

**Overview** This exponents worksheet focuses on two of the main rules for exponents and asks students to apply both of these rules (see below) to various types of problems.

**Exponent rule 1:** multiplying exponents i.e.  $x^a \cdot x^b = x^{a+b}$

**Exponent rule 2:** exponents of exponents i.e.  $(x^a)^b = x^{a \cdot b}$

Questions range in difficulty and the concluding questions include higher level thinking about the rules of exponents in math.

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## Exponents Worksheet

**I. Directions:** Rewrite the each question below without the exponents and simplify.

1)  $2^2 \cdot 2^3 =$

2)  $2^2 \cdot 2^4 =$

3)  $2^2 \cdot 2^5 =$

4)  $2^2 \cdot 2^6 =$

5)  $2^3 \cdot 2^5 =$

6)  $3^2 \cdot 3^3 =$

### From Numbers to letters!

7)  $x^2 \cdot x^3 =$

9)  $x^{12} \cdot x^3 =$

8)  $x^4 \cdot x^3 =$

10)  $x^6 \cdot x^{20} =$

**GENERAL SUMMARY:** Fill in the blank:  $X^a \cdot X^b = X^{a\_b}$

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### Part II

**Directions:**

11)  $(x)^2 = \_ \cdot \_$

16)  $(x^2)^3 =$

12)  $(2^2)^2 =$

17)  $(x^5)^2 =$

13)  $(2^2)^3 =$

18)  $(x^3)^4 =$

14)  $(2^2)^4 =$

19)  $(x^5)^4 =$

15)  $(3^2)^3 =$

20)  $(x^{10})^4 =$

**GENERAL SUMMARY:** Fill in the blank:  $(X^a)^b = X^{a\_b}$

### Putting It all Together!

**III. Simplify:**

21)  $x^2 \cdot (x^2)^3 =$

24)  $z^3 \cdot (z^{11})^5 =$

22)  $x^3 \cdot (x^5)^2 =$

25) Find the product of  $(z^3)^2$  and  $(z^3)^4$

23)  $z^{12} \cdot (z^6)^5 =$

26)  $z^2 \cdot (z^3)^0 =$

Determine what number could replace the question mark

**Example:**  $(x^{10})^2 = x^{17} \bullet x^?$       **Example2:**  $(x^{12})^3 = x^{29} \bullet x^?$

27)  $(x^2)^3 = x^2 \bullet x^?$

31)  $(x^3)^? = x^5 \bullet x^7$

28)  $(x^3)^2 = x^5 \bullet x^?$

32)  $(x^4)^? = x^5 \bullet x^{11}$

29)  $(x^5)^2 = x^3 \bullet x^?$

33)  $(x^?)^3 = x^2 \bullet x^{10}$

30)  $(x^2)^? = x^4 \bullet x^{22}$

34)  $(x^?)^2 = x^5 \bullet x^{20}$

35) How many different pairs of integers could replace the question marks below?

$$(x^?)^? = x^2 \bullet x^6$$

### Think-Pair-Share

Mr. Morris gave the class a problem that was very similar to the questions above (27—34) so the students were asked to find a number that could replace the question mark.

The problem was:  $(x^3)^0 = x^5 \bullet x^?$ .

Jennifer says that the question mark should be replaced by 0.

John says that the question mark should be 1.

Joseph says that the question mark should be -5.

Mary says that the question is impossible to answer..

**Who is correct? Explain why:**

**Explanation:**

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36) Is the following statement true?  $(x^a)^b = (x^b)^a$  Why or why not?

### Extension

**Directions:** Determine the value of  $a$  in the equations below.

1)  $(x^a)^6 = x^2 \bullet x^{10}$

2)  $(x^{a+1})^5 = x^2 \bullet x^{13}$

3)  $(x^{a+4})^2 = x^{12} \bullet x^4$

4)  $(x^{a+2})^3 = x^9 \bullet x^6$

5)  $(x^a)^2 = x^a \bullet x^1$

6)  $(x^{a+4})^3 = x^a \bullet x^{14}$

7)  $(x^{a+7})^2 = x^{5a} \bullet x^5$

8)  $(x^{a+7})^0 = x^{5a}$



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