

Algebra 1 Skills Checklist

1. Solve linear equations

When $\frac{1}{3}k + \frac{1}{4}k = 1$, what is the value of k ?

- A. $\frac{1}{7}$
- B. $\frac{12}{7}$
- C. $\frac{7}{2}$
- D. 6
- E. 12

2. Translate verbal expressions to algebraic expressions or equations

Two enterprising college students decide to start a business. They will make up and deliver helium balloon bouquets for special occasions. It will cost them \$39.99 to buy a machine to fill the balloons with helium. They estimate that it will cost them \$2.00 to buy the balloons, helium, and ribbons needed to make each balloon bouquet. Which of the following expressions could be used to model the total cost for producing b balloon bouquets?

- A. $\$ 2.00b + \39.99
- B. $\$37.99b$
- C. $\$39.99b + \$ 2.00$
- D. $\$41.99b$
- E. $\$79.98b$

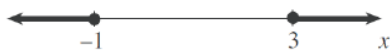
3. Solve linear inequalities

The inequality $3(x + 2) > 4(x - 3)$ is equivalent to which of the following inequalities?

- F. $x < -6$
- G. $x < 5$
- H. $x < 9$
- J. $x < 14$
- K. $x < 18$

4. Solve and graph compound inequalities

The number line graph below is the graph of which of the following inequalities?



- A. $-1 \leq x$ and $3 \leq x$
- B. $-1 \leq x$ and $3 \geq x$
- C. $-1 \leq x$ or $3 \leq x$
- D. $-1 \geq x$ or $3 \leq x$
- E. $-1 \geq x$ or $3 \geq x$

5. Solve word problems with linear equations or inequalities

This month, Kami sold 70 figurines in 2 sizes. The large figurines sold for \$12 each, and the small figurines sold for \$8 each. The amount of money he received from the sales of the large figurines was equal to the amount of money he received from the sales of the small figurines. How many large figurines did Kami sell this month?

- A. 20
- B. 28
- C. 35
- D. 42
- E. 50

6. Solve consecutive integer problems

The 6 consecutive integers below add up to 447.

$$\begin{aligned}x - 2 \\x - 1 \\x \\x + 1 \\x + 2 \\x + 3\end{aligned}$$

What is the value of x ?

- F. 72
- G. 73
- H. 74
- J. 75
- K. 76

7. Solve rate, time, distance problems

Ms. Lewis plans to drive 900 miles to her vacation destination, driving an average of 50 miles per hour. How many miles per hour faster must she average, while driving, to reduce her total driving time by 3 hours?

- A. 5
- B. 8
- C. 10
- D. 15
- E. 18

8. Multiply binomials

For all x , $(3x + 7)^2 = ?$

- A. $6x + 14$
- B. $6x^2 + 14$
- C. $9x^2 + 49$
- D. $9x^2 + 21x + 49$
- E. $9x^2 + 42x + 49$

9. Factor binomials and trinomials

Which of the following is a factored form of the expression $5x^2 - 13x - 6$?

- A. $(x - 3)(5x + 2)$
- B. $(x - 2)(5x - 3)$
- C. $(x - 2)(5x + 3)$
- D. $(x + 2)(5x - 3)$
- E. $(x + 3)(5x - 2)$

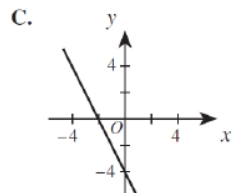
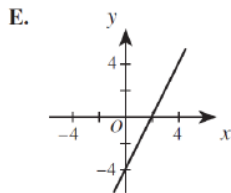
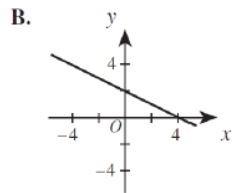
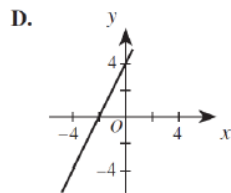
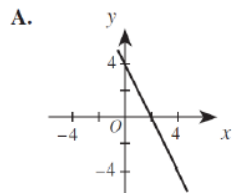
10. Find slope and y-intercept and equations of lines

What is the slope of the line through $(-5, 2)$ and $(6, 7)$ in the standard (x, y) coordinate plane?

- F. 9
- G. 5
- H. -5
- J. $\frac{5}{11}$
- K. $-\frac{5}{11}$

11. Graph linear equations

Which of the following is the graph of the equation $2x + y = 4$ in the standard (x, y) coordinate plane?



12. Operations on polynomials

What polynomial must be added to $x^2 - 2x + 6$ so that the sum is $3x^2 + 7x$?

- A. $4x^2 + 5x + 6$
- B. $3x^2 + 9x + 6$
- C. $3x^2 + 9x - 6$
- D. $2x^2 + 9x - 6$
- E. $2x^2 - 5x + 6$

13. Solve quadratic equations

What values of x are solutions for $x^2 + 2x = 8$?

- A. -4 and 2
- B. -2 and 0
- C. -2 and 4
- D. 0 and 2
- E. 6 and 8

14. Solve equations with fractional exponents or radicals

If $\sqrt{2x} + 5 = 9$, then $x = ?$

- A. -4
- B. 2
- C. 4
- D. 8
- E. 16

15. Solve systems of linear equations

The sum of the real numbers x and y is 11. Their difference is 5. What is the value of xy ?

- F. 3
- G. 5
- H. 8
- J. 24
- K. 55

16. Solve absolute value equations or inequalities

The diameter, d centimeters, of the metal poles Goodpole Manufacturing produces must satisfy the inequality $|d - 3| \leq 0.001$. What is the maximum diameter, in centimeters, such a metal pole may have?

- F. 1.4995
- G. 1.5005
- H. 2.999
- J. 3.000
- K. 3.001

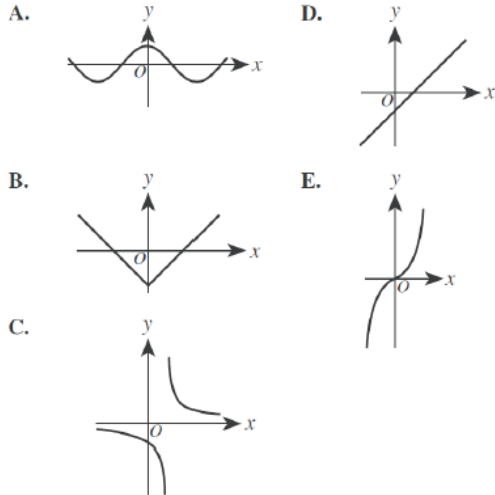
17. Use basic function notation to evaluate functions

If $f(x) = (3x + 7)^2$, then $f(1) = ?$

- A. 10
- B. 16
- C. 58
- D. 79
- E. 100

18. Odd and even functions

A function f is an *odd* function if and only if $f(-x) = -f(x)$ for every value of x in the domain of f . One of the functions graphed in the standard (x,y) coordinate plane below is an odd function. Which one?



19. Solve percent problems with variables

Leticia went into Discount Music to price CDs. All CDs were discounted 23% off the marked price. Leticia wanted to program her calculator so she could input the marked price and the discounted price would be the output. Which of the following is an expression for the discounted price on a marked price of p dollars?

- A. $p - 0.23p$
- B. $p - 0.23$
- C. $p - 23p$
- D. $p - 23$
- E. $0.23p$

20. Simplify rational expressions

For all x in the domain of the function $\frac{x+1}{x^3-x}$, this function is equivalent to:

- F. $\frac{1}{x^2} - \frac{1}{x^3}$
- G. $\frac{1}{x^3} - \frac{1}{x}$
- H. $\frac{1}{x^2-1}$
- J. $\frac{1}{x^2-x}$
- K. $\frac{1}{x^3}$

Answers

Algebra 1 Teaching Problem Answers

- | | |
|-------|-------|
| 1. B | 2. A |
| 3. K | 4. D |
| 5. B | 6. H |
| 7. C | 8. E |
| 9. A | 10. J |
| 11. A | 12. D |
| 13. A | 14. D |
| 15. J | 16. K |
| 17. E | 18. E |
| 19. A | 20. J |

Session 2

Algebra 2 Skills Checklist

1. Matrix operations

Given that $a \begin{bmatrix} 2 & 6 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} x & 27 \\ y & z \end{bmatrix}$ for some real number a , what is $x + z$?

- A. $\frac{4}{3}$
- B. $\frac{27}{2}$
- C. 26
- D. 27
- E. 48

2. Complex number operations

What is the product of the complex numbers $(-3i + 4)$ and $(3i + 4)$?

- A. 1
- B. 7
- C. 25
- D. $-7 + 24i$
- E. $7 + 24i$

3. Solve for x in an exponent

In the real numbers, what is the solution of the equation $8^{2x+1} = 4^{1-x}$?

- A. $-\frac{1}{3}$
- B. $-\frac{1}{4}$
- C. $-\frac{1}{8}$
- D. 0
- E. $\frac{1}{7}$

4. Exponential functions

For a population that grows at a constant rate of $r\%$ per year, the formula $P(t) = p_0 \left(1 + \frac{r}{100}\right)^t$ models the population t years after an initial population of p_0 people is counted.

The population of the city of San Jose was 782,000 in 1990. Assume the population grows at a constant rate of 5% per year. According to this formula, which of the following is an expression for the population of San Jose in the year 2000?

- A. $782,000(6)^{10}$
- B. $782,000(1.5)^{10}$
- C. $782,000(1.05)^{10}$
- D. $(782,000 \times 1.5)^{10}$
- E. $(782,000 \times 1.05)^{10}$

5. Geometric and arithmetic sequences and series

On the first day of school, Mr. Vilani gave his third-grade students 5 new words to spell. On each day of school after that, he gave the students 3 new words to spell. In the first 20 days of school, how many new words had he given the students to spell?

- A. 28
- B. 62
- C. 65
- D. 68
- E. 152

6. Recursive definitions of sequences

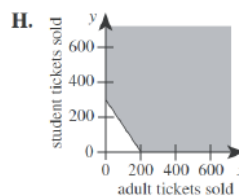
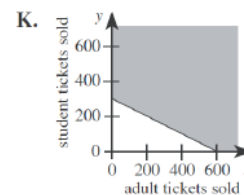
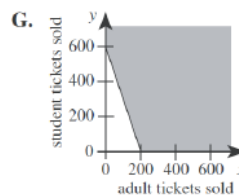
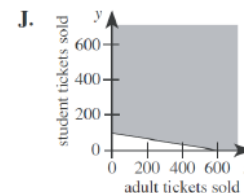
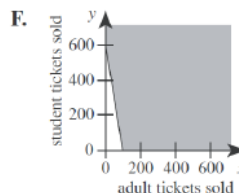
The n th term (t_n) of a certain sequence is defined as $t_n = t_{n-1} + 4$.

If $t_1 = -7$ then $t_{71} =$

- A. 273
- B. 277
- C. 281
- D. 283
- E. 287

7. Systems of inequalities

Tickets for the Senior Talent Show at George Washington Carver High School are \$3 for adults and \$2 for students. To cover expenses, a total of \$600 must be collected from ticket sales for the show. One of the following graphs in the standard (x,y) coordinate plane, where x is the number of adult tickets sold and y is the number of student tickets sold, represents all the possible combinations of ticket sales that cover at least \$600 in expenses. Which graph is it?



8. Compositions of functions

Consider the functions $f(x) = \sqrt{x}$ and $g(x) = 7x + b$. In the standard (x,y) coordinate plane, $y = f(g(x))$ passes through $(4,6)$. What is the value of b ?

- A. 8
- B. -8
- C. -25
- D. -26
- E. $4 - 7\sqrt{6}$

9. Trigonometric values on a unit circle

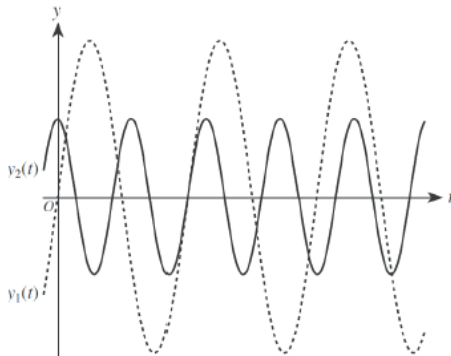
What is $\cos \frac{\pi}{12}$ given that $\frac{\pi}{12} = \frac{\pi}{3} - \frac{\pi}{4}$ and that $\cos(\alpha - \beta) = (\cos \alpha)(\cos \beta) + (\sin \alpha)(\sin \beta)$?

| θ | $\sin \theta$ | $\cos \theta$ |
|-----------------|----------------------|----------------------|
| $\frac{\pi}{6}$ | $\frac{1}{2}$ | $\frac{\sqrt{3}}{2}$ |
| $\frac{\pi}{4}$ | $\frac{\sqrt{2}}{2}$ | $\frac{\sqrt{2}}{2}$ |
| $\frac{\pi}{3}$ | $\frac{\sqrt{3}}{2}$ | $\frac{1}{2}$ |

- F. $\frac{1}{4}$
- G. $\frac{1}{2}$
- H. $\frac{\sqrt{6} + \sqrt{2}}{4}$
- J. $\frac{\sqrt{3} + \sqrt{2}}{2}$
- K. $\frac{\sqrt{6} + 2}{4}$

10. Graphs of trigonometric functions

The equations of the 2 graphs shown below are $y_1(t) = a_1 \sin(b_1 t)$ and $y_2(t) = a_2 \cos(b_2 t)$, where the constants b_1 and b_2 are both positive real numbers.



Which of the following statements is true of the constants a_1 and a_2 ?

- A. $0 < a_1 < a_2$
- B. $0 < a_2 < a_1$
- C. $a_1 < 0 < a_2$
- D. $a_1 < a_2 < 0$
- E. $a_2 < a_1 < 0$

11. Trigonometric identities

For x such that $0 < x < \frac{\pi}{2}$, the expression

$$\frac{\sqrt{1 - \cos^2 x}}{\sin x} + \frac{\sqrt{1 - \sin^2 x}}{\cos x}$$

is equivalent to:

- F. 0
- G. 1
- H. 2
- J. $-\tan x$
- K. $\sin 2x$

12. Simplifying or solve expressions and equations with logarithms

What is the real value of x in the equation $\log_2 24 - \log_2 3 = \log_5 x$?

- F. 3
- G. 21
- H. 72
- J. 125
- K. 243

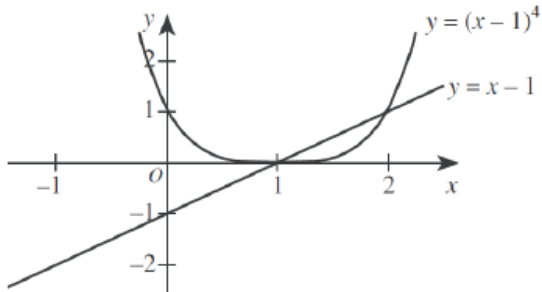
13. Graphing Quadratic functions, identifying the vertex

The equation $y = x^2$ is graphed in the standard (x,y) coordinate plane. In which of the following equations is the graph of the parabola shifted 4 units to the left and 2 units up?

- A. $y = (x - 4)^2 + 2$
- B. $y = (x - 4)^2 - 2$
- C. $y = (x - 2)^2 + 4$
- D. $y = (x + 4)^2 + 2$
- E. $y = (x + 4)^2 - 2$

14. Graphs of systems of equations

The graphs of the equations $y = x - 1$ and $y = (x - 1)^4$ are shown in the standard (x, y) coordinate plane below. What real values of x , if any, satisfy the inequality $(x - 1)^4 < (x - 1)$?



- A. No real values
- B. $x < 0$ and $x > 1$
- C. $x < 1$ and $x > 2$
- D. $0 < x < 1$
- E. $1 < x < 2$

15. Law of sines and law of cosines

The sides of an acute triangle measure 14 cm, 18 cm, and 20 cm, respectively. Which of the following equations, when solved for θ , gives the measure of the smallest angle of the triangle?

(Note: For any triangle with sides of length a , b , and c that are opposite angles A , B , and C , respectively, $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ and $c^2 = a^2 + b^2 - 2ab \cos C$.)

- F. $\frac{\sin \theta}{14} = \frac{1}{18}$
- G. $\frac{\sin \theta}{14} = \frac{1}{20}$
- H. $\frac{\sin \theta}{20} = \frac{1}{14}$
- J. $14^2 = 18^2 + 20^2 - 2(18)(20)\cos \theta$
- K. $20^2 = 14^2 + 18^2 - 2(14)(18)\cos \theta$

Answers

Session 2 Answers

Algebra 2 Teaching Problem Answers

- | | |
|-------|-------|
| 1. D | 2. C |
| 3. C | 4. C |
| 5. B | 6. A |
| 7. H | 8. A |
| 9. H | 10. B |
| 11. H | 12. J |
| 13. A | 14. E |
| 15. J | |

Algebra 1 and Algebra 2 Practice Problems

1.

Students studying motion observed a cart rolling at a constant rate along a straight line. The table below gives the distance, d feet, the cart was from a reference point at 1-second intervals from $t = 0$ seconds to $t = 5$ seconds.

| | | | | | | |
|-----|----|----|----|----|----|----|
| t | 0 | 1 | 2 | 3 | 4 | 5 |
| d | 14 | 20 | 26 | 32 | 38 | 44 |

Which of the following equations represents this relationship between d and t ?

- A. $d = t + 14$
- B. $d = 6t + 8$
- C. $d = 6t + 14$
- D. $d = 14t + 6$
- E. $d = 34t$

2.

An artist makes a profit of $(500p - p^2)$ dollars from selling p paintings. What is the fewest number of paintings the artist can sell to make a profit of at least \$60,000?

- F. 100
- G. 150
- H. 200
- J. 300
- K. 600

3.

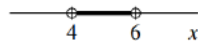


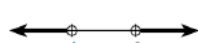

Which of the following is the solution statement for the inequality shown below?

$$-5 < 1 - 3x < 10$$

- F. $-5 < x < 10$
- G. $-3 < x$
- H. $-3 < x < 2$
- J. $-2 < x < 3$
- K. $x < -3$ or $x > 2$

4.

Which of the following number line graphs shows the solution set to the inequality $|x - 5| < -1$?

- F. 
- G. 
- H. 
- J. 
- K. 
(empty set)

5.

What are the real solutions to the equation

$$|x|^2 + 2|x| - 3 = 0?$$

- F. ± 1
- G. ± 3
- H. 1 and 3
- J. -1 and -3
- K. ± 1 and ± 3

6.

A function P is defined as follows:

$$\text{for } x > 0, P(x) = x^5 + x^4 - 36x - 36$$

$$\text{for } x < 0, P(x) = -x^5 + x^4 + 36x - 36$$

What is the value of $P(-1)$?

- A. -70
- B. -36
- C. 0
- D. 36
- E. 70

7.

The expression $(4z + 3)(z - 2)$ is equivalent to:

- F. $4z^2 - 5$
- G. $4z^2 - 6$
- H. $4z^2 - 3z - 5$
- J. $4z^2 - 5z - 6$
- K. $4z^2 + 5z - 6$

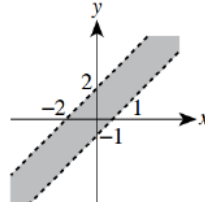
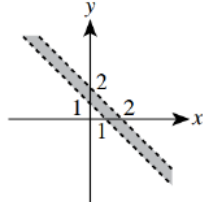
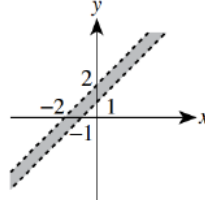
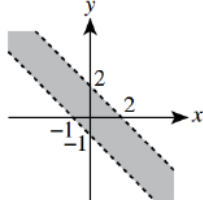
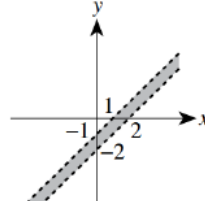
8.

The first term is 1 in the geometric sequence 1, -3, 9, -27, ... What is the SEVENTH term of the geometric sequence?

- A. -243
- B. -30
- C. 81
- D. 189
- E. 729

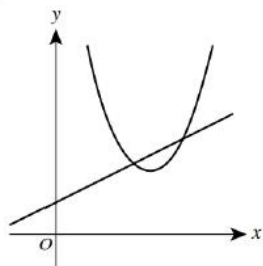
9.

Which of the following is the graph of the region $1 < x + y < 2$ in the standard (x, y) coordinate plane?

- F. 
- J. 
- G. 
- K. 
- H. 

10.

Which of the following describes a true relationship between the functions $f(x) = (x - 3)^2 + 2$ and $g(x) = \frac{1}{2}x + 1$ graphed below in the standard (x, y) coordinate plane?



- F. $f(x) = g(x)$ for exactly 2 values of x
- G. $f(x) = g(x)$ for exactly 1 value of x
- H. $f(x) < g(x)$ for all x
- J. $f(x) > g(x)$ for all x
- K. $f(x)$ is the inverse of $g(x)$

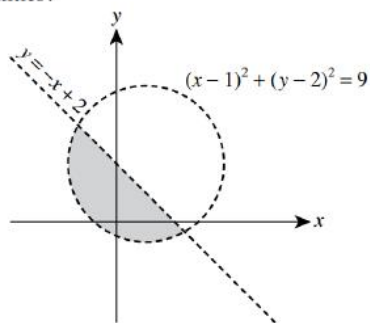
11.

Given $f(x) = x - \frac{1}{x}$ and $g(x) = \frac{1}{x}$, what is $f\left(g\left(\frac{1}{2}\right)\right)$?

- F. -3
- G. $-\frac{3}{2}$
- H. $-\frac{2}{3}$
- J. 0
- K. $\frac{3}{2}$

12.

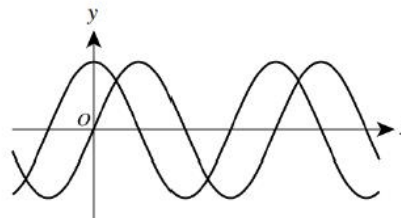
The shaded region in the graph below represents the solution set to which of the following systems of inequalities?



- A. $\begin{cases} y < -x + 2 \\ (x - 1)^2 + (y - 2)^2 < 9 \end{cases}$
- B. $\begin{cases} y > -x + 2 \\ (x - 1)^2 + (y - 2)^2 < 9 \end{cases}$
- C. $\begin{cases} y > -x + 2 \\ (x - 1)^2 + (y - 2)^2 > 9 \end{cases}$
- D. $\begin{cases} y < -x + 2 \\ (x - 1)^2 + (y - 2)^2 > 9 \end{cases}$
- E. $\begin{cases} (y - 2) < 3 \\ (x - 1) > 3 \end{cases}$

13.

The functions $y = \sin x$ and $y = \sin(x + a) + b$, for constants a and b , are graphed in the standard (x, y) coordinate plane below. The functions have the same maximum value. One of the following statements about the values of a and b is true. Which statement is it?



- A. $a < 0$ and $b = 0$
- B. $a < 0$ and $b > 0$
- C. $a = 0$ and $b > 0$
- D. $a > 0$ and $b < 0$
- E. $a > 0$ and $b > 0$

14.

Daisun owns 2 sportswear stores (X and Y). She stocks 3 brands of T-shirts (A, B, and C) in each store. The matrices below show the numbers of each type of T-shirt in each store and the cost for each type of T-shirt. The value of Daisun's T-shirt inventory is computed using the costs listed. What is the total value of the T-shirt inventory for Daisun's 2 stores?

| | A | B | C | Cost |
|---|-----|-----|-----|--------|
| X | 100 | 200 | 150 | A \$5 |
| Y | 120 | 50 | 100 | B \$10 |
| | | | | C \$15 |

- A. \$2,200
- B. \$2,220
- C. \$4,965
- D. \$5,450
- E. \$7,350

15.

A formula used to compute the current value of a savings account is $A = P(1 + r)^n$, where A is the current value; P is the amount deposited; r is the rate of interest for 1 compounding period, expressed as a decimal; and n is the number of compounding periods. Which of the following is closest to the value of a savings account after 5 years if \$10,000 is deposited at 4% annual interest compounded yearly?

- F. \$10,400
- G. \$12,167
- H. \$42,000
- J. \$52,000
- K. \$53,782

Answers

Algebra 1 and Algebra 2 Practice Problems Answers

- | | |
|-------|-------|
| 1. C | 2. H |
| 3. H | 4. K |
| 5. F | 6. A |
| 7. J | 8. E |
| 9. J | 10. F |
| 11. K | 12. A |
| 13. A | 14. E |
| 15. G | |