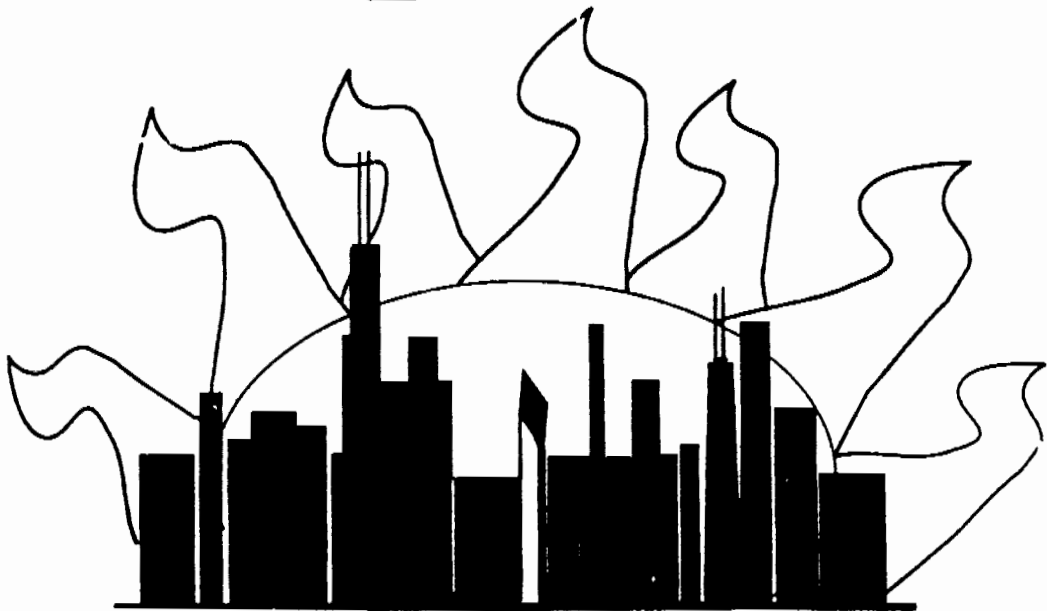


Theta Division

Topic Test 2

Equations & Inequalities



**Mu Alpha Theta National Convention
Chicago 1998**

General Instructions:

1. Unless otherwise stated all answers should be written as decimals.
2. If you are asked to give your answer as a fraction, please give your answer in $\frac{a}{b}$ form where a and b are relatively prime.

Questions

1. Solve for x : $-\frac{1}{4}x + \frac{1}{3} < \frac{1}{6}$. Give your answer in the form $x > k$ with k written as a fraction.

2. Solve the following system of equations. Write your answer as the sum of x and y .

$$\begin{cases} x - 3y = 17 \\ x^2 - 9y^2 = 493 \end{cases}$$

3. Solve for m : $\frac{3}{7}(m-1) + \frac{2}{3}(m-4) = \frac{1}{2}(m-7) + \frac{5}{21}$. Write your answer as a simplified fraction in lowest terms.
4. Solve for x : $3x - |2x - 1| = 1 - |2x - 3x|$. Write your answer as a simplified fraction in lowest terms.
5. Solve for k : $\frac{3}{k+9} - \frac{5}{2k+18} = \frac{3}{7k+63} + \frac{9}{14}$. Write your answer as a simplified fraction in lowest terms.
6. The product of two real numbers is 18. When one is subtracted from each number, the product is 9. What is the sum of the two numbers?
7. Find $\frac{y}{x}$ if (x, y) satisfies the system: $\begin{cases} \frac{1}{x} - \frac{1}{y} = -3 \\ \frac{2}{x} + \frac{3}{y} = 7 \end{cases}$. Give your answer as a simplified fraction in lowest terms.
8. Find the value of $x + y$ for which $123x + 321y = 345$ and $321x + 123y = 543$.

9. Coffee is poured into a cup. The coffee is at 200°F at time $t = 0$ minutes in a room that has a constant air temperature of 70°F . The temperature, y , of the coffee at anytime t (for relatively small t) may be approximated by a linear function $y = mt + b$ where m is given by the formula $m = -0.05769(b - 70)$. Find the approximate temperature to the nearest tenth of a degree of the coffee at $t = 1$ minute. Give answer rounded to four significant digits.

10. How many integral values of x satisfy the inequality $8 < |3x + 4| < 32$?

11. Find the product of the x and y which satisfy $|x + y + 7| + |2x - y + 2| = 0$.

12. Find the smallest positive integer that is in the solution set of

$$\frac{x + 34}{8} + \frac{2x + 36}{20} > \frac{1}{3} \left(\frac{1}{4}x + 21 \right).$$

13. Find the product of the real values of x for which $|(2 - |x|)| = 1$.

14. In a river with a steady current, it takes Bionic Woman 6 minutes to swim a certain distance upstream, but it takes her only 3 minutes to swim back. How many minutes would it take a doll of the Bionic Woman to float this same distance downstream?

15. Find the smallest positive integer such that $|x^2 + 3x + 2| + |2x^2 - 7| > 75$.

16. Solve the following for x : $\left(\frac{2x+1}{x-2}\right)^2 + 6 = 5\left(\frac{2x+1}{x-2}\right)$.

17. How many integers satisfy the inequality $|x - 3| < 9 < |2x - 3|$?

18. Solve the following: $\frac{x^3 + x^2 + 7x - 9}{x^3 - 1} < 1$. Write your answer in the form $x < k$.

19. Given $-3(|x+8|) = 11(|x+8|) - 28$. What is the value of x , furthest from the origin on the number line, that satisfies this equation?

20. Consider the system: $\begin{cases} |x-3| \geq 4 \\ x^2 \leq 64 \end{cases}$. What is the probability, given that x is a randomly

chosen real number from -10 to 10 inclusive, that x will be a solution to this system?

Write your answer as a simplified fraction in lowest terms.