Exponent Properties

PROWORKSHEET

1. Product of like bases: $a^m a^n = a^{m+n}$

To multiply powers with the same base, add the exponents and keep the common base.

Example: $x^5 x^3 = x^{5+3} = x^8$

2. Quotient of like bases: $\frac{a^m}{a^n} = a^{m-n}$

To divide powers with the same base, subtract the exponents and keep the common base.

Example: $\frac{x^5}{x^3} = x^{5-3} = x^2$

3. Power to a power: $(a^m)^n = a^{mn}$

To raise a power to a power, keep the base and multiply the exponents.

Example: $(x^5)^3 = x^{5*3} = x^{15}$

4. Product to a power: $(ab)^m = a^m b^m$

To raise a product to a power, raise each factor to the power.

Example: $(x^4 y^5)^3 = x^{12} y^{15}$

5. Quotient to a power $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$

To raise a quotient to a power, raise the numerator and the denominator to the power.

Example: $\left(\frac{x^3}{y^2}\right)^4 = \frac{x^{12}}{y^8}$

6. Zero Exponent: $a^0 = 1$

Any number raised to the zero power is equal to "1".

Example: $(8x^4)^0 = 1$

7. Negative exponent: $a^{-n} = \frac{1}{a^n}$ or $\frac{1}{a^{-n}} = a^n$

Negative exponents indicate reciprocation, with the exponent of the reciprocal becoming positive. You may want to think of it this way: unhappy (negative) exponents will become happy (positive) by having the base/exponent pair "switch floors"!

Example: $8^{-2} = \frac{1}{8^2} = \frac{1}{64}$ *or* $\frac{4}{x^{-3}} = 4x^3$

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Name_____

Exponents and Multiplication

Date_____ Period____

Simplify. Your answer should contain only positive exponents.

1) $4^2 \cdot 4^2$

2) $4 \cdot 4^2$

3) $3^2 \cdot 3^2$

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

5) $2n^4 \cdot 5n^4$

6) $6r \cdot 5r^2$

7) $2n^4 \cdot 6n^4$

8) $6k^2 \cdot k$

9) $5b^2 \cdot 8b$

10) $4x^2 \cdot 3x$

11) $6x \cdot 2x^2$

12) $6x \cdot 6x^3$

13) $7v^3 \cdot 10u^3v^5 \cdot 8uv^3$

14) $9xy^2 \cdot 9x^5y^2$

15) $6m^3n^3 \cdot 8m^2n^3$

16) $6x^2 \cdot 6x^3y^4$

17) $7u^2v^5 \cdot 9uv^3$

18) $uv \cdot 4uv^5$

19) $10xy^3 \cdot 8x^5y^3$

20) $3u^4v^5 \cdot 7u^2v^3$

21) $(2x^2)^2$

22) $(p^4)^4$

23) $(k^3)^4$

24) $(7k)^2$

25) $(x^2)^3$

26) $(2b^2)^4$

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Name_____

Exponents and Division

Date_____ Period____

Simplify. Your answer should contain only positive exponents.

1) $\frac{5^4}{5}$

2) $\frac{3}{3^3}$

3) $\frac{2^2}{2^3}$

4) $\frac{2^4}{2^2}$

5) $\frac{3r^3}{2r}$

6) $\frac{7k^2}{4k^3}$

7) $\frac{10p^4}{6p}$

8) $\frac{3b}{10b^3}$

9) $\frac{8m^3}{10m^3}$

10) $\frac{7n^3}{2n^5}$

11) $\frac{2n^2}{n}$

12) $\frac{8x^3}{10x^5}$

13) $\frac{12x^3}{9y^8}$

14) $\frac{14x^4y^7}{6x^5y^4}$

15) $\frac{11u^4}{17u^7v^9}$

16) $\frac{4y^4}{14yx^8}$

17) $\frac{12yx^4}{10yx^8}$

18) $\frac{18x^8y^8}{10x^3}$

19) $\frac{5n^8}{20n^8}$

20) $\frac{16yx^4}{9x^8y^2}$

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Name_____

Powers of Products and Quotients

Date_____ Period____

Simplify. Your answer should contain only positive exponents.

1) $(3a^2)^3$

2) $(2n^4)^4$

3) $(3x^4)^4$

4) $(6b^2)^2$

5) $(7y^4)^2$

6) $(3ab^4)^4$

7) $(2x^4y^4)^3$

8) $(5mn^3)^3$

9) $(x^2y^2)^2$

10) $(6yx^4)^2$

11) $(u^4v^3)^2$

12) $(2x^4y^4)^4$

13) $(3x^2 \cdot 2x^2)^2$

14) $(2p^3 \cdot 2p)^2$

15) $(4n^3 \cdot n^2)^2$

16) $(3x \cdot 2x)^2$

17) $(4x^4 \cdot x^4)^3$

18) $(4n^4 \cdot n)^2$

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Name_____

Exponents and Multiplication

Date_____ Period____

Simplify. Your answer should contain only positive exponents.

1) $4^2 \cdot 4^2$

4^4

2) $4 \cdot 4^2$

4^3

3) $3^2 \cdot 3^2$

3^4

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

2^5

5) $2n^4 \cdot 5n^4$

$10n^8$

6) $6r \cdot 5r^2$

$30r^3$

7) $2n^4 \cdot 6n^4$

$12n^8$

8) $6k^2 \cdot k$

$6k^3$

9) $5b^2 \cdot 8b$

$40b^3$

10) $4x^2 \cdot 3x$

$12x^3$

11) $6x \cdot 2x^2$

$12x^3$

12) $6x \cdot 6x^3$

$36x^4$

13) $7v^3 \cdot 10u^3v^5 \cdot 8uv^3$

$560v^{11}u^4$

14) $9xy^2 \cdot 9x^5y^2$

$81x^6y^4$

15) $6m^3n^3 \cdot 8m^2n^3$

$48m^5n^6$

16) $6x^2 \cdot 6x^3y^4$

$36x^5y^4$

17) $7u^2v^5 \cdot 9uv^3$

$63u^3v^8$

18) $uv \cdot 4uv^5$

$4u^2v^6$

19) $10xy^3 \cdot 8x^5y^3$

$80x^6y^6$

20) $3u^4v^5 \cdot 7u^2v^3$

$21u^6v^8$

21) $(2x^2)^2$

$4x^4$

22) $(p^4)^4$

p^{16}

23) $(k^3)^4$

k^{12}

24) $(7k)^2$

$49k^2$

25) $(x^2)^3$

x^6

26) $(2b^2)^4$

$16b^8$

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Name_____

Exponents and Division

Date_____ Period____

Simplify. Your answer should contain only positive exponents.

1) $\frac{5^4}{5}$

5^3

2) $\frac{3}{3^3}$

$\frac{1}{3^2}$

3) $\frac{2^2}{2^3}$

$\frac{1}{2}$

4) $\frac{2^4}{2^2}$

2^2

5) $\frac{3r^3}{2r}$

$\frac{3r^2}{2}$

6) $\frac{7k^2}{4k^3}$

$\frac{7}{4k}$

7) $\frac{10p^4}{6p}$

$\frac{5p^3}{3}$

8) $\frac{3b}{10b^3}$

$\frac{3}{10b^2}$

9) $\frac{8m^3}{10m^3}$

$\frac{4}{5}$

10) $\frac{7n^3}{2n^5}$

$\frac{7}{2n^2}$

11) $\frac{2n^2}{n}$

$2n$

12) $\frac{8x^3}{10x^5}$

$\frac{4}{5x^2}$

13) $\frac{12x^3}{9y^8}$

$\frac{4x^3}{3y^8}$

14) $\frac{14x^4y^7}{6x^5y^4}$

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

15) $\frac{11u^4}{17u^7v^9}$

$\frac{11}{17u^3v^9}$

16) $\frac{4y^4}{14yx^8}$

$\frac{2y^3}{7x^8}$

17) $\frac{12yx^4}{10yx^8}$

$\frac{6}{5x^4}$

18) $\frac{18x^8y^8}{10x^3}$

$\frac{9x^5y^8}{5}$

19) $\frac{5n^8}{20n^8}$

$\frac{1}{4}$

20) $\frac{16yx^4}{9x^8y^2}$

$\frac{16}{9x^4y}$

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Name_____

Powers of Products and Quotients

Date_____ Period____

Simplify. Your answer should contain only positive exponents.

1) $(3a^2)^3$

$27a^6$

2) $(2n^4)^4$

$16n^{16}$

3) $(3x^4)^4$

$81x^{16}$

4) $(6b^2)^2$

$36b^4$

5) $(7y^4)^2$

$49y^8$

6) $(3ab^4)^4$

$81a^4b^{16}$

7) $(2x^4y^4)^3$

$8x^{12}y^{12}$

8) $(5mn^3)^3$

$125m^3n^9$

9) $(x^2y^2)^2$

x^4y^4

10) $(6yx^4)^2$

$36y^2x^8$

11) $(u^4v^3)^2$

u^8v^6

12) $(2x^4y^4)^4$

$16x^{16}y^{16}$

13) $(3x^2 \cdot 2x^2)^2$

$36x^8$

14) $(2p^3 \cdot 2p)^2$

$16p^8$

15) $(4n^3 \cdot n^2)^2$

$16n^{10}$

16) $(3x \cdot 2x)^2$

$36x^4$

17) $(4x^4 \cdot x^4)^3$

$64x^{24}$

18) $(4n^4 \cdot n)^2$

$16n^{10}$