Name _____ Date _____ Class _____

SKILL 5: Prime Factorization with Exponents

You can use exponents to express prime factorization in a compact form. For example, 125 is equal to $5 \times 5 \times 5$ or 5^3.

To write the prime factorization of 360 in exponential form, first write the factors in expanded form.

$$360 = 2 \times 2 \times 2 \times 3 \times 3 \times 5$$

Use exponents to show the number of identical factors.

two factors of $3 = 3^2$

$2 \times 2 \times 2 \times 3 \times 3 \times 5 = 2^3 \times 3^2 \times 5$

three factors of $2 = 2^3$

$5 = 5^1$, but you need not write the exponent.

So, the exponential form of the prime factorization of 360 is $2^3 \times 3^2 \times 5$.

Example

Write the prime factorization $3^3 \times 5^2$ in standard form.

First write in expanded form. $3^3 \times 5^2 = 3 \times 3 \times 3 \times 5 \times 5 = 675$

Then multiply. 27×25

The standard form of the number $3^3 \times 5^2$ is 675.

Guided Practice

1. Write $2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 5$ using exponents.

$2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 5 = 2^{\square} \times 3^{\square} \times 5^{\square}$

2. Write the prime factorization $2^3 \times 7^2$ in standard form.

a. Write 2^3 in expanded form. _____

b. Multiply the factors in part **a**. _____

c. Write 7^2 in expanded form. _____

d. Multiply the factors in part **c**. _____

e. Multiply the numbers you found in parts **b** and **d**. _____

f. So, $2^3 \times 7^2 = 2 \times$ ____ $\times$ ____ $\times 7 \times$ ____ $= 8 \times$ ____ $=$ ____.

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SKILL 5: Practice

Write the prime factorization for each number in expanded form as a product of individual factors. Then write each prime factorization using exponents.

1. 144

_____

_____

2. 90

_____

_____

3. 1,925

_____

_____

4. 480

_____

_____

5. 405

_____

_____

6. 444

_____

_____

7. 128

_____

_____

8. 225

_____

_____

9. 2,600

_____

_____

Write each prime factorization in expanded form. Then write the number in standard form.

10. $2^3 \times 3 \times 5^3$

_____

_____

11. $2^2 \times 3^3 \times 7^2 \times 11$

_____

_____

12. Luis used exponents to write this prime factorization for a number: $2^3 \times 3^3 \times 5^3$
What is the standard form for this number? _____

TEST PREP

13. Which is the prime factorization for 720 using exponents?

Skill 5

A $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

B $2^4 \times 3^2 \times 5$

C $2^3 \times 3^2 \times 5$

D $2 + 2 + 2 + 2 + 3 + 3 + 5$

14. Which is 7^3 in standard form?

Skill 4

F 21

G 37

H 73

J 343