ALGEBRA 1
Workbook
Common Core Standards Edition

Published by
TOPICAL REVIEW BOOK COMPANY
P. O. Box 328
Onsted, MI 49265-0328
www.topicalrbc.com

ALGEBRA 1
August 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 number of bacteria grown in a lab can be modeled by $P(t) = 300 \cdot 2^{4t}$, where t is the number of hours. Which expression is equivalent to $P(t)$?
(1) $300 \cdot 8^t$ (2) $300 \cdot 16^t$ (3) $300^t \cdot 2^4$ (4) $300^{2t} \cdot 2^{2t}$ 1 _____

2. During physical education class, Andrew recorded the exercise times in minutes and heart rates in beats per minute (bpm) of four of his classmates. Which table best represents a linear model of exercise time and heart rate?

Student 1

Exercise Time (in minutes)	Heart Rate (bpm)
0	60
1	65
2	70
3	75
4	80

(1)

Student 2

Exercise Time (in minutes)	Heart Rate (bpm)
0	62
1	70
2	83
3	88
4	90

(2)

Student 3

Exercise Time (in minutes)	Heart Rate (bpm)
0	58
1	65
2	70
3	75
4	79

(3)

Student 4

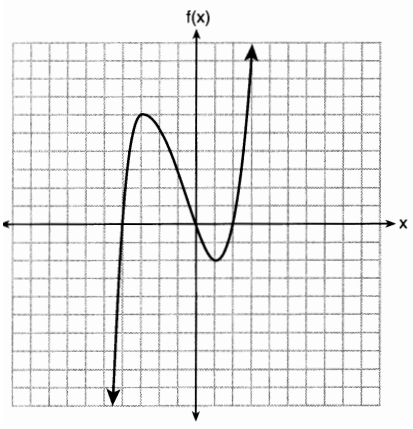
Exercise Time (in minutes)	Heart Rate (bpm)
0	62
1	65
2	66
3	73
4	75

(4) 2 _____

3. David correctly factored the expression $m^2 - 12m - 64$.
Which expression did he write?
(1) $(m - 8)(m - 8)$ (3) $(m - 16)(m + 4)$
(2) $(m - 8)(m + 8)$ (4) $(m + 16)(m - 4)$ 3 _____

4. The solution to $-2(1 - 4x) = 3x + 8$ is
(1) $\frac{6}{11}$ (2) 2 (3) $-\frac{10}{7}$ (4) -2 4 _____

5. The graph of $f(x)$ is shown.
What is the value of $f(-3)$?
(1) 6
(2) 2
(3) –2
(4) –4



5 _____

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6. If the function $f(x) = x^2$ has the domain {0, 1, 4, 9}, what is its range?
(1) {0, 1, 2, 3} (3) {0, –1, 1, –2, 2, –3, 3}
(2) {0, 1, 16, 81} (4) {0, –1, 1, –16, 16, –81, 81} 6 _____

7. The expression $4x^2 - 25$ is equivalent to
(1) $(4x - 5)(x + 5)$ (3) $(2x + 5)(2x - 5)$
(2) $(4x + 5)(x - 5)$ (4) $(2x - 5)(2x - 5)$ 7 _____

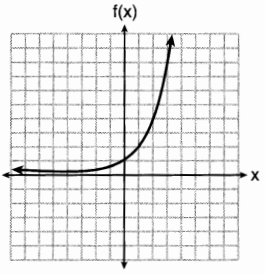
8. Compared to the graph of $f(x) = x^2$, the graph of $g(x) = (x - 2)^2 + 3$ is the result of translating $f(x)$
(1) 2 units up and 3 units right (3) 2 units right and 3 units up
(2) 2 units down and 3 units up (4) 2 units left and 3 units right 8 _____

9. Lizzy has 30 coins that total $4.80. All of her coins are dimes, D, and quarters, Q. Which system of equations models this situation?
(1) $D + Q = 4.80$
$.10D + .25Q = 30$
(2) $D + Q = 30$
$.10D + .25Q = 4.80$
(3) $D + Q = 30$
$.25D + .10Q = 4.80$
(4) $D + Q = 4.80$
$.25D + .10Q = 30$ 9 _____

10. Gretchen has $50 that she can spend at the fair. Ride tickets cost $1.25 each and game tickets cost $2 each. She wants to go on a minimum of 10 rides and play at least 12 games.

Which system of inequalities represents this situation when r is the number of ride tickets purchased and g is the number of game tickets purchased?
(1) $1.25r + 2g < 50$
$r \leq 10$
$g > 12$
(2) $1.25r + 2g \leq 50$
$r \geq 10$
$g \geq 12$
(3) $1.25r + 2g \leq 50$
$r \geq 10$
$g > 12$
(4) $1.25r + 2g < 50$
$r \leq 10$
$g \geq 12$ 10 _____

11. Three functions are shown below.



$g(x) = 3^x + 2$

x	h(x)
–5	30
–4	14
–3	6
–2	2
–1	0
0	–1
1	–1.5
2	–1.75

Which statement is true?
(1) The y-intercept for $h(x)$ is greater than the y-intercept for $f(x)$.
(2) The y-intercept for $f(x)$ is greater than the y-intercept for $g(x)$.
(3) The y-intercept for $h(x)$ is greater than the y-intercept for both $g(x)$ and $f(x)$.
(4) The y-intercept for $g(x)$ is greater than the y-intercept for both $f(x)$ and $h(x)$. 11 ____

12. Olivia entered a baking contest. As part of the contest, she needs to demonstrate how to measure a gallon of milk if she only has a teaspoon measure. She converts the measurement using the ratios below:

$$\frac{4\,quarts}{1\,gallon} \bullet \frac{2\,pints}{1\,quart} \bullet \frac{2\,cups}{1\,pint} \bullet \frac{\frac{1}{4}\,cup}{4\,tablespoons} \bullet \frac{3\,teaspoons}{1\,tablespoon}$$

Which ratio is *incorrectly* written in Olivia's conversion?

(1) $\frac{4\,quarts}{1\,gallon}$ (2) $\frac{2\,pints}{1\,quart}$ (3) $\frac{\frac{1}{4}\,cup}{4\,tablespoons}$ (4) $\frac{3\,teaspoons}{1\,tablespoon}$ 12 ____

13. If $y = 3x^3 + x^2 - 5$ and $z = x^2 - 12$, which polynomial is equivalent to $2(y + z)$?

(1) $6x^3 + 4x^2 - 34$
(2) $6x^3 + 3x^2 - 17$
(3) $6x^3 + 3x^2 - 22$
(4) $6x^3 + 2x^2 - 17$ 13 ____

14. An outdoor club conducted a survey of its members. The members were asked to state their preference between skiing and snowboarding. Each member had to pick one. Of the 60 males, 45 stated they preferred to snowboard. Twenty-two of the 60 females preferred to ski. What is the relative frequency that a male prefers to ski?

(1) 0.125 (2) 0.25 (3) $0.\overline{333}$ (4) $0.\overline{405}$ 14 ____

15. When the function $g(x) = \begin{cases} 5x, x \le 3 \\ x^2 + 4, x > 3 \end{cases}$ is graphed correctly, how should the points be drawn on the graph for an x-value of 3?

(1) open circles at (3, 15) and (3, 13)
(2) closed circles at (3, 15) and (3, 13)
(3) an open circle at (3, 15) and a closed circle at (3, 13)
(4) a closed circle at (3, 15) and an open circle at (3, 13) 15 ____

16. If $f(x) = 2x^2 + x - 3$, which equation can be used to determine the zeros of the function?

(1) $0 = (2x - 3)(x + 1)$
(2) $0 = (2x + 3)(x - 1)$
(3) $0 = 2x(x + 1) - 3$
(4) $0 = 2x(x - 1) - 3(x + 1)$ 16 ____

17. Each day, a local dog shelter spends an average of $2.40 on food per dog. The manager estimates the shelter's daily expenses, assuming there is at least one dog in the shelter, using the function $E(x) = 30 + 2.40x$.

Which statements regarding the function $E(x)$ are correct?

I. x represents the number of dogs at the shelter per day.
II. x represents the number of volunteers at the shelter per day.
III. 30 represents the shelter's total expenses per day.
IV. 30 represents the shelter's nonfood expenses per day.

(1) I and III (2) I and IV (3) II and III (4) II and IV 17 ____

18. Which point is *not* in the solution set of the equation

$$3y + 2 = x^2 - 5x + 17?$$

(1) (–2, 10) (2) (–1, 7) (3) (2, 3) (4) (5, 5) 18 ____

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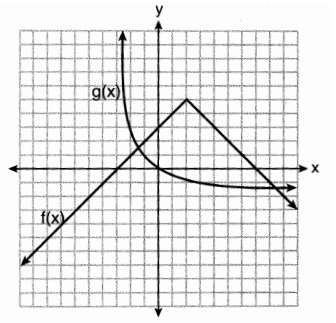
19. The functions $f(x)$ and $g(x)$ are graphed.



Based on the graph, the solutions to the equation $f(x) = g(x)$ are
(1) the x-intercepts
(2) the y-intercepts
(3) the x-values of the points of intersection
(4) the y-values of the points of intersection

19 ____

20. For the sequence –27, –12, 3, 18, ... , the expression that defines the nth term where $a_1 = -27$ is
(1) $15 - 27n$
(2) $15 - 27(n - 1)$
(3) $-27 + 15n$
(4) $-27 + 15(n - 1)$

20 ____

21. The data obtained from a random sample of track athletes showed that as the foot size of the athlete decreased, the average running speed decreased. Which statement is best supported by the data?
(1) Smaller foot sizes cause track athletes to run slower.
(2) The sample of track athletes shows a causal relationship between foot size and running speed.
(3) The sample of track athletes shows a correlation between foot size and running speed.
(4) There is no correlation between foot size and running speed in track athletes.

21 ____

22. Which system of equations will yield the same solution as the system below?

$$x - y = 3$$
$$2x - 3y = -1$$

(1) $-2x - 2y = -6$
$2x - 3y = -1$
(2) $-2x + 2y = 3$
$2x - 3y = -1$
(3) $2x - 2y = 6$
$2x - 3y = -1$
(4) $3x + 3y = 9$
$2x - 3y = -1$

22 ____

23. Which of the three situations given below is best modeled by an exponential function?

I. A bacteria culture doubles in size every day.
II. A plant grows by 1 inch every 4 days.
III. The population of a town declines by 5% every 3 years.

(1) I, only (2) II, only (3) I and II (4) I and III 23 ____

24. The length, width, and height of a rectangular box are represented by $2x$, $3x + 1$, and $5x - 6$, respectively. When the volume is expressed as a polynomial in standard form, what is the coefficient of the 2nd term?
(1) –13 (2) 13 (3) –26 (4) 26 24 ____

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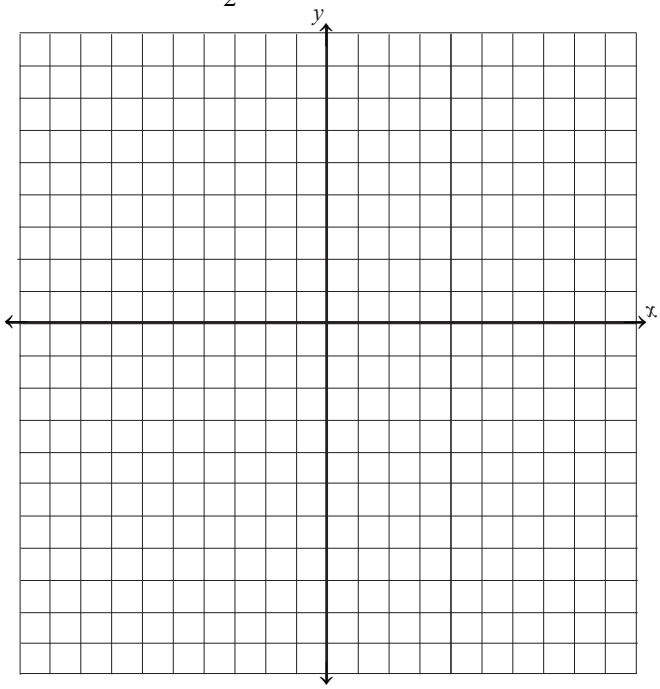
June 2021
Part II

Answer all 8 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, 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. [16]

25. Solve algebraically for y: $4(y - 3) \leq 4(2y + 1)$

26. Graph the function $f(x) = |\frac{1}{2}x + 3|$ over the interval $-8 \leq x \leq 0$.



27. The table below shows the height in feet, $h(t)$, of a hot-air balloon and the number of minutes, t, the balloon is in the air.

Time (min)	2	5	7	10	12
Height (ft)	64	168	222	318	369

The function $h(t) = 30.5t + 8.7$ can be used to model this data table.

Explain the meaning of the slope in the context of the problem.

Explain the meaning of the y-intercept in the context of the problem.

28. Factor $x^4 - 16$ completely.

29. Mike knows that (3,6.5) and (4,17.55) are points on the graph of an exponential function, $g(x)$, and he wants to find another point on the graph of this function.

First, he subtracts 6.5 from 17.55 to get 11.05.

Next, he adds 11.05 and 17.55 to get 28.6.

He states that (5,28.6) is a point on $g(x)$.

Is he correct? Explain your reasoning.

30. Use the method of completing the square to determine the vertex of $f(x) = x^2 - 14x - 15$. State the coordinates of the vertex.

31. The temperature inside a cooling unit is measured in degrees Celsius, C. Josh wants to find out how cold it is in degrees Fahrenheit, F.

Solve the formula $C = \frac{5}{9}(F - 32)$ for F so that Josh can convert Celsius to Fahrenheit.

32. Solve $4w^2 + 12w - 44 = 0$ algebraically for w, to the *nearest hundredth*.

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June 2021
Part III

Answer all 4 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For all questions in this part, 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. [16]

33. Joey recorded his heart rate, in beats per minute (bpm), after doing different numbers of jumping jacks. His results are shown in the accompanying table.

Number of Jumping Jacks x	Heart Rate (bpm) y
0	68
10	84
15	104
20	100
30	120

State the linear regression equation that estimates the heart rate per number of jumping jacks.

State the correlation coefficient of the linear regression equation, rounded to the *nearest hundredth*.

Explain what the correlation coefficient suggests in the context of this problem.

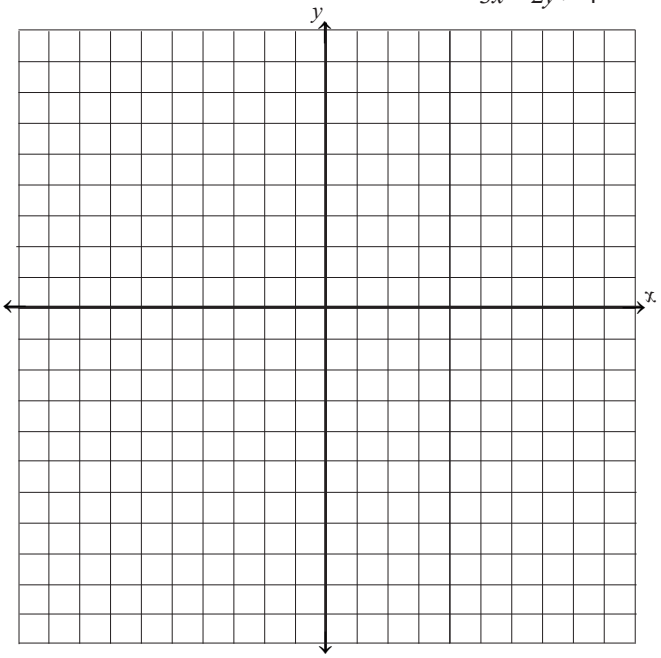
34. Hannah went to the school store to buy supplies and spent $16. She bought four more pencils than pens and two fewer erasers than pens. Pens cost $1.25 each, pencils cost $0.55 each, and erasers cost $0.75 each.

If x represents the number of pens Hannah bought, write an equation in terms of x that can be used to find how many of each item she bought.

Use your equation to determine algebraically how many pens Hannah bought.

35. Graph the system of inequalities on the set of axes below:

$$y \leq -\frac{3}{4}x + 5$$
$$3x - 2y > 4$$



Is (6, 3) a solution to the system of inequalities? Explain your answer.

36. A ball is projected up into the air from the surface of a platform to the ground below. The height of the ball above the ground, in feet, is modeled by the function $f(t) = -16t^2 + 96t + 112$, where t is the time, in seconds, after the ball is projected.

State the height of the platform, in feet.

State the coordinates of the vertex. Explain what it means in the context of the problem.

State the entire interval over which the ball's height is *decreasing.*

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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 a local garden shop, the price of plants includes sales tax.

The cost of 4 large plants and 8 medium plants is $40. The cost of 5 large plants and 2 medium plants is $28.

If l is the cost of a large plant and m is the cost of a medium plant, write a system of equations that models this situation.

Could the cost of one large plant be $5.50 and the cost of one medium plant be $2.25? Justify your answer.

Determine algebraically both the cost of a large plant and the cost of a medium plant.