END OF COURSE
ALGEBRA I
CORE 1

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DIRECTIONS
Read and solve each question. Then mark the space on the answer sheet for the best answer. For this test you may assume that the value of a denominator is not zero.

SAMPLE
Which is equivalent to \( \frac{b^6}{b^2} \)?
A \( \frac{1}{b^3} \)
B \( b^3 \)
C \( b^4 \)
D \( b^8 \)

1 Consider the procedure used below to solve the given equation.

Given: \( 3(x - 2) = 17 \)
(1st step) \( 3x - 6 = 17 \)
(2nd step) \( 3x = 23 \)
(3rd step) \( x = \frac{23}{3} \)

Which of the following properties is a justification for the 1st step?
A Associative property of addition
B Commutative property of addition
C Distributive property
D Transitive property of equality

2 Which statement cannot be justified by one of the properties of real numbers?

F \( (a + b) + c = a + (b + c) \)
G \( a - (b + c) = (a - b) + c \)
H \( (ab)c = a(bc) \)
J \( (a + b) + 0 = 0 + (a + b) \)

3 The volume of a rectangular solid is 960 cubic inches. The dimensions of the base are 12 inches by 10 inches.

What is the height of the solid?
A 4 in.
B 8 in.
C 120 in.
D 840 in.

4 What is the solution to \( 5 - \frac{n}{2} = 12? \)

F -34
G -14
H 14
J 34
5  This graph represents \( y = \frac{1}{2}x \).

If the line in the graph is shifted down 3 units, which is the equation for the new line?

A  \( y = -\frac{1}{2}x \)

B  \( y = \frac{3}{2}x \)

C  \( y = \frac{1}{2}x - 3 \)

D  \( y = \frac{1}{2}x + 3 \)

6  The left side of a solid block is held at a constant temperature of 200°C. The temperature profile within the block is given by \( T = 200 - 5x - x^2 \) where \( x \) is the distance from the left side of the block in centimeters and \( T \) is the temperature in degrees Celsius of the block at location \( x \). At what value of \( x \) is \( T = 50°C \)?

F  \( x = 5 \) cm

G  \( x = 10 \) cm

H  \( x = 15 \) cm

J  \( x = 20 \) cm
7 Which graph best represents the equation of the line with slope of 1 and y-intercept of -3?

A

B

C

D

8 Which equation is the slope-intercept form of 

\[-x + 6y = 12?\]

F \( y = \frac{1}{6}x + 2 \)

G \( y = -\frac{1}{6}x + 2 \)

H \( x = 6y - 12 \)

J \( 6y = 12 + x \)

9 Which line on the graph below has a negative slope?
The line shown contains (-1, 2) and (1, -1). What is the slope of the line?

F 3/2

G 2/3

H -2/3

J -3/2

11 What is the slope of the line 

\[ y = 2x - 3? \]

A -3

B -3/2

C -2/3

D 2

12 Which is an equation of the line with slope \(\frac{2}{3}\) that passes through the point (4, -1)?

F \(y = -\frac{1}{4}x + \frac{2}{3}\)

G \(y = -4x + \frac{2}{3}\)

H \(y = \frac{2}{3}x - \frac{5}{3}\)

J \(y = \frac{2}{3}x - \frac{11}{3}\)

13

<table>
<thead>
<tr>
<th>x</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
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<tbody>
<tr>
<td>y</td>
<td>-3</td>
<td>-1</td>
<td>1</td>
<td>3</td>
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</table>

Which equation fits the data in the table?

A \(y = x - 2\)

B \(y = 2x - 1\)

C \(y = 3x - 3\)

D \(y = x + 1\)

14 Karen makes $5 per hour baby-sitting and $12 per hour giving music lessons. One weekend, she worked a total of 18 hours and made $139. How many hours did she spend baby-sitting?

F 11

G 9

H 7

J 6
15 \[
\begin{align*}
  x - y &= 5 \\
  x + y &= 7 \\
\end{align*}
\]
What is the solution to the system of equations shown above?
A \( x = 6, \ y = 1 \)
B \( x = 4, \ y = 3 \)
C \( x = 1, \ y = 6 \)
D \( x = -1, \ y = 7 \)

16 The Arcadia Theater charges $4 for adult tickets and $3 for student tickets. Mr. Steele purchased 9 tickets (some student and some adult) for $31. Which system of equations could be used to find \( a \), the number of adult tickets, and \( s \), the number of student tickets Mr. Steele purchased?
F \[
\begin{align*}
  a + s &= 31 \\
  4a + 3s &= 9 \\
\end{align*}
\]
G \[
\begin{align*}
  4a + 3s &= 31 \\
  a + s &= 9 \\
\end{align*}
\]
H \[
\begin{align*}
  3a + 4s &= 31 \\
  a + s &= 9 \\
\end{align*}
\]
J \[
\begin{align*}
  3a + 4s &= 9 \\
  a + s &= 31 \\
\end{align*}
\]

17 What is the solution to the inequality shown below?
\(-2x + 3 > 7\)
A \( x < -5 \)
B \( x < -2 \)
C \( x > 2 \)
D \( x < 3 \)

18 Which of the following is a solution of the equation \( x^2 - 13x + 40 = 0 \)?
F \(-8\)
G \(4\)
H \(5\)
J \(10\)

19 The formula for the surface area of a cylinder is \( SA = 2\pi r(h + r) \). What is the value of \( SA \) when \( r = 3 \) centimeters and \( h = 4 \) centimeters?
A \( 28\pi \) cm\(^2\)
B \( 32\pi \) cm\(^2\)
C \( 36\pi \) cm\(^2\)
D \( 42\pi \) cm\(^2\)

20 A consulting engineer bills his customers $90 for each hour he works. If a client's bill is $955, which equation could be used to find the number of hours worked?
F \( \frac{90}{x} = 955 \)
G \( \frac{x}{955} = 90 \)
H \( 90x = 955 \)
J \( 955x = 90 \)
21 Which is equivalent to
   \((-2ab^3)(-3a^2b^5)\)?
   
   A  \(-5ab\)
   B  \(6a^2b^{15}\)
   C  \(6a^3b^2\)
   D  \(6a^3b^8\)

22 Which expression is equivalent to
   \(2x^2y(x^2y - 3xy^2)\)?
   
   F  \(2x^5y^2 - 6x^4y^3\)
   G  \(3x^5y^2 - 5x^4y^3\)
   H  \(2x^6y^2 - 6x^3y^2\)
   J  \(2x^6y - 6x^3y^3\)

23  
   \(\square = x^2 \quad \square = x \quad \square = 1\)

Consider the models above.

What polynomial is represented by this diagram?
   
   A  \(6x^2 + 12x\)
   B  \(2x^2 + 3x + 1\)
   C  \(6x^3 + 9x + 3\)
   D  \(9x^2 + 6x + 3\)

24 Which is one of the correct factors of
   \(x^2 - 3x - 18\)?
   
   F  \((x - 2)\)
   G  \((x + 6)\)
   H  \((x - 9)\)
   J  \((x + 3)\)

25 If \(x \neq 0\), which expression is equivalent to
   \(\frac{8x^7 - 2x^3 + 2x}{2x}\)?
   
   A  \(6x^6 - x^2\)
   B  \(4x^6 - x^2\)
   C  \(6x^7 - x^3 + x\)
   D  \(4x^6 - x^2 + 1\)

26 If \(ab \neq 0\), which is equivalent to
   \(\frac{-12a^3b^2}{6ab^2}\)?
   
   F  \(2a^2b\)
   G  \(-2a^2\)
   H  \(-6a^2b\)
   J  \(6a^4b^4\)
27 When factored completely, 
\[x^2 - 9\] equals —

A \((x + 3)(x - 3)\)
B \((x + 1)(x - 9)\)
C \((x - 3)^2\)
D \((x + 3)^2\)

28 The speed of sound in water is 
\(1.46 \times 10^3\) meters per second. 
The speed of sound in air is 
\(3.31 \times 10^2\) meters per second. 
How much faster does sound travel in water than in air?

F \(1.85 \times 10^{-3}\) m/s
G \(1.129 \times 10^2\) m/s
H \(1.85 \times 10^2\) m/s
J \(1.129 \times 10^3\) m/s

29 Which is closest to the value of 
\[(2\sqrt{3})(6\sqrt{2})?\]

A 7.7
B 8.5
C 18.0
D 29.4

30 Which measure is closest to the length of a side of a square that has an area of 221 square feet?

F 11.0 ft
G 14.9 ft
H 16.4 ft
J 55.2 ft

31 The ordered pairs shown form a quadratic pattern.

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
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<tbody>
<tr>
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<td>2</td>
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<td>2</td>
<td>5</td>
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<td>3</td>
<td>10</td>
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<td>4</td>
<td>17</td>
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<tr>
<td>5</td>
<td>?</td>
</tr>
</tbody>
</table>

What is the missing value of \(y\)?

A 10
B 22
C 24
D 26
Which equation is true for all the values in the table?

F  $y = x - 9$
G  $y = x - 5$
H  $y = 3x - 5$
J  $y = 2x - 7$

33  What is the range of the function

$$f(x) = (x - 1)^2$$

when the domain is $\{-5, 0, 5\}$?

A  $\{1, 16, 36\}$
B  $\{1, 24\}$
C  $\{1, 26\}$
D  $\{-12, -2, 8\}$

34  If $f(x) = -2x^2 + x - 5$, what is $f(3)$?

F  $-20$
G  $-14$
H  $16$
J  $34$

35  Which is a zero of the function

$$f(x) = x^2 - 8x + 7?$$

A  $8$
B  $7$
C  $-1$
D  $-7$
36. The graph of the function \( f(x) = -3x + 3 \) is shown.

What is the value of \( f(3) \)?

F 3
G 0
H -2
J -6

37. The table gives the average per capita income, \( d \), in a region of the country as a function of the percent unemployed, \( u \).

<table>
<thead>
<tr>
<th>( u )</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>( d )</td>
<td>22,500</td>
<td>22,000</td>
<td>21,500</td>
<td>21,000</td>
</tr>
</tbody>
</table>

Which equation represents this data algebraically?

A \( d = 20,000 + 1,000u \)
B \( d = 22,000 + 500u \)
C \( d = 23,000 - 500u \)
D \( d = 25,000 - 1,500u \)
38 Which of these data sets represents a function?

- **F**
  - 3 → 5
  - 6 → 7
  - 12 → 9
  - 18 → 10

- **G**
  - -5 → 25
  - -2 → 4
  - 2 → 4
  - 5 → 25

- **H**
  - 1 → -1
  - 1 → 1
  - 4 → -2
  - 4 → 2

- **J**
  - -5 → 10
  - 5 → 10
  - 7 → 14
  - 9 → 18

39 The number of words Maria typed varied directly with the amount of time she spent typing. If she typed 275 words in 5 minutes, how long would it take her to type 1,100 words?

- A 220 minutes
- B 20 minutes
- C 15 minutes
- D 4 minutes

40 What is the range of the function of x graphed above?

- **F** {all real numbers < 3}
- **G** {all real numbers < -1}
- **H** {all real numbers between -6 and -1}
- **J** {all real numbers between -5 and 3}
41 If $y$ varies directly as $x$ and the constant of variation is $\frac{-2}{H11537}$, which equation represents this relationship?

A $y = -2x$

B $y = \frac{-2}{x}$

C $y = \frac{x}{-2}$

D $y = 2x$

42 Which is an equation for the variation that includes all the data in the table?

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<thead>
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<th>$x$</th>
<th>$y$</th>
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<td>3</td>
<td>$0.15$</td>
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<tr>
<td>4</td>
<td>$0.20$</td>
</tr>
<tr>
<td>5</td>
<td>$0.25$</td>
</tr>
</tbody>
</table>

F $xy = 0.05$

G $y = x + 0.05$

H $y = 0.05x$

J $y = \frac{x}{0.05}$

43 Sally recorded her daily grades for one grading period.

88, 88, 87, 92, 78, 88, 93, 100, 92, 90, 92, 92

What was her mean grade?

A 92

B 91

C 90

D 88

44 Mr. Andrews made a box-and-whisker graph of the quiz grades in his chemistry class.

Which is the median quiz grade for the class?

F 70

G 77

H 80

J 85
45. This matrix shows the prices for some items at three hamburger shops.

<table>
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<tr>
<th></th>
<th>Shop 1</th>
<th>Shop 2</th>
<th>Shop 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burger</td>
<td>$2.60</td>
<td>$1.60</td>
<td>$2.10</td>
</tr>
<tr>
<td>Fries</td>
<td>$0.80</td>
<td>$0.60</td>
<td>$0.70</td>
</tr>
<tr>
<td>Shake</td>
<td>$1.00</td>
<td>$0.90</td>
<td>$1.10</td>
</tr>
</tbody>
</table>

Each of the three shops honor their competitors' coupons. Which matrix shows what the prices would be with a 10%-off coupon?

A. $\begin{bmatrix} 2.34 & 1.44 & 1.90 \\ 0.72 & 0.54 & 0.63 \\ 0.90 & 0.81 & 1.00 \end{bmatrix}$
B. $\begin{bmatrix} 2.36 & 1.44 & 1.89 \\ 0.72 & 0.54 & 0.63 \\ 0.90 & 0.81 & 1.00 \end{bmatrix}$
C. $\begin{bmatrix} 2.36 & 1.44 & 1.90 \\ 0.72 & 0.54 & 0.63 \\ 0.90 & 0.81 & 0.99 \end{bmatrix}$
D. $\begin{bmatrix} 2.34 & 1.44 & 1.89 \\ 0.72 & 0.54 & 0.63 \\ 0.90 & 0.81 & 0.99 \end{bmatrix}$

46. $\begin{bmatrix} -2 & 4 \\ -3 & -6 \end{bmatrix}$ is equal to which matrix?

F. $\begin{bmatrix} -4 & 2 \\ -5 & 12 \end{bmatrix}$
G. $\begin{bmatrix} -4 & 2 \\ -6 & 8 \end{bmatrix}$
H. $\begin{bmatrix} 4 & -8 \\ 6 & 12 \end{bmatrix}$
J. $\begin{bmatrix} 0 & 2 \\ 1 & 4 \end{bmatrix}$

47. $\begin{bmatrix} 2 & -4 \\ 3 & 2 \end{bmatrix} + \begin{bmatrix} 6 & 1 \\ 4 & 2 \end{bmatrix}$ is equal to which matrix?

A. $\begin{bmatrix} 8 & -3 \\ 7 & 4 \end{bmatrix}$
B. $\begin{bmatrix} 12 & -4 \\ 12 & 8 \end{bmatrix}$
C. $\begin{bmatrix} 8 & 4 \\ 0 & 4 \end{bmatrix}$
D. $\begin{bmatrix} -4 & -6 \\ 26 & 7 \end{bmatrix}$
48. The chart below shows the ages in years of the girls on two Olympic teams.

| Gymnastics | 14 | 17 | 15 | 15 | 16 | 13 | 12 |
| Swimming   | 15 | 17 | 19 | 12 | 14 | 18 | 12 |

What is the difference in the median ages of the two teams?

F 0 yrs
G 1 yrs
H 2 yrs
J 3 yrs

49. Joe's New Car dealership lists the following prices for this year's models.

$10,469, $12,895, $15,499, $17,999, $18,595, $21,245, $10,395, $14,985

What is the range in prices?

A $15,260
B $15,242
C $10,850
D $10,776

50. Using the data plotted on the scatterplot, which equation most closely describes a line of best fit for the data?

F \( y = x + 6 \)
G \( y = 2x - 4 \)
H \( y = 2x + 5 \)
J \( y = 3x - 4 \)
<table>
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<tr>
<th>Test Sequence</th>
<th>Correct Answer</th>
<th>Reporting Category</th>
<th>Reporting Category Description</th>
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