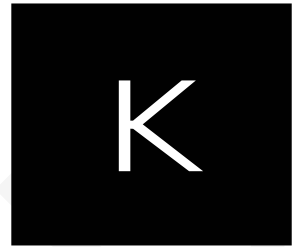


Name

RELEASED FORM

Algebra II

Form K



North Carolina Test of Algebra II

Public Schools of North Carolina
www.ncpublicschools.org
State Board of Education
Department of Public Instruction
Division of Accountability Services/North Carolina Testing Program
Raleigh, North Carolina 27699-6314



1. Which expression is equivalent to

$$\frac{2x + 6}{x^2 + 2x - 24} \cdot \frac{x^2 + 2x - 24}{x^2 - 7x + 12}?$$

A $\frac{2}{x - 4}$

B $\frac{2(x + 3)}{x - 3}$

C $\frac{2(x + 3)}{(x - 4)(x - 3)}$

D $\frac{2(x + 3)}{(x + 4)(x - 3)}$

2. Which expression is equivalent to

$$\frac{x + 3}{6x - 3} \div \frac{x^2 + 2x - 3}{2x - 1}?$$

A $3(x - 1)$

B $\frac{x - 1}{3}$

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

D $\frac{1}{3(x - 1)}$

3. Multiply: $\sqrt[3]{12x^2} \cdot \sqrt[3]{126x^2}$

A $6x(\sqrt[3]{7x})$

B $6x(\sqrt[3]{21x})$

C $6x^2(\sqrt[3]{42})$

D $6x^2(\sqrt[3]{63})$

4. Which polynomial function has as zeros 3 and $4 + i$?

A $f(x) = x^3 - 11x^2 + 41x - 51$

B $f(x) = x^3 - 5x^2 - 7x + 51$

C $f(x) = x^3 + 5x^2 - 7x - 51$

D $f(x) = x^3 + 11x^2 + 41x + 51$

5. If $h(x) = 2x$ and $g(x) = 3x^2 + 1$, what is $h(g(x))$?

A $6x^2 + 1$

B $6x^2 + 2$

C $12x^2 + 1$

D $12x^2 + 2$

6. What are the zeros of the polynomial $p(x) = x^3 - 2x^2 - 23x + 60$?

- A $\{-15, -2, 2\}$
- B $\{-5, 3, 4\}$
- C $\{2, 3, 10\}$
- D $\{1, 2, 30\}$

7. In 1950, a U.S. population model was $y = 151 \cdot (1.013)^{t-1950}$ million people, where t is the year. What did the model predict the U.S. population would be in the year 2000?

- A 247 million
- B 255 million
- C 263 million
- D 288 million

8. The following list shows the number of people (in millions) in the United States whose only means of getting to work was walking.

Year (x)	Number (y)
1940	7.6
1950	7.0
1960	6.4
1970	5.7
1980	5.4
1990	4.5

If $x = 0$ for the year 1940, which equation is the best-fit linear model for the data?

- A $y = -16.5x + 125$
- B $y = -0.06x + 7.6$
- C $y = 0.06x + 10$
- D $y = 7.6x - 0.06$

9. Given: $5x - 2y + z = 0$
 $2x - y + z = -3$
 $3x + 4y = 18$

What is the value of x in the solution of this system?

- A -4
- B -1
- C 2
- D 3

10. Which equation describes the circle with center $(5, -1)$ and radius 7?

- A $(x - 5)^2 + (y + 1)^2 = 7$
- B $(x - 5)^2 + (y + 1)^2 = 49$
- C $(x + 5)^2 + (y - 1)^2 = 7$
- D $(x + 5)^2 + (y - 1)^2 = 49$

11. Solve for x : $-\frac{1}{2}|2x + 6| + 2 = 0$

- A $x = 5$ or $x = 1$
- B $x = 5$
- C $x = -5$ or $x = -1$
- D $x = -1$

12. Which circle has the smallest area?

- A $x^2 + y^2 = 12$
- B $(x - 2)^2 + y^2 = 8$
- C $(x + 1)^2 + (y + 3)^2 = 6$
- D $(x + 8)^2 + (y - 9)^2 = 3$

13. Which matrix equation should be used to find the intersection of these two lines?

$$\begin{aligned} 3x &= 2 + 4y \\ 2y &= 6 - 5x \end{aligned}$$

- A $\begin{bmatrix} 3 & -4 \\ 2 & 5 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 6 \end{bmatrix}$
- B $\begin{bmatrix} 3 \\ 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} -4 \\ 5 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 6 \end{bmatrix}$
- C $\begin{bmatrix} 3 & -4 \\ 5 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 6 \end{bmatrix}$
- D $\begin{bmatrix} 3 \\ 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} 5 \\ -4 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ 6 \end{bmatrix}$

14. The profit (P), in dollars, for a company is modeled by the function $P(x) = -750x^2 + 15,000x$, where x is the number of items produced. For which values of x will the company lose money?

- A $x < 2$
- B $2 < x \leq 10$
- C $10 \leq x < 20$
- D $x > 20$

15. In which direction is the graph of $f(x) = \frac{5}{x+b}$ translated when b increases?
- A left
- B right
- C up
- D down
16. A company that manufactures jeans estimates that the profit for selling a particular style is given by the equation:
- $$P = -250x^3 + 1,505x^2 - 300, \text{ for } 0 < x < 6$$
- where P is profit in tens of thousands of dollars and x is the advertising expense in tens of thousands of dollars. What does an x -intercept mean in the context of the problem?
- A the number of times the company spent zero dollars on advertising
- B the profit when the company spent zero dollars on advertising
- C the advertising expense when the company had the most profit
- D the advertising expense when the company's profit was zero dollars
17. Copper production increased at a rate of about 4.9% per year between 1988 and 1993. In 1993, copper production was approximately 1.801 billion kilograms. If this trend continued, which equation **best** models the copper production (P), in billions of kilograms, since 1993? (Let $t = 0$ for 1993.)
- A $P = 1.801(4.900)^t$
- B $P = 1.801(1.490)^t$
- C $P = 1.801(1.049)^t$
- D $P = 1.801(0.049)^t$

18. Divide:
- $$(6x^3 - 11x^2 - 47x - 20) \div (2x + 1)$$
- A $3x^2 - 7x - 20$
- B $3x^2 + 7x - 20$
- C $3x^2 - 4x - 20$
- D $3x^2 + 4x - 20$
19. By which matrix should both sides of the equation be multiplied to solve for $\begin{bmatrix} x \\ y \end{bmatrix}$?

$$\begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 9 \end{bmatrix}$$

- A $\begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$
- B $\begin{bmatrix} 3 & 5 \\ 5 & 9 \end{bmatrix}$
- C $\begin{bmatrix} 2 & -1 \\ -5 & 3 \end{bmatrix}$
- D $\begin{bmatrix} 2 & -5 \\ -1 & 3 \end{bmatrix}$

20. Which equation is equivalent to $\ln 7 + 3 \ln x = 5 \ln 2$?
- A $\ln 7x^3 = \ln 25$
- B $\ln 7x^3 = \ln 32$
- C $\ln 10x = \ln 10$
- D $\ln 21x = \ln 10$

21. Simplify: $\frac{\frac{1}{y} - \frac{1}{x}}{\frac{1}{y} + \frac{1}{x}}$

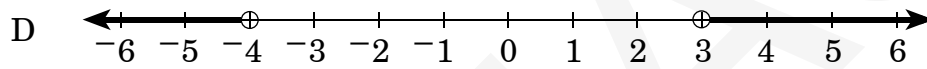
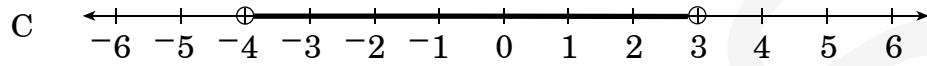
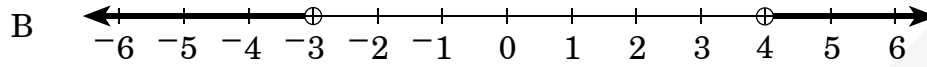
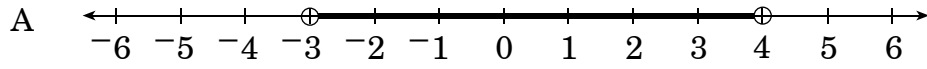
- A $\frac{x - y}{x + y}$
- B $\frac{x + y}{x - y}$
- C 0
- D -1

22. Let x and y be real numbers. If $(x + yi) - (2 - 3i) = -6 + 4i$, what are the values of x and y ?
- A $x = 8, y = 7$
- B $x = 8, y = 1$
- C $x = -4, y = 7$
- D $x = -4, y = 1$
23. If $f(x) = 2x + 1$ and $g(x) = x^3$, what is $f(g(3))$?
- A 343
- B 189
- C 55
- D 34
24. In which direction does the graph of $y = (x + 2)^{\frac{1}{2}} + c$ shift as c decreases?
- A right
- B left
- C up
- D down
25. What is the value of z in the solution of this system?
- $$\begin{aligned}x + y - z &= -5 \\2x + z + 1 &= -2y \\x - y &= 3z + 3\end{aligned}$$
- A -7
- B -1
- C 3
- D 5

26. What is the domain of $f(x) = -2x^3 + x^2 + 1$?
- A the set of all real numbers
- B $\{x \mid -3 < x < 2\}$
- C $\{x \mid -2 < x < 3\}$
- D the empty set
27. The population of a small town in North Carolina is 4,000, and it has a growth rate of 3% per year. Which expression can be used to calculate the town's population x years from now?
- A $3(4,000)^x$
- B $4,000(1.03)^x$
- C $4,000x^{1.03}$
- D $4,000x^3$
28. The graph of $f(x) = x^2 + 3$ is translated to produce the graph of $g(x) = (x + 2)^2 + 3$. In which direction was the graph of f translated?
- A up
- B down
- C left
- D right
29. Solve for x : $\frac{x-1}{x+5} = \frac{x}{2(x+5)}$
- A -5
- B 2
- C -5 or 2
- D 5 or -2

30. Which graph shows the solution set for the following inequality?

$$x^2 > x + 12$$

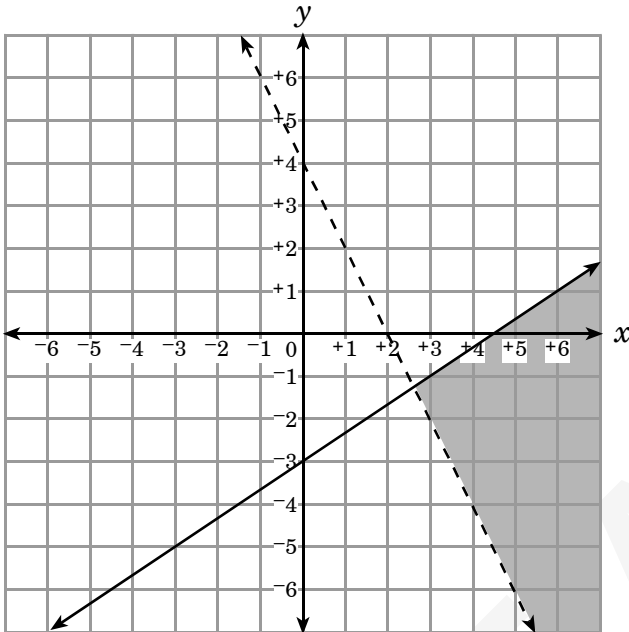


31. Which graph represents the system of inequalities below?

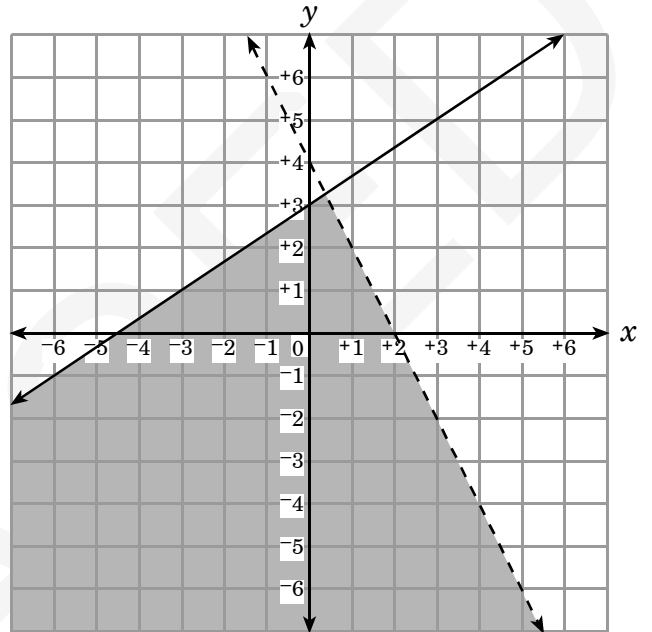
$$2x - 3y \geq 9$$

$$4x + 2y < 8$$

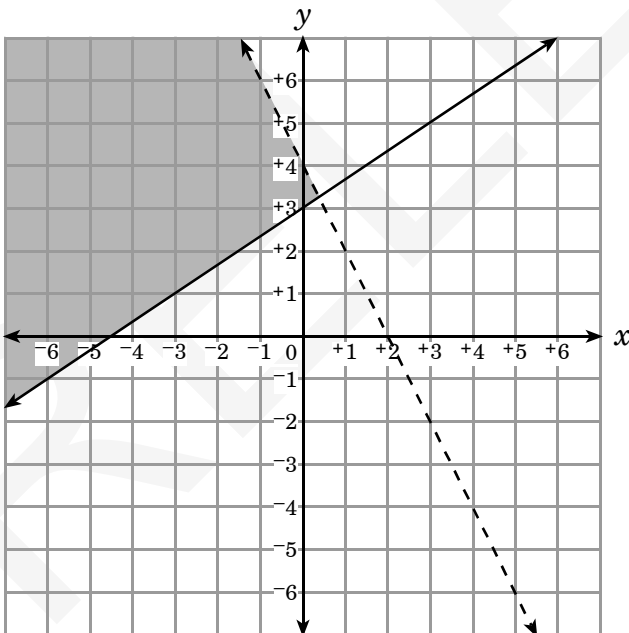
A



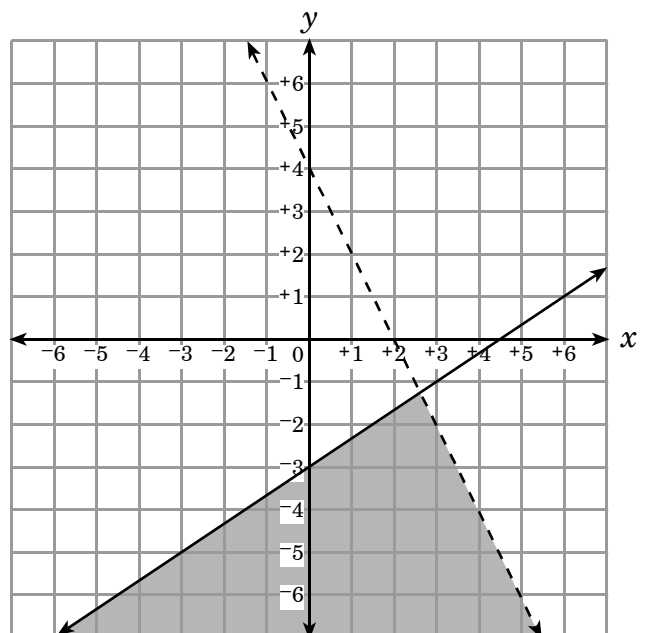
B



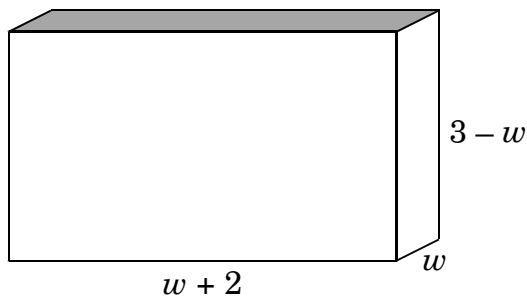
C



D



32. The dimensions of this rectangular prism are given algebraically.



What is the **approximate** width (w) that will maximize the volume?

- A 1 unit
- B $1\frac{1}{2}$ units
- C $1\frac{3}{4}$ units
- D 2 units

33. A single microscopic organism divides into two organisms every 3 days. Use the formula $N(t) = N_0(2)^{\frac{t}{3}}$, where t is the time in days, $N(t)$ is the number of organisms at t days, and N_0 is the number of organisms at $t = 0$.

Approximately how long would it take one organism to produce a population of about 10,000 organisms?

- A 1,667 days
- B 333 days
- C 126 days
- D 40 days

34. What is an equation of the circle that has center $(-2, 3)$ and passes through $(-1, 1)$?

- A $(x + 2)^2 + (y - 3)^2 = 5$
- B $(x - 2)^2 + (y + 3)^2 = 5$
- C $(x + 2)^2 + (y - 3)^2 = 25$
- D $(x - 2)^2 + (y + 3)^2 = 25$

35. Simplify:

$$\left(x^{\frac{3}{4}}\right)^3$$

A $x^{\frac{27}{64}}$

B $x^{\frac{9}{4}}$

C $x^{\frac{9}{12}}$

D $x^{\frac{15}{4}}$

36. The area of a rectangular window is $(4x^2 - 21x - 18)$. Both the length and the width are polynomials with integer coefficients. Which of the following could represent the length of the window?

A $4x + 6$

B $4x + 3$

C $x + 6$

D $x + 3$

37. Which binomial is a factor of $(x^3 - x^2 + 3x - 3)$?

A $x - 3$

B $x + 1$

C $x^2 - 1$

D $x^2 + 3$

38. If 5 tractors can plow a field in 4 hours, how many hours will it take 3 tractors to plow the field?

A $6\frac{2}{3}$

B $6\frac{1}{2}$

C $5\frac{2}{3}$

D $5\frac{1}{2}$

39. Solve: $3x - 7\sqrt{x} + 2 = 0$

A $x = \frac{1}{9}, x = 4$

B $x = \frac{1}{3}, x = 4$

C $x = \frac{1}{9}, x = -\frac{1}{3}$

D $x = \frac{1}{3}, x = \frac{1}{9}$

40. What is the **approximate** value of the greatest zero of $f(x) = x^3 - 6x^2 - x + 3$?

A -0.75

B 2.84

C 6.08

D 6.31

41. What are the vertical asymptotes of the function $f(x) = \frac{4x^2 - 100}{2x^2 + x - 15}$?

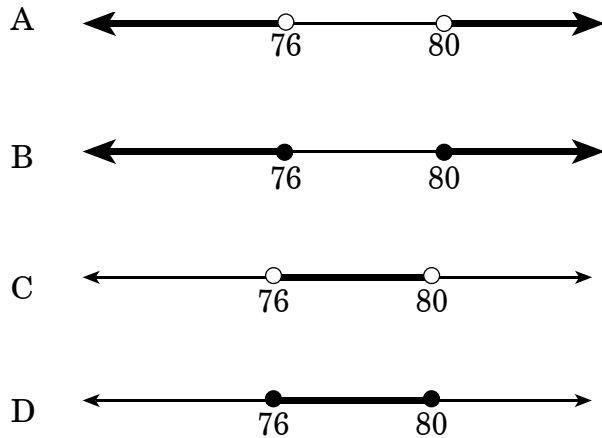
A $x = -5, x = 5$

B $x = -5, x = 4, x = 5$

C $x = -3, x = \frac{5}{2}$

D $x = -3, x = \frac{5}{2}, x = \frac{20}{3}$

42. A poll shows that it is likely that, with a margin of error of ± 2 percentage points, 78% of those randomly selected from a population would vote for a particular candidate. This situation can be described by the inequality $|x - 78| \leq 2$. Which graph shows the percentage of voters (according to the inequality) who favor the candidate?



43. Which equation represents the graph of $y = x^2$ translated 1 unit right and 2 units down?

- A $y = -(x - 1)^2 - 2$
- B $y = (x - 1)^2 - 2$
- C $y = -(x + 1)^2 + 2$
- D $y = (x + 1)^2 - 2$

44. Which is the solution set of the equation $x + 2 = \frac{4}{x - 2}$?

- A $\{\pm 2\sqrt{2}\}$
- B $\{2\sqrt{2}\}$
- C $\left\{\frac{-1 \pm \sqrt{17}}{2}\right\}$
- D $\left\{\frac{-1 + \sqrt{17}}{2}\right\}$

45. When interest is compounded n times a year, the accumulated amount (A) after t years is given by the formula

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

where P is the initial principal and r is the annual rate of interest.

Approximately how long will it take \$2,000 to double at an annual interest rate of 5.25% compounded monthly?

- A 13.98 years
B 13.71 years
C 13.23 years
D 13.08 years
46. Alan has just started a job that pays a salary of \$21,500. At the end of each year of work, he will get a 5% salary increase. What will his salary be after getting his fifth increase?
- A \$22,631
B \$24,889
C \$26,133
D \$27,440

47. In the function $f(x) = a(x - 4)^2$, where $a > 0$, what happens to the graph of f as the value of a increases?

- A The graph narrows.
B The graph widens.
C The graph shifts up.
D The graph shifts right.

48. Which is the inverse of the function $f(x) = x - 9$?

- A $f^{-1}(x) = \frac{1}{x + 9}$
B $f^{-1}(x) = x + 9$
C $f^{-1}(x) = 9 - x$
D $f^{-1}(x) = \frac{1}{x - 9}$

49. What are the zeros of $f(x) = x^2 + 7x + 5$?

A $\left\{ \frac{7 \pm 2\sqrt{5}}{2} \right\}$

B $\left\{ \frac{-7 \pm 2\sqrt{5}}{2} \right\}$

C $\left\{ \frac{7 \pm \sqrt{29}}{2} \right\}$

D $\left\{ \frac{-7 \pm \sqrt{29}}{2} \right\}$

50. The table below shows the number of families living in the city of Sunnyvale from 1965 to 2000.

Year (after 1900)	65	70	75	80	85	90	95	100
Number of Families (thousands)	31.1	30.5	30.1	28.7	27.1	25.7	23.2	20.3

According to the best-fit quadratic model, *approximately* how many families will live in Sunnyvale in 2010?

A 14,000

B 15,000

C 18,000

D 19,000

51. What is the solution set of the system below?

$$\begin{aligned}x &= 2y \\ x - y^2 &= -2y\end{aligned}$$

- A $\{(0, 0)\}$
- B $\{(0, 4)\}$
- C $\{(0, 0), (4, 0)\}$
- D $\{(0, 0), (8, 4)\}$



End of Algebra II Test

**North Carolina Test of Algebra II
Form K RELEASED Fall 2009
Answer Key**

Item Number	Correct Answer	Goal
1	C	1 — Number and Operations
2	D	1 — Number and Operations
3	A	1 — Number and Operations
4	A	1 — Number and Operations
5	B	2 — Algebra
6	B	2 — Algebra
7	D	2 — Algebra
8	B	2 — Algebra
9	C	2 — Algebra
10	B	2 — Algebra
11	C	2 — Algebra
12	D	2 — Algebra
13	C	2 — Algebra
14	D	2 — Algebra
15	A	2 — Algebra
16	D	2 — Algebra
17	C	2 — Algebra
18	A	1 — Number and Operations
19	C	1 — Number and Operations
20	B	1 — Number and Operations
21	A	1 — Number and Operations
22	D	1 — Number and Operations
23	C	2 — Algebra
24	D	2 — Algebra
25	C	2 — Algebra
26	A	2 — Algebra
27	B	2 — Algebra
28	C	2 — Algebra
29	B	2 — Algebra
30	B	2 — Algebra
31	D	2 — Algebra
32	C	2 — Algebra
33	D	2 — Algebra
34	A	2 — Algebra
35	B	1 — Number and Operations
36	B	1 — Number and Operations
37	D	1 — Number and Operations
38	A	1 — Number and Operations
39	A	2 — Algebra
40	C	2 — Algebra
41	C	2 — Algebra
42	D	2 — Algebra

North Carolina Test of Algebra II
Form K RELEASED Fall 2009
Answer Key

43	B	2 — Algebra
44	A	2 — Algebra
45	C	2 — Algebra
46	D	2 — Algebra
47	A	2 — Algebra
48	B	2 — Algebra
49	D	2 — Algebra
50	A	2 — Algebra
51	D	2 — Algebra

**North Carolina Test of Algebra II
Form K RELEASED Fall 2009
Raw to Scale Score Conversion**

Raw Score	Scale Score
0	127
1	127
2	128
3	128
4	129
5	129
6	130
7	131
8	131
9	132
10	133
11	134
12	135
13	136
14	137
15	138
16	139
17	140
18	141
19	143
20	144
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29	152
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31	154
32	154
33	155
34	156
35	157
36	158
37	158
38	159
39	160
40	161
41	162

**North Carolina Test of Algebra II
Form K RELEASED Fall 2009
Raw to Scale Score Conversion**

42	163
43	164
44	165
45	166
46	167
47	169
48	170
49	172
50	175
51	177