PRE Practice Test #1

Calvin College Education Program
http://www.calvin.edu/academic/education/

Answer key found at the end of the test.

Sample mathematical definitions and formulas to help you are given on the next two pages, just as they are on the actual test. However, you should try to answer questions by referring to these definitions and formula as little as possible. Constant page turning back and forth will slow you down and can actually over-tax your working memory.
DEFINITIONS

- Approximately equal to
- Greater than
- Less than
- Similar to
- Congruent to
- Approximately equal to
- Parallel to
- Perpendicular to
- Line segment AB
- Line AB

FORMULAS

<table>
<thead>
<tr>
<th>Formula</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$</td>
<td>Distance formula</td>
</tr>
<tr>
<td>$$\left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$</td>
<td>Midpoint formula</td>
</tr>
<tr>
<td>$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$</td>
<td>Slope</td>
</tr>
<tr>
<td>$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$</td>
<td>Quadratic formula</td>
</tr>
<tr>
<td>$$y = mx + b$$</td>
<td>Slope intercept form of line</td>
</tr>
<tr>
<td>$$d = r \cdot t$$</td>
<td>Distance</td>
</tr>
<tr>
<td>$$b^x = n$$</td>
<td>Exponential</td>
</tr>
<tr>
<td>$$\log_b n = x$$</td>
<td>Logarithm</td>
</tr>
<tr>
<td>Statistics and Probability</td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td></td>
</tr>
<tr>
<td>[ \binom{n}{r} = \frac{n!}{r!(n-r)!} ]</td>
<td>Combinations</td>
</tr>
<tr>
<td>[ \frac{n!}{(n-r)!} ]</td>
<td>Permutations</td>
</tr>
<tr>
<td>[ z = \frac{x - \mu}{\sigma} ]</td>
<td>z-score</td>
</tr>
<tr>
<td>((n)(n-1)(n-2)\ldots(3)(2)(1))</td>
<td>(n!)</td>
</tr>
</tbody>
</table>
Trigonometry

\[ \sin \theta = \frac{\text{opp}}{\text{hyp}} \]
\[ \cos \theta = \frac{\text{adj}}{\text{hyp}} \]
\[ \tan \theta = \frac{\text{opp}}{\text{adj}} \]

<table>
<thead>
<tr>
<th>Angle ((\theta))</th>
<th>(\sin (\theta))</th>
<th>(\cos (\theta))</th>
<th>(\tan (\theta))</th>
</tr>
</thead>
<tbody>
<tr>
<td>0(^\circ)</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>30(^\circ)</td>
<td>(\frac{1}{2})</td>
<td>(\frac{\sqrt{3}}{2})</td>
<td>(\frac{\sqrt{3}}{3})</td>
</tr>
<tr>
<td>45(^\circ)</td>
<td>(\frac{\sqrt{2}}{2})</td>
<td>(\frac{\sqrt{2}}{2})</td>
<td>1</td>
</tr>
<tr>
<td>60(^\circ)</td>
<td>(\frac{\sqrt{3}}{2})</td>
<td>(\frac{1}{2})</td>
<td>(\sqrt{3})</td>
</tr>
<tr>
<td>90(^\circ)</td>
<td>1</td>
<td>0</td>
<td>undefined</td>
</tr>
<tr>
<td>Formula</td>
<td>Description</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$C = 2\pi r$</td>
<td>Circumference of a circle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$A = \frac{1}{2} bh$</td>
<td>Area of a triangle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$A = \pi r^2$</td>
<td>Area of a circle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$A = 2lh + 2lw + 2hw$</td>
<td>Surface Area of a rectangular box</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V = lwh$</td>
<td>Volume of a rectangular box</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$A = \text{sum of areas of polygonal faces}$</td>
<td>Surface Area of a pyramid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V = \frac{1}{3} Bh$</td>
<td>Volume of a pyramid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$A = \pi rs + \pi r^2$</td>
<td>Surface Area of a cone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V = \frac{1}{3} \pi r^2h$</td>
<td>Volume of a cone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$A = 2\pi rh + 2\pi r^2$</td>
<td>Surface Area of a cylinder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V = \pi r^2h$</td>
<td>Volume of a cylinder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$A = 4\pi r^2$</td>
<td>Surface area of a sphere</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V = \frac{4}{3} \pi r^3$</td>
<td>Volume of a sphere</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$a^2 + b^2 = c^2$</td>
<td>Pythagorean theorem</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1.

Use the information below to answer the question that follows.

<table>
<thead>
<tr>
<th>Line 1</th>
<th>3(x + 7 – y) = 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line 2</td>
<td>3x + 21 - 3y = 14</td>
</tr>
</tbody>
</table>

Which of the following properties was applied to the equation in Line 1 to obtain the equation in line 2?

A. Associative
B. Distributive
C. Commutative
D. Multiplicative
2.

Which of the following could be the equation of the graph shown here?

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

Which line segment shown below is tangent to the circle?

A. A
B. B
C. C
D. D
4.

A circle of diameter 2 centimeters undergoes a dilation with a scale factor of 2. How much greater is the area of the new circle compared to the original circle?

A. 1/2  
B. 1  
C. 2  
D. 4
Which of the following is equal to \(4^2 - 3 + |2 - 4|\)?

A. 3  
B. 8  
C. 11  
D. 15
6.

What is $\log_5 25 + \log_5 5$?

A. 3  
B. 5  
C. 6  
D. 30
7.

If both a and b are integers, then which of the following is always an integer?

A. \( ab \)
B. \( \frac{a}{b} \)
C. \( \sqrt{b} \)
D. \( \sqrt{ab} \)
8.

If $4x + 5 = 9$, then what could be used as a multiplicative inverse to solve the equation?

A. $\frac{1}{4}$  
B. $\frac{1}{5}$  
C. $\frac{1}{9}$  
D. $\frac{1}{12}$
9.

What is the sum of the first four terms of the series $a_n = 4 + 3n$?
Where $n = 0, 1, 2, 3$

A. 4
B. 7
C. 13
D. 34
A student measured the length of a pipette advertised to be 150 mm long and found it to be 144 mm long. What is the percent error in the advertised length of the pipette?

A. 4
B. 6
C. 44
D. 50
11.

If a measurement $d$ is stated as $8 \pm .03$, then what is the range of possible $d$ values?

A. $7.7 \leq d \leq 8.3$
B. $7.07 \leq d \leq 8.03$
C. $7.97 \leq d \leq 8.03$
D. $7.097 \leq d \leq 8.30$
12.

What is $(1 + 3i)$ subtracted from $(3 - 2i)$?

A. $-2 - 5i$
B. $2 + i$
C. $-2 + 5i$
D. $2 - 5i$
13.

The cards depicted below each have a number on one side and a letter on the other side. Only one side of each card has been shown to you. Pick the cards you would need to turn over to determine if the following general rule is true or false:

If a card has a vowel on one side then it has an even number on the other side.

A. Just B
B. Just C
C. B and D
D. B, C, and D
A girl has a collection of coins that add up to $0.86. If she has twice as many nickels as quarters, and three times as many pennies as quarters, then how many dimes does she have?

A. 0  
B. 1  
C. 2  
D. 3
If n=2, then what is p?

A. 3
B. 5
C. 10
D. 23
16.

The length of a rectangle \((l)\) is three units greater than its width \((w)\). What is the area of the rectangle?

A. \(a = 2(2w + 3)\)
B. \(a = (w + 3)^2\)
C. \(a = (2w + 3)^2\)
D. \(a = w^2 + 3w\)
17.

What polynomial do you get when you subtract $2x^2 - x + 7$ from $x^3 + 4x - 3$?

A. $x^3 - 2x^2 + 3x + 4$
B. $x^3 - 2x^2 + 5x - 10$
C. $-x^3 + 2x^2 - 5x + 10$
D. $-x^3 + 2x^2 + 5x - 10$
For what values of $x$ is $F(x)$ negative?

A. $x \leq 0$
B. $x \geq 0$
C. $x = -1$
D. $-2 < x < 2$
19.

Consider these values for $x$ and $f(x)$:

<table>
<thead>
<tr>
<th>$x$</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>-9</td>
<td>-4</td>
<td>-1</td>
<td>0</td>
<td>-1</td>
<td>-4</td>
<td>-9</td>
<td>-16</td>
</tr>
</tbody>
</table>

The relationship of $f(x)$ to $x$ is

A. Linear
B. Cubic
C. Quadratic
D. Asymptotic
20.

The number of bacteria growing on the surface of a leftover piece of turkey doubles every hour. The entire surface of the turkey became completely covered with bacteria after 12 hours of growth. How long did it take for the turkey to become half covered with bacteria?

A. 1 hour  
B. 2 hours  
C. 6 hours  
D. 11 hours
The variables $x$ and $y$ are related by the following expression: $x = \frac{y - 7}{4}$

If $y$ is plotted as a function of $x$, what will the slope of the line be equal to?

A. 1
B. 4
C. 7
D. $\frac{4}{7}$
A circle just fits inside a square with a perimeter of 8 meters. What is the area of the circle?

A. $\pi$

B. $\frac{\pi}{2}$

C. $4\pi$

D. $\pi^2$
23.
There are 6 children in a daycare. The daycare worker randomly selects one child to be in charge of picking up toys for the day. From among the remaining 5 children, the day care worker again randomly selects one child to check the coat rack to see if any coats were left behind.

What is the size of the sample space in the illustration described above?

A. 5
B. 6
C. 11
D. 30
What is the midpoint between the two points (-1, 2) and (7, 4) ?

A. (3, 3)
B. (-3, 5)
C. (-8, 2)
D. (8, -2)
When conducting a survey, the best way to reduce the uncertainties in your findings would be to

A. look for causation in the data
B. look for correlations in your data.
C. survey as many subjects as possible.
D. express your results in terms of standard deviations.
What is the median value of the following set of data?

2, 2, 2, 4, 6, 8, 11

A. 2  
B. 4  
C. 5  
D. 7
Researchers found that 85% of the prisoners incarcerated for a violent crime watched far more violent movies when they were young than did prisoners that had not committed violent crimes. This study suggests that

A. committing a violent crime leads to the desire to watch violent movies.

B. watching violent movies when young can cause an individual to later commit a violent crime.

C. watching violent movies when young is correlated with committing violent crimes later in life.

D. there is no link between watching violent movies when young and then later committing a violent crime.
What is the polynomial graphed here?

A. $f(x) = x^2(x-1)$
B. $f(x) = x(x+1)(x-2)$
C. $f(x) = (x+2)(x-1)(x-2)$
D. $f(x) = (x-3)(x+2)(x-1)$
29.

What is the length of the arc length $d$ shown here?

A. $\pi$
B. $\frac{1}{6}\pi$
C. $\frac{1}{2}\pi$
D. $2\pi$
What is the area of the un-shaded portion of the rectangle?

A. 8 cm$^2$
B. 12 cm$^2$
C. 24 cm$^2$
D. 32 cm$^2$
Line segment X is parallel to line segment Y. How long is line segment d?

A. 2.5 m
B. 3 m
C. 3.5 m
D. 4 m
32.

What type of symmetry is manifested by the stars in this diagram?

A. Glide
B. Rotation
C. Reflection
D. Glide reflection
33.

What is \( \frac{8!}{6!} \)?

A. 2
B. 15
C. 56
D. 336
<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B</td>
<td>17</td>
<td>B</td>
<td>33</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>18</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>19</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>D</td>
<td>20</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>D</td>
<td>21</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>A</td>
<td>22</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>A</td>
<td>23</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>A</td>
<td>24</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>D</td>
<td>25</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>A</td>
<td>26</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>C</td>
<td>27</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>D</td>
<td>28</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>C</td>
<td>29</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>B</td>
<td>30</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>B</td>
<td>31</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>D</td>
<td>32</td>
<td>D</td>
<td></td>
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