GENERAL

common multiples of 8 and 9 less than 100

Published: September 3, 2026 | Index ID: #-

Introduction

When students first encounter the concept of multiples in elementary math classes, they often wonder why certain numbers share common factors and how that knowledge can be applied to everyday problems. One classic example that brings clarity to the idea of shared multiples is the pair of numbers 8 and 9. By exploring the common multiples of 8 and 9 that are less than 100, learners not only strengthen their grasp of divisibility but also gain insight into the mechanics of the least common multiple (LCM). This article walks through the theory, offers a step by step calculation, and provides real world applications and practice exercises—all designed to make the topic engaging and memorable.

Understanding Multiples and Divisibility

What Is a Multiple?

A multiple of a number is the result of multiplying that number by an integer. For example, the multiples of 8 are 8, 16, 24, 32, and so on. Each of these numbers can be expressed as 8 × n, where n is a whole number.

Divisibility Rules in a Nutshell

Before diving into common multiples, it helps to review quick divisibility tests:

- Divisible by 2: Even numbers.
- Divisible by 3: Sum of digits is a multiple of 3.
- Divisible by 4: Last two digits form a number divisible by 4.
- Divisible by 5: Ends in 0 or 5.
- Divisible by 9: Sum of digits is a multiple of 9.

These rules allow quick checks without performing full multiplication.

Why Find Common Multiples?

Common multiples are the backbone of many mathematical concepts, such as the least common multiple, fractions with a common denominator, and solving systems of equations. In everyday life, they appear in scheduling, resource allocation, and even in designing patterns that repeat after a certain number of steps.

Finding Common Multiples of 8 and 9

Method 1: Listing Multiples Manually

The most straightforward approach is to list the multiples of each number up to the desired upper bound—in this case, 100—and then identify the overlap.

1. Multiples of 8: 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96.
2. Multiples of 9: 9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99.
3. Common entries: 72.

Thus, 72 is the only common multiple of 8 and 9 that is less than 100.

Method 2: Using the Least Common Multiple Formula

The LCM of two numbers is the smallest positive integer that is a multiple of both. For 8 and 9, the LCM can be found by prime factorization:

- 8 = 23
- 9 = 32

The LCM takes the highest power of each prime factor:

LCM(8, 9) = 2³ × 3² = 8 × 9 = 72.

Because 72 is the smallest common multiple, every other common multiple will be a multiple of 72. Since we restrict ourselves to numbers less than 100, there is only one such multiple—72 itself.

Common Multiples Less Than 100: A Closer Look

Below is a table summarizing the multiples of 8, multiples of 9, and their intersection under 100.

Multiples of 8	Multiples of 9	Common Multiples (
8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96	9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99	72

Notice how the intersection is a single entry. This outcome is a direct consequence of the fact that 8 and 9 are relatively prime (their greatest common divisor is 1). When two numbers share no common prime factors, the only common multiple below a certain threshold is their LCM.

Applications of Common Multiples in Everyday Life

Scheduling and Timetabling

Imagine two repeating events: one occurs every 8 days and another every 9 days. The first day both events coincide is after 72 days. Knowing this helps planners coordinate overlapping activities.

Resource Allocation

A factory produces widgets in batches of 8 and 9. To minimize waste, the production manager might aim for a batch size that satisfies both constraints. The LCM of 8 and 9, which is 72, becomes an optimal batch size that aligns with both production lines.

Pattern Design and Art

Artists often create repeating patterns. If a motif repeats every 8 units horizontally and every 9 units vertically, the overall pattern will repeat after 72 units in both directions. This knowledge informs the design of tessellations and tiling.

Time Management

Consider a scenario where two alarms ring at intervals of 8 minutes and 9 minutes respectively. The first time they ring together is after 72 minutes. This principle can be applied to synchronize tasks in project management.

Practice Problems

To reinforce understanding, try solving the following questions. Answers are provided at the end of the article.

1. What is the smallest positive integer that is a multiple of both 8 and 9?
2. List all multiples of 8 that are less than 50.
3. Find the common multiples of 8 and 9 that are less than 200.
4. Two machines run cycles of 8 seconds and 9 seconds. After how many seconds will both machines complete an integer number of cycles simultaneously?
5. If a student studies for 8 hours each week and attends a class every 9 weeks, how many weeks will pass before the student completes an integer number of both study sessions and class attendances?

Tips for Mastering Common Multiples

- Use Prime Factorization: Breaking numbers into prime components makes finding the LCM straightforward.
- Check for Relatively Prime Numbers: If two numbers share no common factors, the LCM is simply their product.
- Practice with Different Pairs: Work through examples with numbers like 12 and 15, 4 and 6, to see how common factors affect the LCM.

- Apply the Concept to Fractions: Finding a common denominator requires determining the LCM of the denominators.
- Leverage Online Calculators: While manual methods are instructive, calculators can quickly confirm results, especially for large numbers.

Answers to Practice Problems

1. The smallest positive integer that is a multiple of both 8 and 9 is 72.
2. Multiples of 8 less than 50: 8, 16, 24, 32, 40, 48.
3. Common multiples of 8 and 9 less than 200: 72 and 144.
4. The machines will both complete an integer number of cycles after 72 seconds.
5. The student will complete an integer number of both study sessions and class attendances after 72 weeks.

Conclusion

Exploring the common multiples of 8 and 9 below 100 offers a clear window into the principles of divisibility, prime factorization, and the least common multiple. By mastering these foundational tools, students can tackle a wide range of mathematical challenges—from simplifying fractions to coordinating schedules. The single common multiple, 72, not only exemplifies how two relatively prime numbers intersect but also demonstrates the power of systematic problem solving. Armed with the techniques discussed, learners can confidently approach more complex problems, knowing that the path to the solution often starts with a simple list of multiples and a careful look at prime factors.

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