *conditional probability* and use it to solve for probabilities in finite sample spaces.
PS7.0	Students compute the variance and the standard deviation of a distribution of data.

* Denotes key standards

Algebra II

Released Test Questions

1 **What is the complete solution to the equation $|3-6x|=15$?**

A $x=2; x=3$

B $x=-2; x=3$

C $x=2; x=-3$

D $x=-2; x=-3$

2 **For a wedding, Shereda bought several dozen roses and several dozen carnations. The roses cost $15 per dozen, and the carnations cost $8 per dozen. Shereda bought a total of 17 dozen flowers and paid a total of $192. How many roses did she buy?**

A 6 dozen

B 7 dozen

C 8 dozen

D 9 dozen

3 **What is the solution to the system of equations shown below?**

$$\begin{cases} 2x-y+3z=8 \\ x-6y-z=0 \\ -6x+3y-9z=24 \end{cases}$$

A $(0, 4, 4)$

B $\left(1, 4, \frac{10}{3}\right)$

C no solution

D infinitely many solutions

4 $2x+7\overline{)2x^4+21x^3+35x^2-37x+46}$

A $x^3+7x^2-7x+6-\frac{4}{2x+7}$

B $2x^3+14x^2-14x+12-\frac{4}{2x+7}$

C $x^3-7x^2+7x-6+\frac{4}{2x+7}$

D $x^3+7x^2-7x+6+\frac{4}{2x+7}$

5 **Which polynomial represents $(3x^2+x-4)(2x-5)$?**

A $6x^3-13x^2-13x-20$

B $6x^3-13x^2-13x+20$

C $6x^3+13x^2+3x-20$

D $6x^3+13x^2+3x+20$

6 $8a^3 + c^3 =$

A $(2a + c)(2a + c)(2a + c)$

B $(2a - c)(4a^2 + 2ac + c^2)$

C $(2a - c)(4a^2 + 4ac + c^2)$

D $(2a + c)(4a^2 - 2ac + c^2)$

7 $\dfrac{x+3}{x+5}+\dfrac{6}{x^2+3x-10}=$

A $\dfrac{x^2+x}{x^2+3x-10}$

B $\dfrac{7x-9}{x^2+3x-10}$

C $\dfrac{x^2+x+12}{x^2+3x-10}$

D $\dfrac{x^2+x+1}{x^2+3x-10}$

8 **Which is a simplified form of $\dfrac{3a^2b^3c^{-2}}{(a^{-1}b^2c)^3}$?**

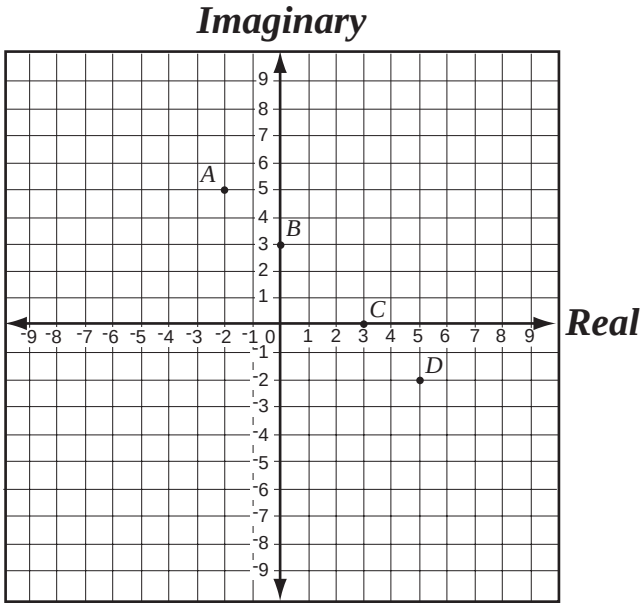
A $\dfrac{3a^5}{b^3c^5}$

B $\dfrac{3ab}{c^5}$

C $\dfrac{3}{b^2c^5}$

D $\dfrac{3}{ab^3c^5}$

9 **If $i=\sqrt{-1}$, which point shows the location of $5-2i$ on the plane?**



A point A

B point B

C point C

D point D

10 **If $i=\sqrt{-1}$, then $4i(6i)=$**

A 48

B 24

C -24

D -48

11 **What is an equivalent form of $\frac{2}{3+i}$?**

A $\frac{3-i}{4}$

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

C $\frac{4-i}{4}$

D $\frac{4-i}{5}$

12 **What are the solutions to the equation $x^2 + 2x + 2 = 0$?**

A $x = 0;\ x = -2$

B $x = 0;\ x = -2i$

C $x = -1 + i;\ x = -1 - i$

D $x = -1 + 2\sqrt{2};\ x = -1 - 2\sqrt{2}$

13 **What are the solutions to the equation $1 + \frac{1}{x^2} = \frac{3}{x}$?**

A $x = \frac{3}{2} + \frac{\sqrt{5}}{2};\ x = \frac{3}{2} - \frac{\sqrt{5}}{2}$

B $x = 3 + \frac{\sqrt{5}}{2};\ x = 3 - \frac{\sqrt{5}}{2}$

C $x = \frac{3}{2} + \frac{\sqrt{13}}{2};\ x = \frac{3}{2} - \frac{\sqrt{13}}{2}$

D $x = 3 + \frac{\sqrt{13}}{2};\ x = 3 - \frac{\sqrt{13}}{2}$

14 **Which of the following *most* accurately describes the translation of the graph $y = (x+3)^2 - 2$ to the graph of $y = (x-2)^2 + 2$?**

A up 4 and 5 to the right

B down 2 and 2 to the right

C down 2 and 3 to the left

D up 4 and 2 to the left

15 **What are the x-intercepts of the graph of $y = 12x^2 - 5x - 2$?**

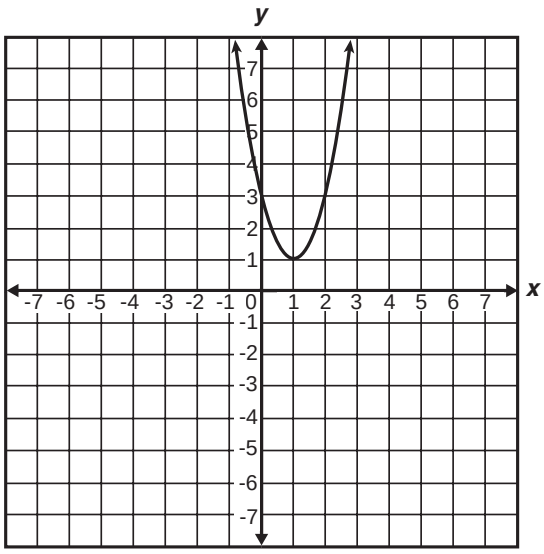
A 1 and $-\frac{1}{6}$

B -1 and $\frac{1}{6}$

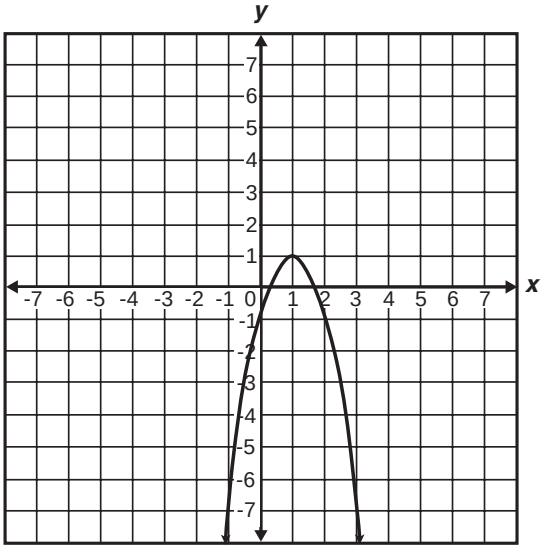
C $\frac{2}{3}$ and $-\frac{1}{4}$

D $-\frac{2}{3}$ and $\frac{1}{4}$

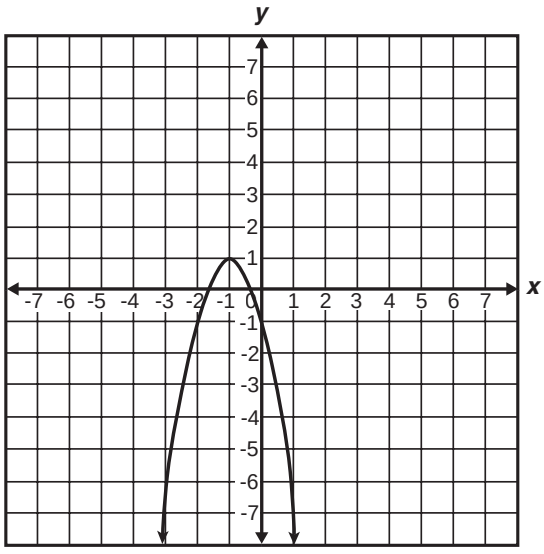
16 **Which is the graph of $y = -2(x-1)^2 + 1$?**



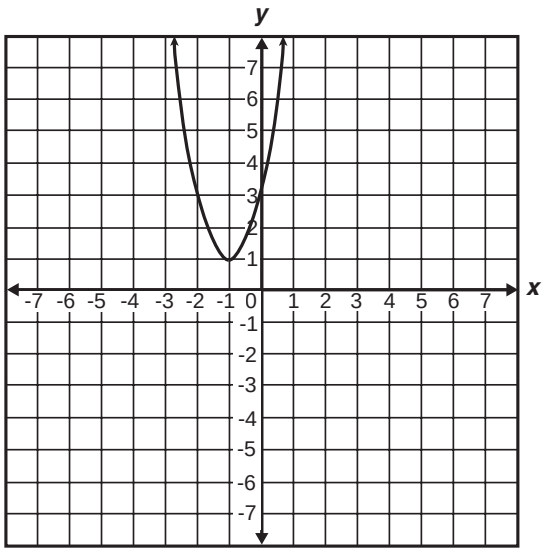
A



C



B



D

17 **The graph of $\left(\frac{x}{2}\right)^2 - \left(\frac{y}{3}\right)^2 = 1$ is a hyperbola.**

Which set of equations represents the asymptotes of the hyperbola's graph?

A $y = \frac{3}{2}x, y = -\frac{3}{2}x$

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

C $y = \frac{1}{2}x, y = -\frac{1}{2}x$

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

18 $$4x^2 - 5y^2 - 16x - 30y - 9 = 0$$

What is the standard form of the equation of the conic given above?

A $\frac{(x-4)^2}{11} - \frac{(y-3)^2}{4} = 1$

B $\frac{(y+3)^2}{4} - \frac{(x-2)^2}{5} = 1$

C $\frac{(y-3)^2}{6} - \frac{(x+2)^2}{9} = 1$

D $\frac{(x-4)^2}{11} + \frac{(y-3)^2}{4} = 1$

19 **What is the solution to the equation $5^x = 17$?**

A $x = 2$

B $x = \log_{10} 2$

C $x = \log_{10} 17 + \log_{10} 5$

D $x = \frac{\log_{10} 17}{\log_{10} 5}$

20 **If $\log_{10} x = -2$, what is the value of x?**

A $x = -\sqrt{\frac{1}{10}}$

B $x = \sqrt{\frac{1}{10}}$

C $x = \frac{1}{100}$

D $x = 100$

21 **Which is the first *incorrect* step in simplifying $\log_4 \frac{4}{64}$?**

Step 1: $\log_4 \frac{4}{64} = \log_4 4 - \log_4 64$

Step 2: $= 1 - 16$

Step 3: $= -15$

A Step 1

B Step 2

C Step 3

D Each step is correct.

---

22 **A certain radioactive element decays over time according to the equation $y = A\left(\frac{1}{2}\right)^{\frac{t}{300}}$, where A = the number of grams present initially and t = time in years. If 1000 grams were present initially, how many grams will remain after 900 years?**

A 500 grams

B 250 grams

C 125 grams

D 62.5 grams

23 **Bacteria in a culture are growing exponentially with time, as shown in the table below.**

Bacteria Growth

Day	Bacteria
0	100
1	200
2	400

Which of the following equations expresses the number of bacteria, y, present at any time, t?

A $y = 100 + 2^t$

B $y = (100) \cdot (2)^t$

C $y = 2^t$

D $y = (200) \cdot (2)^t$

---

24 $\log_6 40 =$

A $\log_{10} 6 + \log_{10} 40$

B $\log_{10} 6 - \log_{10} 40$

C $(\log_{10} 6)(\log_{10} 40)$

D $\frac{\log_{10} 40}{\log_{10} 6}$

25 **What is the value of $\log_3 27$?**

A 2

B 3

C 6

D 9

---

26 **If $\log 2 \approx 0.301$ and $\log 3 \approx 0.477$, what is the approximate value of $\log 72$?**

A 0.051

B 0.778

C 0.861

D 1.857

---

27 **If x is a real number, for what values of x is the equation $\frac{3x-9}{3} = x-3$ true?**

A all values of x

B some values of x

C no values of x

D impossible to determine

---

28 **On a recent test, Jeremy wrote the equation $\frac{x^2-16}{x-4} = x+4$. Which of the following statements is correct about the equation he wrote?**

A The equation is always true.

B The equation is always true, except when $x = 4$.

C The equation is never true.

D The equation is sometimes true when $x = 4$.

---

29 $(3y - 1)^4 =$

A $81y^4 - 108y^3 + 54y^2 - 12y + 1$

B $81y^4 + 108y^3 - 54y^2 - 12y + 1$

C $81y^4 - 54y^3 - 108y^2 - 12y + 1$

D $81y^4 + 54y^3 - 108y^2 - 12y + 1$

---

30 **If $f(x) = x^2 + 2x + 1$ and $g(x) = 3(x+1)^2$, which is an equivalent form of $f(x) + g(x)$?**

A $x^2 + 4x + 2$

B $4x^2 + 2x + 4$

C $4x^2 + 8x + 4$

D $10x^2 + 20x + 10$

31 **A math teacher is randomly distributing 15 rulers with centimeter labels and 10 rulers without centimeter labels. What is the probability that the first ruler she hands out will have centimeter labels and the second ruler will *not* have labels?**

A $\frac{1}{24}$

B $\frac{1}{4}$

C $\frac{2}{5}$

D $\frac{23}{25}$

32 **A box contains 7 large red marbles, 5 large yellow marbles, 3 small red marbles, and 5 small yellow marbles. If a marble is drawn at random, what is the probability that it is yellow, given that it is one of the large marbles?**

A $\frac{5}{12}$

B $\frac{7}{20}$

C $\frac{5}{8}$

D $\frac{1}{5}$

Algebra II

Released Test Questions

Question Number	Correct Answer	Standard	Year of Test
1	*B*	1.0	2004
2	*C*	2.0	2003
3	*C*	2.0	2004
4	*D*	3.0	2003
5	*B*	3.0	2004
6	*D*	4.0	2003
7	*A*	7.0	2003
8	*A*	7.0	2004
9	*D*	5.0	2003
10	*C*	6.0	2003
11	*B*	6.0	2004
12	*C*	8.0	2003
13	*A*	8.0	2004
14	*A*	9.0	2004
15	*C*	10.0	2003
16	*C*	10.0	2004
17	*A*	16.0	2004
18	*B*	17.0	2003
19	*D*	11.1	2003
20	*C*	11.1	2004
21	*B*	11.2	2003
22	*C*	12.0	2003
23	*B*	12.0	2004
24	*D*	13.0	2004
25	*B*	14.0	2003
26	*D*	14.0	2004
27	*A*	15.0	2003
28	*B*	15.0	2004
29	*A*	20.0	2003
30	*C*	25.0	2004
31	*B*	PS1.0	2004
32	*A*	PS2.0	2003