

**Title:** Exponents**Materials:**

Teacher notes and script (*This page and next*)  
 Student note sheet (*Make a copy for each student*)  
 Student worksheet (*Make a copy for each student.*)  
 Overheads (*Make transparencies*)

**Previous Knowledge Needed:** Understanding of multiplication process and properties

**Important Concepts/Methods:**

**Definitions:** Exponents are just a shortcut for writing a multiplication problem.

The base is the number that you are multiplying.

The exponent is how many times you multiply the base.

**Rules:** When you are multiplying things with the same base, you add the exponents.

When you are dividing things with the same base, you subtract the exponents.

**Script:**

To work out exponents, you need to think of them as multiplication problems. (*Put up overhead and read.*)

$$3^4$$

- a) 12
- b) 64
- c) 81
- d) 7

Three is the number that you are multiplying, and the 4 is how many times that you're multiplying it, so we can think of this problem as  $3 \cdot 3 \cdot 3 \cdot 3$ . (*Write this on the board as you explain and have students write it on their papers.*) So three times three is nine – nine times three is twenty seven – and twenty seven times three is eighty one. (*Write answer down and have students do the same.*)

$$\begin{aligned} \text{Answer: } 3 \cdot 3 \cdot 3 \cdot 3 &= \begin{array}{c} 3 \cdot 3 \\ \hline 9 \end{array} \cdot 3 \cdot 3 \\ &= \begin{array}{c} 9 \cdot 3 \\ \hline 27 \end{array} \cdot 3 \\ &= \begin{array}{c} 27 \cdot 3 \\ \hline 81 \end{array} \\ &= 81 \end{aligned}$$

Any questions? (*Answer any questions they have.*)

Let's look at the next problem. (*Put up overhead and read.*)

$$\frac{x^5 x^6}{x^4}$$

- a)  $x^{15}$
- b)  $x^7$
- c)  $x^{26}$
- d)  $x^{7.5}$

$$\text{Answer: } \frac{x^5 x^6}{x^4} = \frac{x^{5+6}}{x^4} = \frac{x^{11}}{x^4} = x^{11-4} = x^7$$

The rules say that if we are multiplying the same bases we need to add the exponents. All of the bases in this problem are x. The top is multiplied, so we add the exponents. Five plus six is eleven. (*Write  $\frac{x^{11}}{x^4}$  on the overhead and have students do the same on their papers.*) Our problem is now x to the eleventh divided by x to the fourth. When we divide, we subtract the exponents, so eleven minus four is seven. The answer is x to the seventh. (*Write  $x^7$  on the overhead and have students do the same on their papers.*) Any questions? (*Answer any questions they have.*)

**Common Mistakes:**

Let's look at the mistakes that you could have made in these problems. In the first problem, for answer a, they multiplied the two numbers together. For answer b, they took four to the third power instead of three to the fourth power. For answer d, they added the two numbers.

In the second problem, to get answer a, they added all the exponents, instead of subtracting when they should have. Answer c they got by multiplying the top exponents instead of adding them. Finally, they got answer d by multiplying the top exponents and dividing the bottom one, instead of adding and subtracting.

**Student Problems:**

Try the next three problems on your own. (*Give students time to try the problems.*)

(*Put overhead up and either work out problems or give students the opportunity to come up and explain them.*)

*Make sure they do all steps.*)

**Assignment:**

(*Hand out assignment sheet. Either give students time to do and then discuss their problems, or give as homework and collect the next day.*)

1)  $3^4$

a) 12

b) 64

c) 81

d) 7

2)  $\frac{x^5 x^6}{x^4}$

a)  $x^{15}$

c)  $x^{26}$

b)  $x^7$

d)  $x^{7.5}$

3)  $5^3$

a) 15

b) 243

c) 8

d) 125

4)  $\frac{2^4 2^7}{2^8}$

a) 6

b) 8

c) 512

d) 64

5)  $\frac{x^5 y^8}{x^2}$

a)  $x^3 y^8$

b)  $xy^{11}$

c)  $x^7 y^8$

d)  $x^3 y^6$

6)  $2^3 3^2$

a) 10

b) 12

c) 36

d) 72

# Ideas that I'm going to study and learn.

Definitions: Exponents are just a shortcut for writing a multiplication problem.

The base is the number that you are multiplying.

The exponent is how many times you multiply it.

Rules: When you are multiplying things with the same base, you add the exponents.

When you are dividing things with the same base, you subtract the exponents.

- 1.)  $3^4$   
a) 12  
b) 64  
c) 81  
d) 7

2.)  $\frac{x^5 x^6}{x^4}$

- a)  $x^{15}$                       c)  $x^{26}$   
b)  $x^7$                          d)  $x^{7.5}$

- 3.)  $5^3$   
a) 15  
b) 243  
c) 8  
d) 125

4.)  $\frac{2^4 2^7}{2^8}$

- a) 6  
b) 8  
c) 512  
d) 64

5.)  $\frac{x^5 y^8}{x^2}$

- a)  $x^3 y^8$                       c)  $x^7 y^8$   
b)  $xy^{11}$                         d)  $x^3 y^6$

6.)  $2^3 3^2$

- a) 10  
b) 12  
c) 36  
d) 72

# Let me show what I know!

Solve each of the exponent problems, and then connect the dots in order from smallest to largest.



