Unit 4 · Factors, Fractions, and Exponents Cheat Sheet

Unit 4 focus: divisibility, prime factorization, GCF and simplifying fractions

1 DIVISIBILITY RULES

Divisible by	If …
2	the last digit is even
3	the digit sum is divisible by 3
5	the last digit is 0 or 5
9	the digit sum is divisible by 9
10	the last digit is 0

2 PRIME FACTORIZATION

Use a factor tree until every branch ends in a prime.

Example: Prime factorization of 72
Tree: $72 = 8 \cdot 9 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3$
Answer: $2^3 \cdot 3^2$

3 GREATEST COMMON FACTOR

Multiply the primes the numbers share.

Example: GCF of 36 and 60
Primes: $36 = 2^2 \cdot 3^2$, $60 = 2^2 \cdot 3 \cdot 5$
Shared: $2^2 \cdot 3$
Answer: 12

4 SIMPLIFYING FRACTIONS

Divide the numerator and denominator by their GCF.

Example: Simplify $\frac{36}{60}$.
Divide by 12: $\frac{3}{5}$
Answer: $\frac{3}{5}$

5 KEY VOCABULARY

prime	Exactly two factors: 1 and itself.	2, 3, 5, 7, 11
composite	More than two factors.	4, 9, 12
rational	Can be written as a fraction of integers.	$-\frac{2}{3}$, 0.25
irrational	Non-ending, non-repeating decimal.	$\sqrt{2}$, π

6 QUICK REMINDERS & COMMON MISTAKES

✓ Do remember

- 1 is neither prime nor composite.
- Use exponents to group repeated prime factors.
- $\sqrt{n}$ is irrational unless n is a perfect square.

✗ Common mistakes

- Calling 51 prime: $51 = 3 \cdot 17$
- GCF = product of all primes: only the shared ones
- Writing $\frac{36}{60} = \frac{6}{10}$ as final: keep dividing: $\frac{3}{5}$

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More practice: rational and irrational numbers, exponent rules, scientific notation and cube roots

1 EXPONENT RULES

Rule	Example
$a^m \cdot a^n = a^{m+n}$	$x^3 \cdot x^4 = x^7$
$\frac{a^m}{a^n} = a^{m-n}$	$\frac{5^6}{5^2} = 5^4$
$a^0 = 1$	$9^0 = 1$
$a^{-n} = \frac{1}{a^n}$	$2^{-3} = \frac{1}{8}$

2 EXPONENTS AND MULTIPLICATION

Multiply coefficients and add exponents of the same base.

Example: $(3x^2)(4x^5)$
Coefficients: 3 · 4 = 12
Exponents: 2 + 5 = 7
Answer: $12x^7$

3 EXPONENTS AND DIVISION

Divide coefficients and subtract exponents.

Example: $\frac{18y^9}{6y^3}$
Divide: 18 ÷ 6 = 3
Subtract: 9 − 3 = 6
Answer: $3y^6$

4 SCIENTIFIC NOTATION

Standard form	Scientific notation
5,600,000	5.6×10^6
0.00043	4.3×10^{-4}
72,000	7.2×10^4

$a \times 10^n$ with $1 \le a < 10$.

5 CUBE ROOTS

Find	Answer
$\sqrt[3]{64}$	4
$\sqrt[3]{-125}$	−5
$x^3 = 27$	x = 3
$\sqrt[3]{\frac{8}{27}}$	$\frac{2}{3}$

A negative number has a negative cube root.

6 CHECK YOURSELF

- Did I follow the order of operations?
- Did I do the same thing to both sides?
- Did I check my answer in the original problem?
- Does my answer have the right sign and units?