

Algebra 1 Ciphering - Hoover High School Math Tournament - February 22, 2003

1-1. $21202_3 = \underline{\hspace{2cm}}_9$

Ans: 252_9

1-2. Simplify $\frac{8}{4-\sqrt{3}}$

Ans: $\frac{32+8\sqrt{3}}{13}$

1-3. What is the remainder when $3x^5 - 7x^4 - 20x^2 + 2$ is divided by $x-3$? Ans: -16

1-4. Find the equation, in slope-y-intercept form, of the line that is perpendicular to the line $x+4y=8$ and that passes through the point $(-4,3)$. Ans: $y=4x+19$

1-5. Given: $\begin{matrix} x+2y=4 \\ 4x-5y=15 \end{matrix}$ Find: $-13x+26y$

Ans: -48

2-1. If A is 25% of B, B is 150% of C and C is 40% of D. What is the ratio of A to D? Ans: 3:20

2-2. Given the set : $\{5, 7, 21, 10, 7, 8, 12\}$. If a = median, b = mean, and c = mode, find $\frac{a+b}{c}$. Ans: 18/7

2-3. Find the value of y that satisfies the system of equations: $\begin{matrix} 2x-y^3=81 \\ \sqrt[3]{x}+y=0 \end{matrix}$ Ans: -3

2-4. Joe travels 75 miles per hour for 90 miles. Then he travels 50 miles per hour for 60 miles. What was Joe's average speed for the entire trip? Round your answer to the nearest whole number. Ans: 63 mph

2-5. Solve for x :

$$2x^3(x^2+1)+7x+21=2x^5+2(x^3-3x)+5$$

Ans: $x = \frac{-16}{13}$

3-1. Find the greatest common factor of 336, 48, and 120

Ans: 24

3-2. Given: $4x^2+4=20$ If a is the number of roots the equation has and b is the smallest of all of the roots, find a^3+b^2 . Ans: 12

3-3. Simplify: $\frac{2^9}{6^2} \cdot \frac{5^2}{3^4} \cdot \frac{6^3}{2^8} \div \frac{5^3}{9^2}$

Ans: $\frac{12}{5}$

3-4. y varies directly with z and inversely with x . If $y = 16$ when $x = \frac{1}{2}$ and $z = 24$, find z when $y = 4$ and $x = \frac{1}{8}$. Ans: $\frac{3}{2}$

3-5. If $x = \frac{1}{3}$, $y = 9$ and $z = \frac{3}{4}$, find $\left(\frac{yz}{x+y}\right)^{4xz}$ Ans: $\frac{81}{112}$

4-1. Simplify: $\left(\left[4b^{-5}(3a^2)^3\right]\left[(2a^2)^{-2}(3b^{-3})^{-2}\right]\right)^2$ Ans: $9b^2a^4$

4-2. Find the equation of the line that passes through the point $(8, 11)$ and is parallel to the line $(y - 8) = .75(x - 4)$. Write your answer in $y = mx + b$ form. Ans: $y = \frac{3}{4}x + 5$

4-3. Given: $f(x) = x^2 + 2x + 1$ and $g(x) = x^2$. Find: $g(g(f(2)))$ Ans: 6561

4-4. A triangle has vertices $(3, 4), (3, 11), (5, 4)$. Find the area of the triangle. Ans: 7

4-5 Evaluate: $(-4)^4 + (13)^3 - (12)^2 + (11)^1$ Ans: 2320

E-1. Solve for w : $2w^2 - 17w = -35$ Ans: 5 or $\frac{7}{2}$

E-2. Write the equation of the line which passes through the points $(4, 2)$ and $(4, -2)$. Ans: $x = 4$

E-3. Find the vertex of the parabola $y = x^2$ Ans: $(0, 0)$