1. A rectangular park is 30 meters by 40 meters, what is the length a diagonal sidewalk in the park?
A) $\sqrt{70}$ meters       B) 50 meters       C) 70 meters       D) 2500 meters       E) none of these

2. An equilateral triangle has side lengths 50. What is the area of the triangle?
A) 150       B) $625\sqrt{2}$       C) $625\sqrt{3}$       D) 2500       E) none of these

3. What is the y-intercept of the equation: $2x + 3y = 12$?
A) 2       B) 3       C) 4       D) 6       E) none of these

4. Charlie has $100 in his lunch account and spends $2.50 on lunch each day. Which equation models the amount of money, $y$, Charlie has after purchasing $x$ lunches?
A) $y = 100 + 2.50x$       B) $y = 100 - 2.50x$       C) $y = 100x + 2.50$       D) $y = 100x - 2.50$       E) none of these

5. Charlie has $100 in his lunch account and spends $2.50 on lunch each day. How much money does Charlie have in his account after buying 14 lunches?
A) $57.50$       B) $62.50$       C) $70$       D) $75$       E) none of these

6. Which equation could represent this pattern? 3, 7, 11, 15, 19, …
A) $y = 3x + 7$       B) $y = 3x + 4$       C) $y = 4x - 1$       D) $y = 7x + 3$       E) none of these

7. Which equation could represent this pattern? 64, 32, 16, 8, 4, …
A) $y = 64(2)^x$       B) $y = 32(2)^x$       C) $y = 128 \left(\frac{1}{2}\right)^x$       D) $y = 64 \left(\frac{1}{2}\right)^x$       E) none of these

8. What type of function is represented in the table at right?
<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>2</td>
<td>6</td>
<td>18</td>
<td>54</td>
<td>162</td>
</tr>
</tbody>
</table>
A) Linear       B) Exponential       C) Quadratic       D) cubic       E) none of these

9. Which equation models the data in the previous table?
A) $y = 3x + 2$       B) $y = 3x^2 + 2$       C) $y = 2(3)^x$       D) $y = 2(3)^{x-1}$       E) none of these

10. If Savannah, on average, sends 6 texts each minute from 11:50am -12:32pm during lunch. How many texts will be sent in 5 days?
A) 210       B) 252       C) 540       D) 1080       E) none of these
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11. Which is a solution to this system: \( y < 3x + 2 \) and \( y \geq \frac{1}{2} x - 4 \)
   A) \((5, -3)\)       B) \((0, 2)\)       C) \((0, -4)\)       D) \((-5, 0)\)       E) none of these

12. A wrestling team is moving bricks to make money as a fundraiser. They move 2000 bricks, which weigh 3 pounds each. If 1 kg is approximately 2.2 pounds, approximately how many kilograms did they move?
   A) 1333        B) 2727        C) 3000        D) 14520        E) none of these

13. Which models the piecewise function to the right
   \[ f(x) = \begin{cases} 5x, & 0 \leq x < 2 \\ 10, & 2 \leq x \leq 6 \\ 7.5(x - 6) + 10, & 6 < x \leq 10 \\ 5x, & 0 \leq x < 2 \end{cases} \]
   A) \( f(x) = \begin{cases} 2x, & 0 \leq x < 2 \\ 10, & 2 \leq x \leq 6 \\ 7.5x, & 6 < x \leq 10 \\ 5x, & 0 \leq x < 2 \end{cases} \)
   B) \( f(x) = \begin{cases} 4, & 2 \leq x \leq 6 \\ 7.5(x - 6) + 10, & 6 < x \leq 10 \\ 5.5(x - 6) + 10, & 10 < x \leq 40 \end{cases} \)
   C) \( f(x) = \begin{cases} 5x, & 0 \leq x < 2 \\ 10, & 2 \leq x \leq 6 \\ 7.5(x - 6) + 10, & 6 < x \leq 10 \\ 5x, & 0 \leq x < 2 \end{cases} \)
   D) \( f(x) = \begin{cases} 5x, & 0 \leq x < 10 \\ 10, & x = 10 \\ 7.5(x - 6) + 10, & 10 < x \leq 40 \end{cases} \)
   E) none of these

14. Using the previous graph, what is the rate of change from 2 hours to 6 hours?
   A) 0 mph        B) 7.5 mph        C) 10 mph        D) 15 mph        E) none of these

15. If this represents Donna’s bike ride, when is she traveling the fastest?
   A) 0 – 2 hours        B) 2 – 4 hours        C) 2 – 6 hours        D) 6 – 10 hours        E) none of these

16. What is the value of the element in row 1, column 2 of \( F \cdot G \)?
   A) 2        B) 3        C) 4        D) 7        E) undefined

17. Which matrix operation is undefined?
   A) \( F - H \)        B) \( F + H \)        C) \( G \cdot H \)        D) \( H^{-1} \)        E) none of these

18. What is matrix is \( F - H \)?
   A) \[
   \begin{bmatrix}
   4 & -4 \\
   -2 & 6 \\
   \end{bmatrix}
   \]
   B) \[
   \begin{bmatrix}
   -2 & 8 \\
   2 & 8 \\
   \end{bmatrix}
   \]
   C) \[
   \begin{bmatrix}
   -2 & -4 \\
   -2 & 2 \\
   \end{bmatrix}
   \]
   D) \[
   \begin{bmatrix}
   7 & 2 \\
   11 & -10 \\
   \end{bmatrix}
   \]
   E) undefined

19. Which type of function models the pictured graph of a car trip from Billings to Bozeman?
   A) Inverse variation        B) Direct Variation        C) Linear        D) Exponential Growth        E) none of these

20. As time increases, the speed …
   A) increases.        B) approaches zero.        C) stays constant        D) becomes negative        E) none of these

21. If a car takes 2 hrs to make a trip at 60 mph, how long would it take the car to make the trip at 20 mph?
   A) 40 min.        B) 60 min.        C) 4 hours        D) 6 hours        E) none of these
PROBLEM SOLVING 2017 Answer Key

1. B
2. C
3. C
4. B
5. E
6. C
7. C
8. B
9. C
10. E
11. C
12. B
13. A
14. A
15. D
16. A
17. C
18. A
19. A
20. B
21. D