

Basic Arithmetic
Skill-Builder # W – 8
Raising Whole Numbers to Nonzero Whole Numbers

Exponentiation is repeated multiplication. Thus, the **exponential expression** 2^5 is the same as the expression $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$ which gives the product 32. In this example, 2 is called the **base** and 5 is called the **exponent**.

Examples

1. $3^4 = \underbrace{3 \cdot 3}_{9} \cdot 3 \cdot 3 = \underbrace{9 \cdot 3}_{27} \cdot 3 = 27 \cdot 3 = 81$

OR $3^4 = \underbrace{3 \cdot 3}_{9} \cdot \underbrace{3 \cdot 3}_{9} = 9 \cdot 9 = 81$

2. $4^3 = \underbrace{4 \cdot 4}_{16} \cdot 4 = 16 \cdot 4 = 64$

3. $10^5 = 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 100,000$

Note from Example 3 that if the base is 10 the **power** (the answer when 10 is raised to a nonzero whole number) of 10 is simply 1 with as many trailing zeros as the exponent to which 10 is raised to. Let's look at another example.

4. $10^{11} = \underbrace{100,000,000,000}_{11 \text{ zeros}}$

Next, let us consider the following:

5. $20^3 = 20 \cdot 20 \cdot 20 = 8,000$

We note that we get the same answer by performing $2^3 = 2 \cdot 2 \cdot 2$ to get 8 and then we simply write 3 trailing zeros after 8. Note that 20^3 is the same as the product $2^3 \cdot 10^3$. Thus, for the following we have:

6. $20^6 = 2^6 \cdot 10^6 = \underbrace{2 \cdot 2 \cdot 2}_{8} \cdot \underbrace{2 \cdot 2 \cdot 2}_{8} \cdot 10^6 = 64 \cdot 10^6 = 64,000,000$

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Perform the exponentiation.

1. 6^2

2. 2^5

3. 3^3

4. 5^3

5. 7^4

6. 14^2

7. 10^7

8. 10^{24}

9. 30^4

10. 40^3

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Answers

1. 36
2. 32
3. 27
4. 125
5. 2,401
6. 196
7. 10,000,000
8. 1,000,000,000,000,000,000,000,000
9. 810,000
10. 64,000

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