

Intermediate Algebra

Skill-BUILDER # AE - 3

Applying Exponent Rules Involving Quotients and Powers

Following are the exponent rules for quotients and powers.

$$\frac{a^n}{a^m} = a^{n-m} \quad (4)$$

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n} \quad (5)$$

Examples

The following show how rule (4) is used:

$$1. \frac{2^5}{2^2} = 2^{5-2} = 2^3 = 8$$

$$2. \frac{x^{12}}{x^7} = x^{12-7} = x^5$$

$$3. \frac{a^4 b^9}{a^3 b^4} = a^{4-3} b^{9-4} = ab^5$$

$$4. \frac{3^5 m^6 n^{12}}{3^3 m^2 n^{10}} = 3^{5-3} m^{6-2} n^{12-10} = 3^2 m^4 n^2 = 9m^4 n^2$$

The following shows how rule (5) is used:

$$5. \left(\frac{x}{y}\right)^8 = \frac{x^8}{y^8}$$

The following shows how rule (5) can be combined with rule (2):

$$6. \left(\frac{c^4}{d^3}\right)^9 = \frac{c^{4 \cdot 9}}{d^{3 \cdot 9}} = \frac{c^{36}}{d^{27}}$$

The following shows how rule (5) can be combined with rule (3):

$$7. \left(\frac{ab}{xyz}\right)^5 = \frac{(ab)^5}{(xyz)^5} = \frac{a^5 b^5}{w^5 y^5 z^5}$$

The following shows how rule (5) can be combined with rules (2) and (3):

$$8. \left(\frac{2x^2}{y^3}\right)^6 = \frac{2^6 x^{2 \cdot 6}}{y^{3 \cdot 6}} = \frac{64x^{12}}{y^{18}}$$

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Simplify.

1. $\frac{4^9}{4^6}$

2. $\frac{7^{15}}{7^{13}}$

3. $\frac{x^7}{x^3}$

4. $\frac{y^{11}}{y^6}$

5. $\frac{2^6 a^3}{2^4 a}$

6. $\frac{-4^3 b^8}{4b^2}$

7. $\frac{3^7 x^8 y^9}{3^5 x^5 y^3}$

8. $\frac{6^4 w^7 y^{11}}{6^3 w^3 y^{10}}$

9. $\left(\frac{a^3}{b^6}\right)^4$

10. $\left(\frac{y^6}{z^8}\right)^5$

11. $\left(\frac{mn}{4p}\right)^2$

12. $\left(\frac{2xy}{5w}\right)^3$

13. $\left(\frac{2ab^3}{c^5}\right)^4$

14. $\left(\frac{3n^3m}{4p^2}\right)^3$

15. $\left(\frac{2x^4y^5}{x^3y}\right)^5$

16. $\left(\frac{r^3s^6}{2rs^2}\right)^6$

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Answers

1. 64

2. 49

3. x^4

4. y^5

5. $4a^2$

6. $-16b^6$

7. $9x^3y^6$

8. $6w^4y$

9. a^{12}/b^{24}

10. y^{30}/z^{40}

11. $m^2n^2/16p^2$

12. $8x^3y^3/125w^3$

13. $16a^4b^{12}/c^{20}$

14. $27n^9m^3/64p^6$

15. $32x^5y^{20}$

16. $r^{12}s^{24}/64$

Prepared by: Dr. Teresa V. Sutcliffe, Fall 2009