Multiple Choice - Identify the choice that best completes the statement or answers the question.

1. Simplify \( \frac{m^{2a} + a}{m^{2a} m^{3a}} \) using the rules of exponents.
   a. \( m^{3a^2} + a \)
   b. \( m^{2a + a^3} \)
   c. \( m^{2a + a^2} + a \)
   d. \( m^{3a^2 + 4 + a^2} + a^{5a} \)

2. Which set of \( x \)- and \( y \)-values makes the equation \( y = 6x^2 + 2 \) true?
   a. \((56, 3)\)
   b. \((5, –25)\)
   c. \((6, 6)\)
   d. \((1, 8)\)

3. Solve \( Y \):
   \[
   \begin{pmatrix}
   -2 & 1 \\
   -6 & 8
   \end{pmatrix}
   = \begin{pmatrix}
   -13 & -10 \\
   5 & 7
   \end{pmatrix}
   \]
   a. \[
   \begin{pmatrix}
   -11 & -11 \\
   11 & -1
   \end{pmatrix}
   \]
   b. \[
   \begin{pmatrix}
   -15 & -9 \\
   -1 & 15
   \end{pmatrix}
   \]
   c. \[
   \begin{pmatrix}
   -5 & 3 \\
   -7 & 15
   \end{pmatrix}
   \]
   d. \[
   \begin{pmatrix}
   2 & -5 \\
   12 & 4
   \end{pmatrix}
   \]

4. What is the percent change from 60 to 66?
   a. decrease 9%
   b. decrease 10%
   c. increase 10%
   d. increase 9%

5. Solve \( 2(t – 3) = 8(t + 6) – 4t \).
   a. \( 3 \)
   b. \( 27 \)
   c. \( -27 \)
   d. \( 21 \)

6. Solve the inequality \( 6(-6 + b) \leq 6 \).
   a. \( b \leq 7 \)
   b. \( b \leq 2 \)
   c. \( b \geq 7 \)
   d. \( b \geq 2 \)

7. Subtract \( (-5x^3 – 4x^2 + 4x – 3) – (8x^2 – 8) \).
   a. \( -5x^3 – 4x^2 + 4x + 5 \)
   b. \( -5x^3 – 12x^2 + 4x + 5 \)
   c. \( -5x^3 – 12x^2 + 4x + 5 \)
   d. \( -5x^3 – 4x^2 + 4x + 5 \)

8. Find \( x \).
   \[
   \begin{vmatrix}
   x – 7 & 8 \\
   4 & 1
   \end{vmatrix}
   = -26
   \]
   a. \(-10\)
   b. \(13\)
   c. \(2\)
   d. \(8\)

9. Use Cramer’s rule to solve \[
\begin{cases}
-3x - 5y = -2 \\
x - 3y = -4
\end{cases}
\]
   a. \( x = 1, y = -1 \)
   b. \( x = 1, y = -1 \)
   c. \( x = -1, y = 1 \)
   d. \( x = -1, y = 1 \)
Algebra II Cumulative Exam Study Guide
Semester 1 Exam

10. Solve $5|6x| + 4 \leq 10$.
   a. $\frac{1}{5} \leq x$  
   b. $x \leq \frac{1}{5}$  
   c. $x \geq \frac{1}{5}$  
   d. $\frac{1}{5} \leq x \leq \frac{1}{5}$

11. Convert 30 meters per second to kilometers per hour.
   a. 71 km/hr  
   b. 1.1 km/hr  
   c. 10.8 km/hr  
   d. 108 km/hr

12. Multiply $(x - 8)(x + 2)(x + 6)$.
   a. $x^3 - 96$  
   b. $x^3 + 44x - 96$  
   c. $x^3 - 52x + 96$  
   d. $x^3 - 52x - 96$

13. Given $f(x) = -3x - 3; D = \{\text{Reals}\}$, $g(x) = 3x - 2; D = \{\text{Reals}\}$, find $(f - g)(3)$.
   a. $-23$  
   b. $-19$  
   c. $-17$  
   d. $-7$

   a. $-216$  
   b. $216$  
   c. $1$  
   d. $\frac{1}{216}$

15. Calculate the percent change from 30 to 39.
   a. increase 23%  
   b. decrease 23%  
   c. decrease 30%  
   d. increase 30%

16. Solve $6(t + 10) = 10(t + 9) - 12t$.
   a. $t = -\frac{15}{14}$  
   b. $t = -15$  
   c. $t = -\frac{75}{4}$  
   d. $t = -\frac{75}{14}$

17. Which choice describes the graph of the parametric equation $\begin{cases} x = 10t \\ y = -3t^2 - 16 \end{cases}$?
   a. Line with negative slope  
   b. Line with positive slope  
   c. Parabola that opens upward  
   d. Parabola that opens downward

18. Multiply $(x - 6)(x + 3)(x - 2)$.
   a. $x^3 - 5x^2 - 36x + 36$  
   b. $x^3 - 5x^2 - 36x + 36$  
   c. $x^3 + x^2 - 12x + 36$  
   d. $x^3 - 5x^2 - 12x + 36$

19. Factor $3x^2 - 54x + 243$.
   a. $3(x + 3)(x + 7)$  
   b. $3(x - 9)(x + 9)$  
   c. $3(x - 9)^2$  
   d. $3(x + 9)^2$
20. A line has slope 3 and passes through the point \((-2, -9)\). What is the equation of this line written in slope-intercept form?
   a. \(y - 7 = 3(x - 8)\)
   b. \(y = 3x + 3\)
   c. \(y = 3x - 3\)
   d. \(y + 9 = 3(x + 2)\)

21. Convert \(y = 3(x + 9)^2 - 2\) to standard form.
   a. \(y = 3x^2 - 27x + 245\)
   b. \(y = 3x^2 + 27x + 241\)
   c. \(y = 3x^2 + 54x + 245\)
   d. \(y = 3x^2 + 54x + 241\)

22. Identify any excluded values and simplify the expression \(\frac{9b - 21}{3b - 7}\).
   a. \(3; b \neq \frac{7}{3}\)
   b. \(3; b \neq \frac{7}{3}\)
   c. \(3; b \neq \frac{3}{7}\)
   d. \(3; b \neq \frac{3}{7}\)

23. Solve the system.
   \[
   \begin{align*}
   2x - y - 2z &= 10 \\
   -x + 5y - 3z &= 38 \\
   -5x + y - 5z &= 6
   \end{align*}
   \]
   a. \((6, 3, -3)\)
   b. \((4, 6, -4)\)
   c. \((5, 4, 4)\)
   d. \((-5, 5, -1)\)

24. Solve for matrix \(X\).
   \[
   \begin{bmatrix}
   3 & 5 \\
   2 & 1
   \end{bmatrix} = \begin{bmatrix} 2 & 24 \\ 20 & 2 \end{bmatrix}
   \]
   a. \(X = \begin{bmatrix} 9 & 3 \\ 8 & 7 \end{bmatrix}\)
   b. \(X = \begin{bmatrix} -14 & 2 \\ 8 & -6 \end{bmatrix}\)
   c. \(X = \begin{bmatrix} 14 & -2 \\ -8 & 6 \end{bmatrix}\)
   d. \(X = \begin{bmatrix} -9 & -3 \\ -8 & -7 \end{bmatrix}\)

25. Find the zeros of the quadratic function.
   \(f(x) = 25x^2 - 49\)
   a. \(x = \pm \frac{7}{5}\)
   b. \(x = \pm \frac{49}{25}\)
   c. \(x = \pm \frac{5}{7}\)
   d. \(x = \pm \frac{25}{49}\)

26. Which of the following is a factor of \(x^3 + 2x^2 - 23x - 60\)?
   a. \(x - 3\)
   b. \(x - 4\)
   c. \(x - 5\)
   d. \(x + 5\)

27. Which statement is logically equivalent to \(p \rightarrow p \land q\)?
   a. \(\neg p \lor q\)
   b. \(\neg p \rightarrow p\)
   c. \(p \lor q\)
   d. \(p \land q \rightarrow p\)
28. Simplify 20.5 m × 4.342 m × 0.060 m using significant digits.
   a. 5.341 m³  
   b. 5.34 m³  
   c. 5 m³  
   d. 5.3 m³

29. What is the z-intercept for the equation 4x + 8y + 2z = 24?
   a. z = 6  
   b. z = 0  
   c. z = 3  
   d. z = 12

30. Solve the system.
   \[ \begin{align*}
   \frac{1}{2}x &= 6y \\
   -2x + 6y &= 36 
   \end{align*} \]
   a. (-24, -2)  
   b. (-2, -8)  
   c. (-15, -7)  
   d. (0, 0)

31. Add the rational expressions.
   \[ \frac{1}{14x^3} + \frac{1}{35x} \]
   a. \( \frac{5x^2 + 2}{70x^3} \)  
   b. \( \frac{1}{14x^3} \)  
   c. \( \frac{2x^2 + 5}{70x^3} \)  
   d. \( \frac{5x^2 + 3}{14x^3} \)

32. Simplify \( \frac{245}{3\sqrt{7}} \).
   a. \( \frac{35\sqrt{7}}{7} \)  
   b. \( \frac{35\sqrt{49}}{7} \)  
   c. \( \frac{5\sqrt{49}}{7} \)  
   d. \( \frac{5\sqrt{7}}{7} \)

33. Which is the best estimate of the correlation coefficient of the data in the graph?
   a. 0.1  
   b. 0.9  
   c. -0.1  
   d. -0.9

34. Which equation is the inverse of \( y = \frac{1}{3} x^2 + 6 \)?
   a. \( y = \sqrt{3x - 6} \)  
   b. \( y = \sqrt{-\frac{1}{3}x - 6} \)  
   c. \( y = \sqrt{3x - 18} \)  
   d. \( y = \sqrt{-\frac{1}{3}x - 18} \)
35. Evaluate \(\frac{4a(a + b^2) + 4}{2}\) if \(a = 5\) and \(b = -3\).

36. The number of yards varies directly as the number of feet. There are 9 feet in 3 yards. If Leah walked 39 feet, how many yards did she walk?

37. The data set below represents an inverse variation. What is the constant of variation?

<table>
<thead>
<tr>
<th>x</th>
<th>2</th>
<th>4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>24</td>
<td>12</td>
<td>8</td>
</tr>
</tbody>
</table>

38. An art studio charges $110 per class. With a $50 membership, each class costs $100. After how many classes will the total cost be the same for members and non-members?

39. Find the determinant of
\[
\begin{pmatrix}
-4 & 4 & 0 \\
5 & 5 & 4 \\
-6 & -7 & -2
\end{pmatrix}
\]

40. Multiply
\[
\frac{x - 5}{3x - 9} \cdot \frac{x^2 - 9}{x - 5} \cdot \frac{5x - 25}{x^2 - 2x - 15}
\]

41. Find the number of outcomes when choosing a multiple of 8 or a multiple of 6 at random from the whole number 1 through 50.

42. Simplify \(\sqrt{32} \cdot \sqrt{2}\).

43. Find the standard deviation for the following data: 9, 13, 5, 6, 10. Round your answer to the nearest tenth if necessary.

44. Identify the properties of real numbers being demonstrated in the first two steps below.
\[
7(4 + 3) + 9 = 28 + 21 + 9 \\
= 28 + (21 + 9) \\
= 28 + 30 \quad \text{Add.} \\
= 58 \quad \text{Add.}
\]

45. Determine if the product of matrices \(A\) and \(B\) is defined. If so, give the dimensions of the product matrix.
Matrix \(A: 6 \times 5\), Matrix \(B: 5 \times 4\)

46. Solve \(|x + 1| \leq 2\). Graph the solution.
47. Graph $-2x - 3y < 12$ by using slope-intercept form.

48. Determine whether the function in the graph is continuous, discontinuous, and/or discrete. Then find its domain and range.

![Graph of a function with points at (0,0), (1,1), (2,2), (3,3), and (4,4).]

49. Solve this system by graphing.

\[
\begin{align*}
y + 6x &= 12 \\
-6x + 6y &= -12
\end{align*}
\]

a. Rewrite the equations in slope-intercept form.

b. Identify the slope and y-intercept of each line represented by the equations.

c. Tell whether each equation is rising, falling, horizontal, or vertical. Explain.

d. Graph the equations on a coordinate plane.

e. Where do the lines intersect? What does this mean? Is the system of equations consistent or inconsistent?

50. Graph the quadratic function $y = (x + 1)^2 - 3$ and compare it to the parent function.

a. What is the vertex of $y = (x + 1)^2 - 3$?

b. What is the equation of the line of symmetry of $y = (x + 1)^2 - 3$?

c. Graph $y = (x + 1)^2 - 3$ on a coordinate plane.

d. Explain how the graph of $y = (x + 1)^2 - 3$ is shifted relative to the parent function $y = x^2$.

e. How does the graph of $y = (x + 1)^2 - 3$ compare to the graph of $y = (x + 4)^2 - 3$? Explain how you can tell without graphing.
Cumulative Semester 1 Exam Study Guide Algebra II

Answer Section

MULTIPLE CHOICE

   NAT: NCTM A.2a     TOP: Benchmark Test 1     MSC: Alg2_S01_00004
2. ANS: D     PTS: 1
   REF: Lesson 4: Identifying Functions and Using Function Notation
   NAT: NCTM A.1f     TOP: Benchmark Test 1     MSC: Alg2_S01_00007
3. ANS: A     PTS: 1
   REF: Lesson 5: Using Matrices to Organize Data and to Solve Problems
   NAT: NCTM A.2b     TOP: Benchmark Test 1     MSC: Alg2_S01_00008
4. ANS: C     PTS: 1     REF: Lesson 6: Finding Percent Increase and Decrease
   NAT: NCTM NO.3a     TOP: Benchmark Test 1     MSC: Alg2_S01_00010
5. ANS: C     PTS: 1     REF: Lesson 7: Solving Linear Equations
   NAT: NCTM A.2b     TOP: Benchmark Test 1     MSC: Alg2_S01_00013
6. ANS: A     PTS: 1     REF: Lesson 10: Solving and Graphing Inequalities
   NAT: NCTM A.2b     TOP: Benchmark Test 1     MSC: Alg2_S01_00016
7. ANS: C     PTS: 1     REF: Lesson 11: Understanding Polynomials
   NAT: NCTM A.2a     TOP: Benchmark Test 1     MSC: Alg2_S02_00045
8. ANS: B     PTS: 1     REF: Lesson 14: Finding Determinants
   NAT: NCTM A.2b     TOP: Benchmark Test 1     MSC: Alg2_S02_00046
9. ANS: C     PTS: 1     REF: Lesson 16: Using Cramer's Rule
   NAT: NCTM A.2b     TOP: Benchmark Test 1     MSC: Alg2_S02_00048
10. ANS: D     PTS: 1
     REF: Lesson 17: Solving Equations and Inequalities with Absolute Value
     NAT: NCTM A.2a     TOP: Benchmark Test 1     MSC: Alg2_S02_00049
11. ANS: D     PTS: 1     REF: Lesson 18: Calculating with Units of Measure
    NAT: NCTM M.1     TOP: Benchmark Test 1     MSC: Alg2_S02_00051
12. ANS: D     PTS: 1     REF: Lesson 19: Multiplying Polynomials
    NAT: NCTM A.2a     TOP: Benchmark Test 1     MSC: Alg2_S02_00054
13. ANS: B     PTS: 1     REF: Lesson 20: Performing Operations with Functions
    NAT: NCTM A.2b     TOP: Benchmark Test 1     MSC: Alg2_S02_00056
    NAT: NCTM A.4     TOP: Benchmark Test 2     MSC: Alg2_S01_00005
15. ANS: D     PTS: 1     REF: Lesson 6: Finding Percent Increase and Decrease
    NAT: NCTM NO.3a     TOP: Benchmark Test 2     MSC: Alg2_S01_00011
16. ANS: B     PTS: 1     REF: Lesson 7: Solving Linear Equations
    NAT: NCTM A.2b     TOP: Benchmark Test 2     MSC: Alg2_S01_00014
17. ANS: D     PTS: 1     REF: Investigation 2: Solving Parametric Equations
    NAT: NCTM A.2b     TOP: Benchmark Test 2     MSC: Alg2_S02_00044
18. ANS: D     PTS: 1     REF: Lesson 19: Multiplying Polynomials
    NAT: NCTM A.2a     TOP: Benchmark Test 2     MSC: Alg2_S02_00055
19. ANS: C  PTS: 1  REF: Lesson 23: Factoring Polynomials  
NAT: NCTM A.2a  TOP: Benchmark Test 2  MSC: Alg2_S03_00004
20. ANS: C  PTS: 1  REF: Lesson 26: Writing the Equation of a Line  
NAT: NCTM A.2c  TOP: Benchmark Test 2  MSC: Alg2_S03_00008
21. ANS: D  PTS: 1  REF: Lesson 27: Connecting the Parabola with the Quadratic Function  
NAT: NCTM A.2a  TOP: Benchmark Test 2  MSC: Alg2_S03_00010
22. ANS: B  PTS: 1  REF: Lesson 28: Simplifying Rational Expressions  
NAT: NCTM A.2a  TOP: Benchmark Test 2  MSC: Alg2_S03_00011
23. ANS: B  PTS: 1  REF: Lesson 29: Systems of Three Equations and Three Variables  
NAT: NCTM A.2b  TOP: Benchmark Test 2  MSC: Alg2_S03_00012
24. ANS: C  PTS: 1  REF: Lesson 32: Solving Linear Systems with Matrix Inverses  
NAT: NCTM A.2b  TOP: Benchmark Test 2  MSC: Alg2_S03_00013
25. ANS: A  PTS: 1  REF: Lesson 35: Solving Quadratic Equations I  
NAT: NCTM A.2c  TOP: Benchmark Test 2  MSC: Alg2_S03_00014
26. ANS: C  PTS: 1  REF: Lesson 38: Dividing Polynomials Using Long Division  
NAT: NCTM A.2b  TOP: Benchmark Test 2  MSC: Alg2_S03_00015
27. ANS: A  PTS: 1  REF: Investigation 1: Logic and Truth Tables  
NAT: NCTM R.1c  TOP: Benchmark Test 3  MSC: Alg2_S03_00016
28. ANS: D  PTS: 1  REF: Lesson 18: Calculating with Units of Measure  
NAT: NCTM NO.2a  TOP: Benchmark Test 3  MSC: Alg2_S03_00017
29. ANS: D  PTS: 1  REF: Investigation 3: Graphing Linear Equations in Three Variables  
NAT: NCTM A.2b  TOP: Benchmark Test 3  MSC: Alg2_S03_00018
30. ANS: A  PTS: 1  REF: Lesson 24: Solving Systems of Equations Using the Elimination Method  
NAT: NCTM A.2b  TOP: Benchmark Test 3  MSC: Alg2_S03_00019
31. ANS: C  PTS: 1  REF: Lesson 37: Adding and Subtracting Rational Expressions  
NAT: NCTM A.2a  TOP: Benchmark Test 3  MSC: Alg2_S03_00020
32. ANS: B  PTS: 1  REF: Lesson 40: Simplifying Radical Expressions  
NAT: NCTM NO.2a  TOP: Benchmark Test 3  MSC: Alg2_S03_00021
33. ANS: B  PTS: 1  REF: Lesson 45: Finding the Line of Best Fit  
NAT: NCTM R.1b  TOP: Benchmark Test 3  MSC: Alg2_S03_00022
34. ANS: C  PTS: 1  REF: Lesson 50: Finding Inverses of Relations and Functions  
NAT: NCTM A.1d  TOP: Benchmark Test 3  MSC: Alg2_S03_00023

NUMERIC RESPONSE

35. ANS: 142  PTS: 1  REF: Lesson 2: Evaluating Expressions and Combining Like Terms  
NAT: NCTM A.2b  TOP: Benchmark Test 1  MSC: Alg2_S03_00025
36. ANS: 13  PTS: 1  REF: Lesson 8: Finding Direct Variation  NAT: NCTM A.2b
Algebra II Cumulative Exam Study Guide
Semester 1 Exam

Name: ________________________
Date: _________________________
Period: _______________________

TOP: Benchmark Test 1
MSC: Alg2_S01_00083

37. ANS: 48
PTS: 1
REF: Lesson 12: Solving Inverse Variation Problems
NAT: NCTM A.2b
TOP: Benchmark Test 1
MSC: Alg2_S02_00061

38. ANS: 5
PTS: 1
REF: Lesson 15: Solving Systems of Equations by Graphing
NAT: NCTM A.2b
TOP: Benchmark Test 1
MSC: Alg2_S02_00073

39. ANS: −128
PTS: 1
REF: Lesson 14: Finding Determinants
NAT: NCTM NO.3a
TOP: Benchmark Test 2
MSC: Alg2_S02_00065

40. ANS: 5/3
PTS: 1
REF: Lesson 31: Multiplying and Dividing Rational Expressions
NAT: NCTM A.2a
TOP: Benchmark Test 2
MSC: Alg2_S04_00058

41. ANS: 14
PTS: 1
REF: Lesson 33: Applying Counting Principles
NAT: NCTM NO.3a
TOP: Benchmark Test 2
MSC: Alg2_S04_00059

42. ANS: 8
PTS: 1
REF: Lesson 40: Simplifying Radical Expressions
NAT: NCTM NO.2a
TOP: Benchmark Test 2
MSC: Alg2_S04_00065

43. ANS: 2.9
PTS: 1
REF: Lesson 25: Finding Measures of Central Tendency and Dispersion
NAT: NCTM DAP.1a
TOP: Benchmark Test 3
MSC: Alg2_S03_00059

PROBLEM

44. ANS:
Distributive Property; Associative Property of Addition
PTS: 1
REF: Lesson 1: Using Properties of Real Numbers
NAT: NCTM NO.1b
TOP: Benchmark Test 1
MSC: Alg2_S01_00097

45. ANS:
yes, 6 × 4
PTS: 1
REF: Lesson 9: Multiplying Matrices
NAT: NCTM NO.2b
TOP: Benchmark Test 1
MSC: Alg2_S01_00148

46. ANS:
−3 ≤ x ≤ 1
PTS: 1   REF: Lesson 17: Solving Equations and Inequalities with Absolute Value
NAT: NCTM A.2b   TOP: Benchmark Test 2   MSC: Alg2_S02_00117
47. ANS:

\[
\begin{array}{|c|c|c|}
\hline
\text{y} & \text{2} & \text{4} \\
\text{x} & \text{2} & \text{4} \\
\hline
\end{array}
\]

PTS: 1   REF: Lesson 39: Graphing Linear Inequalities in Two Variables
NAT: NCTM A.4   TOP: Benchmark Test 2   MSC: Alg2_S04_00105
48. ANS:
Discontinuous; Domain: \(-3 < x \leq 3\), Range: \(y = 2, 4\)

PTS: 1   REF: Lesson 22: Analyzing Discrete and Continuous Functions
NAT: NCTM R.1b   TOP: Benchmark Test 3   MSC: Alg2_S03_00070
49. ANS:
\begin{enumerate}
\item \(y = -6x + 12, y = x - 2\)
\item \(y = -6x + 12\) has slope -6 and y-intercept (0, 12); \(y = x - 2\) has slope 1 and y-intercept (0, -2)
\item \(y = -6x + 12\) is falling, slope is negative; \(y = x - 2\) is falling, slope is negative
\end{enumerate}
Algebra II Cumulative Exam Study Guide
Semester 1 Exam

Name: __________________________
Date: __________________________
Period: _________________________

50. ANS:
   a. \((-1, -3)\)
   b. \(x = -1\)
   c. 
   ![](image)
   d. The graph is shifted 1 unit left and 3 units down from the graph of the parent function.
   e. The graph of \(y = (x + 4)^2 - 3\) is shifted 3 units left of the graph of \(y = (x + 1)^2 - 3\). The horizontal shift is determined by the 4 in \(y = (x + 4)^2 - 3\) and the 1 in \(y = (x + 1)^2 - 3\). Since 4 is 3 units greater than 1, the shift is 3 units to the left.