Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Class\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Finding Rules of Exponents

 Use patterns to discover rules for multiplying and dividing powers.

Copy and complete each table.

**PRODUCTS**

|  |  |  |  |
| --- | --- | --- | --- |
| **Expression** | **Expression written as repeated multiplication** | **Number of Factors** | **Product as a power** |
| $2^{4}$ $∙ $ $2^{5}$ | (2$∙2∙2∙2) ∙(2∙2∙2∙2∙2)$ | 9 | $$2^{9}$$ |
| $$3^{2}∙ 3^{3}$$ | ($3 ∙3)$ (3$∙3 ∙3$) | ? 5 | $3^{?}$ 5 |
| $5^{1}$∙ $5^{3}$ | ? | ? 4 | ? $5^{4}$ |

 (5)∙ (5∙5∙5)

**QUOTIENTS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Expression** | **Expression written as repeated multiplication** | **Simplified Expression** | **Number of Factors** | **Quotient as a power** |
| $$\frac{2^{7}}{2^{3}}$$ | $$\frac{2∙2∙2∙2∙2∙2∙2}{2∙2∙2}$$ | 2∙2∙2∙2 | 4 | $$2^{4}$$ |
| $$\frac{3^{6}}{3^{2}}$$ | ? | ? 3∙3∙3∙3 | ? | ? |
| $$\frac{5^{4}}{5^{3}}$$ | ? | ? 5 | ? 1 | ? $5^{1}$ |

 Row 2: $\frac{3∙3∙3∙3∙3∙3}{3∙3}$ Row 3: $\frac{5∙5∙5∙5}{5∙5∙5}$

DRAW CONCLUSIONS

1. **Critical Thinking** In the *Products* table, how are the exponents in the first and last columns related? [The exponents in the last column are the sums of the exponents in the corresponding rows of the first columns.]

2. Use your answer to Exercise 1 to write the products $10^{7 }$ ∙ $10^{4}$ as a power. [$10^{11}$ ]

3. **Critical Thinking** In the *Quotients* table, how are the exponents in the first and last columns related? [The exponents in the last column are the differences of the exponents in the corresponding rows of the first columns.]

4. Use your answer to Exercise 3 to write the quotient $\frac{8^{10}}{8^{6}}$ as a power. [ $8^{4}$ ]