

# ALGEBRA 2

## 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	$V = \frac{1}{3}Bh$		

June 2016

Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. 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  $b > 0$  and  $d$  is a positive integer, the expression  $(3b)^{\frac{2}{d}}$  is equivalent to

- (1)  $\frac{1}{(\sqrt[d]{3b})^2}$       (2)  $(\sqrt{3b})^d$       (3)  $\frac{1}{\sqrt{3b^d}}$       (4)  $(\sqrt[d]{3b})^2$       1 \_\_\_\_\_

2. Julie averaged 85 on the first three tests of the semester in her mathematics class. If she scores 93 on each of the remaining tests, her average will be 90. Which equation could be used to determine how many tests,  $T$ , are left in the semester?

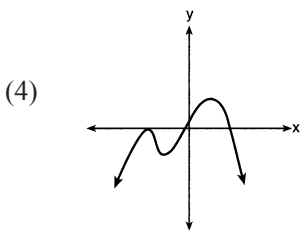
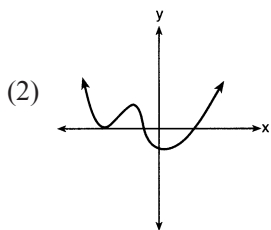
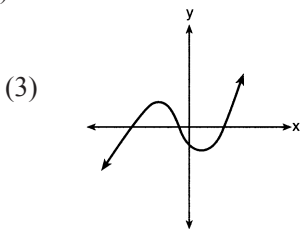
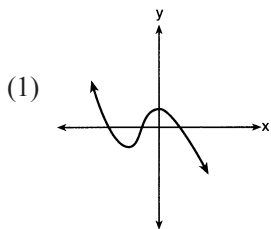
- (1)  $\frac{255 + 93T}{3T} = 90$       (3)  $\frac{255 + 93T}{T + 3} = 90$   
 (2)  $\frac{255 + 90T}{3T} = 93$       (4)  $\frac{255 + 90T}{T + 3} = 93$       2 \_\_\_\_\_

3. Given  $i$  is the imaginary unit,  $(2 - yi)^2$  in simplest form is

- (1)  $y^2 - 4yi + 4$       (2)  $-y^2 - 4yi + 4$       (3)  $-y^2 + 4$       (4)  $y^2 + 4$       3 \_\_\_\_\_

4. Which graph has the following characteristics?

- three real zeros
- as  $x \rightarrow -\infty$ ,  $f(x) \rightarrow -\infty$
- as  $x \rightarrow \infty$ ,  $f(x) \rightarrow \infty$



4 \_\_\_\_\_

June 2016

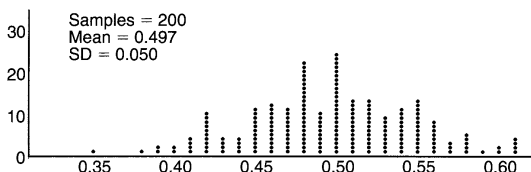
5. The solution set for the equation  $\sqrt{56 - x} = x$  is

- (1)  $\{-8, 7\}$       (2)  $\{-7, 8\}$       (3)  $\{7\}$       (4)  $\{\}$       5 \_\_\_\_\_

6. The zeros for  $f(x) = x^4 - 4x^3 - 9x^2 + 36x$  are

- (1)  $\{0, \pm 3, 4\}$       (2)  $\{0, 3, 4\}$       (3)  $\{0, \pm 3, -4\}$       (4)  $\{0, 3, -4\}$       6 \_\_\_\_\_

7. Anne has a coin. She does not know if it is a fair coin. She flipped the coin 100 times and obtained 73 heads and 27 tails. She ran a computer simulation of 200 samples of 100 fair coin flips. The output of the proportion of heads is shown below.



Given the results of her coin flips and of her computer simulation, which statement is most accurate?

- (1) 73 of the computer's next 100 coin flips will be heads.  
 (2) 50 of her next 100 coin flips will be heads.  
 (3) Her coin is not fair.  
 (4) Her coin is fair.      7 \_\_\_\_\_

8. If  $g(c) = 1 - c^2$  and  $m(c) = c + 1$ , then which statement is *not* true?

- (1)  $g(c) \cdot m(c) = 1 + c - c^2 - c^3$       (3)  $m(c) - g(c) = c + c^2$   
 (2)  $g(c) + m(c) = 2 + c - c^2$       (4)  $\frac{m(c)}{g(c)} = \frac{-1}{1 - c}$       8 \_\_\_\_\_

9. The heights of women in the United States are normally distributed with a mean of 64 inches and a standard deviation of 2.75 inches. The percent of women whose heights are between 64 and 69.5 inches, to the nearest whole percent, is

- (1) 6      (2) 48      (3) 68      (4) 95      9 \_\_\_\_\_

10. The formula below can be used to model which scenario?

$$a_1 = 3000$$

$$a_n = 0.80a_{n-1}$$

- (1) The first row of a stadium has 3000 seats, and each row thereafter has 80 more seats than the row in front of it.  
 (2) The last row of a stadium has 3000 seats, and each row before it has 80 fewer seats than the row behind it.  
 (3) A bank account starts with a deposit of \$3000, and each year it grows by 80%.  
 (4) The initial value of a specialty toy is \$3000, and its value each of the following years is 20% less.      10 \_\_\_\_\_

## June 2016

11. Sean's team has a baseball game tomorrow. He pitches 50% of the games. There is a 40% chance of rain during the game tomorrow. If the probability that it rains given that Sean pitches is 40%, it can be concluded that these two events are

- (1) independent (3) mutually exclusive  
 (2) dependent (4) complements 11 \_\_\_\_\_

12. A solution of the equation  $2x^2 + 3x + 2 = 0$  is

- (1)  $-\frac{3}{4} + \frac{1}{4}i\sqrt{7}$  (3)  $-\frac{3}{4} + \frac{1}{4}\sqrt{7}$   
 (2)  $-\frac{3}{4} + \frac{7}{4}i$  (4)  $\frac{1}{2}$  12 \_\_\_\_\_

13. The Ferris wheel at the landmark Navy Pier in Chicago takes 7 minutes to make one full rotation. The height,  $H$ , in feet, above the ground of one of the six-person cars can be modeled by  $H(t) = 70 \sin\left(\frac{2\pi}{7}(t - 1.75)\right) + 80$ , where  $t$  is time, in minutes. Using  $H(t)$  for one full rotation, this car's minimum height, in feet, is

- (1) 150 (2) 70 (3) 10 (4) 0 13 \_\_\_\_\_

14. The expression  $\frac{4x^3 + 5x + 10}{2x + 3}$  is equivalent to

- (1)  $2x^2 + 3x - 7 + \frac{31}{2x + 3}$  (3)  $2x^2 + 2.5x + 5 + \frac{15}{2x + 3}$   
 (2)  $2x^2 - 3x + 7 - \frac{11}{2x + 3}$  (4)  $2x^2 - 2.5x - 5 - \frac{20}{2x + 3}$  14 \_\_\_\_\_

15. Which function represents exponential decay?

- (1)  $y = 2^{0.3t}$  (2)  $y = 1.2^{3t}$  (3)  $y = \left(\frac{1}{2}\right)^{-t}$  (4)  $y = 5^{-t}$  15 \_\_\_\_\_

16. Given  $f^{-1}(x) = -\frac{3}{4}x + 2$ , which equation represents  $f(x)$ ?

- (1)  $f(x) = \frac{4}{3}x - \frac{8}{3}$  (3)  $f(x) = \frac{3}{4}x - 2$   
 (2)  $f(x) = -\frac{4}{3}x + \frac{8}{3}$  (4)  $f(x) = -\frac{3}{4}x + 2$  16 \_\_\_\_\_

17. A circle centered at the origin has a radius of 10 units. The terminal side of an angle,  $\theta$ , intercepts the circle in Quadrant II at point  $C$ . The  $y$ -coordinate of point  $C$  is 8. What is the value of  $\cos \theta$ ?

- (1)  $-\frac{3}{5}$  (2)  $-\frac{3}{4}$  (3)  $\frac{3}{5}$  (4)  $\frac{4}{5}$  17 \_\_\_\_\_

January 2018

## Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. 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 operator of the local mall wants to find out how many of the mall's employees make purchases in the food court when they are working. She hopes to use these data to increase the rent and attract new food vendors.

In total, there are 1023 employees who work at the mall. The best method to obtain a random sample of the employees would be to survey

- (1) all 170 employees at each of the larger stores  
 (2) 50% of the 90 employees of the food court  
 (3) every employee  
 (4) every 30th employee entering each mall entrance for one week      1 \_\_\_\_\_

2. What is the solution set for  $x$  in the equation below?

$$\sqrt{x+1}-1=x$$

- (1)  $\{1\}$                       (2)  $\{0\}$                       (3)  $\{-1, 0\}$                       (4)  $\{0, 1\}$                       2 \_\_\_\_\_

3. For the system shown below, what is the value of  $z$ ?

$$y = -2x + 14$$

$$3x - 4z = 2$$

$$3x - y = 16$$

- (1) 5                      (2) 2                      (3) 6                      (4) 4                      3 \_\_\_\_\_

4. The hours of daylight,  $y$ , in Utica in days,  $x$ , from January 1, 2013

can be modeled by the equation  $y = 3.06\sin(0.017x - 1.40) + 12.23$ .

How many hours of daylight, to the *nearest tenth*, does this model predict for February 14, 2013?

- (1) 9.4                      (2) 10.4                      (3) 12.1                      (4) 12.2                      4 \_\_\_\_\_

5. A certain pain reliever is taken in 220 mg dosages and has a half-life

of 12 hours. The function  $A = 220\left(\frac{1}{2}\right)^{\frac{t}{12}}$  can be used to model this

situation, where  $A$  is the amount of pain reliever in milligrams remaining in the body after  $t$  hours.

According to this function, which statement is true?

- (1) Every hour, the amount of pain reliever remaining is cut in half.  
 (2) In 12 hours, there is no pain reliever remaining in the body.  
 (3) In 24 hours, there is no pain reliever remaining in the body.  
 (4) In 12 hours, 110 mg of pain reliever is remaining.      5 \_\_\_\_\_

January 2018

6. The expression  $(x + a)(x + b)$  can *not* be written as

(1)  $a(x + b) + x(x + b)$

(3)  $x^2 + (a + b)x + ab$

(2)  $x^2 + abx + ab$

(4)  $x(x + a) + b(x + a)$

6 \_\_\_\_\_

7. There are 440 students at Thomas Paine High School enrolled in U.S. History. On the April report card, the students' grades are approximately normally distributed with a mean of 79 and a standard deviation of 7. Students who earn a grade less than or equal to 64.9 must attend summer school. The number of students who must attend summer school for U.S. History is closest to

(1) 3

(2) 5

(3) 10

(4) 22

7 \_\_\_\_\_

8. For a given time,  $x$ , in seconds, an electric current,  $y$ , can be represented by  $y = 2.5(1 - 2.7^{-10x})$ . Which equation is *not* equivalent?

(1)  $y = 2.5 - 2.5(2.7^{-10x})$

(3)  $y = 2.5 - 2.5\left(\frac{1}{2.7^{10x}}\right)$

(2)  $y = 2.5 - 2.5((2.7^2)^{-0.5x})$

(4)  $y = 2.5 - 2.5(2.7^{-2})(2.7^{0.5x})$

8 \_\_\_\_\_

9. What is the quotient when  $10x^3 - 3x^2 - 7x + 3$  is divided by  $2x - 1$ ?

(1)  $5x^2 + x + 3$

(2)  $5x^2 - x + 3$

(3)  $5x^2 - x - 3$

(4)  $5x^2 + x - 3$

9 \_\_\_\_\_

10. Judith puts \$5000 into an investment account with interest compounded continuously. Which approximate annual rate is needed for the account to grow to \$9110 after 30 years?

(1) 2%

(2) 2.2%

(3) 0.02%

(4) 0.022%

10 \_\_\_\_\_

11. If  $n = \sqrt{a^5}$  and  $m = a$ , where  $a > 0$ , an expression for  $\frac{n}{m}$  could be

(1)  $a^{\frac{5}{2}}$

(2)  $a^4$

(3)  $\sqrt[3]{a^2}$

(4)  $\sqrt{a^3}$

11 \_\_\_\_\_

12. The solutions to  $x + 3 - \frac{4}{x-1} = 5$  are

(1)  $\frac{3}{2} \pm \frac{\sqrt{17}}{2}$

(2)  $\frac{3}{2} \pm \frac{\sqrt{17}}{2}i$

(3)  $\frac{3}{2} \pm \frac{\sqrt{33}}{2}$

(4)  $\frac{3}{2} \pm \frac{\sqrt{33}}{2}i$

12 \_\_\_\_\_

13. If  $ae^{bt} = c$ , where  $a$ ,  $b$ , and  $c$  are positive, then  $t$  equals

(1)  $\ln\left(\frac{c}{ab}\right)$

(2)  $\ln\left(\frac{cb}{a}\right)$

(3)  $\ln\left(\frac{c}{a}\right)$

(4)  $\ln\left(\frac{c}{a}\right)$

13 \_\_\_\_\_

14. For which values of  $x$ , rounded to the *nearest hundredth*, will  $|x^2 - 9| - 3 = \log_3 x$ ?

(1) 2.29 and 3.63

(3) 2.84 and 3.17

(2) 2.37 and 3.54

(4) 2.92 and 3.06

14 \_\_\_\_\_

15. The terminal side of  $\theta$ , an angle in standard position, intersects the unit circle at  $P\left(-\frac{1}{3}, -\frac{\sqrt{8}}{3}\right)$ . What is the value of  $\sec \theta$ ?

(1) -3

(2)  $-\frac{3\sqrt{8}}{8}$

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

(4)  $-\frac{\sqrt{8}}{3}$

15 \_\_\_\_\_

January 2018

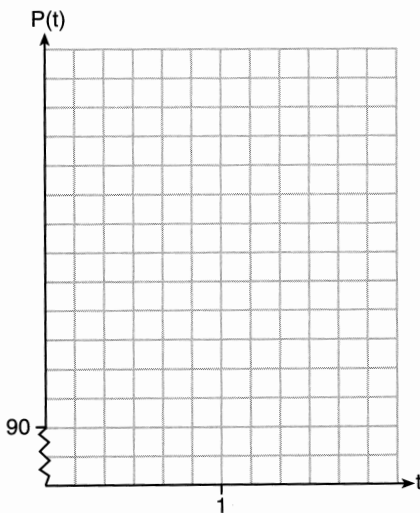
## Part IV

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. The resting blood pressure of an adult patient can be modeled by the function  $P$  below, where  $P(t)$  is the pressure in millimeters of mercury after time  $t$  in seconds.

$$P(t) = 24\cos(3\pi t) + 120$$

On the set of axes, graph  $y = P(t)$  over the domain  $0 \leq t \leq 2$ .



Determine the period of  $P$ . Explain what this value represents in the given context.

Normal resting blood pressure for an adult is 120 over 80. This means that the blood pressure oscillates between a maximum of 120 and a minimum of 80. Adults with high blood pressure (above 140 over 90) and adults with low blood pressure (below 90 over 60) may be at risk for health disorders. Classify the given patient's blood pressure as low, normal, or high and explain your reasoning.