

Sets and the Real Number System

name _____

class _____ date _____

1. Use proper set notation to write the set of numbers (S) that is between 0 and 50 AND are squares of counting numbers. $S = \{1, 4, 9, 16, 25, 36, 49\}$
- \downarrow 0, 1, 2, 3, ... \downarrow 1, 4, 9, 16, ..., 49

2. Using proper set notation to write the set of all whole numbers (W) that are greater than 5, less than 25, AND multiples of 3. $W = \{6, 9, 12, 15, 18, 21, 24\}$
- \downarrow 6, 7, ..., 24
 3, 6, 9

3. What is a subset? Is it possible for the original set to be a subset of itself?

IT IS A SECTION / PART OF THE ORIGINAL SET. YES !!

4. Given that $A \subset C$ and $C \subset B$, is it true that $A \subset B$? Explain why or why not.



YES, A IS CONTAINED IN C & C IS CONTAINED IN B

5. Which number set is -5 a member of? (circle all that apply)

a. \mathbb{R}

b. \mathbb{N}

c. \mathbb{Z}

d. \mathbb{Q}

6. Given $S = \{1, 2, 3\}$, list the eight subsets of S.

$\{1, 2, 3\}$ $\{1, 3\}$ $\{1\}$ $\{3\}$
 $\{1, 2\}$ $\{2, 3\}$ $\{2\}$ \emptyset

7. How many distinct subsets are possible for each of the following sets of numbers?

a. $\{1\} = 2$

b. $\{1, 2\} = 4$

c. $\emptyset = 1$

8. Given $A = \{1, 2, 3, 4, 5, 6\}$, $B = \{1, 2, 3, 4\}$, $C = \{2, 6\}$, $D = \{4, 5\}$. Find each of the following:

a. $B \cap A$

$\{1, 2, 3, 4\}$ OR B

c. $D \cup C$

$\{2, 4, 5, 6\}$

e. $(B \cup C) \cup D$

$\{1, 2, 3, 4, 6\} \cup \{4, 5\}$
 $\{1, 2, 3, 4, 5, 6\}$ OR A

b. $B \cup C$

$\{1, 2, 3, 4, 6\}$

d. $(D \cup C) \cap B$

$\{2, 4\}$

f. $(A \cup C) \cap C$

$\{2, 6\}$ OR C

9. a. The ?? of $\{a, d, j\}$ and $\{j, c, m\}$ is $\{a, m, c, j, d\}$ UNION; (\cup); OR

- b. The ?? of $\{-2, -1, 0, 1, 2\}$ and $\{0, 4, 6, 8\}$ is $\{0\}$ INTERSECTION; (\cap); AND

- c. The ?? of $\{2, 5, 8\}$ and $\{0, 1\}$ is \emptyset INTERSECTION; (\cap); AND

10. Which of the following are true?

T a. There is no least real number

T b. Zero is a real number

T c. Negative numbers are real numbers

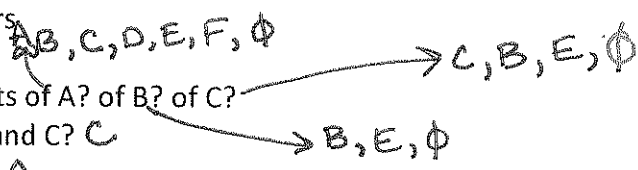
F d. No irrational number is a real number ex) π

T e. A rational number is a number that can be expressed in the form $\frac{a}{b}$

F f. The number 3.1416 is not a rational number

3.1415926... IS IRRATIONAL

11. Given A = the set of real numbers
 B = the set of integers
 C = the set of rational numbers
 D = the set of irrational numbers
 E = the set of counting (Natural) numbers
 F = the set of positive numbers



- a. Which of the above sets are subsets of A? of B? of C?
 b. Which set is the intersection of A and C? C
 c. Which set is the union of A and C? A
 d. Describe $C \cap D$

THE INTERSECTION OF RATIONAL & IRRATIONAL #S, WHICH IS IMPOSSIBLE \emptyset

12. Is it possible for $(x + y)$ to be a counting number if x is a counting number while y is NOT a counting number? Explain why or why not.

yes; $(0+1)=1$

13. Find two irrational numbers whose sum is 10.

ex) $2 + \sqrt{3}$ & $8 - \sqrt{3}$: their sum is 10

- Find two irrational numbers whose product is 10.

ex) $\sqrt{50} \cdot \sqrt{2}$: PRODUCT IS 10

14. Write each of the following statements in terms of one or more inequalities.

- a. k is a positive number

$k > 0$

- b. r is a negative number

$r < 0$

- c. t is a number that is not positive

$t \leq 0$

- d. s is a nonnegative number

$s \geq 0$

- e. y is a number between 2 and 3

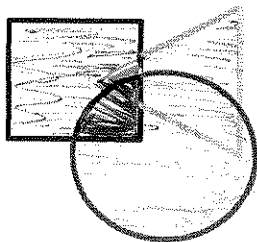
$2 < y < 3$

- f. w is a number that is greater than or equal to a and less than or equal to b

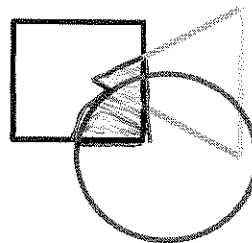
$a \leq w \leq b$

15. Shade the regions representing the sets. NOTE: Set X is the square area, Set Y is the triangular area, and Set Z is the circular area.

a. $X \cap (Y \cup Z)$



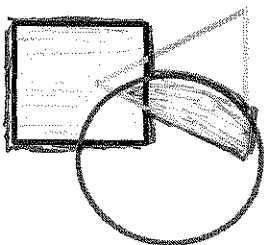
b. $(X \cap Y) \cup (X \cap Z)$



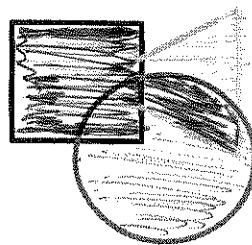
THESE HAVE THE SAME SHADED REGION!

What do you notice about the shaded regions in parts a & b? in parts c & d? hmmm...

c. $X \cup (Y \cap Z)$

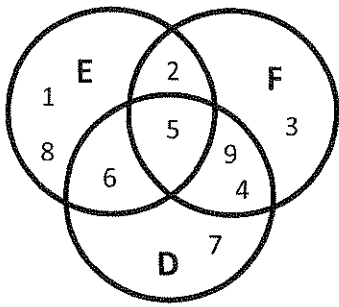


d. $(X \cup Y) \cap (X \cup Z)$



THESE ALSO HAVE THE SAME SHADED REGION

16. Refer to the diagram and list the members (numbers) that make each of the following true:



a. $D \cap E$

$$\{5, 6\}$$

b. $D \cup E$

$$\{1, 2, 4, 5, 6, 7, 8, 9\}$$

c. $F \cup E$

$$\{1, 2, 3, 4, 5, 6, 8, 9\}$$

d. $F \cap E$

$$\{2, 5\}$$

e. $(D \cap E) \cap F$

$$\{5\}$$

f. $D \cup (E \cap F)$

$$\{2, 4, 5, 6, 7, 9\}$$

g. $D \cap (E \cup F)$

$$\{4, 5, 6, 9\}$$

f. $(D \cap E) \cup F$

$$\{2, 3, 4, 5, 6, 9\}$$

g. $(D \cap F) \cup (E \cap F)$

$$\{2, 4, 5, 9\}$$

17. Graph each of the following on a number line.

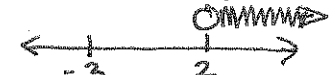
a. $x < 0$



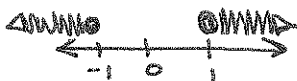
b. $|-x| \leq 1$



c. $x > 2$ and $x > -3$



d. $|x| \geq 1$



e. $x > 0$



f. $x < -3$ or $x > -2$



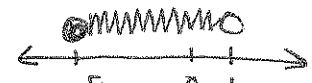
g. $x \geq 0$



h. $|x| = 3$



i. $x \geq -5$ and $x < 1$



18. Given $A = \{1, 2, 3, 4, 5, \dots\}$; $B = \{2, 4, 6, 8, 10, \dots\}$; and $C = \{1, 3, 5, 7, 9, \dots\}$. Find each of the following:
 <NOTE: The three dots form an ellipsis, which means to continue on>

a. $A \cup B$

A

b. $A \cup C$

A

c. $B \cup C$

A

d. $A \cap B$

B

e. $A \cap C$

C

f. $B \cap C$

\emptyset

g. $(A \cup B) \cup C$

A

h. $(A \cap B) \cap C$

\emptyset

i. $(A \cap B) \cup C$

A

19. Solve and graph on a number line.

a. $2(x-6) - 3x > 4 - 2(x-1)$

$$2x - 12 - 3x > 4 - 2x + 2$$

$$-x - 12 > -2x + 6$$

$$+2x + 12 \quad +2x + 12$$

$$x > 18$$



b. $8 - 2(3x+7) \leq 5x - 3(2-x)$

$$8 - 6x - 14 \leq 5x - 6 + 3x$$

$$-6x - 6 \leq 8x - 6$$

$$+14x + 6 \quad +14x + 6$$

$$0 \leq 22x$$

$$0 \leq x$$



c. $3(2x-8) - 12 = 8 - 3(4-2x)$

$$6x - 24 - 12 = 8 - 12 + 6x$$

$$6x - 36 = -4 + 6x$$

$$-6x \quad -6x$$

$$-36 = -4 \quad \text{?} \quad \text{in } \emptyset$$

NO SOLUTION \longleftrightarrow

d. $9 - 5(x-9) = 4(2-x)$

$$9 - 5x + 45 = 8 - 4x$$

$$-5x + 54 = 8 - 4x$$

$$+5x \quad -8 \quad -8 \quad +5x$$

$$46 = x$$

