Common Core Practice (1)

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

1. The Pell numbers can be defined recursively by the formula, \( p(1) = 0, p(2) = 1 \).
   What is the value of \( p(6) \)? \( p(n) = 2p(n - 1) + p(n - 2) \)
   a. 1  
   b. 20  
   c. 5  
   d. 29

2. The table below shows the results of a survey in which workers between the ages of 26 and 45 were asked if they have at least one month’s income set aside for emergencies.

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than one month’s income</td>
<td>66</td>
<td>83</td>
</tr>
<tr>
<td>One month’s income or more</td>
<td>76</td>
<td>62</td>
</tr>
</tbody>
</table>

If two different workers were randomly selected, find the probability that they both have one month’s income or more set aside for emergencies:

a. 64%  
   b. 24%  
   c. 48%  
   d. 23%  

3. A controlled experiment would be most appropriate for which of the following studies?

a. Determining student’s lunch preferences.  
   b. Determining if calculator use improves test grades.  
   c. Determining the personality factors that help children develop friendships.  
   d. Determining which sports team is the favorite of the female students in a school.

4. Which expression is equivalent to \( (8x^4y^6)^{\frac{1}{2}} \)?

a. \( 2xy^2 \)  
   b. \( 2xy^2 \sqrt{x} \)  
   c. \( \frac{8}{3}x^{2}y^{3}\sqrt{x} \)  
   d. \( 3\sqrt{2x^4y^6} \)

5. Solve for \( x \): \( \sqrt{x-1} = x - 7 \)
   a. \{10, 5\}  
   b. \{5\sqrt{2}\}  
   c. \{-7, 7\}  
   d. \{10\}

Extra:

Other options to solve:
1. Use \( y_1 = \frac{y}{x-1} \) and \( y_2 = x - 7 \) to find both values of \( y \) and check which values are the same.
2. Substitute the answers into the given equation.

05/21/2016
6. Sabrina is playing ball with her dog. She throws the ball in a parabolic path that can be modeled by the function \( y = -\frac{1}{2} (x - 3)^2 + 7 \). Her brother Bobby, is playing in a tree next to her. Bobby shines his laser pointer from the tree in a line that can be modeled by the function \( y = -\frac{1}{2} x + 8.5 \). At what point(s) will the ball and the laser beam intersect?

- a. (3, 7)
- b. (4, 6.5)
- c. (3, 7) and (4, 6.5)
- d. (7, 8.5) and (0.5, 3)

7. Determine which of the following has the largest maximum:

- a. \( x^2 + y = 4x - 8 \)
- b. \( y = -(x - 3)^2 + 5 \)
- c. \( x \) values

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>-1</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>-1</td>
</tr>
</tbody>
</table>

8. Professor Malg has 184 students in her mathematics class. The scores on the final examination are normally distributed and have a mean of 72 and a standard deviation of 9. What percentage of the students in the class can be expected to receive a score between 81 and 90?

- a. 13.6%
- b. 47.7%
- c. 68.2%
- d. 95.4%

9. If \( \sin \Theta = \frac{7}{25} \) where \( \Theta \) is an angle in standard position that terminates in quadrant II, what is the value of \( \tan \Theta \)?

- a. \( \frac{7}{24} \)
- b. \( \frac{-7}{24} \)
- c. \( \frac{24}{7} \)
- d. \( \frac{-24}{7} \)

10. How many complex roots does the following polynomial function have?

\( P(x) = (x^2 - 5)(x^2 + 4)(x^2 + 10)(2x + 6) \)

- a. 0
- b. 2
- c. 3
- d. 4
11. Find the values of \(x, y,\) and \(z\) in the following system of equations:
   
   \[
   \begin{align*}
   (1) & \quad x + 2y - z = 3 \\
   (2) & \quad x + 2y + z = 5 \\
   (3) & \quad 2x + y + z = 0 \\
   (4) & \quad 3x + 3y = 8 \\
   (5) & \quad 3x + 3y + z = 3
   \end{align*}
   \]

   a. \(x = 1, y = 0, z = 0\)
   
   b. \(x = 5, y = -4, z = -1\)
   
   c. \(x = -2, y = 3, z = 1\)
   
   d. \(x = -2, y = 4, z = -3\)

12. The function \(P(t) = 43,000e^{-0.25t}\) models the population of a city, in hundreds, \(t\) years after 2010. How many people lived in the city in 2010 and at what rate is the population changing?

   a. \(43,000\) Increasing by 2.5% each year
   
   b. \(4,300,000\) Increasing by 2.5% each year
   
   c. \(43,000\) Decreasing by 2.5% each year
   
   d. \(4,300,000\) Decreasing by 2.5% each year

13. If events \(A\) and \(B\) are independent events, which of the following is not necessarily true.

   a. \(P(A) \cdot P(B) = P(A \text{ and } B)\)
   
   b. \(P(B|A) = 1\)
   
   c. \(P(A|B) = P(A)\)
   
   d. \(P(B|A) = P(A)\)

14. Solve \(x^2 - 12 = -7x\)

   a. \(-3\) and \(-4\)
   
   b. \(-7 - \sqrt{97} \over 2\) and \(-7 + \sqrt{97} \over 2\)
   
   c. \(3\) and \(4\)
   
   d. \(7 - \sqrt{97} \over 2\) and \(7 + \sqrt{97} \over 2\)

15. A rabbit farm currently has 25 rabbits. This population doubles every three months which can be represented by the equation, \(r(t) = 25(2)^{4t}\) where \(t\) is years since the population was 25 rabbits. If the farm does not sell any rabbits, after how many months, to the nearest whole number, will there be 3,000 rabbits on the farm?

   a. 2
   
   b. 21
   
   c. 6
   
   d. 25

Option when number value:

a) 2 month = \(2 \over 12 = \frac{1}{6}\) yr.

b) 21 months = \(21 \over 12 = 1.75\) yr.

c) 6 months = \(6 \over 12 = 1\) yr.

d) 25 months = \(25 \over 12\)

\[\frac{3000}{25} = (2)^{4t}\]

\[120 = 2^{4t}\]

\[\log 120 = 4t \log 2\]

\[\log 120 = 4t \log 2\]

\[20.72\]... Round to 21 months

05/21/2016
16. Kyle finds data on the Internet about carbon dating. The following table shows the years since an organism’s death and the concentration of C\(^{14}\) atoms in the organism. Which type of regression would best model this situation?

<table>
<thead>
<tr>
<th>Years since death</th>
<th>(C^{14}) atoms remaining per 1.0 \times 10^{6}</th>
<th>(C^{14}) atoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>5,700</td>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td>11,400</td>
<td>2,500</td>
<td></td>
</tr>
<tr>
<td>17,100</td>
<td>1,250</td>
<td></td>
</tr>
<tr>
<td>22,800</td>
<td>625</td>
<td></td>
</tr>
<tr>
<td>28,500</td>
<td>312</td>
<td></td>
</tr>
<tr>
<td>34,200</td>
<td>156</td>
<td></td>
</tr>
<tr>
<td>39,900</td>
<td>78</td>
<td></td>
</tr>
</tbody>
</table>

a. linear  

b. logarithmic  

c. exponential  

d. trigonometric

17. Suppose you select a person at random from a large group at a conference. What is the probability that the person selected has a birthday that is not in August?

a. \(\frac{31}{365}\)  

b. \(\frac{6}{73}\)  

c. \(\frac{334}{365}\)  

d. \(\frac{11}{12}\)

31 days in August  
out of 365  
Not more 365-31=334  
365

18. Divide \(x^2 - 3x - 28\) by \(x - 7\).

a. \(x - 4\)  

b. \(x + 4\)  

c. \(x - 7\)  

d. \(x + 7\)

19. Two methods of instruction were used to teach young athletes how to shoot a basketball. The methods were assessed by assigning students to two groups, one that was taught with method A and one that was taught with method B. The students in each group took 30 foul shots after each of ten sessions. The average number of shots made in each of the \(x\) rounds by an athlete using method A can be modeled by the function, \(A(x) = 11.90 + 4.3\ln x\). The average number of foul shots made in each of the \(x\) rounds by an athlete using method B can be modeled by the function, \(B(x) = 9.17(1.109)^x\). In which of the 10 rounds will the number of baskets made with each method be the closest?

a. 6  

b. 8  

c. 7  

d. 9  

Use calculator  

\(y_1=\)  
\(y_2=\)  

Look at table.  
Look at each answer.  
Determine which two \(y\)-values are closer.
20. The graph of a quadratic function, \( f(x) \), is shown. What is the remainder when \( f(x) \) is divided by \( x - 2 \)?

\[
\begin{align*}
\text{Vertex form} & \quad (x-h)^2 + k = f(x) \\
(1, -6) & \quad (x-1)^2 - 6 \\
f(x) & = x^2 - 2x + 1 - 6 \\
f(x) & = x^2 - 2x - 5 \\
x^2 - 2x - 5 & = (x-2)
\end{align*}
\]

\[
\text{Remainder} = \frac{2}{1} - \frac{2}{2} = \frac{0}{1} - \frac{2}{2} = -\frac{2}{2} = -1
\]

- a. -5
- b. 3
- c. -3
- d. 5

21. Write \((2 + i)^3\) in standard \(a + bi\) form.

\[
\begin{align*}
\text{a.} & \quad 2 + 11i \\
\text{b.} & \quad 2 + 13i \\
\text{c.} & \quad 8 + 17i \\
\text{d.} & \quad 8 + 19i
\end{align*}
\]

22. Which recursive definition models the growth of a one-time investment of $6000 in a bank account with a yearly interest rate of 3\%, compounded monthly, after \(n\) years.

\[
\begin{align*}
\text{a.} & \quad a_0 = 6000, a_n = a_{n-1}\left(1 + \frac{.03}{12}\right)^{12} \\
\text{b.} & \quad a_0 = 6000, a_n = a_{n-1}(e)^{.03} \\
\text{c.} & \quad a_0 = 6000, a_n = a_{n-1}(1.03) \\
\text{d.} & \quad a_0 = 6000, a_n = a_{n-1}\left(1 + \frac{3}{12}\right)^{12}
\end{align*}
\]

23. Find \(g(x)\), the inverse of \(f(x) = -2x + 5\)

\[
\begin{align*}
\text{a.} & \quad g(x) = -\frac{x}{2} + 5
\\
\text{b.} & \quad g(x) = -\frac{x}{2} - \frac{5}{2}
\end{align*}
\]
24. The table below lists the number of Americans (in thousands) who are expected to be over 100 years old for selected years. Let \( x \) represent the number of years after 2010. Determine the quadratic regression equation for the data. Use the quadratic regression equation to predict the number of Americans who will be over 100 years old in the year 2026 to the nearest thousand.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number (in thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>50</td>
</tr>
<tr>
<td>2016</td>
<td>56</td>
</tr>
<tr>
<td>2018</td>
<td>65</td>
</tr>
<tr>
<td>2020</td>
<td>75</td>
</tr>
<tr>
<td>2022</td>
<td>94</td>
</tr>
<tr>
<td>2024</td>
<td>110</td>
</tr>
</tbody>
</table>

**Use Calculator (2 ways)**

1st way:

\[ y = ax^2 + bx + c \]

\[ a = 4.017857143 \]
\[ b = -9.210714286 \]
\[ c = 100.2714286 \]

at 2026 \( x = 26 \)

\[ y = 4.017857143(26)^2 - 9.210714286(26) + 100.2714286 \]

\[ y = 132.4 \]

2nd way - puts equation into \( y = \)

\[ \text{Stat} \rightarrow \text{Calc} \rightarrow 5: \text{QuadReg} \]

\[ XList: L_1 \]
\[ YList: L_2 \]
\[ \text{FreqList:} \]
\[ \text{StoreRegEq:} \text{VARS} \rightarrow \text{Y-VARS} \rightarrow 1: \text{Function} \]

Calculate: Enter

2nd Table + Scroll to \( x = 26 \rightarrow y_1 = 132.4 \)