Laws of Exponents

Write the following problems out completely using only the definition of exponents and multiplication or division.

Example: \( x^3 \cdot x^2 = (x\cdot x\cdot x) \cdot (x\cdot x) = x^5 \)

1. \( a^4 \cdot a^3 \)
2. \( n^5 \cdot n^4 \)
3. \( x^2 \cdot x^9 \)
4. \( y \cdot y^6 \cdot y^2 \)

In the above cases, the base number is the same in each problem. What is the relationship between the exponents in the problem and the exponent in the final, simplified answer? _____________________________

Example:
\[
\frac{x^5}{x^2} = \frac{x \cdot x \cdot x \cdot x \cdot x}{x \cdot x} = \frac{x \cdot x \cdot x \cdot x \cdot x}{1} = x^3 \quad \text{Notice how anything divided by itself} = 1.
\]

5. \( \frac{y^3}{y^2} \)
6. \( \frac{a^7}{a^3} \)
7. \( \frac{m^6}{m^4} \)
8. \( \frac{x^5}{x^6} \)

Again, in the above cases, the base number is the same in each problem. What is the relationship between the exponents in the problem and the exponent in the final, simplified answer? _____________________________

In the following problems, you may use the shortcuts you discovered, or work them completely out.

9. \( \frac{x^2 y^4}{y^6} \)
10. \( \frac{a^3 b}{a^2 b^3} \)
11. \( \frac{2x^5}{6x^6} \)
12. \( \frac{x^{11}}{x^{18} y^{14}} \)

13. \( \frac{12y^5}{18y^5} \)
14. \( \frac{-15a^{17}}{25a^{14}} \)
15. \( \frac{3b^{22}}{9b^{26}} \)
16. \( \frac{10x^5 y^7}{35x^{12} y^5} \)