

Multiplication

Multiplication is the mathematical operation where one number is added repeatedly to itself. It is often referred to as repeated addition. For example, if we multiply 4 by 3 (4×3), it means adding 4 three times: $4 + 4 + 4 = 12$.

Multiplication helps us find the total of equal groups and is one of the most fundamental operations in mathematics.

Steps for Multiplying Large Numbers

Align the numbers: Write the numbers one below the other, ensuring that the digits are aligned according to their place values (ones, tens, hundreds, etc.).

Multiply each digit: Start from the rightmost digit of the second number and multiply it by each digit of the first number.

Carry over if needed: If the product is greater than 9, carry over the extra digit to the next place value.

Add the results: After multiplying, add the results to get the final product.

Check your work: Always check your work to ensure accuracy, especially when multiplying large numbers.

Properties of Multiplication

Commutative Property: Changing the order of the numbers does not affect the product.

Example: $5 \times 3 = 3 \times 5 = 15$

Associative Property: Changing the grouping of numbers does not affect the product.

Example: $(2 \times 3) \times 4 = 2 \times (3 \times 4) = 24$

Multiplicative Identity: Any number multiplied by 1 gives the same number.

Example: $7 \times 1 = 7$

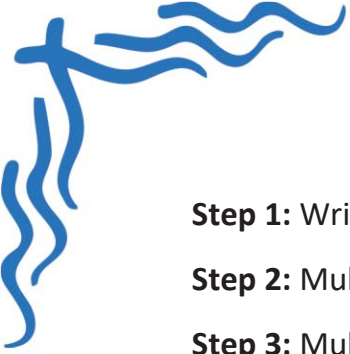
Multiplying by 0: Any number multiplied by 0 gives 0.

Example: $8 \times 0 = 0$

Example 1

Question: Multiply 4,567 by 6.

Solution:



Step 1: Write the numbers vertically: $4,567 \times 6$

Step 2: Multiply the ones place: $7 \times 6 = 42$ (write 2, carry over 4).

Step 3: Multiply the tens place: $6 \times 6 = 36 + 4$ (carry over) = 40 (write 0, carry over 4).

Step 4: Multiply the hundreds place: $5 \times 6 = 30 + 4$ (carry over) = 34 (write 4, carry over 3).

Step 5: Multiply the thousands place: $4 \times 6 = 24 + 3$ (carry over) = 27.

So, the product is 27,402.

Answer: $4,567 \times 6 = 27,402$

Example 2

Question: Multiply 3,142 by 9.

Solution:

Step 1: Write the numbers vertically: $3,142 \times 9$

Step 2: Multiply the ones place: $2 \times 9 = 18$ (write 8, carry over 1).

Step 3: Multiply the tens place: $4 \times 9 = 36 + 1$ (carry over) = 37 (write 7, carry over 3).

Step 4: Multiply the hundreds place: $1 \times 9 = 9 + 3$ (carry over) = 12 (write 2, carry over 1).

Step 5: Multiply the thousands place: $3 \times 9 = 27 + 1$ (carry over) = 28.

So, the product is 28,278.

Answer: $3,142 \times 9 = 28,278$

Summary Points

- ☐ Multiplication is a process of repeated addition and is used to find the total of equal groups.
- ☐ The commutative property means the order of multiplication does not change the product.
- ☐ Use the associative property to group numbers differently without changing the result.
- ☐ Multiplying by 1 gives the same number, and multiplying by 0 gives 0.
- ☐ When multiplying large numbers, align the digits correctly and follow the steps carefully.