Real Numbers & Fundamental Theorem of Arithmetic

TEACHER ANSWER KEY & DERIVATIONS

Q1. The Fundamental Theorem of Arithmetic states that every composite number can be uniquely expressed as a product of: [1 Mark]

(A) Even numbers

(B) Prime numbers ✓ Correct

(C) Rational numbers

(D) Irrational numbers

STEP-BY-STEP DERIVATION & EXPLANATION:
Every composite number can be factorized uniquely into prime factors apart from order.

Q2. If HCF(a, b) = 12 and a x b = 1800, what is LCM(a, b)? [1 Mark]

(A) 120

(B) 150 ✓ Correct

(C) 180

(D) 200

STEP-BY-STEP DERIVATION & EXPLANATION:
$LCM \times HCF = a \times b \Rightarrow LCM \times 12 = 1800 \Rightarrow LCM = 150$.

Q3. Is $\sqrt{5}$ a rational or irrational number? [1 Mark]

(A) Rational

(B) Irrational ✓ Correct

(C) Integer

(D) Whole number

STEP-BY-STEP DERIVATION & EXPLANATION:
The square root of any non-square prime number is irrational.

Q4. The decimal expansion of 13 / 125 will terminate after how many decimal places? [1 Mark]

(A) 1 place

(B) 2 places

(C) 3 places ✓ Correct

(D) 4 places

STEP-BY-STEP DERIVATION & EXPLANATION:
$125 = 5^3$. Maximum exponent of 2 or 5 in denominator is 3, so decimal expansion terminates after 3 places.

Q5. The exponent of 2 in prime factorization of 144 is: [1 Mark]

(A) 2

(B) 3

(C) 4 ✓ Correct

(D) 6

STEP-BY-STEP DERIVATION & EXPLANATION:
$144 = 16 \times 9 = 2^4 \times 3^2$. Exponent of 2 is 4.

Q6. The HCF of smallest composite number and smallest prime number is: [1 Mark]

(A) 1 | **(B) 2 ✓ Correct**

(C) 4 | (D) 8

STEP-BY-STEP DERIVATION & EXPLANATION:
Smallest prime = 2, smallest composite = 4. $HCF(2, 4) = 2$.

Q7. If p and q are co-prime positive integers, then HCF(p, q) is: [1 Mark]

(A) 0 | **(B) 1 ✓ Correct**

(C) p x q | (D) p + q

STEP-BY-STEP DERIVATION & EXPLANATION:
Co-prime numbers have no common prime factors except 1.

Q8. The product of a non-zero rational number and an irrational number is always: [1 Mark]

(A) Rational | **(B) Irrational ✓ Correct**

(C) Zero | (D) Whole number

STEP-BY-STEP DERIVATION & EXPLANATION:
Product of non-zero rational and irrational is always irrational.

Q9. What is the sum of exponents of prime factors in prime factorization of 196? [1 Mark]

(A) 2 | **(B) 4 ✓ Correct**

(C) 6 | (D) 8

STEP-BY-STEP DERIVATION & EXPLANATION:
$196 = 14^2 = 2^2 \times 7^2$. Sum of exponents = $2 + 2 = 4$.

Q10. Find HCF of 96 and 404 using prime factorization. [1 Mark]

(A) 2 | **(B) 4 ✓ Correct**

(C) 8 | (D) 12

STEP-BY-STEP DERIVATION & EXPLANATION:
$96 = 2^5 \times 3$, $404 = 2^2 \times 101$. $HCF = 2^2 = 4$.