

Instructions: You must show all work to receive credit. Unless the problem states otherwise you should do the work by hand and check by calculator, and report exact values (no decimals). Use proper notation for your answers and be sure to answer all part of each question.

1. Consider the set of numbers below. For each indicated number type below, list the elements in the set that are of that type. Use correct set notation for your response. If no numbers are of that type in the set, write NONE. (25 points)

$$\left\{ -13, \frac{4}{5}, 21.68, \overset{=-9}{|-9|}, 0, \sqrt{10}, 4, \frac{1}{\pi}, \overset{=8}{2^3}, \overset{=2}{\frac{\sqrt{36}}{3}}, 0.\overline{01}, 4.424424442 \dots, 10\,000 \right\}$$

- a. Irrational numbers (I):

$$\left\{ \sqrt{10}, \frac{1}{\pi}, 4.424424442 \dots \right\}$$

- b. Rational numbers (Q):

$$\left\{ -13, \frac{4}{5}, 21.68, |-9|, 0, 4, 2^3, \frac{\sqrt{36}}{3}, 0.\overline{01}, 10,000 \right\}$$

- c. Natural Numbers (N):

$$\left\{ 4, 2^3, \frac{\sqrt{36}}{3}, 10\,000 \right\}$$

- d. Integers (Z):

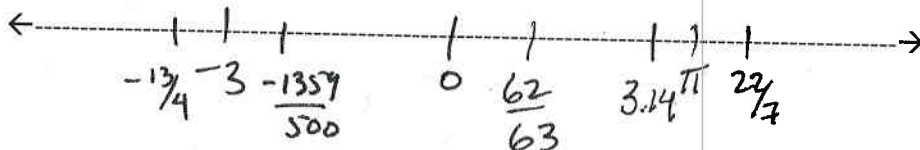
$$\left\{ -13, |-9|, 0, 4, 2^3, \frac{\sqrt{36}}{3}, 10\,000 \right\}$$

- e. Are there any numbers in this set which are not real?

none

2. Place the following numbers on the number line below in order of smallest to largest. (You don't need to worry about "spacing", but the order does matter. You may wish to convert fractions to decimal equivalents to find relationship with nearby numbers.) (16 points)

$$\left\{ -3, \pi, -\frac{13}{4}, \frac{22}{7}, 3.14, -\frac{1359}{500}, 0, \frac{62}{63} \right\}$$



3. Evaluate the following expressions. If the expression cannot be evaluated write "undefined".
(3 points each)

a. $(-4)^2$ 16

b. -5^2 -25

c. $\frac{0}{9}$ 0

d. $\frac{8}{0}$ undefined

4. Evaluate the following expressions. (4 points each)

a. $\frac{(-3)^2 + 6(3-8)}{2 \cdot 3 + 11} = \frac{9 + 6(-5)}{6 + 11} = \frac{9 - 30}{17} = \boxed{\frac{-21}{17}}$

b. $-3^3 + 5^2 \div |4 - 3^2| = -27 + 25 \div |4 - 9| =$
 $-27 + 25 \div 5 = -27 + 5 = \boxed{-22}$

c. $\left(\frac{1 - (-4)^3}{5^2 - 6 \cdot 2}\right)^2 = \left(\frac{1 - (-64)}{25 - 12}\right)^2 = \left(\frac{65}{13}\right)^2 = 5^2 = \boxed{25}$

5. Evaluate the following expression. (Reminder: You need to show work to earn all points.) (8 points)

$$\frac{5}{6} \left[\frac{4}{3} \div \left(\frac{8}{9} - \frac{5}{3} \right) - 2 \right]$$

$$\frac{5}{6} \left[\frac{4}{3} \div \left(-\frac{7}{9} \right) - 2 \right]$$

$$\frac{5}{6} \left[\frac{4}{3} \cdot \frac{-9}{7} - 2 \right] =$$

$$\frac{5}{6} \left[-\frac{12}{7} - 2 \right] = \frac{5}{6} \left[-\frac{26}{7} \right]$$

$$= \boxed{-\frac{65}{21}}$$

6. Evaluate the expression $\frac{2y-3z^2}{3z+4y}$ for $y = 2, z = -3$. (8 points)

$$\frac{2(2) - 3(-3)^2}{3(-3) + 4(2)} = \frac{-23}{-1} = \boxed{23}$$

7. Simplify the expressions by distributing and combining like terms. (6 points each)

a. $5x - 4(x - 2) - 7x + 3$

$$5x - 4x + 8 - 7x + 3 =$$

$$\boxed{-6x + 11}$$

b. $\frac{1}{2}(2x - 4) - \frac{2}{3}(9x + 9)$

$$x - 2 - 6x - 6 = \boxed{-5x - 8}$$

8. Solve the equations below. (7 points each)

a. $3x - 8 = 5(x + 3)$

$$\begin{array}{r} 3x - 8 = 5x + 15 \\ -5x \quad -5x \\ \hline -2x - 8 = 15 \\ +8 \quad +8 \\ \hline \end{array}$$

$$\frac{-2x}{-2} = \frac{23}{-2}$$

$$\boxed{x = -\frac{23}{2}}$$

b. $\left(\frac{4(x+3)}{3} = 6x - 1\right) 3$

$$\begin{array}{r} 4(x+3) = 18x - 3 \\ 4x + 12 = 18x - 3 \\ -18x \quad -18x \\ \hline \end{array}$$

$$\begin{array}{r} -14x + 12 = -3 \\ -12 \quad -12 \\ \hline \end{array}$$

$$\frac{-14x}{-14} = \frac{-15}{-14}$$

$$\boxed{x = \frac{15}{14}}$$

c. $\left(\frac{3}{4}x + \frac{1}{12} = -\frac{1}{4}x - \frac{1}{4}\right) 12$

$$\begin{array}{r} 9x + 1 = -3x - 3 \\ +3x \quad +3x \\ \hline 12x + 1 = -3 \\ -1 \quad -1 \\ \hline \end{array}$$

$$\frac{12x}{12} = \frac{-4}{12}$$

$$\boxed{x = -\frac{1}{3}}$$

d. $8z - 7(z + 2) = 3(z - 7) - 2z$

$$8z - 7z - 14 = 3z - 21 - 2z$$

$$\begin{array}{r} z - 14 = z - 21 \\ -z \quad \quad -z \\ \hline \end{array}$$

$$-14 = -21$$

no solution

e. $-4x + 5x = 2(x + 3) - (x + 6)$

$$x = 2x + 6 - x - 6$$

$$x = x$$

all real numbers

9. For each of the problems in #8, state whether the equation is conditional, an identity or a contradiction. (2 points each)

a.

conditional

b.

conditional

c.

conditional

d.

contradiction

e.

identity