Mathematical Operations: Multiplication

**Multiplying Numbers**

Rule #1: If you are multiplying two numbers that have the same sign (++ or ), then the result (called the “product”) will be positive.

Rule #2: If you are multiplying two numbers that have different signs (+ or +), then the result will be negative.

Rule #3: If you are multiplying two numbers, you can write the problem as a repeated addition or a repeated subtraction problem.

|  |  |  |  |
| --- | --- | --- | --- |
| **Example 1** | **Example 2** | **Example 3** | **Example 4** |
| Simplify.  *(same as +5 +3)*   |  |  | | --- | --- | |  | +5 | | +3 | 15 |     ***is +5 added 3 times***  ***or +3 added 5 times*** | Simplify.   |  |  | | --- | --- | |  | -2 | | -6 | 12 |     ***is -2 subtracted 6 times***  ***or -6 subtracted 2 times*** | Simplify.  *(same as +4 -3)*   |  |  | | --- | --- | |  | +4 | | -3 | -12 |     ***is +4 subtracted 3 times***  ***or -3 added 4 times*** | Simplify.  *(same as -4 +1)*   |  |  | | --- | --- | |  | -4 | | +1 | -4 |   ***is -4 added 1 time***  ***or +1 subtracted 4 times*** |
| 1. Simplify. | 2. Simplify. | 3. Simplify. | 4. Simplify. |
| 5. Simplify. | 6. Simplify. | 7. Simplify. | 8. Simplify. |

Rule #3: If you are multiplying a variable term by a number, then the numbers will multiply while the variable stays the same.

Rule #4: If you are multiplying a variable term by a variable that doesn’t match (x with y, a with b…), then the variables sit next to each other without combining, but the numbers in front (called “coefficients”) multiply.

|  |  |  |  |
| --- | --- | --- | --- |
| **Example 5** | **Example 6** | **Example 7** | **Example 8** |
| Simplify.   |  |  | | --- | --- | |  |  | | -2 |  |   ***is (-2 added 3 times)()***  ***or (+3 subtracted 2 times)()*** | Simplify.   |  |  | | --- | --- | |  | +4z | | +3 | 12z |   ***is (+3 added 4 times)(z)***  ***or (+4 added 3 times)(z)*** | Simplify.  *(same as )*   |  |  | | --- | --- | |  | -1r | |  |  |   ***is (-1 subtracted 1 time)()***  ***or(-1 subtracted 1 time)()***  *which is the same as above* | Simplify.  *(same as )*   |  |  | | --- | --- | |  |  | |  |  |   ***is (+5 added 2 times)()***  ***is (+2 added 5 times)()*** |
| 9. Simplify. | 10. Simplify. | 11. Simplify. | 12. Simplify. |
| 13. Simplify. | 14. Simplify. | 15. Simplify. | 16. Simplify. |

Rule #5: If you are multiplying a variable term with a matching variable, then the exponents will add together without changing the coefficient in front.

|  |  |  |  |
| --- | --- | --- | --- |
| **Example 9** | **Example 10** | **Example 11** | **Example 12** |
| Simplify.  *(same as 3)*   |  |  | | --- | --- | |  |  | |  |  |   ***to multiply the x’s, add their exponents*** | Simplify.   |  |  | | --- | --- | |  |  | |  |  |   ***to multiply the a’s, add their exponents*** | Simplify.  *(same as)*   |  |  | | --- | --- | |  |  | |  |  |   ***to multiply the m’s, add their exponents***  ***different letters can’t combine*** | Simplify.   |  |  | | --- | --- | |  |  | |  |  |   ***to multiply the r’s, add their exponents***  ***different letters can’t combine*** |
| 17. Simplify. | 18. Simplify. | 19. Simplify. | 20. Simplify. |
| 21. Simplify. | 22. Simplify. | 23. Simplify. | 24. Simplify. |

Rule #6: If you are multiplying a number to a group, then you must multiply the number to every term in that group.

Rule #7: If you are multiplying a group to a group, then you must multiply every part of the first group by every part of the second group.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Example 13**  Simplify.   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  |   *Now, add ‘em up:* | **Example 14**  Simplify.   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  |   *Now, add ‘em up:* | **Example 15**  Simplify.   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |  |  |  |   *Now, add ‘em up:* | **Example 16**  Simplify.   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |  |  |  |   *Now, add ‘em up:* |
| 25. Simplify. | 26. Simplify. | 27. Simplify. | 28. Simplify. |