Number Sets

Natural N = {1, 2, 3, 4, 5, . . .}

Whole W = {0, 1, 2, 3, 4, 5, . . .}

Integers Z = {. . . , -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, . . .}

Rational the set of real numbers that can be expressed as a ratio of integers

Note: Both terminating (e.g., 5.625) and repeating decimal numbers (e.g., ) are rational.

Irrational the set of real numbers that cannot be expressed as a ratio of integers

Real the union of the rational and irrational number sets  
  
Symbols

2 + 2 = 4 7 ≠ 23 5 > 4.9 2 ≥ 2 -3 < -1 0.3 ≤ 1

Complete the table. Use Y for yes, and N for no.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 9/3 | -4.25 |  | - | π | 0 | 23 |  |
| 1. Rational |  |  |  |  |  |  |  |  |
| 2. Irrational |  |  |  |  |  |  |  |  |
| 3. Whole |  |  |  |  |  |  |  |  |
| 4. Natural |  |  |  |  |  |  |  |  |
| 5. Integers |  |  |  |  |  |  |  |  |
| 6. Real |  |  |  |  |  |  |  |  |

Absolute value | a | = the distance from 0 to a on the real number line

Fill in the blank with <, =, or >.

| -5 | \_\_\_ 5 -13 \_\_\_ -12 | -13 | \_\_\_ | -12 |

Solve | x | = 5 for x. x = \_\_\_\_\_\_\_\_\_\_

Set = a well-defined collection of objects

G = {∆, ⌂, □, ◊, ○, ♯}

U.S. Military Services = M = { \_\_\_ , \_\_\_ , \_\_\_ , \_\_\_ , \_\_\_\_ }  
   
 C = States in the U.S. whose name begins with the letter C

3 ways to describe a set:

(1) complete list of elements A = {a, b, c, d, e, f, g, . . . , x, y, z}

a \_\_\_\_ A 5 \_\_\_\_ A

(2) a phrase   
 the set of Math 0997 students born in June

the set of Math 0997 students with more than one pet

(3) set-builder notation

{x | x = 2n, n  N} = { \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ }

{x | x = 2n − 1, n  N} = { \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ }

{x | x = 2n, n  W} = { \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ }

Cardinality of a set n(G) = \_\_\_\_\_ n(M) = \_\_\_\_\_ n(C) = \_\_\_\_\_

Set operations: Given a universal set, U Use Venn diagrams to “visualize”.

(1) Set Complement = the set of elements in the universal set not in the original set

U = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}

A = {0, 2, 3, 4, 6, 8, 9} A’ or  = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

B = {0, 1, 4, 9} B’ or  = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(2) Intersection

AB = the set of elements in A and in B Find AB.

P = students in a PHED class   
 M = students in MATH class Find PM.

(3) Union

CD = the set of elements in C or in D (or in both) the “inclusive or”

C = {2, 3, 4, 6, 8} CD = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

D = {0, 1, 2, 4, 8}

P = the students in a PHED class   
 M = the students in math class Find PM.

(4) Set Difference

B – A = B   = the set of elements in B that are not in A

A – B = A   = the set of elements in A that are not in B

Find B – A and A – B.

Subsets

B  A every element of B is an element of A n(B) ≤ n(A)

B  A every element of B is an element of A and BA n(B) < n(A)

Find all of the subsets of A = {a, b, c}. How many are proper?

Exercises:

1. If set B = {l, i, n, e, a, r}, find the cardinality of B. n(B) = \_\_\_\_\_\_\_\_\_\_

Fill in the blank with the symbol that makes the statement true:

2. 5 \_\_\_\_\_ {0, 1, 2, 3, 4} 3. 16 \_\_\_\_\_ 

4. How many subsets does the set {0, 1, 2, 3} have? Multiple choice.

(a) 4 (b) 6 (c) 15 (d) 16 (e) None of these

List all of the 2-element subsets.

If A = {1, 3, 4, 7, 9}, B = {0, 1, 4, 9}, and the universal set U = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}, find

5.  6.  7. 

If A = {1, 3, 4, 7, 9}, B = {0, 1, 4, 9}, and the universal set U = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}, find

8. A – B 9.  10. 

11. For #5–10, complete the following Venn diagram.

A

## B

**U**

12. The Venn diagram below shows the results of a survey of 25 pet owners on whether they own dogs, cats, or other pets.

**Dogs**

10

3

**Cats**

4

8

Universal Set set

What percent of pet owners in the survey have dogs? Dogs or cats? Dogs and cats? Only cats?