Prime and Composite Numbers

Prime and Composite Numbers: Find, Fix, and Work Backward

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QUICK REVIEW

A prime whole number has exactly two positive factors, 1 and itself; 13 has factors $1, 13$. A composite has more than two; $15 = 3 \times 5$ has factors $1, 3, 5, 15$. The number 1 is neither. The only even prime is 2.

Worked example

Classify 41 as prime, composite, or neither. Show its factor pairs.

1. The complete factor pairs are $1 \times 41 = 41$.

2. The positive factors are $1, 41$, a total of 2; exactly two factors means prime.

Answer: 41 is prime.

Practice Problems

Show your thinking.

1. A student calls 27 prime because it is odd. Correct the classification with factors.

2. A student calls 31 composite because it is odd. Correct the classification with factors.

3. How many different rectangular arrays of 49 tiles are possible if rotations count as the same? Use this to classify 49.

4. Can 39 tokens make equal groups with more than one token per group and more than one group? Explain with factors.

5. Find all prime numbers strictly between 10 and 20.

6. Find a composite number whose only positive factors are $1, 7, 49$.

7. Correct: Every prime number is odd. Give a counterexample.

8. Find two different primes with sum 20.

Answer Key

1. 27 is composite.
2. 31 is prime.
3. 1×49, 7×7; 49 is composite.
4. Yes; 39 is composite.
5. $11, 13, 17, 19$.
6. 49.
7. 2 is an even prime.
8. For example, 3 and 17.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The complete factor pairs are $1 \times 27 = 27$, $3 \times 9 = 27$.

2. The positive factors are $1, 3, 9, 27$, a total of 4; more than two means composite.

Problem 2

1. The complete factor pairs are $1 \times 31 = 31$.

2. The positive factors are $1, 31$, a total of 2; exactly two factors means prime.

Problem 3

1. The complete factor pairs are $1 \times 49 = 49$, $7 \times 7 = 49$.

2. The positive factors are $1, 7, 49$, a total of 3; more than two means composite.

Problem 4

1. The complete factor pairs are $1 \times 39 = 39$, $3 \times 13 = 39$.

2. The positive factors are $1, 3, 13, 39$, a total of 4; more than two means composite.

Problem 5

1. $12, 14, 16, 18$ have factor 2; $15 = 3 \times 5$.

2. For $11, 13, 17, 19$, neither 2 nor 3 divides; no larger possible smaller factor is needed because each is less than $5^2 = 25$.

Problem 6

1. $7 \times 7 = 49$.

2. The factor pairs are 1×49 and 7×7, giving exactly $1, 7, 49$.

Problem 7

1. $2 = 1 \times 2$ has exactly the two factors 1 and 2.

2. $2 \div 2 = 1$, so 2 is even; one counterexample disproves every.

Problem 8

1. 3 has factors $1, 3$; 17 has factors $1, 17$.

2. $3 + 17 = 20$ verifies the required sum.

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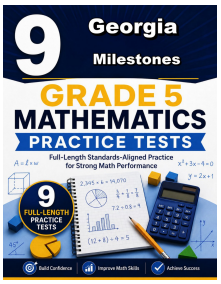

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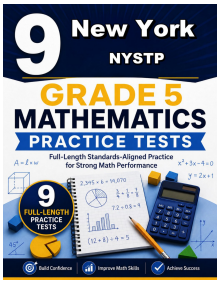

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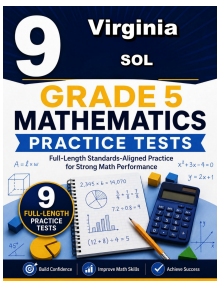

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