

# NUMBER SYSTEM



## Understanding Real and Complex Numbers

### LEVEL 1: The Basics

Q1: Classify each number as {Real, Rational, Irrational, Integer, Whole or Natural}.

A number can belong to multiple categories.

a) 5 \_\_\_\_\_

g)  $\sqrt{-49}$  \_\_\_\_\_

b) -10 \_\_\_\_\_

h)  $(-3)^2$  \_\_\_\_\_

c)  $2\pi$  \_\_\_\_\_

i) 55 \_\_\_\_\_

d)  $\sqrt{25}$  \_\_\_\_\_

j)  $-\sqrt{15}$  \_\_\_\_\_

e) 0 \_\_\_\_\_

k)  $\sqrt{100}$  \_\_\_\_\_

f) 2.5 \_\_\_\_\_

l)  $\frac{32}{8}$  \_\_\_\_\_

Q2: Answer the following true/false questions.

1) True or False: All integers are rational numbers.

2) True or False: All real numbers are complex numbers.

3) True or False: The square root of any positive number is always irrational.

4) True or False: 0 is a natural number.

5) True or False: Imaginary numbers are a type of complex number.

Q3: Write a number that is:

a) Rational but not an integer → \_\_\_\_\_

b) Irrational → \_\_\_\_\_

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## LEVEL 2: Dive Deeper

Q1: For each number, write the most specific number family it belongs to (Natural, Whole, Integer, Rational, Irrational, or Complex)

m)  $3i^2$  \_\_\_\_\_

s)  $7\sqrt{9}$  \_\_\_\_\_

n)  $-1$  \_\_\_\_\_

t)  $(-3)^2$  \_\_\_\_\_

o)  $\pi^2$  \_\_\_\_\_

u)  $55$  \_\_\_\_\_

p)  $-\sqrt{25}$  \_\_\_\_\_

v)  $-\sqrt{-15}$  \_\_\_\_\_

q)  $14$  \_\_\_\_\_

w)  $3e$  \_\_\_\_\_

r)  $2.5 - i$  \_\_\_\_\_

x)  $\frac{-15}{2}$  \_\_\_\_\_

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Q2: Identify the real part and the imaginary part of each complex number.

Number	Real Part	Imaginary Part
$8 + 5i$		
$-2 - i$		
$6i$		
$-5$		

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Q3: Give an example of a number that is a Real number but not an Integer.

Q4: Which of the following Numbers is not an irrational number?

a)  $\sqrt{39}$

b)  $-\sqrt{62}$

c)  $\sqrt{36}$

d)  $\pi\sqrt{8}$

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## LEVEL 3: Mastering the Concept

Q1: For each number, write the most specific number family it belongs to (Natural, Whole, Integer, Rational, Irrational, or Complex)

a)  $-i^2$  \_\_\_\_\_

d)  $i^{37}$  \_\_\_\_\_

b)  $-6^2$  \_\_\_\_\_

e)  $-\sqrt{0.09}$  \_\_\_\_\_

c)  $\pi - e$  \_\_\_\_\_

f)  $(5 - 2i) - (5 + 2i)$  \_\_\_\_\_

Q2: Simplify and classify:  $(-2i)(4i) =$  \_\_\_\_\_ type: \_\_\_\_\_

Q3: Answer the following questions with a brief explanation.

a) Which number is larger:  $2\pi$  or 6?

b) Give an example of a number that is a Real number but not an Integer.

Example: \_\_\_\_\_

Why? \_\_\_\_\_

c) Explain why every Integer is also a Rational number.

Explanation: \_\_\_\_\_

Q4: Create your own complex number and its conjugate. Multiply them. What type of number do you get?

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## Real-Life / Word Problems (Additional)

1) Temperature Change: The temperature in the morning was  $-5^{\circ}\text{C}$ . By noon, it had risen by  $12^{\circ}\text{C}$ .

To which family does the noontime temperature belong?

2) Pizza Party: You and your friends eat  $\frac{3}{4}$  of a large pizza.

Does the amount of pizza you ate represent a Rational or an Irrational number? Explain why.

3) Area of a Garden: You want to build a square garden with an area of 10 square meters. The length of one side of this garden would be  $\sqrt{10}$  meters.

Is the length of the garden's side a Rational or Irrational number?

## Challenge Problem

Critical Thinking: Is the sum of two irrational numbers *always* an irrational number? Give an example to support your answer.

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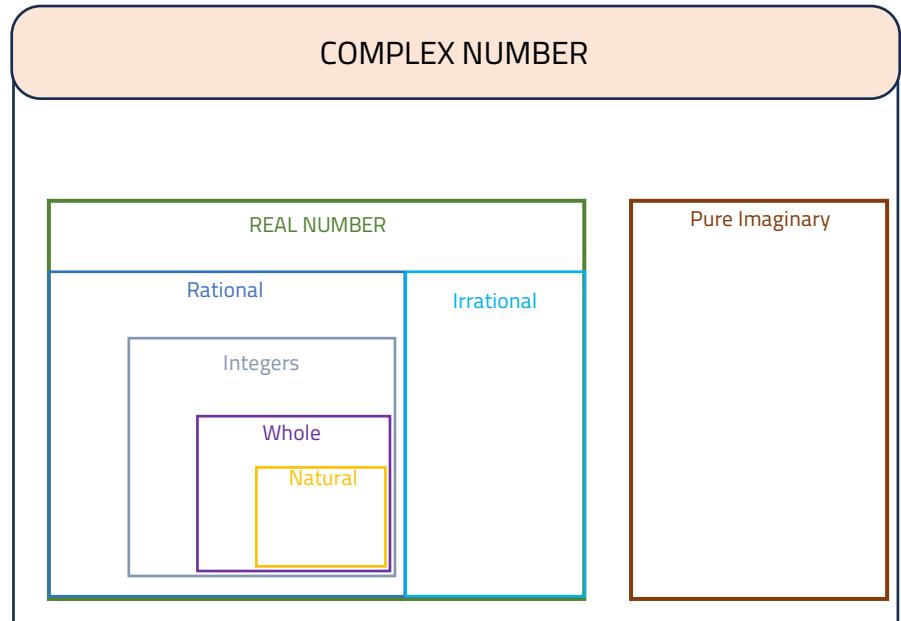
EXTRA WORKSHEET:

Q1: Re-write each number in the Venn Diagram where it belongs.

-16       $1.\bar{2}$        $0 + 6i$        $3i$

$\sqrt{10}$        $\sqrt{81}$       3.485       $-\frac{6}{11}$

$3 + \pi$        $-i$        $2 + 6i^2$       9



Q2: Check all boxes that apply to the number.

	Complex	Imaginary	Real	Rational	Irrational	Integer	Whole	Natural
9								
$12 + 2i$								
$1.2222 \dots$								
$6i$								
$-\frac{14}{7}$								

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Q3: True or False? If false, correct the statement.

- a) If a number is an integer, then the number is also rational. -----
  - b) If a number is real, then it is also rational. -----
  - c) 3.456 is an irrational number. -----
  - d)  $\sqrt{11}$  is a real number. -----
  - e) Zero is a natural number. -----
  - f) 9 is an integer. -----
  - g) If a number is natural, then it's also whole. -----
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Q4: Answer the following questions

- a) 11) Name a number that is an integer, but not whole.  
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- b) 12) Give an example of an irrational number that was not already used on this worksheet or our notes.  
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- c) 13) Give an example of a rational number that was not already used on this worksheet or our notes.  
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