The Ninth Grade Math Competition Class

Exponents

Anthony Wang

1. Find $5^{-3}5^{5}5^{1}$.

5-3+5+1 = 5

2. Find
$$\frac{3^{4}3^{-2}}{3^{5}3^{-1}} = \frac{3^{2}}{3^{4}} = \frac{3^{2} - 4}{3^{4}} = \frac{3^{2}}{3^{4}} = \frac{3^$$

3. Find 4^{x+1} if 2^x is 9.

$$2^{\times} = 9$$

$$4^{\times + 1} = 4^{\times} \cdot 4^{\prime} = 4 \cdot 9^{\times}$$

$$= 4 \cdot (2^{2})^{\times} = 4 \cdot 2^{2 \times} = 4 \cdot (2^{\times})^{2}$$

$$= 4 \cdot (2^{2})^{\times} = 4 \cdot 9^{2} = 324$$

4. If $8^x = 27$, what is 4^{2x-3} .

$$6^{\times} = 27 \qquad (2^{3})^{\times} = 27 = 2^{3\times} = (2^{\times})^{3}$$

$$4^{2\times -3} = 4^{2\times} = (2^{2})^{2\times} = 2^{3\times} = 2^{3\times}$$

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5. Find all values of x such that $25^{-2} = \frac{5\frac{48}{x}}{5\frac{26}{x}25\frac{17}{x}}$.

$$(5^{2})^{-2} = \frac{5 \times 48}{5 \times (5^{2})^{\frac{1}{x}}}$$

$$(5^{2})^{-2} = \frac{5 \times (5^{2})^{\frac{1}{x}}}{5 \times (5^{2})^{\frac{1}{x}}} = \frac{48}{5 \times (5^{2})^{\frac{1}{x}}} = \frac{48}{5$$

6. Simplify the expression $81 + (2^{-2})$.

$$81^{-\frac{1}{4}} = \frac{1}{81^{\frac{1}{4}}} = \frac{1}{3} = 3^{-1}$$

7. Find x if $2^{16^x} = 16^{2^x}$.

$$2^{16} = (2^{4})^{2}$$

$$16^{x} = (2^{4})^{2}$$

$$16^{x} = 4 \cdot 2^{x}$$

$$16^{x} = 4 \cdot 2^{x}$$

$$16^{x} = 2^{2} \cdot 2^{x}$$

$$2^{4x} = 2^{2} \cdot 2^{x}$$

$$2^{4x} = 2^{2} + 2^{2}$$

8. Solve for n: $\sqrt{1 + \sqrt{2 + \sqrt{n}}} = 2$.

9. Find, with a rational common denominator, the sum

$$(\frac{1}{2})^{-\frac{1}{2}} + (\frac{3}{2})^{-\frac{3}{2}} + (\frac{5}{2})^{-\frac{5}{2}}$$

10. What is the difference between $x^2 = 9$ and $x = \sqrt{9}$?

11. Suppose that $y = \frac{3}{4}x$ and $x^y = y^x$, the quantity x + y can be expressed as a rational number $\frac{r}{s}$, where r and s are relatively prime positive integers. Find

Y= 3/3 Y= 3/3

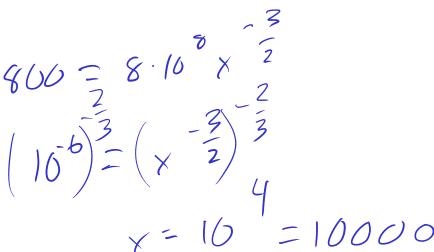
 $\times_{\lambda} = \lambda_{\chi}$

 $\chi^{\frac{3}{4}\chi} = \left(\frac{3}{4}\chi\right)^{\chi}$

 $\chi^{3}_{ax} = (\frac{3}{4})^{\chi} \times \chi$

 $\frac{\chi_{4}^{3}\chi}{\chi} = \left(\frac{3}{4}\right)^{\chi}$

12. The formula $N=8*10^8*x^{-\frac{3}{2}}$ gives, for a certain group, the number of individuals whose income exceeds x dollars. What is the smallest possible value of the lowest income of the wealthiest 800 individuals?



13. Solve for x in the equation $2^{333x-2} + 2^{111x+2} = 2^{222x+1}$.

$$= \sqrt{x-2}$$

$$1/(x-2)$$

The for
$$x$$
 in the equation $2^{333x-2} + 2^{111x+2} = 2^{222x+1}$

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$$= \frac{333}{2} + 2^{2} \cdot 2^{111} = 2^{1} \cdot 2^{22}$$

$$\frac{2^{2}}{(2^{111}x)^{3}} + 4 \cdot 2^{111x} = 2 \cdot (2^{111x})^{2}$$

$$\frac{y^3}{4} + 4, \quad \gamma = 7. \quad \gamma^2$$

$$\frac{y^{2}}{4} + 4 = 2x$$

$$y^{2} - 8y + 16 = 0$$

$$(y - 4)^{2} = 0 \implies y = 4$$