Factors, Multiples, and Primes

*A **factor** divides exactly into a number. A **multiple** is the result of multiplying a number by an integer. A **prime** number has exactly two factors: 1 and itself.*

1. List all the factors of 48.

2. List the first six multiples of 13.

3. Circle the prime numbers in this list: 2, 9, 15, 23, 29, 39

Prime Factorization: Write the following numbers as a product of their prime factors. Use a factor tree if it helps.

4. Find the prime factorization of 72.

5. Find the prime factorization of 200.

HCF and LCM with Venn Diagrams: The Highest Common Factor (HCF) is the product of the prime factors in the intersection. The Lowest Common Multiple (LCM) is the product of all prime factors in the diagram.
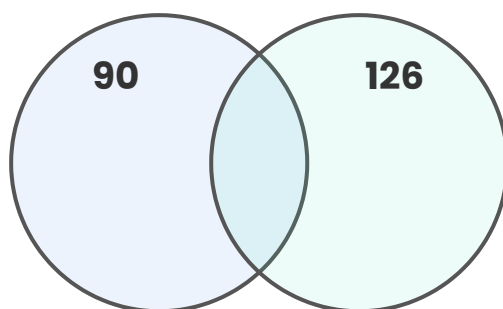
6. The prime factors of 60 are $2, 2, 3, 5$. The prime factors of 84 are $2, 2, 3, 7$. Place these in the Venn diagram below and find the HCF and LCM.
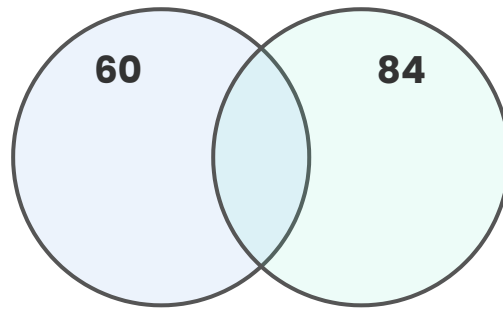
7. Use a Venn diagram to find the HCF and LCM of 54 (prime factors: $2, 3, 3, 3$) and 72 (prime factors: $2, 2, 2, 3, 3$).
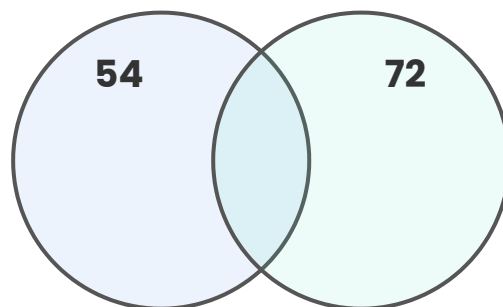
8. Use a Venn diagram to find the HCF and LCM of 90 (prime factors: $2, 3, 3, 5$) and 126 (prime factors: $2, 3, 3, 7$).

9. What is the smallest number you could multiply 90 by to make a perfect square?.

10. What is the smallest number you could divide 2700 by to make a perfect square?.

11. A square number is a multiple of 2 and a multiple of 3, what is the smallest number it could be?.

12. Find the highest common factor of 34, 42, and 58.

"Who Am I?" Number Riddles: Use the clues to find the mystery number.

13. I am a number between 30 and 40. I am a multiple of 4 and a factor of 108. Who am I?

14. I have exactly three factors. I am the square of a prime number, and I am greater than 20 but less than 50. Who am I?

15. My prime factorization is $2^2 \times 3 \times 7$. Who am I?

16. I am the largest two-digit number that is a multiple of both 6 and 9. Who am I?

17. Find the lowest common multiple of 28 and 12.

18. Find the lowest common multiple of 105 and 30.

19. Find the lowest common multiple of 70, 105, and 175.

20. By considering its prime factorisation, show 900 is a square number.

21. Find the only multiple of 5, 6, 7, and 10 between 500 and 600.

Perfect Number Challenge: A number is **perfect** if the sum of its factors (excluding itself) equals the number. It is **abundant** if the sum is greater, and **deficient** if the sum is less.

13. The factors of 12 (excluding 12) are 1, 2, 3, 4, and 6. Their sum is $1 + 2 + 3 + 4 + 6 = 16$. Since 16 > 12, the number 12 is abundant. Now, determine if the number **28** is perfect, abundant, or deficient.

The Goldbach Conjecture Puzzle: The Goldbach Conjecture is a famous unsolved problem that states every even integer greater than 2 is the sum of two prime numbers (e.g., 10 = 3 + 7).

14. Find a pair of prime numbers that add up to **52**.

Find the Password: Solve each clue to find the digits of the 4-digit password.

First Digit: The number of prime numbers between 20 and 30.

Second Digit: The digit sum of the Highest Common Factor (HCF) of 42 and 70.

Third Digit: The digit product of the smallest prime number greater than 50.

Fourth Digit: The largest single-digit prime number.