

# ALGEBRA 1

## Workbook

### Common Core Standards Edition

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**Common Core High School Math Reference Sheet  
(Algebra I, Geometry, Algebra II)**

**CONVERSIONS**

1 inch = 2.54 centimeters	1 kilometer = 0.62 mile	1 cup = 8 fluid ounces
1 meter = 39.37 inches	1 pound = 16 ounces	1 pint = 2 cups
1 mile = 5280 feet	1 pound = 0.454 kilograms	1 quart = 2 pints
1 mile = 1760 yards	1 kilogram = 2.2 pounds	1 gallon = 4 quarts
1 mile = 1.609 kilometers	1 ton = 2000 pounds	1 gallon = 3.785 liters
		1 liter = 0.264 gallon
		1 liter = 1000 cubic centimeters

**FORMULAS**

Triangle	$A = \frac{1}{2}bh$	Pythagorean Theorem	$a^2 + b^2 = c^2$
Parallelogram	$A = bh$	Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Circle	$A = \pi r^2$	Arithmetic Sequence	$a_n = a_1 + (n-1)d$
Circle	$C = \pi d$ or $C = 2\pi r$	Geometric Sequence	$a_n = a_1 r^{n-1}$
General Prisms	$V = Bh$	Geometric Series	$S_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$
Cylinder	$V = \pi r^2 h$	Radians	1 radian = $\frac{180}{\pi}$ degrees
Sphere	$V = \frac{4}{3}\pi r^3$	Degrees	1 degree = $\frac{\pi}{180}$ radians
Cone	$V = \frac{1}{3}\pi r^2 h$	Exponential Growth/Decay	$A = A_0 e^{k(t-t_0)} + B_0$
Pyramid	$V = \frac{1}{3}Bh$		

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Record your answers in the space provided. [48]

1. The expression  $x^4 - 16$  is equivalent to

- (1)  $(x^2 + 8)(x^2 - 8)$  (3)  $(x^2 + 4)(x^2 - 4)$   
 (2)  $(x^2 - 8)(x^2 - 8)$  (4)  $(x^2 - 4)(x^2 - 4)$  1 \_\_\_\_\_

2. An expression of the fifth degree is written with a leading coefficient of seven and a constant of six. Which expression is correctly written for these conditions?

- (1)  $6x^5 + x^4 + 7$  (2)  $7x^6 - 6x^4 + 5$  (3)  $6x^7 - x^5 + 5$  (4)  $7x^5 + 2x^2 + 6$  2 \_\_\_\_\_

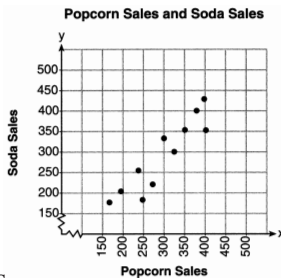
3. The table below shows the year and the number of households in a building that had high-speed broadband internet access.

Number of Households	11	16	23	33	42	47
Year	2002	2003	2004	2005	2006	2007

For which interval of time was the average rate of change the *smallest*?

- (1) 2002 - 2004 (2) 2003 - 2005 (3) 2004 - 2006 (4) 2005 - 2007 3 \_\_\_\_\_

4. The scatterplot compares the number of bags of popcorn and the number of sodas sold at each performance of the circus over one week.



Which conclusion can be drawn from the scatterplot?

- (1) There is a negative correlation between popcorn sales and soda sales.  
 (2) There is a positive correlation between popcorn sales and soda sales.  
 (3) There is no correlation between popcorn sales and soda sales.  
 (4) Buying popcorn causes people to buy soda. 4 \_\_\_\_\_

5. The Celluloid Cinema sold 150 tickets to a movie. Some of these were child tickets and the rest were adult tickets. A child ticket cost \$7.75 and an adult ticket cost \$10.25. If the cinema sold \$1470 worth of tickets, which system of equations could be used to determine how many adult tickets,  $a$ , and how many child tickets,  $c$ , were sold?

- (1)  $a + c = 150$  (3)  $a + c = 150$   
 $10.25a + 7.75c = 1470$   $7.75a + 10.25c = 1470$   
 (2)  $a + c = 1470$  (4)  $a + c = 1470$   
 $10.25a + 7.75c = 150$   $7.75a + 10.25c = 150$  5 \_\_\_\_\_

June 2016

6. The tables below show the values of four different functions for given values of  $x$ .

$x$	$f(x)$
1	12
2	19
3	26
4	33

$x$	$g(x)$
1	-1
2	1
3	5
4	13

$x$	$h(x)$
1	9
2	12
3	17
4	24

$x$	$k(x)$
1	-2
2	4
3	14
4	28

Which table represents a linear function?

- (1)  $f(x)$                       (2)  $g(x)$                       (3)  $h(x)$                       (4)  $k(x)$                       6 \_\_\_\_\_

7. The acidity in a swimming pool is considered normal if the average of three pH readings,  $p$ , is defined such that  $7.0 < p < 7.8$ . If the first two readings are 7.2 and 7.6, which value for the third reading will result in an overall rating of normal?

- (1) 6.2                      (2) 7.3                      (3) 8.6                      (4) 8.8                      7 \_\_\_\_\_

8. Dan took 12.5 seconds to run the 100-meter dash. He calculated the time to be approximately

- (1) 0.2083 minute                      (3) 0.2083 hour  
(2) 750 minutes                      (4) 0.52083 hour                      8 \_\_\_\_\_

9. When  $3x + 2 \leq 5(x - 4)$  is solved for  $x$ , the solution is

- (1)  $x \leq 3$                       (2)  $x \geq 3$                       (3)  $x \leq -11$                       (4)  $x \geq 11$                       9 \_\_\_\_\_

10. The expression  $3(x^2 - 1) - (x^2 - 7x + 10)$  is equivalent to

- (1)  $2x^2 - 7x + 7$                       (3)  $2x^2 - 7x + 9$   
(2)  $2x^2 + 7x - 13$                       (4)  $2x^2 + 7x - 11$                       10 \_\_\_\_\_

11. The range of the function  $f(x) = x^2 + 2x - 8$  is all real numbers

- (1) less than or equal to -9  
(2) greater than or equal to -9  
(3) less than or equal to -1  
(4) greater than or equal to -1                      11 \_\_\_\_\_

12. The zeros of the function  $f(x) = x^2 - 5x - 6$  are

- (1) -1 and 6                      (2) 1 and -6                      (3) 2 and -3                      (4) -2 and 3                      12 \_\_\_\_\_

13. In a sequence, the first term is 4 and the common difference is 3.

The fifth term of this sequence is

- (1) -11                      (2) -8                      (3) 16                      (4) 19                      13 \_\_\_\_\_

14. The growth of a certain organism can be modeled by  $C(t) = 10(1.029)^{24t}$ , where  $C(t)$  is the total number of cells after  $t$  hours. Which function is approximately equivalent to  $C(t)$ ?

- (1)  $C(t) = 240(.083)^{24t}$                       (3)  $C(t) = 10(1.986)^t$   
(2)  $C(t) = 10(.083)^t$                       (4)  $C(t) = 240(1.986)^{\frac{t}{24}}$                       14 \_\_\_\_\_



January 2018

## Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Record your answers in the space provided. [48]

1. When solving the equation  $12x^2 - 7x = 6 - 2(x^2 - 1)$ , Evan wrote  $12x^2 - 7x = 6 - 2x^2 + 2$  as his first step. Which property justifies this step?

- (1) subtraction property of equality  
 (2) multiplication property of equality  
 (3) associative property of multiplication  
 (4) distributive property of multiplication over subtraction

1 \_\_\_\_\_

2. Jill invests \$400 in a savings bond. The value of the bond,  $V(x)$ , in hundreds of dollars after  $x$  years is illustrated in the table.

$x$	$V(x)$
0	4
1	5.4
2	7.29
3	9.84

Which equation and statement illustrate the approximate value of the bond in hundreds of dollars over time in years?

- (1)  $V(x) = 4(0.65)^x$ , and it grows. (3)  $V(x) = 4(1.35)^x$ , and it grows.  
 (2)  $V(x) = 4(0.65)^x$ , and it decays. (4)  $V(x) = 4(1.35)^x$ , and it decays.

2 \_\_\_\_\_

3. Alicia purchased  $H$  half-gallons of ice cream for \$3.50 each and  $P$  packages of ice cream cones for \$2.50 each. She purchased 14 items and spent \$43. Which system of equations could be used to determine how many of each item Alicia purchased?

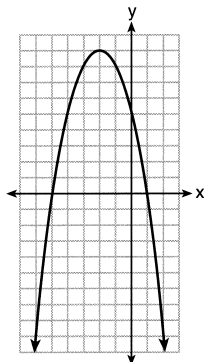
- (1)  $3.50H + 2.50P = 43$   
 $H + P = 14$   
 (2)  $3.50P + 2.50H = 43$   
 $P + H = 14$   
 (3)  $3.50H + 2.50P = 14$   
 $H + P = 43$   
 (4)  $3.50P + 2.50H = 14$   
 $P + H = 43$

3 \_\_\_\_\_

4. A relation is graphed on the set of axes.

Based on this graph, the relation is

- (1) a function because it passes the horizontal line test  
 (2) a function because it passes the vertical line test  
 (3) not a function because it fails the horizontal line test  
 (4) not a function because it fails the vertical line test



4 \_\_\_\_\_

5. Ian is saving up to buy a new baseball glove. Every month he puts \$10 into a jar. Which type of function best models the total amount of money in the jar after a given number of months?

- (1) linear (2) exponential (3) quadratic (4) square root

5 \_\_\_\_\_

6. Which ordered pair would *not* be a solution to  $y = x^3 - x$ ?

- (1)  $(-4, -60)$     (2)  $(-3, -24)$     (3)  $(-2, -6)$     (4)  $(-1, -2)$     6 \_\_\_\_\_

7. Last weekend, Emma sold lemonade at a yard sale. The function  $P(c) = .50c - 9.96$  represented the profit,  $P(c)$ , Emma earned selling  $c$  cups of lemonade. Sales were strong, so she raised the price for this weekend by 25 cents per cup. Which function represents her profit for this weekend?

- (1)  $P(c) = .25c - 9.96$     (3)  $P(c) = .50c - 10.21$   
 (2)  $P(c) = .50c - 9.71$     (4)  $P(c) = .75c - 9.96$     7 \_\_\_\_\_

8. The product of  $\sqrt{576}$  and  $\sqrt{684}$  is

- (1) irrational because both factors are irrational  
 (2) rational because both factors are rational  
 (3) irrational because one factor is irrational  
 (4) rational because one factor is rational    8 \_\_\_\_\_

9. Which expression is equivalent to  $y^4 - 100$ ?

- (1)  $(y^2 - 10)^2$     (3)  $(y^2 + 10)(y^2 - 10)$   
 (2)  $(y^2 - 50)^2$     (4)  $(y^2 + 50)(y^2 - 50)$     9 \_\_\_\_\_

10. The graphs of  $y = x^2 - 3$  and  $y = 3x - 4$  intersect at approximately

- (1)  $(0.38, -2.85)$ , only    (3)  $(0.38, -2.85)$  and  $(2.62, 3.85)$   
 (2)  $(2.62, 3.85)$ , only    (4)  $(0.38, -2.85)$  and  $(3.85, 2.62)$     10 \_\_\_\_\_

11. The expression  $-4.9t^2 + 50t + 2$  represents the height, in meters, of a toy rocket  $t$  seconds after launch. The initial height of the rocket, in meters, is

- (1) 0    (2) 2    (3) 4.9    (4) 50    11 \_\_\_\_\_

12. If the domain of the function  $f(x) = 2x^2 - 8$  is  $\{-2, 3, 5\}$ , then the range is

- (1)  $\{-16, 4, 92\}$     (2)  $\{-16, 10, 42\}$     (3)  $\{0, 10, 42\}$     (4)  $\{0, 4, 92\}$     12 \_\_\_\_\_

13. Which polynomial is twice the sum of  $4x^2 - x + 1$  and  $-6x^2 + x - 4$ ?

- (1)  $-2x^2 - 3$     (2)  $-4x^2 - 3$     (3)  $-4x^2 - 6$     (4)  $-2x^2 + x - 5$     13 \_\_\_\_\_

14. What are the solutions to the equation  $3(x - 4)^2 = 27$ ?

- (1) 1 and 7    (2)  $-1$  and  $-7$     (3)  $4 \pm \sqrt{24}$     (4)  $-4 \pm \sqrt{24}$     14 \_\_\_\_\_

15. A system of equations is shown below.

$$\text{Equation A: } 5x + 9y = 12$$

$$\text{Equation B: } 4x - 3y = 8$$

Which method eliminates one of the variables?

- (1) Multiply equation  $A$  by  $-\frac{1}{3}$  and add the result to equation  $B$ .  
 (2) Multiply equation  $B$  by 3 and add the result to equation  $A$ .  
 (3) Multiply equation  $A$  by 2 and equation  $B$  by  $-6$  and add the results together.  
 (4) Multiply equation  $B$  by 5 and equation  $A$  by 4 and add the results together.    15 \_\_\_\_\_

**ALGEBRA 1**  
**January 2018**  
**Part IV**

**Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided to determine your answer. Note that diagrams are not necessarily drawn to scale. A correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [6]**

37. At Bea's Pet Shop, the number of dogs,  $d$ , is initially five less than twice the number of cats,  $c$ . If she decides to add three more of each, the ratio of cats to dogs will be  $\frac{3}{4}$ .

Write an equation or system of equations that can be used to find the number of cats and dogs Bea has in her pet shop.

Could Bea's Pet Shop initially have 15 cats and 20 dogs? Explain your reasoning.

Determine algebraically the number of cats and the number of dogs Bea initially had in her pet shop.