■ Self-Test Worksheet: Number Systems in Number Theory

Practice problems only — no answer key included (for exam-style self-testing).

A. Classify Each Number

1) 7
2) 0
3) –8
4) 5/6
5) –2/5
6) √9
7) √2
8) π
9) 0.125
10) 0.333…
11) –√16
12) 3 + 4i
13) –2i
14) e
15) –11.75

B. True/False — Justify Your Answer

1) Every integer is a rational number.
2) Every rational number is an integer.
3) Every irrational number is a real number.
4) Some complex numbers are real numbers.
5) If a decimal expansion terminates, the number is rational.
6) If a decimal repeats, the number is irrational.
7) The number 0 is rational.
8) If $x \in$ ■ and $x \neq 0$, then $1/x \in$ ■.

C. Short Proof or Reasoning

1) Prove √2 is irrational.
2) Show that the sum of a rational and an irrational number is irrational.
3) Show that the product of a nonzero rational and an irrational is irrational.

D. Applications and Edge Cases

1) Classify 0/7 and 7/0 (if defined).
2) Is √(16/9) rational? Classify it.
3) Decide whether 0.101001000100001… is rational or irrational.
4) Let a = 1/3 and b = 2/3. Classify a + b, a × b, and b – a.
5) Determine whether –√(25) and √(–25) are real.

E. Integer Subfamilies: Primes and Composites

1) Determine if 19 is prime or composite.
2) Factorize 84 completely into primes.
3) List all primes less than 20.
4) Why is 1 not prime or composite?
5) Is -7 prime, composite, or neither? Explain.

F. Intervals

1) Express all real numbers greater than -2 and ≤ 6 in interval notation.
2) Write $(-\infty, 3)$ in words.
3) Which integers belong to $[4,9)$?
4) Express the set $\{x \in \blacksquare \mid x \geq 0\}$ in interval notation.
5) Write the interval of numbers strictly between π and 5.