Student Name _____

Teacher Name _____

School _____

System _____

Item Sampler

Tennessee End of Course Assessment
Algebra I Form 3

Reporting Category 3: Algebra

PEARSON

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Algebra I Reference Page

Abbreviations for Geometric Formulas

A = area	d = diameter	r = radius
B = area of base	h = height	s = length of side
b = base	ℓ = length	V = volume
C = circumference	P = perimeter	w = width

Perimeter (P) and Circumference (C)

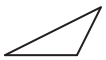
Any Polygon: P = sum of side lengths

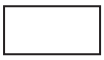
Rectangle: $P = 2\ell + 2w$

Circle: $C = 2\pi r$ or πd

$\pi \approx 3.14$ or $\frac{22}{7}$

Plane Figures — Area (A)

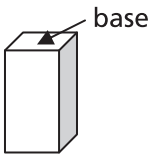
Triangle:  $A = \frac{1}{2}bh$

Rectangle:  $A = \ell w$

Circle: $A = \pi r^2$

$\pi \approx 3.14$ or $\frac{22}{7}$

Solid Figures — Volume (V)

Right Rectangular Prism 

$V = Bh$ or $V = \ell wh$

Cube $V = s^3$

Algebraic Formulas and Equations

$d = rt$ — distance = rate × time

Distance Formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

d = distance between two points

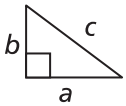
Midpoint Formula: $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Slope Formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$

Standard Form of a Linear Equation: $Ax + By = C$

Slope-Intercept Equation: $y = mx + b$

Point-Slope Equation: $y - y_1 = m(x - x_1)$

Pythagorean Theorem: $a^2 + b^2 = c^2$ 

Quadratics

For $ax^2 + bx + c = 0$: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Discriminant: $b^2 - 4ac$

Measurement Conversions

LENGTH

1 foot (ft) = 12 inches (in.)
1 yard (yd) = 3 feet
1 yard = 36 inches
1 mile = 1,760 yards
1 mile = 5,280 feet

CAPACITY

1 cup (c) = 8 fluid ounces (fl oz)
1 pint (pt) = 2 cups
1 quart (qt) = 2 pints
1 quart = 4 cups
1 gallon (gal) = 4 quarts

WEIGHT

1 pound (lb) = 16 ounces (oz)
1 ton (T) = 2,000 pounds

CONVERSION BETWEEN CUSTOMARY AND METRIC MEASUREMENT

1 yard = 0.9144 m
1 foot = 0.3048 m
1 inch = 2.54 cm
1 quart = 0.946 L
1 ounce = 28.35 g
1 lb = 0.45 kg

Contents

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Introduction to Algebra I

Content of tests

The testing program titled the *Tennessee End of Course Assessment* was established to meet the Tennessee mandate for end of course assessments in Tennessee secondary schools. These tests measure the Tennessee State Performance Indicators. Subject areas covered by the end of course assessments include Mathematics, Language Arts, History, and Science.

Test development

For the *Tennessee End of Course Assessment,* a staff of writers – composed of both teachers and professional test developers experienced in each of the content areas – researched and wrote the items. Professional editors and content specialists carefully reviewed all items and test directions for content and accuracy. To provide a large pool of items for final test selection, the test developers created approximately twice as many items as were needed in the final editions of the tests.

After tryout tests were administered, student responses were analyzed. Professional content editors and researchers carefully reviewed items, their data, and test directions for content, suitability, and accuracy before including particular items and test directions in operational tests.

Test administration

Tennessee End of Course Assessments are given to students as they near the end of courses that are included in the program. Tests may be given midyear for block schedules or at the end of the school year.

This test contains 65 multiple-choice questions.

You will have ample time to read and answer each of the questions. The Algebra I test has been designed to be administered in one session and is not timed. The first 15 minutes are set aside to complete identifying data on the answer sheet.

Calculator use is optional. Sharing calculators during testing is not permitted.

The following types of calculators/devices may **NOT** be used during the test:

- pocket organizers
- electronic writing pads or input devices
- Some examples of prohibited calculators are:
    - Casio models: CFX-9970G, Algebra FX 2.0
    - Hewlett-Packard models: HP-40G, HP-49G
    - Texas Instruments models: TI-89, TI-92, Voyage 200, TI-NSPIRE – the CAS version (The non-CAS version of TI-NSPIRE is allowable.)
- calculators that can communicate (transfer data or information) wirelessly with other student calculators/devices
- cell phones, PSPs, and/or iPods
- Students may use any four-function, scientific, or graphing calculator does not have any of the above features. The use of units that have a Computer Algebra System (CAS) is NOT allowed.

Tips for Taking the Test

Preparing for the test

- Review this Tennessee End of Course Item Sampler for Algebra I carefully and thoroughly.
- Acquire the Tennessee End of Course Practice Test for Algebra I, and take the test several times.
- Become familiar with the correct way to mark answers on the answer sheet. There is a sample answer sheet in this Practice Test.

Before the test

- Get a good night's sleep. To do your best, you need to be rested.

During the test

- Relax. It is normal to be somewhat nervous before the test. Try to relax and not worry.
- Listen. Listen to and read the test directions carefully. Ask for an explanation of the directions if you do not understand them.
- Plan your time. Do not spend too much time on any one question. If a question seems to take too long, skip it and return to it later. First answer all questions that you are sure about.
- Think. If you are not sure how to answer a question, read it again and try your best to answer the question. Rule out answer choices that you know are incorrect and choose from those that remain.

Directions for Using the Item Sampler

This Item Sampler for Algebra I provides specific information to students and teachers. It contains examples of different item types for each Performance Indicator that may be tested in any given end of course test administration. Performance Indicators have been grouped by Reporting Categories. These Reporting Categories will be used to report information regarding performance on the end of courts test to students, teachers, schools, and systems.

The items in this Item Sampler will not be found in the end of course tests. The number of items in this Item Sampler does not reflect the emphasis of content on the test. In order to identify the emphasis of content, the End of Course Assessment Practice Test for Algebra I should be used. The Practice Test gives a better representation of content emphasis across Reporting Categories and Performance Indicators.

An Answer Key is located in Page 43. Use it to check your answers. Review items that you get wrong.

Reporting Category: Algebra

Numbers 1 through 67

Performance Indicator: 3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.

1. **In a football tournament, each team plays all the other teams twice. The number of total games played depends on the number of teams in the tournament, as shown in the table below.**

Number of Games Played

Number of Teams, n	Number of Games, $f(n)$
4	12
5	20
6	30
8	56

Which function, $f(n)$, gives the number of games played for n number of teams?

- **A** $f(n) = 3n$
- **B** $f(n) = 4n$
- **C** $f(n) = n^2 - 4$
- **D** $f(n) = n^2 - n$

Performance Indicator: 3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.

2. **Which expression describes the nth term in the sequence below?**

2, 11, 26, 47, . . .

- **A** $n + 1$
- **B** $3n - 1$
- **C** $3n^2 - 1$
- **D** $n^3 + 2n - 1$

Performance Indicator: 3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.

3. **Observe the pattern below.**

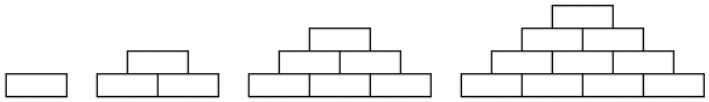


Figure 1 **Figure 2** **Figure 3** **Figure 4**

Which expression represents the number of rectangles in the *n*th figure?

- **A** $2n - 1$
- **B** $2n^2 - 1$
- **C** $\frac{n^2 + 1}{2}$
- **D** $\frac{n(n + 1)}{2}$

Performance Indicator: 3102.3.2 Operate with polynomials and simplify results.

4. **Which expression is equivalent to $(6x^3 + 4x^2 - x + 3) - (4x^3 + 2x - 4)$?**

- **A** $10x^3 + 4x^2 + x + 7$
- **B** $10x^3 + 4x^2 + x - 1$
- **C** $2x^3 + 4x^2 + x - 1$
- **D** $2x^3 + 4x^2 - 3x + 7$

Go On ▶

Performance Indicator: 3102.3.2 Operate with polynomials and simplify results.

5. **From 2005 to 2010, the sales of two different products, *P* and *Q*, can be modeled by $P = -8.5t^2 + 45.6t + 325.5$ and $Q = 2.9t^2 - 27.3t + 220.4$, where *t* represents the number of years since 2005. Which polynomial represents the difference, *P* minus *Q*, in the amount of sales for the two products?**

- **A** $-5.6t^2 + 72.9t + 545.9$
- **B** $-5.6t^2 + 18.3t + 105.1$
- **C** $-11.4t^2 + 72.9t + 105.1$
- **D** $-11.4t^2 + 18.3t + 545.9$

Performance Indicator: 3102.3.3 Factor polynomials.

6. **Factor: $2x^2 + 17x - 84$**

- **A** $(2x - 21)(x + 4)$
- **B** $(2x - 7)(x + 12)$
- **C** $(2x + 21)(x - 4)$
- **D** $(2x + 7)(x - 12)$

Performance Indicator: 3102.3.3 Factor polynomials.

7.

Which expression below is not equivalent to $54x^4 - 24x^2$?

- **A** $3x^2(18x^2 - 8)$
- **B** $6x^2(9x^2 - 4)$
- **C** $6x^2(3x - 2)(3x - 2)$
- **D** $6x^2(3x - 2)(3x + 2)$

Performance Indicator: 3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.

8.

What are the restricted values of x in the following expression?

$$\frac{2x^2-8}{x^2+3x}$$

- **A** −3, 0
- **B** −2, 2
- **C** 0, 3
- **D** 1, 3

Go On ▶

Performance Indicator: 3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.

9. **Which expression is equivalent to $(2x^2 + 5x - 12)\left(\frac{x^2 - x - 2}{2x^2 - x - 3}\right)$, if $x \neq -1$ and $x \neq \frac{3}{2}$?**

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

Performance Indicator: 3102.3.5 Write and/or solve linear equations, inequalities, and compound inequalities including those containing absolute value.

10. **Melinda wants to spend less than $45 to buy two T-shirts and a pair of shoes. She selects a pair of shoes that costs $24. If the cost of each T-shirt she selects is *x*, which inequality represents the amount that she can spend on each T-shirt?**

- **A** $x > 21$
- **B** $x < 21$
- **C** $x > 10.5$
- **D** $x < 10.5$

Go On ▶

Performance Indicator: 3102.3.5 Write and/or solve linear equations, inequalities, and compound inequalities including those containing absolute value.

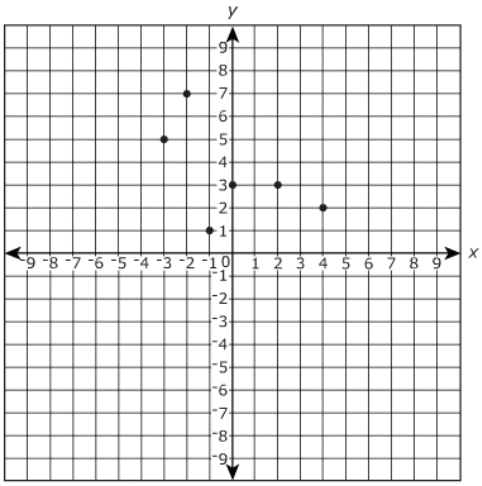
11. **The mean temperature in the city of Alcoa for the month of January is 36°F. However, it is known that the temperature can vary from the mean by as much as 10°F. Based on this information, which is a possible value of the temperature, in degrees Celsius, on any day of January in Alcoa?**

$$F = \frac{9}{5}C + 32$$

- **A** −20°C
- **B** −7°C
- **C** 5°C
- **D** 12°C

Performance Indicator: 3102.3.6 Interpret various relations in multiple representations.

12. **Which set represents the relation shown on the graph?**



- **A** $\{(-3, 5), (-2, 7), (-1, 1), (0, 3), (2, 3), (4, 2)\}$
- **B** $\{(5, -3), (7, -2), (1, -1), (3, 0), (3, 2), (2, 4)\}$
- **C** $\{5, 7, 1, 3, 3, 2\}$
- **D** $\{-3, -2, -1, 0, 2, 4\}$

Go On ▶

Performance Indicator: 3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.

13. **What is the domain of the relation shown in the table?**

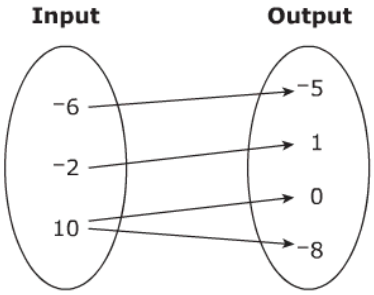
x	*y*
−2	2
3	15
4	7
1	8
9	7
7	−2

- **A** $\{-2, 3, 4, 8, 9, 7\}$
- **B** $\{-2, 3, 4, 1, 9, 7\}$
- **C** $\{2, 15, 7, 8, 7, -2\}$
- **D** $\{2, 15, 7, 1, 7, -2\}$

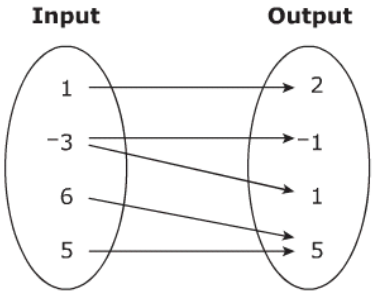
Performance Indicator: 3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.

14. **Which relation represents a function?**

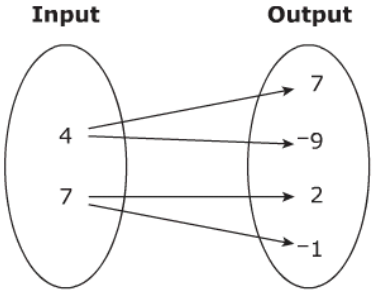
A



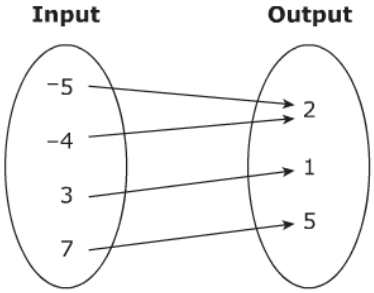
C



B



D



Go On ▶

Performance Indicator: 3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.

15.

Richard and his friends sell cookies for a school fundraiser. The table shows the profit they earn selling various numbers of cookies.

Cookie Sales

Number of Cookies Sold	Profit Earned
10	$1
20	$2
30	$3
40	$4

What is the range of the function that relates the profit earned to the number of cookies sold?

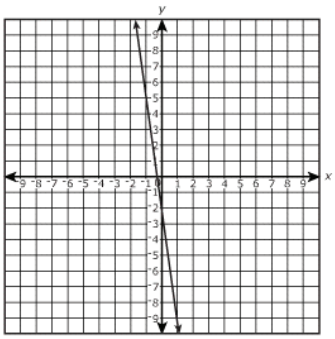
- **A** $\{1, 4\}$
- **B** $\{10, 40\}$
- **C** $\{1, 2, 3, 4\}$
- **D** $\{10, 20, 30, 40\}$

Performance Indicator: 3102.3.8 Determine the equation of a line and/or graph a linear equation.

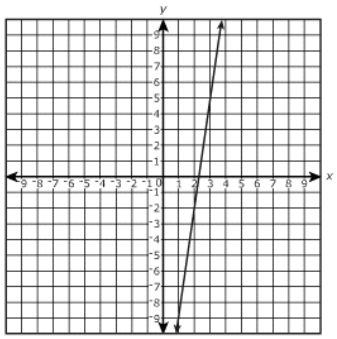
16.

Which is the graph of the equation $y + 9 = -7(x - 1)$?

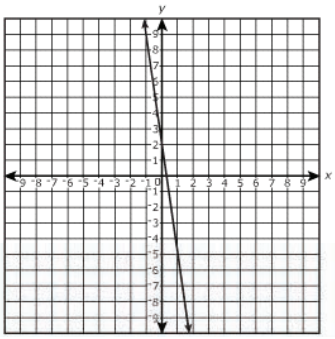
- **A**



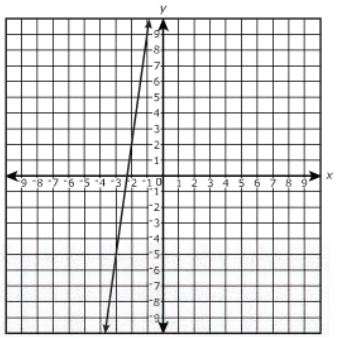
- **C**



- **B**



- **D**



Performance Indicator: 3102.3.9 Solve systems of linear equations/inequalities in two variables.

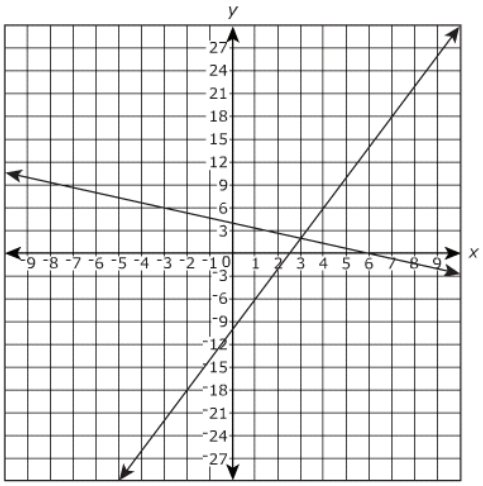
17. **Which ordered pair (x, y) represents the solution for the system of equations shown below?**

$$x - 15y = -227$$
$$15x - y = -45$$

- **A** (15, −2)
- **B** (2, 75)
- **C** (−2, 15)
- **D** (−2, −75)

Performance Indicator: 3102.3.9 Solve systems of linear equations/inequalities in two variables.

18. **Which system of linear equations <u>best</u> represents the graph shown below?**

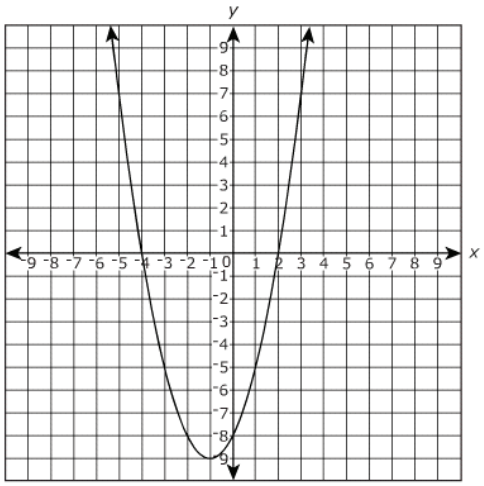


- **A** $2x + 3y = 12$, $4x - y = 10$
- **B** $2x - 3y = 12$, $4x + y = 10$
- **C** $2x + 3y = 12$, $4x + y = 10$
- **D** $2x - 3y = 12$, $4x - y = 10$

Go On ▶

Performance Indicator: 3102.3.10 Find the solution of a quadratic equation and/or zeros of a quadratic function.

19. **What are the zeros of the quadratic function graphed below?**



- **A** −4 and −2
- **B** −4 and 2
- **C** 4 and −2
- **D** 4 and 2

Performance Indicator: 3102.3.10 Find the solution of a quadratic equation and/or zeros of a quadratic function.

20. **What are the solutions to the quadratic equation shown below?**

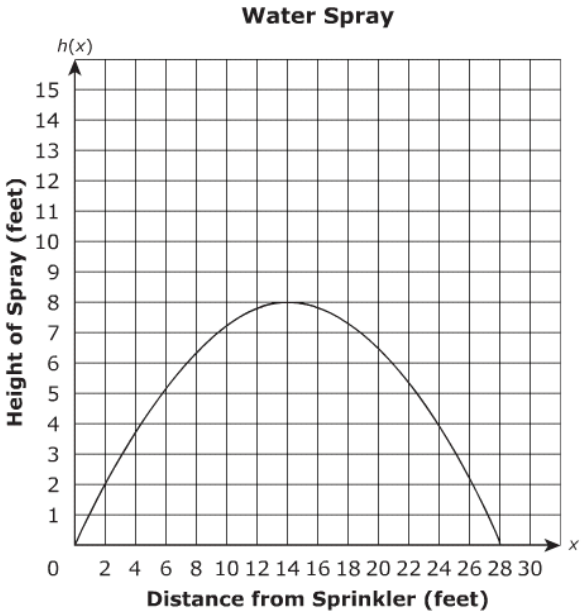
$$21x^2 = 2x + 3$$

- **A** $\frac{3}{7}, -\frac{1}{3}$
- **B** $\frac{1}{3}, \frac{3}{7}$
- **C** $-\frac{3}{7}, \frac{1}{3}$
- **D** $-\frac{1}{3}, -\frac{3}{7}$

Go On ▶

Performance Indicator: 3102.3.11 Analyze nonlinear graphs including quadratic and exponential functions that model a contextual situation.

21. **The height of the water spray from a sprinkler is modeled using a quadratic function, where $h(x)$ represents the height of the spray and x represents the horizontal distance from the sprinkler.**

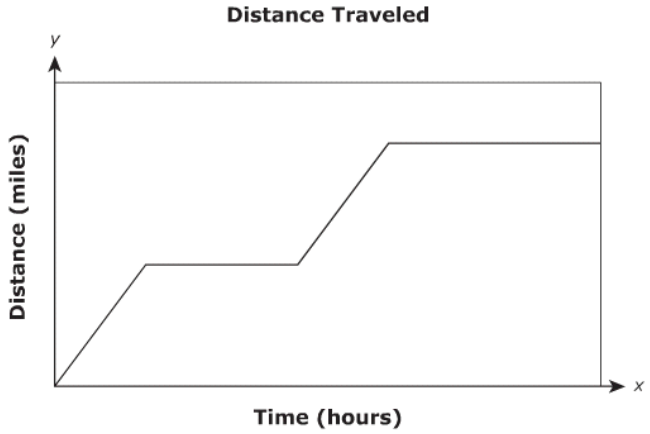


What is the maximum height of the water spray?

- **A** 8 feet
- **B** 14 feet
- **C** 16 feet
- **D** 28 feet

Performance Indicator: 3102.3.11 Analyze nonlinear graphs including quadratic and exponential functions that model a contextual situation.

22. **The graph below shows the relationship between the distance traveled by a car and time.**



What do the two horizontal segments of the graph represent?

- **A** a car driving at a decreasing speed
- **B** a car driving at an increasing speed
- **C** a car driving on level ground
- **D** a car stopped in traffic

Go On ▶

Performance Indicator: 3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.

23. **Which function represents the pattern shown in the table?**

x	$f(x)$
1	7
2	4
3	1
4	−2

- **A** $f(x) = x + 6$
- **B** $f(x) = x + 2$
- **C** $f(x) = 10 - 3x$
- **D** $f(x) = 12 - 5x$

Performance Indicator: 3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.

24. **Observe the pattern below.**

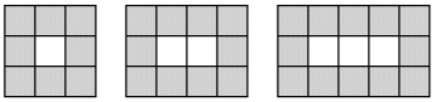


Figure 1 **Figure 2** **Figure 3**

Which expression describes the number of shaded squares in the *n*th figure?

- **A** $4n$
- **B** $8n$
- **C** $3(n + 2)$
- **D** $2(n + 3)$

Performance Indicator: 3102.3.2 Operate with polynomials and simplify results.

25. **If $3x + 8$ represents the length of a rectangle and $2x - 4$ represents its width, which expression represents the area of the rectangle?**

- **A** $6x^2 - 32$
- **B** $6x^2 + 32$
- **C** $6x^2 + 4x - 32$
- **D** $6x^2 + 4x + 32$

Performance Indicator: 3102.3.2 Operate with polynomials and simplify results.

26. **What is the sum of $(25p^2 + 12p + 43)$ and $(13p^3 - 17)$?**

- **A** $13p^3 + 25p^2 + 12p + 26$
- **B** $13p^3 + 25p^2 + 12p + 60$
- **C** $38p^3 + 12p + 26$
- **D** $38p^3 + 12p + 60$

Go On ▶

Performance Indicator: 3102.3.3 Factor polynomials.

27. **The volume of a box is represented by $2x^3 + 5x^2 + 2x$. Factor this polynomial.**

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

Performance Indicator: 3102.3.3 Factor polynomials.

28. **Which expression is equivalent to $27a^3 + 117a^2$?**

- **A** $3a(9a^2 + 13)$
- **B** $9a(3a^2 + 13)$
- **C** $3a^2(9a + 13)$
- **D** $9a^2(3a + 13)$

Go On ▶

Performance Indicator: 3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.

29. **Which is the simplified form of $\frac{(x^2-4)}{(x^2+3x)} \cdot \frac{(x^2-2x-15)}{(10+3x-x^2)}$ including all restrictions on the domain?**

- **A** $-\frac{(x-2)}{x}$, $x \neq -3, -2, 0, 5$
- **B** $\frac{(x-2)}{x}$, $x \neq -3, -2, 0, 5$
- **C** $\frac{(x+2)}{x}$, $x \neq -5, -3, 0, 2$
- **D** $\frac{(x+2)}{x(x-2)}$, $x \neq -5, -3, 0, 2$

Performance Indicator: 3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.

30. **Which expression is an equivalent form of $\frac{a^3bc^2}{a^2b^3c - bc^3}$ for all defined values?**

- **A** $\frac{ac^2}{(ab + c)(ab - c)}$
- **B** $\frac{a^3c}{(ab + c)(ab - c)}$
- **C** $\frac{a^3c}{(b + c)(b - c)}$
- **D** $\frac{ac}{(b + c)(b - c)}$

Go On ▶

Performance Indicator: 3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.

31. **Evaluate the expression $\frac{4}{a-3} - \frac{1}{a}$ where $a = 4$.**

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

Performance Indicator: 3102.3.5 Write and/or solve linear equations, inequalities, and compound inequalities including those containing absolute value.

32. **Solve $3(2x + 1) + 10 = x + 18$ for x.**

- A $\{1\}$
- B $\left\{\frac{7}{5}\right\}$
- C $\{3\}$
- D $\left\{\frac{31}{7}\right\}$

Go On ▶

Performance Indicator: 3102.3.6 Interpret various relations in multiple representations.

33. **Solve:** $-4x + 5 \geq -7$

- **A** $x \leq \frac{1}{2}$
- **B** $x \geq \frac{1}{2}$
- **C** $x \leq 3$
- **D** $x \geq 3$

Performance Indicator: 3102.3.6 Interpret various relations in multiple representations.

34. **Which value of *n* satisfies the given inequality?**

$$|2 - 5n| < 10$$

- **A** $-\frac{9}{5}$
- **B** -1
- **C** $\frac{12}{5}$
- **D** 3

Go On ▶

Performance Indicator: 3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.

35.

Which set of ordered pairs represents a relation that is <u>not</u> a function?

- **A** $\{(-1, 1), (5, 0), (3, 6), (8, 0)\}$
- **B** $\{(-1, 2), (2, -3), (4, 2), (1, 9)\}$
- **C** $\{(1, 1), (2, 2), (3, 3), (4, 4)\}$
- **D** $\{(3, 3), (7, 9), (4, 2), (7, 10)\}$

Performance Indicator: 3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.

36.

What is the domain of the relation $\{(-4, 5), (-2, -3), (0, 1), (1, -6), (3, 8)\}$?

- **A** $\{5, -3, 0, -6, 8\}$
- **B** $\{5, -3, 1, -6, 8\}$
- **C** $\{-4, -2, 0, 1, 3\}$
- **D** $\{-4, -3, 0, 1, 3\}$

Go On ▶

Performance Indicator: 3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.

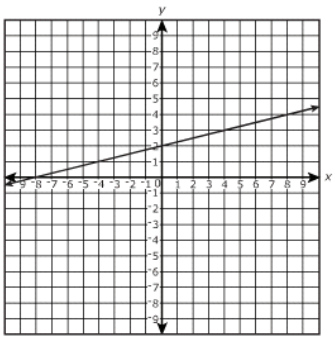
37. **What is the value of the function $f(x) = 2x^2 + 3x - 5$ when $x = -\frac{1}{2}$?**

- **A** −7
- **B** −6
- **C** −4
- **D** −3

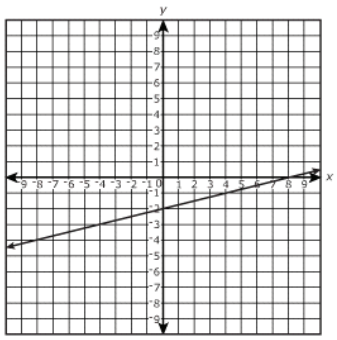
Performance Indicator: 3102.3.8 Determine the equation of a line and/or graph a linear equation.

38. **Which is the graph of the line defined by the equation $y = \frac{1}{4}x - 2$?**

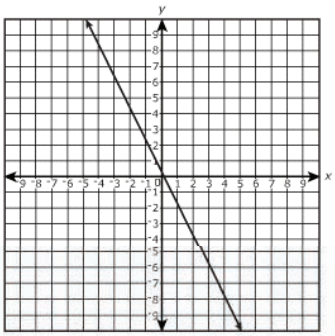
A



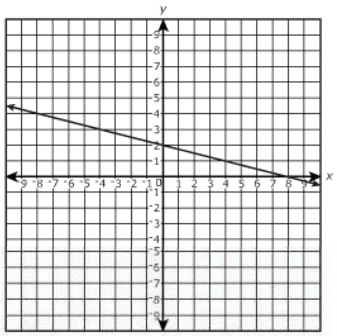
C



B



D



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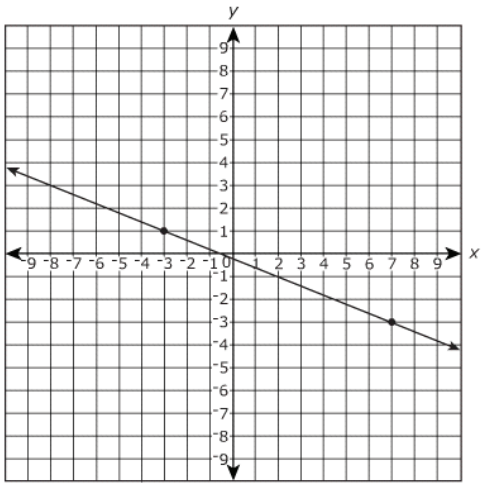
Performance Indicator: 3102.3.8 Determine the equation of a line and/or graph a linear equation.

39. **Which equation best represents the graph of the line?**



- **A** $5x + 2y = -1$
- **B** $2x + 5y = -1$
- **C** $5x + 2y = 11$
- **D** $2x + 5y = 11$

Performance Indicator: 3102.3.9 Solve systems of linear equations/inequalities in two variables.

40. **Which ordered pair (x, y) represents the solution for the system of equations shown below?**

$$9x - 3y = 12$$
$$y = 2x$$

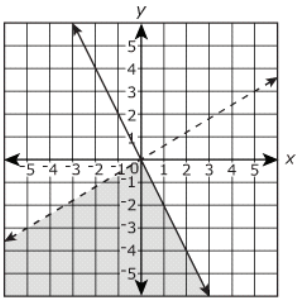
- **A** (1, 2)
- **B** (1, −1)
- **C** (4, 8)
- **D** (8, 4)

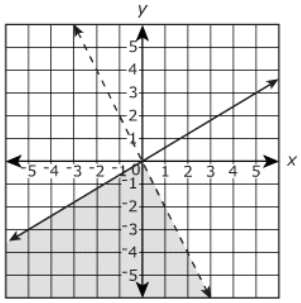
Go On ▶

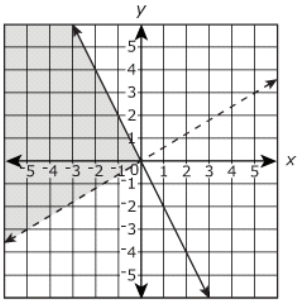
Performance Indicator: 3102.3.9 Solve systems of linear equations/inequalities in two variables.

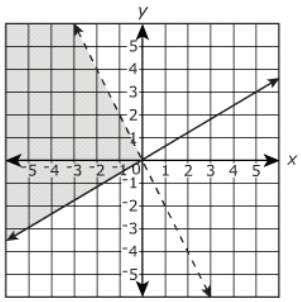
41. **Which graph best represents the solution to the system of linear inequalities shown below?**

$$2x + y \leq 0$$
$$3x - 5y > 0$$

A


C


B


D


Performance Indicator: 3102.3.10 Find the solution of a quadratic equation and/or zeros of a quadratic function.

42. **What are the zeros of the quadratic function shown below?**

$$f(x) = 10x^2 - x - 2$$

- A $\frac{1}{2}$ and $\frac{2}{5}$
- B $-\frac{1}{2}$ and $\frac{2}{5}$
- C $\frac{1}{2}$ and $-\frac{2}{5}$
- D $-\frac{1}{2}$ and $-\frac{2}{5}$

Performance Indicator: 3102.3.10 Find the solution of a quadratic equation and/or zeros of a quadratic function.

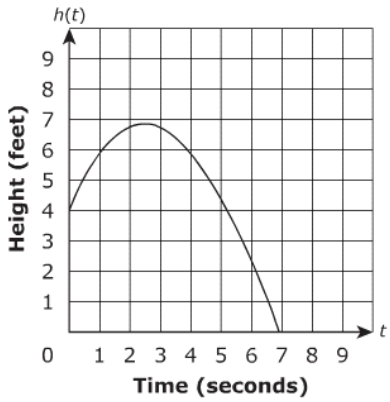
43. **Solve:** $25x^2 - 9 = 4^2$

- **A** $x = \pm 1$
- **B** $x = \pm 5$
- **C** $x = \pm \frac{\sqrt{7}}{5}$
- **D** $x = \pm \frac{\sqrt{17}}{5}$

Performance Indicator: 3102.3.11 Analyze nonlinear graphs including quadratic and exponential functions that model a contextual situation.

44. **A juggler throws balls into the air during a performance. The path traced by a ball is modeled using a quadratic function as shown below, where $h(t)$ represents the height in feet and t represents the time in seconds.**

Path Traced by the Ball



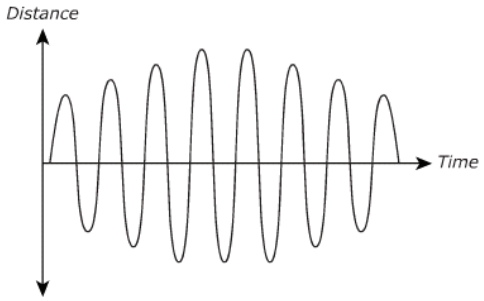
What does the $h(t)$ intercept of the graph represent?

- **A** the height from which the ball is thrown
- **B** the maximum height reached by the ball
- **C** the time taken for the ball to reach the ground
- **D** the time taken by the ball to reach the maximum height

Go On ▶

Performance Indicator: 3102.3.11 Analyze nonlinear graphs including quadratic and exponential functions that model a contextual situation.

45. **Which scenario could be best represented by the graph?**



- **A** a balloon descending
- **B** a car increasing speed
- **C** a person climbing up the stairs
- **D** a child swinging on a swing

Performance Indicator: 3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.

46. **Which function will generate the *n*th term of the sequence $-\frac{1}{2}$, 1, $\frac{7}{2}$, 7, ...?**

- **A** $f(n) = \frac{1 - 2n^2}{2}$
- **B** $f(n) = \frac{n^2 - 2}{2}$
- **C** $f(n) = \frac{n - 2}{2}$
- **D** $f(n) = \frac{n - 3}{4}$

Performance Indicator: 3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.

47.

Felipe created a pattern by arranging regular pentagons of unit side lengths as shown below.

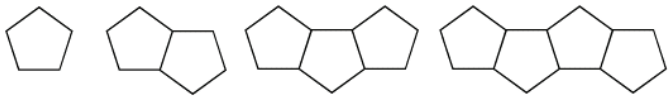


Figure 1 **Figure 2** **Figure 3** **Figure 4**

If Felipe continues this pattern, which perimeter function, $P(n)$, will represent the perimeter of n pentagons?

- **A** $P(n) = n + 4$
- **B** $P(n) = 2n + 3$
- **C** $P(n) = 3n + 2$
- **D** $P(n) = 4n + 1$

Performance Indicator: 3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.

48.

Which expression describes the nth term in the sequence below?

$$-1, -1, 0, 2, \ldots$$

- **A** $\frac{n-5}{4}$
- **B** $\frac{n^2-3n}{2}$
- **C** $n - 2$
- **D** $2n^2 - 3$

Performance Indicator: 3102.3.2 Operate with polynomials and simplify results.

49. **Simplify:** $\frac{2x^2+9x+10}{2x+5}$, **if** $x \neq -\frac{5}{2}$

- **A** $x + 2$
- **B** $x - 2$
- **C** $2x + 5$
- **D** $10x + 2$

Performance Indicator: 3102.3.2 Operate with polynomials and simplify results.

50. **What is the sum of** $(x^2 - 6x + 10)$ **and** $(-8x^2 + 3x - 5)$**?**

- **A** $-9x^2 - 9x + 15$
- **B** $-9x^2 + 9x - 15$
- **C** $-7x^2 - 3x + 5$
- **D** $7x^2 - 3x + 5$

Go On ▶

Performance Indicator: 3102.3.3 Factor polynomials.

51. **The area of a rectangle is represented by the expression $x^2 + 19x + 60$. Which expression could represent the length of the rectangle?**

- **A** $(x + 10)$
- **B** $(x - 10)$
- **C** $(x + 15)$
- **D** $(x - 15)$

Performance Indicator: 3102.3.3 Factor polynomials.

52. **Factor $4x^2 + 4x - 168$ completely.**

- **A** $4(x + 7)(x - 6)$
- **B** $4(x - 7)(x + 6)$
- **C** $(x + 7)(x - 6)$
- **D** $(x - 7)(x + 6)$

Performance Indicator: 3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.

53. **Simplify** $\frac{a^2 - 4}{18a - 9a^2} \div \frac{a^2 - 2a}{2 + a - a^2}$ **for all defined values.**

- A $\frac{(a + 2)}{9(a + 1)}$
- B $\frac{(a - 2)}{9(a + 1)}$
- C $\frac{(a + 2)(a + 1)}{9a^2}$
- D $\frac{(a + 2)(a - 1)}{9a^2}$

Performance Indicator: 3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.

54. **Evaluate the expression** $\frac{5}{x - 1} - (x - 2)$**, where** $x = \frac{3}{2}$**.**

- A $\frac{9}{2}$
- B $\frac{11}{2}$
- C $\frac{19}{2}$
- D $\frac{21}{2}$

Go On ▶

Performance Indicator: 3102.3.5 Write and/or solve linear equations, inequalities, and compound inequalities including those containing absolute value.

55. **Which statement represents the solution to this compound inequality?**

$$2x + 7 < 3 \text{ or } 5x + 5 \geq 10$$

- **A** $x < -2$ or $x \geq 1$
- **B** $x > 5$ or $x \leq 3$
- **C** $x > -2$ or $x \leq 1$
- **D** $x < 5$ or $x \geq 3$

Performance Indicator: 3102.3.5 Write and/or solve linear equations, inequalities, and compound inequalities including those containing absolute value.

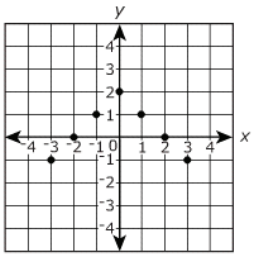
56. **Solve:** $2x + 3^2 = 15$

- **A** $x = 3$
- **B** $x = 4\frac{1}{2}$
- **C** $x = 7$
- **D** $x = 10\frac{1}{2}$

Go On ▶

Performance Indicator: 3102.3.6 Interpret various relations in multiple representations.

57. **The graph below represents a relation.**

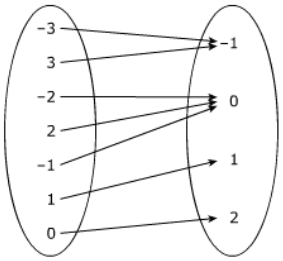


Which is <u>not</u> an equivalent representation of this relation?

- **A** $\{(-3, -1), (-2, 0), (-1, 1), (0, 2), (1, 1), (2, 0), (3, -1)\}$
- **B** $y = -|x| + 2$ with domain $\{-3, -2, -1, 0, 1, 2, 3\}$
- **C**

x	y
−3	−1
3	−1
−2	0
2	0
−1	1
1	1
0	2

- **D**



Performance Indicator: 3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.

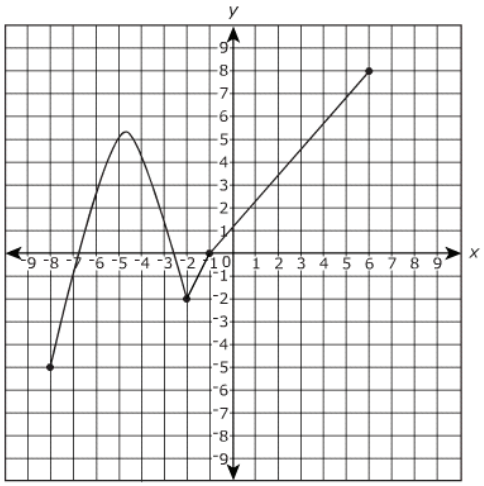
58. **What are the domain and range of the relation $\{(-5, 6), (-1, 3), (0, 0), (7, -9), (4, 2)\}$?**

- **A** domain: $\{-5, -1, 0, 7, 4\}$
  range: $\{6, 3, 0, -9, 2\}$
- **B** domain: $\{-5, -1, 0, -9, 4\}$
  range: $\{6, 3, 0, -9, 2\}$
- **C** domain: $\{6, 3, 0, -9, 2\}$
  range: $\{-5, -1, 0, 7, 4\}$
- **D** domain: $\{6, 3, 0, -9, 2\}$
  range: $\{-5, 3, 0, 7, 4\}$

Go On ▶

Performance Indicator: 3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.

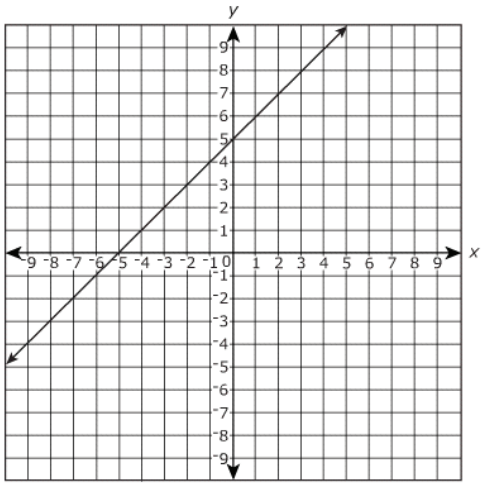
59. **Which expression represents the range of the function shown in the graph below?**



- **A** $-8 \le x \le 6$
- **B** $-5 \le x \le 8$
- **C** $-8 \le y \le 6$
- **D** $-5 \le y \le 8$

Performance Indicator: 3102.3.8 Determine the equation of a line and/or graph a linear equation.

60. **Which equation <u>best</u> represents the line shown on the graph?**

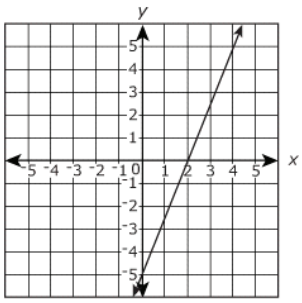


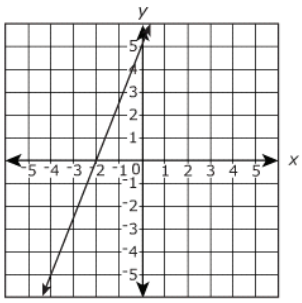
- **A** $x - y = -5$
- **B** $x + y = -5$
- **C** $x - y = 5$
- **D** $x + y = 5$

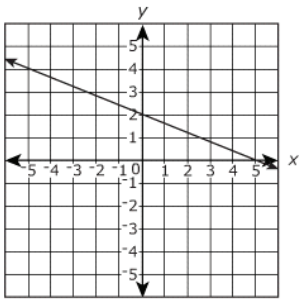
Go On ▶

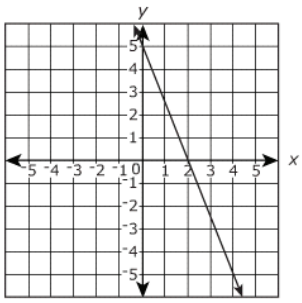
Performance Indicator: 3102.3.8 Determine the equation of a line and/or graph a linear equation.

61. **Which graph <u>best</u> represents the equation $5x + 2y = 10$?**

A


C


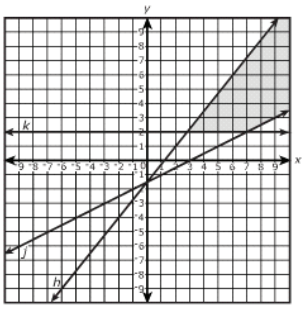
B


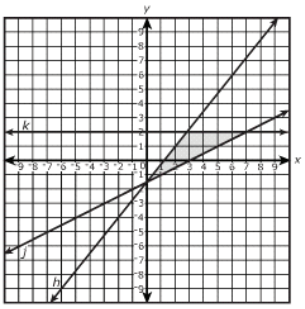
D


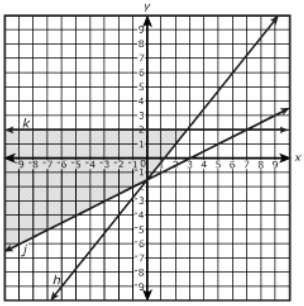
Performance Indicator: 3102.3.9 Solve systems of linear equations/inequalities in two variables.

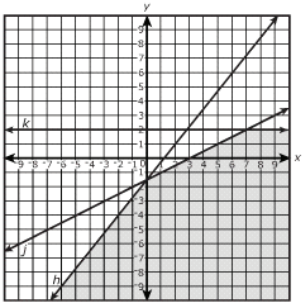
62. **Which graph <u>best</u> represents the solution to the system of linear equations shown below?**

Line h: $5x - 4y \geq 6$
Line j: $x - 2y \geq 3$
Line k: $y \leq 2$

A


C


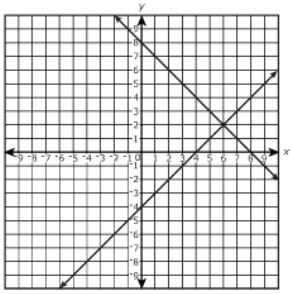
B


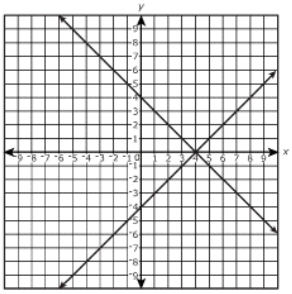
D


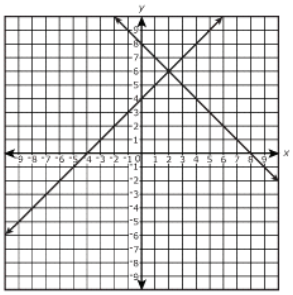
Performance Indicator: 3102.3.9 Solve systems of linear equations/inequalities in two variables.

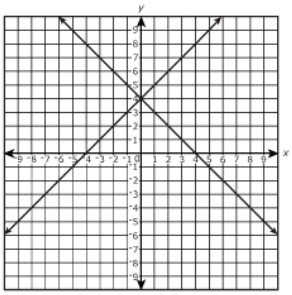
63. **Which graph best represents the solution to the system of linear equations shown below?**

$$x + y = 8$$
$$x - y = -4$$

A


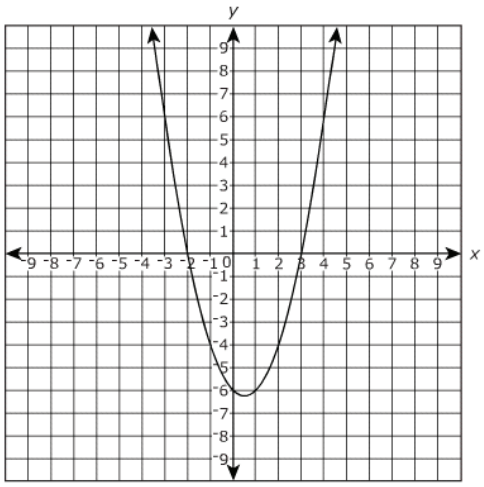
C


B


D


Performance Indicator: 3102.3.10 Find the solution of a quadratic equation and/or zeros of a quadratic function.

64. **What are the zeros of the quadratic function graphed below?**



- **A** (−2, 0) and (3, 0)
- **B** (2, 0) and (−3, 0)
- **C** (0, 0) and (−6, 0)
- **D** (0, 0) and (6, 0)

Go On ▶

Performance Indicator: 3102.3.10 Find the solution of a quadratic equation and/or zeros of a quadratic function.

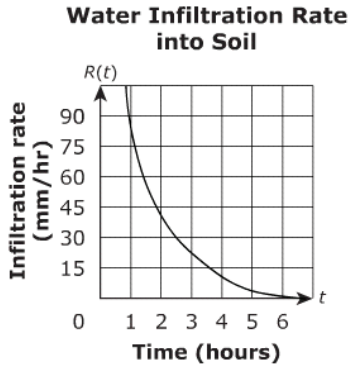
65. **What are the zeros of the quadratic function shown below?**

$$f(x) = x^2 - 2x - 15$$

- **A** −13 and −15
- **B** −5 and 3
- **C** −3 and 5
- **D** 15 and 17

Performance Indicator: 3102.3.11 Analyze nonlinear graphs including quadratic and exponential functions that model a contextual situation.

66. **The water infiltration rate, $R(t)$, of rainfall into dry soil, in millimeters per hour (mm/hr), decreases with respect to time, t, in hours. The rate can be modeled by an exponential equation as shown in the graph below.**



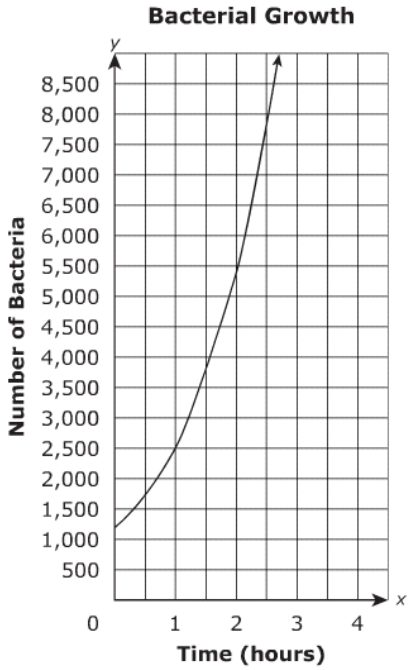
Which value <u>best</u> represents the water infiltration rate after $2\frac{1}{2}$ hours of rainfall?

- **A** 15 mm/hr
- **B** 30 mm/hr
- **C** 45 mm/hr
- **D** 90 mm/hr

Go On ▶

Performance Indicator: 3102.3.11 Analyze nonlinear graphs including quadratic and exponential functions that model a contextual situation.

67. **A biologist observes bacteria growing in a culture as modeled in the graph below.**



About how many bacteria are present after 2.5 hours?

- **A** 1,200
- **B** 3,696
- **C** 5,378
- **D** 7,825

Reporting Category 3: Algebra		
Item Number	**Correct Answer**	**Performance Indicator**
1	D	3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.
2	C	3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.
3	D	3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.
4	D	3102.3.2 Operate with polynomials and simplify results.
5	C	3102.3.2 Operate with polynomials and simplify results.
6	B	3102.3.3 Factor polynomials.
7	C	3102.3.3 Factor polynomials.
8	A	3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.
9	B	3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.
10	D	3102.3.5 Write and/or solve linear equations, inequalities, and compound inequalities including those containing absolute value.
11	C	3102.3.5 Write and/or solve linear equations, inequalities, and compound inequalities including those containing absolute value.
12	A	3102.3.6 Interpret various relations in multiple representations.
13	B	3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.

14	D	3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.
15	C	3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.
16	A	3102.3.8 Determine the equation of a line and/or graph a linear equation.
17	C	3102.3.9 Solve systems of linear equations/inequalities in two variables.
18	A	3102.3.9 Solve systems of linear equations/inequalities in two variables.
19	B	3102.3.10 Find the solution of a quadratic equation and/or zeros of a quadratic function.
20	A	3102.3.10 Find the solution of a quadratic equation and/or zeros of a quadratic function.
21	A	3102.3.11 Analyze nonlinear graphs including quadratic and exponential functions that model a contextual situation.
22	D	3102.3.11 Analyze nonlinear graphs including quadratic and exponential functions that model a contextual situation.
23	C	3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.
24	D	3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.
25	C	3102.3.2 Operate with polynomials and simplify results.
26	A	3102.3.2 Operate with polynomials and simplify results.
27	A	3102.3.3 Factor polynomials.
28	D	3102.3.3 Factor polynomials.
29	A	3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.

30	B	3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.
31	D	3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.
32	A	3102.3.5 Write and/or solve linear equations, inequalities, and compound inequalities including those containing absolute value.
33	C	3102.3.6 Interpret various relations in multiple representations.
34	B	3102.3.6 Interpret various relations in multiple representations.
35	D	3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.
36	C	3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.
37	B	3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.
38	C	3102.3.8 Determine the equation of a line and/or graph a linear equation.
39	B	3102.3.8 Determine the equation of a line and/or graph a linear equation.
40	C	3102.3.9 Solve systems of linear equations/inequalities in two variables.
41	A	3102.3.9 Solve systems of linear equations/inequalities in two variables.
42	C	3102.3.10 Find the solution of a quadratic equation and/or zeros of a quadratic function.
43	A	3102.3.10 Find the solution of a quadratic equation and/or zeros of a quadratic function.
44	A	3102.3.11 Analyze nonlinear graphs including quadratic and exponential functions that model a contextual situation.

45	D	3102.3.11 Analyze nonlinear graphs including quadratic and exponential functions that model a contextual situation.
46	B	3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.
47	C	3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.
48	B	3102.3.1 Express a generalization of a pattern in various representations including algebraic and function notation.
49	A	3102.3.2 Operate with polynomials and simplify results.
50	C	3102.3.2 Operate with polynomials and simplify results.
51	C	3102.3.3 Factor polynomials.
52	A	3102.3.3 Factor polynomials.
53	C	3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.
54	D	3102.3.4 Operate with, evaluate, and simplify rational expressions including determining restrictions on the domain of the variables.
55	A	3102.3.5 Write and/or solve linear equations, inequalities, and compound inequalities including those containing absolute value.
56	A	3102.3.5 Write and/or solve linear equations, inequalities, and compound inequalities including those containing absolute value.
57	D	3102.3.6 Interpret various relations in multiple representations.
58	A	3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.
59	D	3102.3.7 Determine domain and range of a relation, determine whether a relation is a function and/or evaluate a function at a specified rational value.

60	A	3102.3.8 Determine the equation of a line and/or graph a linear equation.
61	D	3102.3.8 Determine the equation of a line and/or graph a linear equation.
62	D	3102.3.9 Solve systems of linear equations/inequalities in two variables.
63	B	3102.3.9 Solve systems of linear equations/inequalities in two variables.
64	A	3102.3.10 Find the solution of a quadratic equation and/or zeros of a quadratic function.
65	C	3102.3.10 Find the solution of a quadratic equation and/or zeros of a quadratic function.
66	B	3102.3.11 Analyze nonlinear graphs including quadratic and exponential functions that model a contextual situation.
67	D	3102.3.11 Analyze nonlinear graphs including quadratic and exponential functions that model a contextual situation.