

**VIRGINIA  
STANDARDS OF LEARNING ASSESSMENTS**

**Spring 2002 Released Test**

---

**END OF COURSE  
ALGEBRA II**

# Property of the Virginia Department of Education

© 2002 by the Commonwealth of Virginia Department of Education, James Monroe Building, 101 N. 14th Street, Richmond, Virginia, 23219. All rights reserved. Except as permitted by law, this material may not be reproduced or used in any form or by any means, electronic or mechanical, including photocopying or recording, or by any information storage or retrieval system, without written permission from the copyright owner. Commonwealth of Virginia public school educators may photocopy or print any portion of these Released Tests for educational purposes without requesting permission. All others should direct their requests to the Commonwealth of Virginia Department of Education at (804) 225-2102, Division of Assessment and Reporting.

## Algebra II

### DIRECTIONS

Read and solve each question. Then mark the space on the answer sheet for the best answer.

#### SAMPLE

What is the next term in the arithmetic sequence 2, 5, 8, 11, ...?

- A 3
- B 13
- C 14
- D 17

1 What is the sum of the polynomials  $(4q^4 + 3q^2 + 8q)$  and  $(5q^3 - 2q^2 - q)$ ?

- A  $-q^4 + q^2 + 7q$
- B  $4q^4 + 5q^3 + q^2 + 7q$
- C  $4q^4 + q^2 + 7q$
- D  $15q^7 + 2q^6$

2 Which of the following equations is an example of the commutative property?

F  $2x^2 + 4x = 4x + 2x^2$

G  $(2x^2 + 4x) + 6 = 2x^2 + (4x + 6)$

H  $3(2x^2 + 4x) = 6x^2 + 12x$

J  $(2x^2 + 4x) \left( \frac{1}{2x^2 + 4x} \right) = 1$

3 For which of the following operations is the commutative property *not* valid?

- A Multiplication of real numbers
- B Multiplication of complex numbers
- C Multiplication of matrices
- D Multiplication of negative real numbers

4 Which is equivalent to  $\frac{\frac{x}{x+7}}{\frac{x-9}{x+7}}$ ?

F -9

G  $\frac{x^2 - 9x}{(x + 7)^2}$

H  $\frac{x}{x - 9}$

J  $\frac{-1}{9}$

5 Which expression is equivalent to  $\sqrt[3]{a^2}$ ?

A  $a^{\frac{3}{2}}$

B  $a^{\frac{2}{3}}$

C  $a^{\frac{1}{6}}$

D  $a^6$

6 Which is equivalent to  $\sqrt[3]{8x^6}$ ?

- F 2
- G  $2x$
- H  $2x^2$
- J  $2x^3$

7 Which is a factored form of  $8x^3 + 1$ ?

- A  $(2x - 1)(4x^2 - 2x + 1)$
- B  $(2x - 1)(4x^2 + 2x - 1)$
- C  $(2x + 1)(4x^2 - 2x + 1)$
- D  $(2x + 1)(4x^2 + 2x - 1)$

8 Which is a factor of  $16x^2 - 1$ ?

- F  $(x - 1)$
- G  $(4x + 1)$
- H  $(8x - 1)$
- J  $4x$

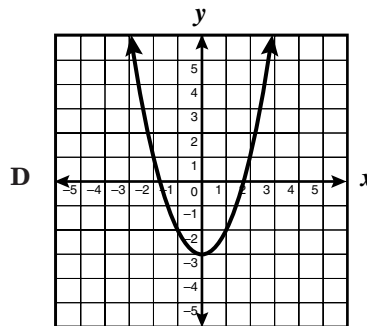
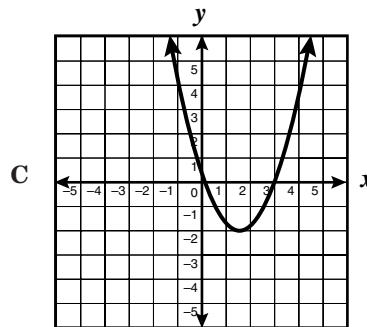
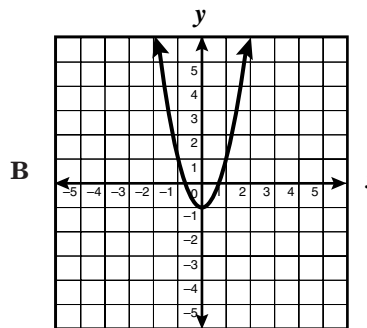
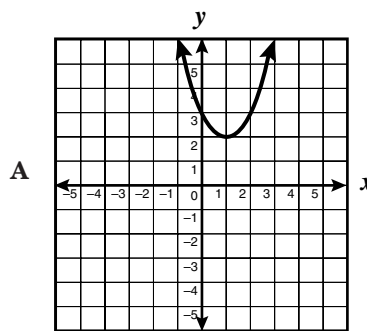
9 Which is equivalent to  $(4 - 3i)^2$ ?

- A 25
- B  $25 - 2i$
- C 7
- D  $7 - 24i$

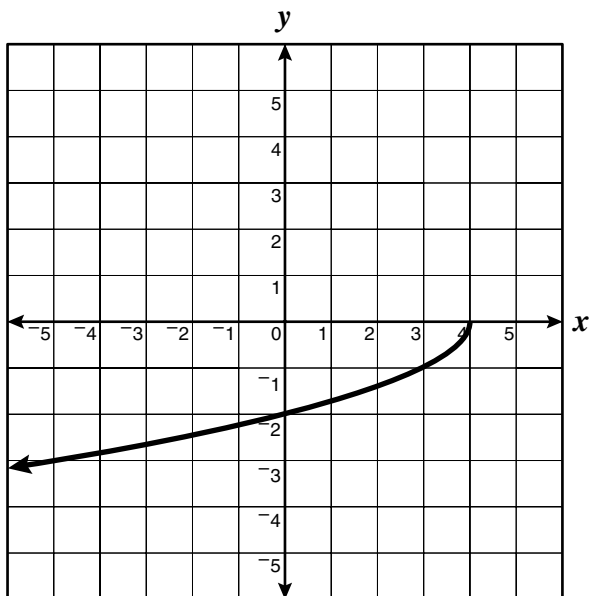
10 What number does  $i^4$  equal?

- F  $i$
- G  $-1$
- H  $-i$
- J 1

11 Which best represents the graph of  $y = x^2 - 2x + 3$ ?



12



Which most likely represents the equation of the graph above?

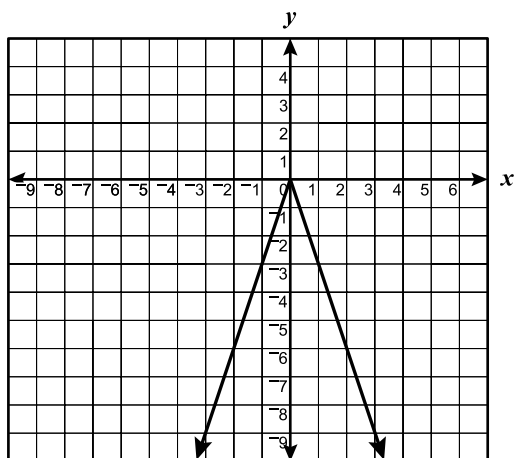
F  $y = \sqrt{4 - x}$

G  $y = -\sqrt{4 - x}$

H  $y = -\sqrt{4 + x}$

J  $y = \sqrt{4 + x}$

13 The graph below is an example of which type of function?



- A Absolute value
- B Exponential
- C Linear
- D Quadratic

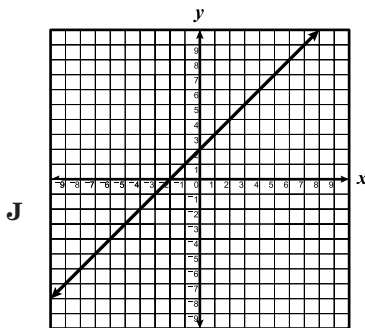
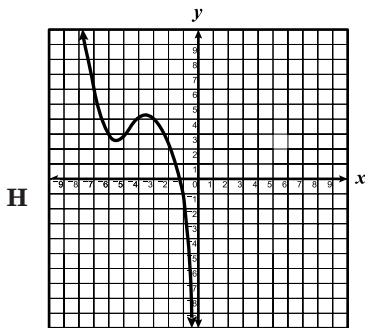
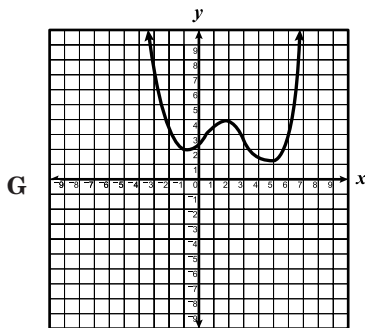
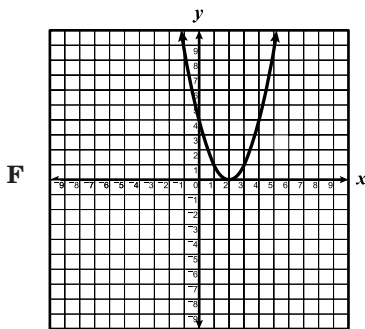
14 If  $f(x) = 5x^2 - 7$ , what is  $f(-3)$ ?

- F -52
- G -22
- H 38
- J 45

15 Which value is *not* a zero of  $P(x) = x^3 + 3x^2 - x - 3$ ?

- A 1
- B -1
- C 3
- D -3

- 16 Which graph could represent a polynomial function with *no* real zeros?



- 17 The amount of interest ( $I$ ) owed on a loan varies directly with the length of time ( $t$ ) of the loan. If  $k$  is the constant of proportionality, which formula represents this relationship?

A  $I = kt$

B  $I = \frac{k}{t}$

C  $t = kI$

D  $t = \frac{k^2}{I}$

- 18 Boyle's Law states that, for a fixed amount of gas, the volume of the gas at a constant temperature is inversely proportional to the pressure. If a certain gas occupies 9.84 liters at a pressure of 50 centimeters of mercury (cm Hg), what is the approximate pressure when the volume is increased to 12 liters?

F 39.8 cm Hg

G 41.0 cm Hg

H 43.2 cm Hg

J 45.1 cm Hg

- 19 Which of the following sets represents an arithmetic sequence?

A  $\{2, 11, 20, 29, 38, \dots\}$

B  $\{1, 3, 9, 27, 81, \dots\}$

C  $\{3, -5, 7, -9, 11, \dots\}$

D  $\{1, 16, 36, 64, 100, \dots\}$

20 If  $a_n = 6 + (n - 1)5$ , then  $a_7 =$

- F 31
- G 36
- H 40
- J 42

21 Given:

$$f(x) = \sqrt{x^2 - 1}$$

$$g(x) = x^2$$

Which of the following expressions represents  $g(f(x))$ ?

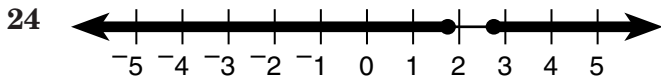
- A  $x^2\sqrt{x^2 - 1}$
- B  $x$
- C  $\sqrt{x^4 - 1}$
- D  $x^2 - 1$

22 Which of the following represents the solution to  $|x| = 7$ ?

- F  $x = 7$
- G  $x = 0$
- H  $x = -7$
- J  $x = -7$  or  $x = 7$

23 What is the solution to  $\sqrt{x + 16} = 3\sqrt{x}$ ?

- A  $x = \frac{1}{2}$
- B  $x = \frac{8}{5}$
- C  $x = 2$
- D  $x = 8$



Which inequality describes the solution set graphed above?

- F  $|x - 3| > 1$
- G  $|2x - 5| < 3$
- H  $|4x - 9| \geq 2$
- J  $|5x - 13| \leq 5$

25 What are the solutions to  $y^2 - 4y + 4 = 36$ ?

- A  $y = -4$  or  $y = 8$
- B  $y = 4$  or  $y = 8i$
- C  $y = \pm 4$
- D  $y = \pm 4i$

26 What is the solution set for  $(x + 1)^2 - 9 = 0$ ?

- F  $\{-4, 2\}$
- G  $\{-3, -1\}$
- H  $\{2, 4\}$
- J  $\{-1, 3\}$

27 Which quadratic equation has solutions  $x = \frac{1}{2}$  and  $x = \frac{2}{3}$ ?

- A  $6x^2 - 7x - 2 = 0$
- B  $6x^2 + 7x + 2 = 0$
- C  $6x^2 + 7x - 2 = 0$
- D  $6x^2 - 7x + 2 = 0$

28 What is the solution set for  $5x^2 + 4x = 1$ ?

- F  $\left\{-1, \frac{-1}{5}\right\}$
- G  $\left\{-1, \frac{1}{5}\right\}$
- H  $\left\{\frac{-1}{5}, 1\right\}$
- J  $\left\{\frac{1}{5}, 1\right\}$

29 What is the solution set for  $\sqrt{x - 4} = 5$ ?

- A  $\{21\}$
- B  $\{25\}$
- C  $\{29\}$
- D  $\{33\}$



30 What value of  $q$  is the solution to the equation  $\frac{7q - 9}{6} = \frac{6q + 2}{4}$ ?

F  $q = -\frac{11}{8}$

G  $q = -6$

H  $q = \frac{31}{9}$

J  $q = 48$

31 What is the solution to  $|2x - 3| < 4$ ?

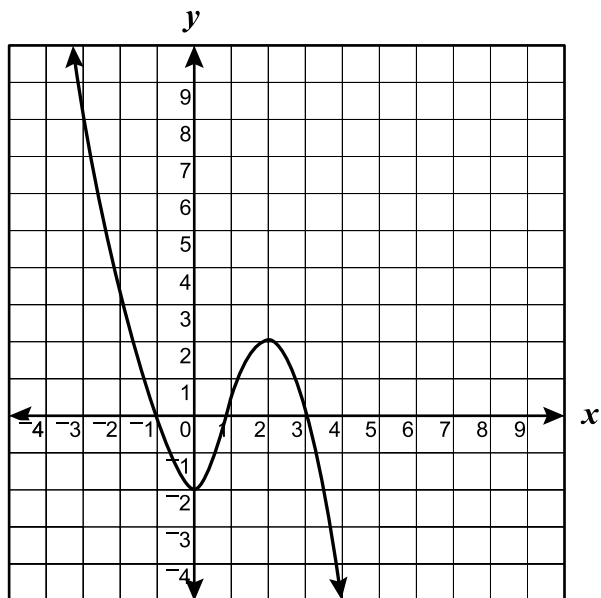
A  $-\frac{1}{2} < x < \frac{7}{2}$

B  $-\frac{7}{2} < x < \frac{7}{2}$

C  $x > -\frac{1}{2}$  or  $x < \frac{7}{2}$

D  $x = -\frac{1}{2}$  or  $x = \frac{7}{2}$

32



The polynomial function shown apparently has zeros at —

F  $-1$  and  $2$

G  $-1, 0.7,$  and  $3$

H  $-2$

J  $1, -0.7,$  and  $-3$

33 Which of the following functions has  $x$ -intercepts at  $-2$  and  $1$ ?

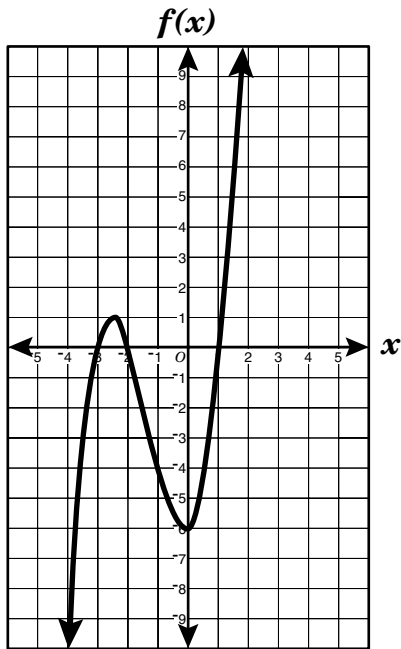
A  $y = x^2 - x - 2$

B  $y = x^2 + x - 2$

C  $y = x^2 - 2x + 1$

D  $y = 2x - 1$

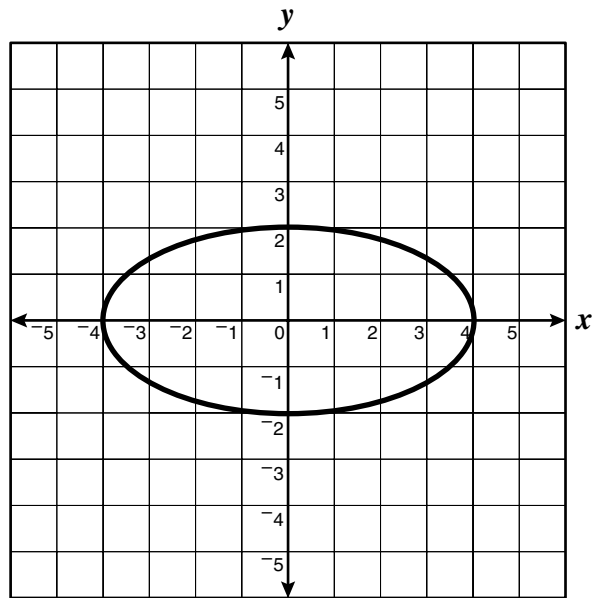
34  $f(x) = x^3 + 4x^2 + x - 6$  is graphed below.



Which is the factored form of  $f(x)$ ?

- F  $f(x) = (x - 3)(x - 2)(x + 1)$
- G  $f(x) = x(2x + 5)(x - 1)$
- H  $f(x) = x(x + 3)(x + 2)$
- J  $f(x) = (x - 1)(x + 2)(x + 3)$

35



Which equation is most likely represented by the ellipse shown?

- A  $\frac{x}{16} + \frac{y}{4} = 1$
- B  $\frac{x^2}{4} + \frac{y^2}{2} = 1$
- C  $\frac{x^2}{4} + \frac{y^2}{16} = 1$
- D  $\frac{x^2}{16} + \frac{y^2}{4} = 1$

36 When graphed, which of the following equations would produce a parabola?

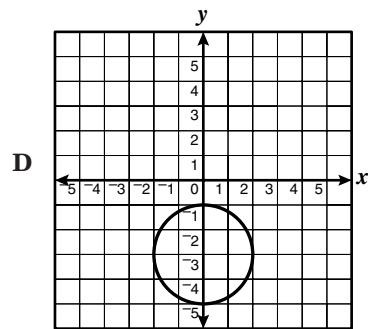
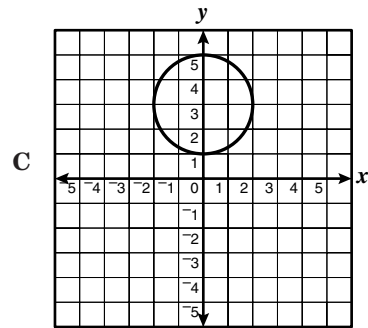
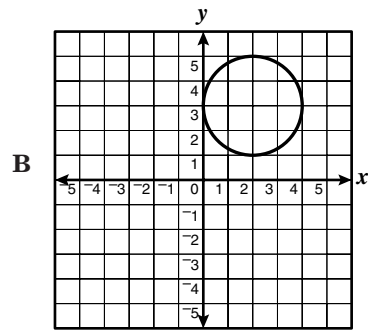
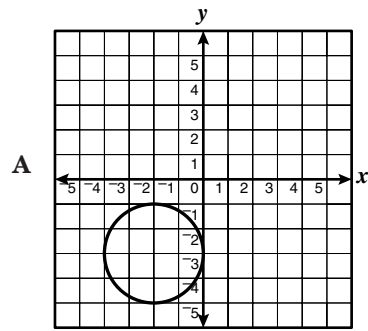
F  $(y - 2)(x - 4) = \frac{1}{4}$

G  $(y - 4) = \frac{1}{4}(x - 2)^2$

H  $(y - 4) = \frac{1}{4}(x - 2)$

J  $(y - 4)^2 = \frac{1}{4}(x - 2)^2$

37 Which graph best represents  $(x - 2)^2 + (y - 3)^2 = 4$ ?



$$38 \quad A = \begin{bmatrix} 0 & 2 & -1 \\ 3 & 0 & 4 \\ 1 & -2 & -3 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 & -2 & 1 \\ 2 & 0 & 3 \\ -3 & 2 & -1 \end{bmatrix}$$

Which matrix is the product of  $B \cdot A$ ?

$$F \begin{bmatrix} 1 & 0 & 0 \\ 5 & 0 & 7 \\ -2 & 0 & -4 \end{bmatrix}$$

$$G \begin{bmatrix} -5 & 0 & -12 \\ 3 & -2 & -11 \\ 5 & -4 & 14 \end{bmatrix}$$

$$H \begin{bmatrix} 0 & -4 & -1 \\ 6 & 0 & 12 \\ -3 & -4 & 3 \end{bmatrix}$$

$$J \begin{bmatrix} 7 & -2 & 7 \\ -9 & 2 & -1 \\ 6 & -8 & -2 \end{bmatrix}$$

39 Which matrix is the multiplicative inverse of  $\begin{bmatrix} 7 & 16 \\ 4 & 9 \end{bmatrix}$ ?

$$A \begin{bmatrix} -9 & 4 \\ 4 & 7 \end{bmatrix}$$

$$B \begin{bmatrix} -9 & 16 \\ 4 & -7 \end{bmatrix}$$

$$C \begin{bmatrix} 9 & 16 \\ 4 & 7 \end{bmatrix}$$

$$D \begin{bmatrix} -9 & 16 \\ 4 & 7 \end{bmatrix}$$

$$40 \quad \begin{cases} -x + 2y - 5z = -12 \\ 2x - 3y + 7z = 19 \\ -5x - 2y + z = -10 \end{cases}$$

Given the system of equations above,

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = ?$$

$$F \begin{bmatrix} 3 \\ -2 \\ 1 \end{bmatrix}$$

$$G \begin{bmatrix} -12 \\ 19 \\ 10 \end{bmatrix}$$

$$H \begin{bmatrix} 1.1 & 0.8 & -0.1 \\ -3.7 & -2.6 & -0.3 \\ -1.9 & -1.2 & -0.1 \end{bmatrix}$$

$$J \begin{bmatrix} 0 \\ -11 \\ 32 \end{bmatrix}$$

$$41 \quad \begin{cases} 9x - 5y = 12 \\ 8x + 3y = 22 \end{cases}$$

Which matrix equation represents the given system of linear equations?

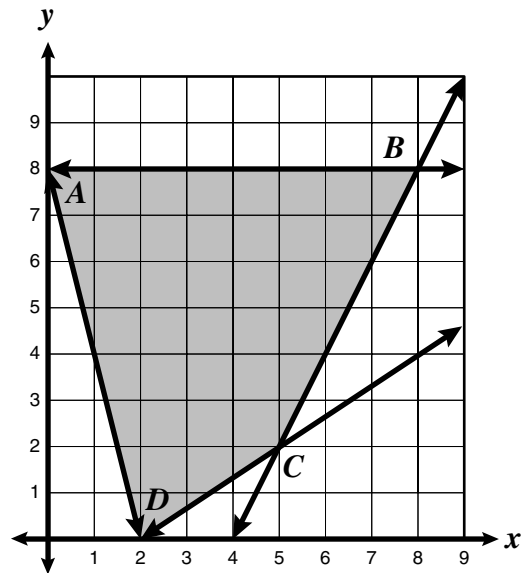
A  $\begin{bmatrix} 9 & 8 \\ -5 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 12 \\ 22 \end{bmatrix}$

B  $\begin{bmatrix} 9 & 8 \\ -5 & 3 \end{bmatrix} \begin{bmatrix} x & y \end{bmatrix} = \begin{bmatrix} 12 \\ 22 \end{bmatrix}$

C  $\begin{bmatrix} 9 & -5 \\ 8 & 3 \end{bmatrix} \begin{bmatrix} x & y \end{bmatrix} = \begin{bmatrix} 12 \\ 22 \end{bmatrix}$

D  $\begin{bmatrix} 9 & -5 \\ 8 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 12 \\ 22 \end{bmatrix}$

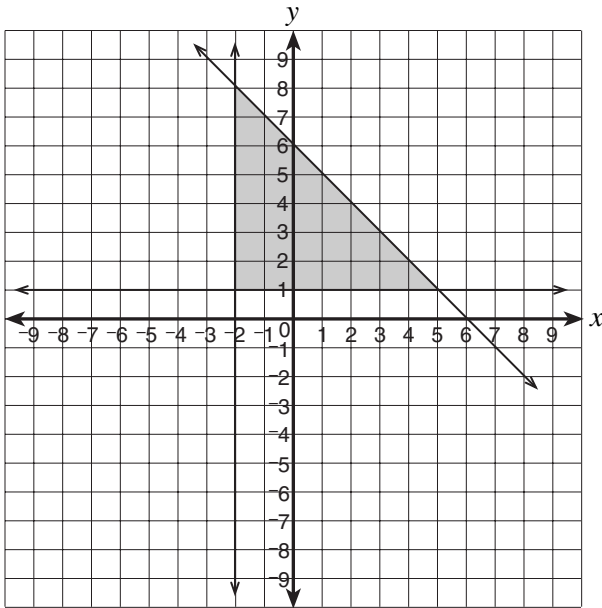
42



The graph of the linear programming model consists of polygon  $ABCD$  and its interior. Under these constraints, which is the point where the *maximum* value of  $4x + 3y$  occurs?

- F A
- G B
- H C
- J D

43



Which set of constraints produced the shaded feasible region?

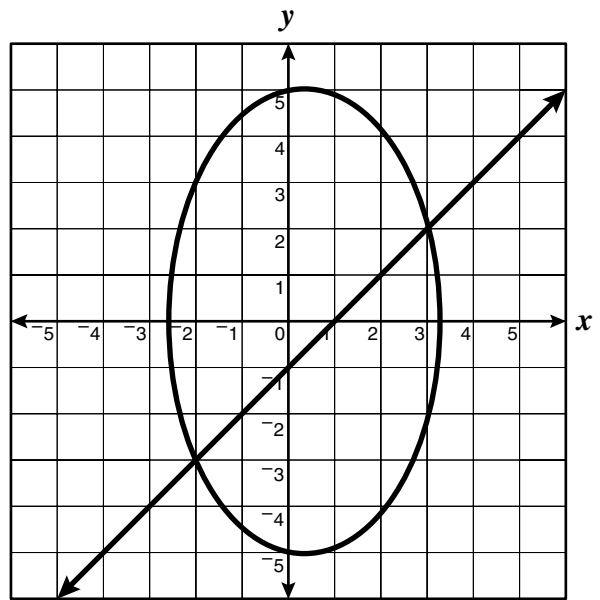
A  $\begin{cases} y \geq 6 - x \\ x \geq 1 \\ y \geq -2 \end{cases}$

B  $\begin{cases} x + y \leq 6 \\ x \geq -2 \\ y \geq 1 \end{cases}$

C  $\begin{cases} x \geq 6 - y \\ x \geq 1 \\ y \leq 2 \end{cases}$

D  $\begin{cases} x + y \leq 8 \\ x - y \leq 6 \\ x \geq -2 \\ y \geq 1 \end{cases}$

44



This is a portion of the graph of a system of equations. Which is most likely the solution set for the system?

F  $\{(-2.1, -3.4), (2, 3)\}$

G  $\{(-3, 2), (-2.1, 3.4)\}$

H  $\{(-2, -3), (3, 2)\}$

J  $\{(2.1, -3.4), (3, 2)\}$

45  $\begin{cases} y = x + 1 \\ y = (x + 3)^2 - 4 \end{cases}$

Which is the solution set for the system of equations above?

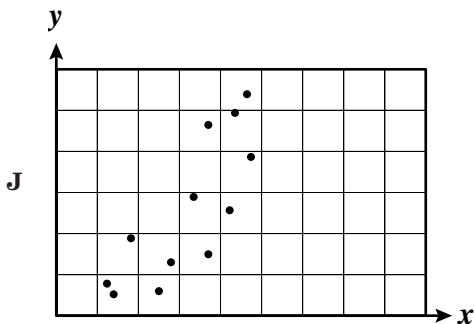
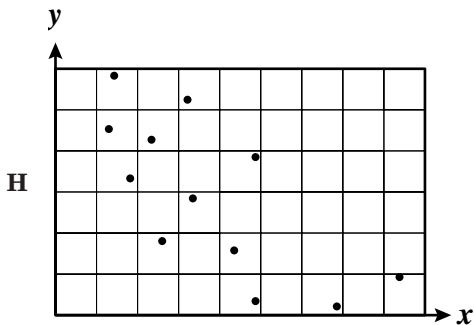
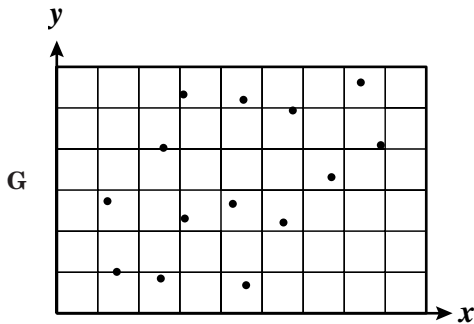
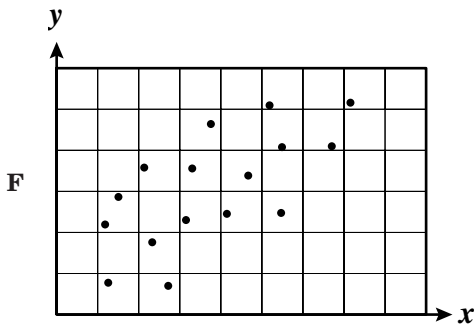
A  $\{(-6.4, 7.4), (-0.6, 1.6)\}$

B  $\{(-4, -3), (-2, -3)\}$

C  $\{(-4, -3), (-1, 0)\}$

D  $\{(0.6, 1.6), (6.4, 7.4)\}$

46 Which of the following scatterplots shows a negative correlation?



47 The Social Security (FICA) wage base,  $y$ , (in thousands of dollars) from 1983 to 1988 is given by the equation  $y = 1.9x + 34.1$ , where  $x$  is the number of years since 1983. What was the FICA wage base in 1995?

- A \$53,100
- B \$48,200
- C \$56,900
- D \$58,800

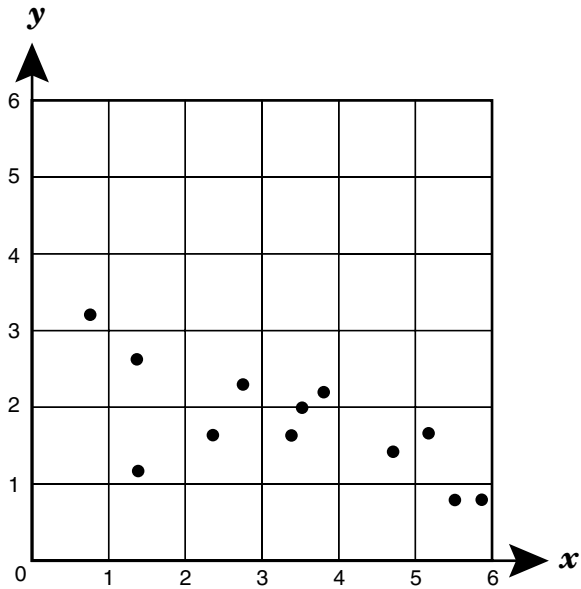
48 A clothing manufacturer is funding a study to determine the amount spent annually on clothes, given a family's income. This table contains data tracking the clothing purchases for seven families.

Annual Income	Annual Clothes Expenditure
\$25,100	\$3,800
29,600	4,200
34,400	5,000
28,700	3,900
34,600	4,700
31,500	4,500
27,700	4,200

Assuming a linear relationship, approximately how much would you expect a family with an annual income of \$33,000 to spend on clothes?

- F 4,400
- G 4,600
- H 4,800
- J 5,000

49 Consider this scatter plot.



Which equation represents the line closest to the curve of best fit?

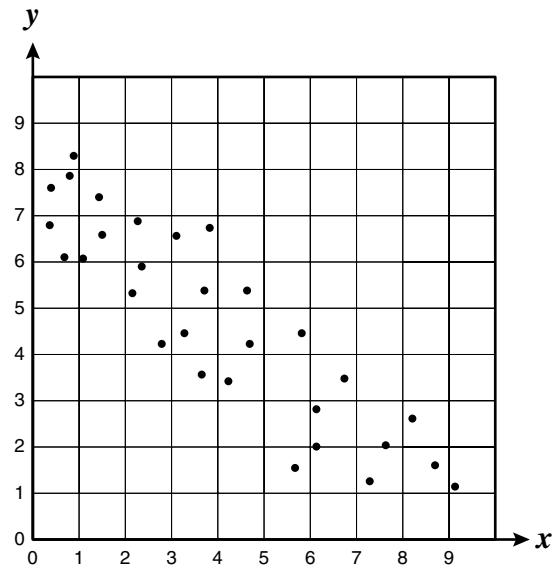
A  $y = \frac{1}{2}x + 3$

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

C  $y = -\frac{1}{3}x + 3$

D  $y = x$

50



Which is closest to the value of the slope of the line of best fit of the data in this scatterplot?

F  $-3$

G  $-1$

H  $-\frac{1}{3}$

J  $1$





## Answer Key

Test Sequence	Correct Answer	Reporting Category	Reporting Category Description
1	B	001	Expressions and Operations
2	F	001	Expressions and Operations
3	C	001	Expressions and Operations
4	H	001	Expressions and Operations
5	B	001	Expressions and Operations
6	H	001	Expressions and Operations
7	C	001	Expressions and Operations
8	G	001	Expressions and Operations
9	D	001	Expressions and Operations
10	J	001	Expressions and Operations
11	A	002	Relations and Functions
12	G	002	Relations and Functions
13	A	002	Relations and Functions
14	H	002	Relations and Functions
15	C	002	Relations and Functions
16	G	002	Relations and Functions
17	A	002	Relations and Functions
18	G	002	Relations and Functions
19	A	002	Relations and Functions
20	G	002	Relations and Functions
21	D	002	Relations and Functions
22	J	003	Equations and Inequalities
23	C	003	Equations and Inequalities
24	H	003	Equations and Inequalities
25	A	003	Equations and Inequalities
26	F	003	Equations and Inequalities
27	D	003	Equations and Inequalities
28	G	003	Equations and Inequalities
29	C	003	Equations and Inequalities
30	G	003	Equations and Inequalities
31	A	003	Equations and Inequalities
32	G	004	Analytical Geometry
33	B	004	Analytical Geometry
34	J	004	Analytical Geometry
35	D	004	Analytical Geometry
36	G	004	Analytical Geometry
37	B	004	Analytical Geometry
38	G	005	Systems of Equations/Inequalities
39	B	005	Systems of Equations/Inequalities
40	F	005	Systems of Equations/Inequalities
41	D	005	Systems of Equations/Inequalities
42	G	005	Systems of Equations/Inequalities
43	B	005	Systems of Equations/Inequalities
44	H	005	Systems of Equations/Inequalities
45	C	005	Systems of Equations/Inequalities
46	H	006	Statistical Analysis
47	C	006	Statistical Analysis
48	G	006	Statistical Analysis
49	C	006	Statistical Analysis
50	G	006	Statistical Analysis