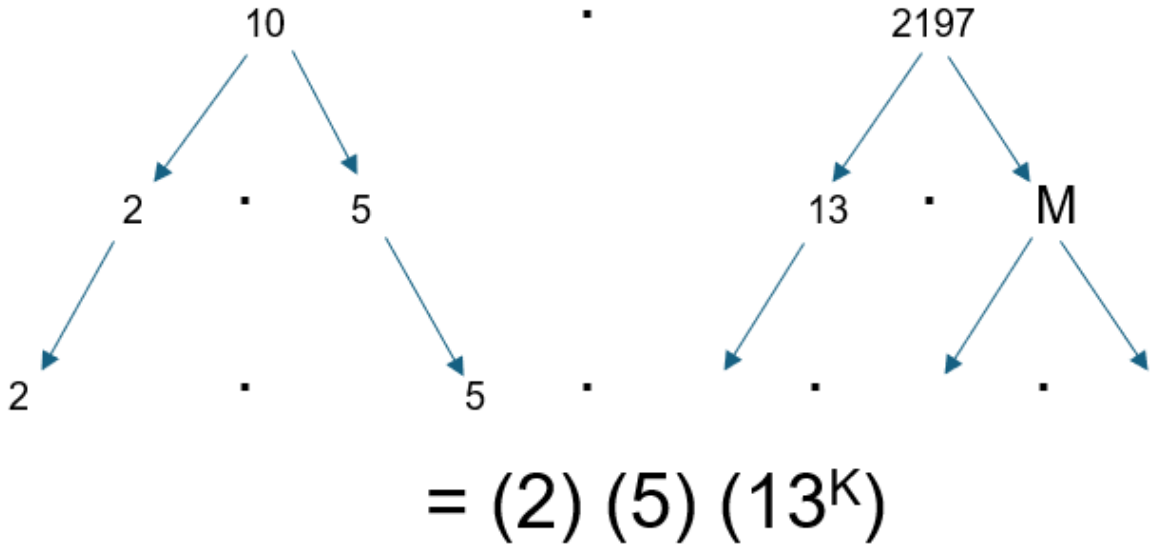
Prime Factorization Practice

1. The prime factorization of 19 500 is

   A) $2 \cdot 5^2 \cdot 6 \cdot 65$
   B) $2 \cdot 3^2 \cdot 5^3 \cdot 13$
   C) $2^2 \cdot 3 \cdot 5^3 \cdot 13$
   D) $2^2 \cdot 3^2 \cdot 5 \cdot 65$

Use the following information to answer the next question.

A partial factor tree showing the prime factorization of 21 970 is shown below. There are two integers represented by the letters M and K. The letter M is a factor in the factor tree and M is an exponent for the power of 13, in the final prime factorization.



2. The **sum** of the values of M and K is _____.

Use the following information to answer the next question.

Analyze the work below showing the prime factorization of 20 328 using repeated division of prime factors.

20 328 ÷ ___ = 10 164
_____ ÷ 2 = 5082
5082 ÷ ___ = 2541
2541 ÷ ___ = 847
_____ ÷ 7 = 121
121 ÷ ___ = 11
11 ÷ 11 = ___

3. The completed prime factorization of 20 328 is

A) (2) (7) (11)
B) (2^2) (7^2) (11^2)
C) (2^3) (3) (7) (121)
D) (2^3) (3) (7) (11^2)

Use the following information to answer the next question.

Consider the statements below.

Statement 1	The number 1 is both a prime and a composite number.
Statement 2	Between 20 and 36, there are 3 prime numbers.
Statement 3	The prime factorization of 24 is (2^3) (3).
Statement 4	The prime factorization of 210 is (2) (7) (15).
Statement 5	The largest prime number less than 50 is 47.

4. The true statements are

A) 2 and 3 B) 1 and 2 C) 3, 4, and 5 D) 2, 3, and 5

Use the following information to answer the next question.

A math student was asked to determine the least common multiple (LCM) of 36 and 84, using prime factorization.
The student correctly found the prime factorization of 36 to be (2^2) (3^2) and the prime factorization of 84 to be (2^2) (3) (7).

5. The student concluded that the LCM of 36 and 84 is (2^2) (3^3) (7), or 756. Is the student correct? Explain.

6. The least common multiple (LCM) of 6, 14 and 18 is

   A) 72 B) 108 C) 126 D) 154

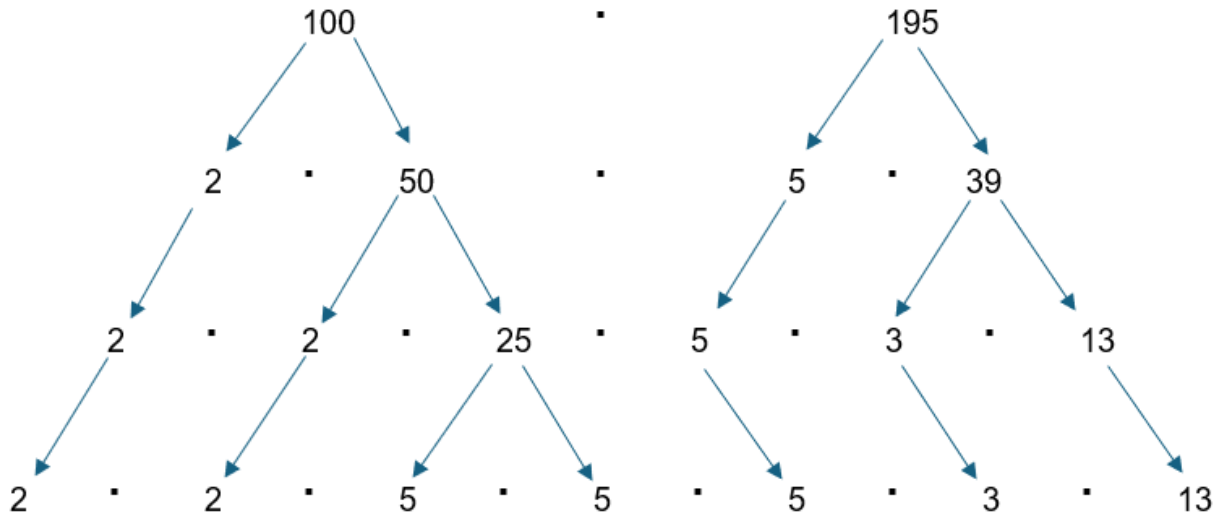
7. Determine the prime factorization of 28 665 by using a factor tree and by using repeated division of prime factors. Show all work.

Prime Factorization Practice Solutions

1. The prime factorization of 19 500 is

   A) $2 \cdot 5^2 \cdot 6 \cdot 65$
   B) $2 \cdot 3^2 \cdot 5^3 \cdot 13$
   C) $2^2 \cdot 3 \cdot 5^3 \cdot 13$
   D) $2^2 \cdot 3^2 \cdot 5 \cdot 65$

Solution

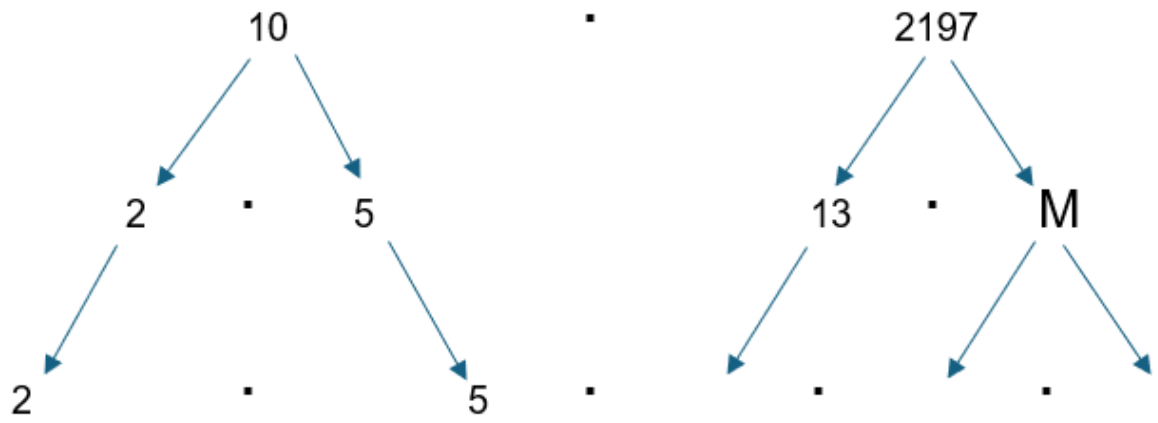


$$= (2^2)\,(3)\,(5^3)\,(13)$$

The correct answer is C.

Use the following information to answer the next question.

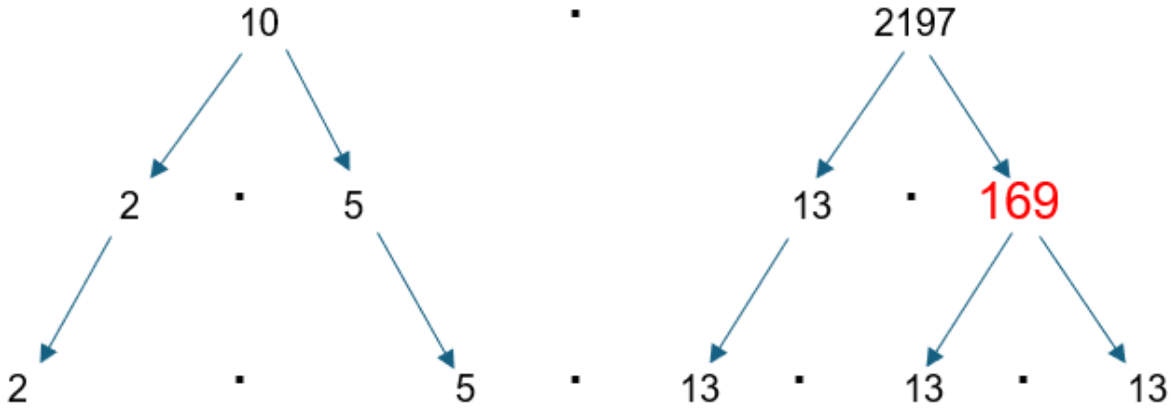
A partial factor tree showing the prime factorization of 21 970 is shown below. There are two integers represented by the letters M and K. The letter M is a factor in the factor tree and M is an exponent for the power of 13, in the final prime factorization.



$$= (2)\,(5)\,(13^{K})$$

2. The **sum** of the values of M and K is __172__.

Solution



$$= (2)\,(5)\,(13^{3})$$

The value of M is 169, because $\frac{2197}{13} = 169$.

From the bottom of the factor tree, we can see that the factor 13 appears three times. Thus, the value on the power of 13 is 3.

The value of K is 3.

The sum of M and K is 172.

Use the following information to answer the next question.

Analyze the work below showing the prime factorization of 20 328 using repeated division of prime factors.

20 328 ÷ _2_ = 10 164
10 164 ÷ 2 = 5082
5082 ÷ _2_ = 2541
2541 ÷ _3_ = 847
847 ÷ 7 = 121
121 ÷ 11 = 11
11 ÷ 11 = _1_

3. The completed prime factorization of 20 328 is

A) (2) (7) (11)
B) (2^2) (7^2) (11^2)
C) (2^3) (3) (7) (121)
D) (2^3) (3) (7) (11^2)

Solution

The prime factors are listed in the column following the division sign. They are, (2)(2)(2)(3)(7)(11)(11).

Both options C and D multiply to 20 328. Option C is not the answer because one of the listed factors (121) is not a prime number.

The correct answer is D.

Use the following information to answer the next question.

Consider the statements below.

Statement 1	The number 1 is both a prime and a composite number.
Statement 2	Between 20 and 36, there are 3 prime numbers.
Statement 3	The prime factorization of 24 is (2^3) (3).
Statement 4	The prime factorization of 210 is (2) (7) (15).
Statement 5	The largest prime number less than 50 is 47.

4. The true statements are

A) 2 and 3 B) 1 and 2 C) 3, 4, and 5 D) 2, 3, and 5

Solution

Statement 1

This statement is false. The number 1 is neither a prime nor a composite.

Statement 2

This statement is true. The three prime numbers between 20 and 36 are 23, 29, and 31.

Statement 3

This statement is true. Both 2 and 3 are prime numbers, and (2^3) (3) = 24.

Statement 4

This statement is false. One of the listed factors, 15, is not prime.

Statement 5

This statement is true.

The correct answer is D.

Use the following information to answer the next question.

A math student was asked to determine the least common multiple (LCM) of 36 and 84, using prime factorization.
The student correctly found the prime factorization of 36 to be (2^2) (3^2) and the prime factorization of 84 to be (2^2) (3) (7).

5. The student concluded that the LCM of 36 and 84 is (2^2) (3^3) (7), or 756. Is the student correct? Explain.

Solution

The LCM is found by multiplying prime factors raised to their respective highest power.

In this example, it is (2^2) (3^2) (7), which is 252. The LCM is 252.

252 ÷ 36 = 7

252 ÷ 84 = 3

The student is not correct. They used (3^3) instead of (3^2). The number 756 is a common multiple, but not the smallest one.

6. The least common multiple (LCM) of 6, 14 and 18 is

A) 72 B) 108 C) 126 D) 154

Solution

The prime factorization of 6 is (2) (3).

The prime factorization of 14 is (2) (7).

The prime factorization of 18 is (2) (3^2)

The LCM is found by multiplying prime factors raised to their respective highest power.

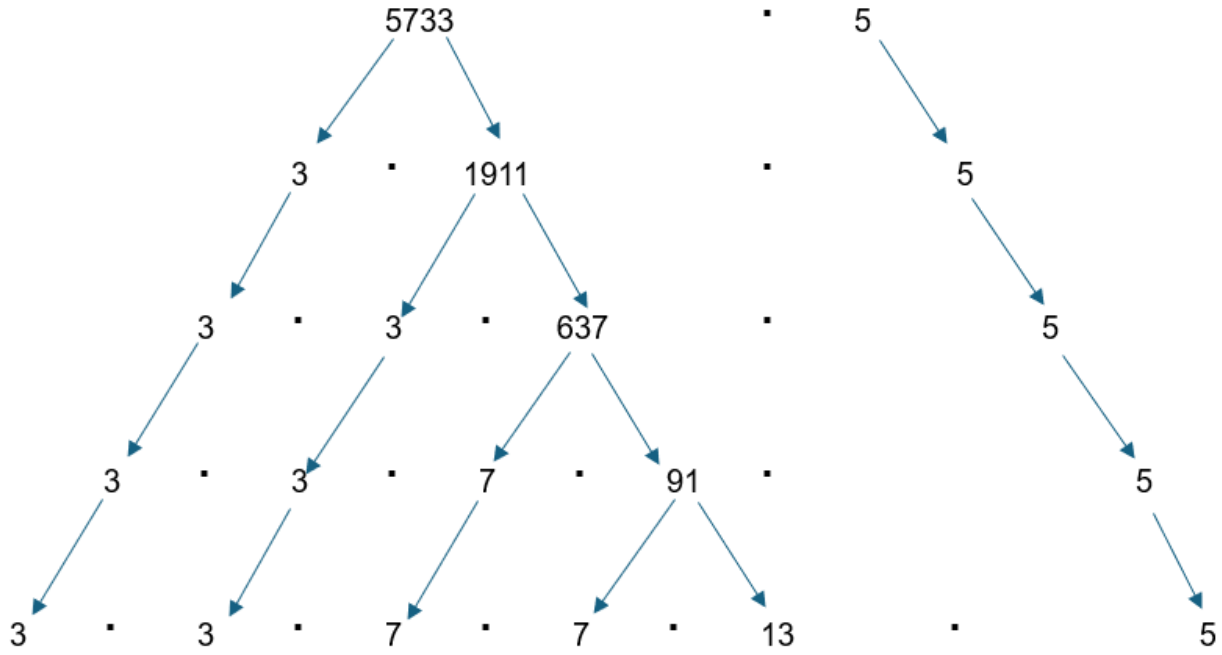
(2) (3^2) (7) = 126

The correct answer is C.

7. Determine the prime factorization of 28 665 by using a factor tree and by using repeated division of prime factors. Show all work.

Solution

Using a factor tree:



$= (3^2)\ (5)\ (7^2)\ (13)$

Using repeated division of prime numbers

28 665 ÷ 3 = 9555

9555 ÷ 3 = 3185

3185 ÷ 5 = 637

637 ÷ 7 = 91

91 ÷ 7 = 13

13 ÷ 13 = 1

The prime factorization of 28 665 is $(3^2)\ (5)\ (7^2)\ (13)$.