**Patterns in Arithmetic**

When you first learned to multiply, you learned that **multiplication** is **repeated addition**. This means that 4(3) is equal to 3 + 3 + 3 + 3, and 3(8) is equal to 8 + 8 + 8.

Represent each **sum** as a **product**.

1. 5 + 5 + 5 + 5 + 5 + 5 = 2. 7 + 7 + 7 + 7 =

3. 2.4 + 2.4 + 2.4 = 4. 2 + 2 + 2 + 2 + 2 =

Represent the following situations using multiplication for repeated addition.

5. Add together eight fours.

6. Add together *n* threes.

7. Start with twenty and add ten 5 times.

8. Start with two and add seven 3 times.

9. Start with fifty and add six *n* times.

10. Complete the following statement:

 We can use \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to shorten how you represent repeated addition.

Does it work the same way for repeated **subtraction**? Yes. Represent the following situations using multiplication for repeated subtraction.

11. Start with zero and subtract three 2 times.

12. Start with eighty and subtract five 10 times.

13. Start with 10 and subtract four 8 times.

|  |  |
| --- | --- |
| **Exponents** are a short-hand notation for multiplication; they tell us how many times to use the **base** as a **factor**. (Recall that factors are the numbers you multiply together to get a **product**.) | base and exponent - Math |
|  |

Look at the following examples:

 

Represent each product using exponents.

14. $5∙5∙5∙5=$

15. $ 7∙7∙7=$

16. $2.7∙2.7$ =

17. $9∙9∙9∙9∙9∙9$ =

Represent the following situations using exponents for repeated multiplication.

18. Multiply together eight fours.

19. Multiply together *n* threes.

20. Start with twenty and multiply by ten 5 times.

21. Start with two and multiply by seven 3 times.

22. Start with fifty and multiply by six *n* times.

23. Complete the following statement:

 We can use \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to represent repeated multiplication.

Can we represent repeated division using exponents? Yes, but we must first change the division to a multiplication. Instead of dividing by a number several times, we must multiply by the **reciprocal** of that number several times.

$\frac{100}{x}=100∙\frac{1}{x}$ , assuming $x\ne 0$

Change the division to a multiplication, and then use exponents to represent repeated multiplication.

24. Divide one by six.

25. Start with thirty and divide by three 2 times.

26. Start with eighty and divide by five 10 times.

27. Start with 90 and divide by ten 3 times.

Indicate whether the following situations can be represented by repeated addition or repeated multiplication.

28. Your phone bill has a charge of $29.95 and an extra $0.10 per minute for the *n* minutes you went over your plan. Write an expression for the cost of your phone bill if you exceed your plan by *n* minutes.

29. You put the wrong soap in the dishwasher, and strange things happened. Your dishwasher started with 100 bubbles, and for *n* minutes, the number of bubbles tripled each minute. Write an expression for the number of bubbles in your dishwasher after *n* minutes.