1 Which group of numbers is ordered from least to greatest?

A $\frac{4}{3}, -0.9, -3$
B $-3, -0.9, \frac{4}{5}$
C $-0.9, \frac{4}{3}, -3$
D $\frac{4}{5}, -3, -0.9$

2 Which equation matches the graph shown?

A $x + y = 1$
B $x - y = -1$
C $x + y = -1$
D $-x + y = -1$
3. Which line is the graph of the function rule?

\[ y = \frac{1}{2} x + 4 \]

A line A  
B line B  
C line C  
D line D

4. Which expression simplifies to –1?

A \[ \frac{w + 8}{w - 8} \]  
B \[ \frac{x - d}{6 - x} \]  
C \[ \frac{8 - y}{8 + y} \]  
D \[ \frac{z + 9}{9 - z} \]

5. Solve.

\[ 9x = 1 \]

A \[ \frac{1}{9} \]  
B 9  
C \[ -\frac{1}{9} \]  
D 10
6  Simplify.
   \(4x(2 - 3x)\)
   A  \(5x\)
   B  \(-4x\)
   C  \(-4x^2\)
   D  \(8x - 12x^2\)

7  Simplify.
   \((3x^3 + 9x^2 - 2x) - (7x^3 - 6x^2 + 1)\)
   A  \(-4x^3 + 15x^2 - 3x\)
   B  \(-4x^3 + 3x^2 - 2x + 1\)
   C  \(-4x^3 + 15x^2 - 2x - 1\)
   D  \(-4x^3 + 15x^2 - 2x + 1\)

8  Simplify.
   \(\sqrt{32x^3} \cdot \sqrt{2x^3}\)
   A  \(2x \sqrt{2 \cdot \sqrt{x}}\)
   B  \(8x^2 \sqrt{x}\)
   C  \(8x^2 \sqrt{x}\)
   D  \(8x^3\)

9  Simplify.
   \(3^2 + (9 - 8 ÷ 2)\)
   A  \(6 \frac{1}{2}\)
   B  \(9 \frac{1}{2}\)
   C  11
   D  14
10. Simplify.
\[5x^3y^4(6xy^{-1})^2\]
A. \(30x^4y^2\)
B. \(30x^4y^5\)
C. \(30x^4y^2\)
D. \(180x^5y^2\)

11. Simplify.
\[\frac{4x^5y^8}{12x^5y^2z^0}\]
A. 0
B. \(\frac{y^3}{3x}\)
C. \(\frac{y^6}{3x}\)
D. undefined

12. Simplify.
\[\frac{y-3}{y^2} - \frac{y+3}{2y}\]
A. \(-\frac{y^2 - 5y + 6}{2y^2}\)
B. \(-\frac{y^2 + y + 6}{2y^2}\)
C. \(-\frac{6}{y^3 - 2y}\)
D. \(\frac{y-9}{2y}\)
13  Solve for $x$.

$7x - 14 = 10$

A $\frac{4}{7}$
B $\frac{-4}{7}$
C $\frac{24}{7}$
D 12

14  Solve for $x$.

$\frac{2}{5 - x} = \frac{4}{x} - 1$

A 2
B $\frac{19}{7}$
C 2 or 10
D $-13.48$ or 1.48

15  Solve for $x$.

$\sqrt{3x + 4} = \sqrt{7x + 4}$

A 0
B 2
C identity
D no solution

16  Solve for $x$.

$|x - 5| = -8$

A $-3$
B $-3$ or 3
C $-3$ or 13
D no solution
17 Solve for $x$.

$$2x^2 - 11x - 21 = 0$$

A $-3$ or $7$

B $3$ or $\frac{7}{2}$

C $-7$ or $\frac{3}{2}$

D $-\frac{3}{2}$ or $7$

18 Solve for $x$.

$$\frac{2x + 1}{x + 1} = \frac{7}{4}$$

A 3

B 11

C $\frac{11}{15}$

D no solution

19 Choose the equation of a line in standard form that satisfies the given conditions. perpendicular to $4x + y = 8$ through $(4, 3)$

A $x - 4y = -8$

B $x + 4y = 16$

C $4x - y = 11$

D $4x + y = 19$

20 Evaluate.

$$f(x) = 3^x + 4$$ when $x = 2$

A 10

B 13

C 18

D 36
21 Factor.

\[ x^2 - 7x - 18 \]
A \((x - 3)(x - 6)\)
B \((x + 2)(x - 9)\)
C \((x - 2)(x + 9)\)
D \((x - 3)(x - 4)\)

22 Factor.

\[ x^3 + 3x^2 - 8x - 24 \]
A \(x^3 + (3x + 4)(x - 4) - 8\)
B \(x^2(x + 3) - 8(x - 3)\)
C \((x^3 - 8)(x + 3)\)
D \((x^2 - 8)(x - 3)\)

23 How many real number solutions exist for \(2x^2 + 8x + 8 = 0\)?
A 0
B 1
C 2
D 3

24 Find the 7th term in the sequence.

\(-10, -6, -2, 2, \ldots\)
A 8
B 10
C 12
D 14
25  Find one solution for the equation, if possible.

\[
\frac{1}{x+1} = \frac{x+3}{2}
\]

A  1  
B  \(\sqrt{3} - 2\)  
C  \(-\sqrt{3} + 2\)  
D  all real numbers except \(-1\)

26  Find the product. Choose the correct answer given in standard form.

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

A  \(x^3 - 15\)  
B  \(x^2 - 2x - 15\)  
C  \(x^3 - 2x - 15\)  
D  \(x^3 + 3x^2 - 5x - 15\)

27  Suppose the function \(y = 30,000(1.06)^x\) models the annual profit for a small business \(x\) years after 2000. Find the profit at the end of 2011.

A  about $56,949  
B  about $222,600  
C  about $1.84 \times 10^{35}  
D  about $2.29 \times 10^{31}

28  Which inequality describes the graph?

A  \(y \leq x + 1\)  
B  \(y < x + 1\)  
C  \(y > x + 1\)  
D  \(y \geq x - 1\)
29. Solve the system of equations by any method.

\[11x + 8y = -16\]
\[x = 4y + 10\]

A. \((4, 7 \frac{1}{2})\)
B. \((4, -1 \frac{1}{2})\)
C. \((\frac{4}{9}, -2 \frac{7}{8})\)
D. \((\frac{4}{13}, -2 \frac{11}{26})\)

30. Solve the system of equations by any method.

\[y = x^2 + 5\]
\[y = -x + 7\]

A. \((4, 23)\) and \((-3, 10)\)
B. \((-2, 9)\) and \((1, 6)\)
C. \((-1, 6)\) and \((2, 9)\)
D. \((-4, 11)\) and \((3, 14)\)

31. At a garage sale, a CD costs three times as much as a book. You spend $28 to buy two books and four CDs. Choose a system of equations to find the price of a CD and the price of a book. Then solve.

A. \(c = 3b\)
   \(28 = 2b + 4c;\)
   The CD costs $2 and a book costs $6.
   \(3c = b\)
B. \(28 = 2b + 4c;\)
   The CD costs $2.80 and a book costs $8.40.
   \(c = 3b\)
C. \(28 = 2b + 4c;\)
   The CD costs $6 and a book costs $2.
   \(3c = b\)
D. \(28 = 2b + 4c;\)
   The CD costs $8.40 and a book costs $2.80.
32 Julian plans to buy a car. The car costs $14,500. He lives in Kansas where the sales tax is 5.2%. What is the total cost of the car?

A $754
B $15,254
C $22,040
D $75,400

33 The students in a band are selling entertainment books. They earn $11.25 for each book they sell. Their goal is to earn more than $5,000. What is the fewest number of books they can sell and reach their goal?

A 444
B 445
C 444.44
D 56,250
34. What is the correct graph of the function?

\[ y = \sqrt{x} + 4 \]
35 Suppose the graph of the equation below is translated 3 units up. What is the equation of the new graph?

\[ y = \frac{2}{x} \]

- A \( y = \frac{2}{x-3} \)
- B \( y = \frac{2}{x+3} \)
- C \( y = \frac{2}{x} - 3 \)
- D \( y = \frac{2}{x} + 3 \)

36 A local phone company charges a monthly fee of $34.99 plus $.05 for each minute of long distance calls. Parts of minutes are rounded up to the next whole minute. Find the minimum and maximum long-distance minutes for customers whose monthly bill is at least $53.24 but no more than $132.00.

- A at least 2, no more than 3
- B at least 365, no more than 1,940
- C at least 365, no more than 1,941
- D at least 1,065, no more than 2,640

37 Which of these could be the sides of a right triangle?

- A 8 cm, 16 cm, 20 cm
- B 10 cm, 16 cm, 20 cm
- C 11 cm, 16 cm, 20 cm
- D 12 cm, 16 cm, 20 cm
38  What is the equation of this graph?

A  \( y = |x - 2| \)
B  \( y = |x| - 2 \)
C  \( y = |x + 2| \)
D  \( y = |x| + 2 \)

39  What is true of the equation \( y = 2x^2 - 5 \)?

A  Its graph opens upward.
B  The vertex of the graph is at the origin.
C  Its graph opens downward.
D  Its graph is wider than \( y = x^2 \).

40  Is this graph a function? Explain.

A  Yes; you cannot draw a horizontal line that goes through more than one point of the graph.
B  Yes; each \( y \)-value has a single corresponding \( x \)-value.
C  No; some \( x \)-values do not have corresponding \( y \)-values.
D  No; you can draw vertical lines that go through more than one point of the graph.
41 Which expression is equal to \((x^2 - 4y)^2\)?
A \(x^4 - 4y^2\)
B \(x^4 - 16y^2\)
C \(x^4 + 16y^2\)
D \(x^4 - 8x^2y + 16y^2\)

42 Which is a step used to simplify \(\frac{8}{\sqrt{5} + \sqrt{23}}\)?
A Multiply \(\sqrt{5} + \sqrt{23}\) by \(\sqrt{5} + \sqrt{23}\) to get \(5 + 23\).
B Add \(\sqrt{5} + \sqrt{23}\) to get \(\sqrt{28}\).
C Multiply \(\sqrt{5} - \sqrt{23}\) by \(\sqrt{5} - \sqrt{23}\) to get \(5 - 23\).
D The expression cannot be simplified.

43 Find the vertex of the function \(y = 2x^2 - 4x + 5\).
A (1, 3)
B (0, 5)
C (2, 5)
D (1, -3)

44 Choose the equation of the direct variation that includes the point (3, -9).
A \(y = 3x\)
B \(y = -3x\)
C \(y = x + 6\)
D \(y = x - 12\)
45 Which system of inequalities is shown in the graph?

A
\[
\begin{align*}
y &> \frac{1}{2}x - 3 \\
y &\geq -\frac{3}{2}x + 5
\end{align*}
\]

B
\[
\begin{align*}
y &< \frac{1}{2}x - 3 \\
y &\geq -\frac{3}{2}x + 5
\end{align*}
\]

C
\[
\begin{align*}
y &< \frac{1}{2}x - 3 \\
y &\leq -\frac{3}{2}x + 5
\end{align*}
\]

D
\[
\begin{align*}
y &< \frac{1}{2}x - 3 \\
y &< -\frac{3}{2}x + 5
\end{align*}
\]

46 Solve \( PV = nRT \) for \( R \).

A \( R = PVnT \)
B \( R = \frac{PVT}{n} \)
C \( R = \frac{PVn}{T} \)
D \( R = \frac{PV}{nT} \)

47 Solve the compound inequality \(-1 < x + 2 \leq 7\).

A \( 1 < x \leq 9 \)
B \( -1 < x \leq 5 \)
C \( -3 < x \leq 5 \)
D \( -3 < x \leq 7 \)
48  Last quarter, 200 students participated in the after-school tutoring program. This quarter, 184 students are participating in the after-school tutoring program. Find the percent of decrease from last quarter to this quarter.

A  8%
B  8.7%
C  16%
D  92%

49  When you roll a standard number cube once, what is the probability of rolling a number divisible by 3?

A  1
B  \(\frac{1}{2}\)
C  \(\frac{1}{3}\)
D  \(\frac{1}{6}\)

50  At a horse show, ribbons are awarded for first, second, third, and fourth places. There are 16 horses in the show. How many different arrangements of four horses are possible?

A  1,820
B  43,680
C  65,536
D  \(8.72 \times 10^{11}\)

51  Suzi's first five tests scores were 92, 95, 96, 92, and 93. Find the mean of her test scores.

A  92
B  93
C  93.6
D  96
52 Choose the box-and-whisker plot that best represents the data.

numbers of hours spent using the Internet:

0.8 6 7 4 2 3 11 15 5 6 7 0.9 8 5 8 7 6 10 4 6 9

A

B

C

53 Juanita measures the angle of elevation from the ground to the top of an 18-foot-tall tree as 30°.

To the nearest tenth of a foot, how far is she from the tree?

A 10.4 feet
B 15.6 feet
C 31.2 feet
D 36.0 feet
For the table, identify the independent and dependent variables. What is the relationship using words, an equation, and a graph?

<table>
<thead>
<tr>
<th>Carrots Left</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number</strong></td>
</tr>
<tr>
<td><strong>of Friends</strong></td>
</tr>
<tr>
<td><strong>Number</strong></td>
</tr>
<tr>
<td><strong>of Carrots</strong></td>
</tr>
</tbody>
</table>

The independent variable is the number of friends and the dependent variable is the number of carrots. The number of friends, \( f \), is equal to 35 minus the number of carrots, \( c \). An equation for this situation is \( f = 35 - 5c \).

The independent variable is the number of friends and the dependent variable is the number of carrots. The number of carrots, \( c \), is equal to 35 minus five times the number of friends, \( f \). An equation for this situation is \( c = 35 - 5f \).

The independent variable is the number of carrots and the dependent variable is the number of friends. The number of friends, \( f \), is equal to one fifth of the difference of 35 and the number of carrots. An equation for this situation is \( f = \frac{35 - c}{5} \).
The independent variable is the number of carrots and the dependent variable is the number of friends. The number of friends, \( f \), is equal to one fifth of the difference of the number of carrots and 35. An equation for this situation is

\[
f = \frac{c - 35}{5}
\]

55. Students were surveyed at random about whether they had an apple, a pear, or both an apple and a pear for lunch today. The results of the survey are displayed in the Venn diagram below. Regardless of whether they ate an apple or not, how many students ate a pear?

A. 8  
B. 15  
C. 7  
D. 24

56. Evaluate the expression for \( g = 8 \).

\[
g + [28 - (g + 3)]
\]

A. 47  
B. 25  
C. 31  
D. 9
57. Simplify.
   \(-12 - (-25) + 8\)
   
   A. \(-45\)  
   B. \(-29\)  
   C. \(-5\)   
   D. \(21\)

58. Multiply the two expressions.
   \(\frac{1}{3} \left( \frac{3}{5} \right) \left( \frac{5}{3} \right)\)
   
   A. \(\frac{1}{3}\)  
   B. \(\frac{1}{5}\)  
   C. \(\frac{5}{9}\)  
   D. \(\frac{1}{3}\)

59. Simplify.
   \(\left( \frac{6}{b} \right)^{\frac{1}{4}}\)
   
   A. \(\frac{24}{5}\)  
   B. \(\frac{2}{3}\)  
   C. \(\frac{29}{30}\)  
   D. \(\frac{1}{10}\)
If \( f(x) = x^2 + 1 \) and \( g(x) = f(3x) \), graph \( g(x) \) and write the equation for \( g(x) \).
61. Find the vertex of each parabola by completing the square.
\[ x^2 - 4x + 3 = y \]
- A (2, 1)
- B (2, -1)
- C (-2, -1)
- D (-4, 1)

62. A slide is 21 ft long. To get to the top of the slide, you use a vertical 9-foot high rung ladder. What is the distance, \( b \), from the bottom of the slide to the bottom of the stairs? Round your answer to the nearest tenth.
The data below shows the number of hours a week on average a group of students spend volunteering for community service projects. What is a cumulative frequency table that represents the data?

4  5  10  21  6  2  9  8  12  15  8  14
6  4  6  11  3  2  9  16  22  23

<table>
<thead>
<tr>
<th>Hours</th>
<th>Frequency</th>
<th>Cumulative Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5–9</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>10–14</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>15–19</td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>20–24</td>
<td>3</td>
<td>22</td>
</tr>
</tbody>
</table>

A

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<th>Cumulative Frequency</th>
</tr>
</thead>
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</tr>
<tr>
<td>5–9</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>10–14</td>
<td>4</td>
<td>15</td>
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<tr>
<td>15–19</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>20–24</td>
<td>3</td>
<td>22</td>
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</table>

B

<table>
<thead>
<tr>
<th>Hours</th>
<th>Frequency</th>
<th>Cumulative Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5–9</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>10–14</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td>15–19</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>20–24</td>
<td>2</td>
<td>22</td>
</tr>
</tbody>
</table>

C

<table>
<thead>
<tr>
<th>Hours</th>
<th>Frequency</th>
<th>Cumulative Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–4</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5–9</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>10–14</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>15–19</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>20–24</td>
<td>8</td>
<td>22</td>
</tr>
</tbody>
</table>

D
64 The table shows the number of hours that a group of friends spent in their first week training to run a marathon. What are the mean, median, mode, and range of times? Round to the nearest tenth.

<table>
<thead>
<tr>
<th>Hours Spent Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
</tr>
<tr>
<td>x</td>
</tr>
<tr>
<td>x</td>
</tr>
<tr>
<td>x</td>
</tr>
<tr>
<td>2</td>
</tr>
</tbody>
</table>

A  mean = 7  
   median = 6.5  
   mode = 7  
   range = 6  

B  mean = 5.4  
   median = 6  
   mode = 7  
   range = 6  

C  mean = 6.5  
   median = 5.4  
   mode = 6  
   range = 7  

D  mean = 7  
   median = 6  
   mode = 7  
   range = 7
65 The back-to-back stem-and-leaf plot below show exam scores from two different math classes. Which class has a greater mean score? Which class has a greater median score?

Class A | Class B
---|---
15 | 2
168 | 4
579 | 6
66789 | 7
12 | 00489
1 | 3567

Key: 1[93] means 91 for Class A and 93 for Class B

A greater mean = class A  
greater median = class B

B greater mean = class B  
greater median = class A

C greater mean = class B  
greater median = class B

D greater mean = class A  
greater median = class A

66 The local zoo is filling two water tanks for the elephant exhibit. One water tank contains 28 gal of water and is filled at a constant rate of 8 gal/h. The second water tank contains 22 gal of water and is filled at a constant rate of 5 gal/h. When will the two tanks have the same amount of water? Explain. Let \( x \) = the number of hours the tanks are filling and let \( y \) = the number of gallons in the tank.

A In 2 hours, because the solution to the system is (2, 12).
B They will never have the same amount of water because the solution to the system is (–2, 12). It is not possible to have time be –2 hours.
C In –2 hours, because the solution to the system is (–2, 12).
D They will never have the same amount of water because the solution to the system is (–2, 12). It is not possible to have –2 gallons in the tanks.
67 Jane recorded the temperature over a period of four hours. Which equation best represents the relationship between $h$ and $t$?

<table>
<thead>
<tr>
<th>Hour ($h$)</th>
<th>Temperature ($t$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

A $t = h + 2$
B $t = h + 6$
C $h = t - 1$
D $h = t - 2$
The table lists postage for letters weighing as much as 3 oz. You want to mail a letter that weighs 1.5 oz. Graph the step function. How much will you pay in postage?

<table>
<thead>
<tr>
<th>Weight Less Than (oz)</th>
<th>Price (cents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>46</td>
</tr>
<tr>
<td>2</td>
<td>71</td>
</tr>
<tr>
<td>3</td>
<td>96</td>
</tr>
</tbody>
</table>

You will pay 71 cents.
69 Simplify the expression $9xy + 6xy - 2xy$. What is the coefficient of the simplified expression?

A $x$
B 13
C $xy$
D $y$

70 A geometric sequence has an initial value of $-5$ and a common ratio of $-2$. Write a function to represent the sequence.

A $f(n) = -5f(n - 1)$
B $f(n) = -5 (-2)^{n-1}$
C $f(n) = -2f(n - 1)$
D $f(n) = -2 (-5)^{n-1}$