

8.2 Practice B [1.E3 Practice A (NAQ.c.3)]

Date _____ Period _____

NAQ.c.3

Evaluate complex numeric expressions with whole number exponents demonstrating the ability to use the product, power, and quotient properties

Clearly show work. Simplify the exponent expression; then evaluate. Circle your answer.

QUOTIENT PROPERTY

$$1) \frac{5^4}{5^2} = 5^{4-2} = \boxed{5^2} = \textcircled{25}$$

$$2) \frac{5^4}{5^3} = 5^{4-3} = \boxed{5^1} = \textcircled{5}$$

$$3) \frac{2^4}{2^1} = 2^{4-1} = \boxed{2^3} = \textcircled{8}$$

$$4) \frac{9^4}{9^4} = 9^{4-4} = \boxed{9^0} = \textcircled{1}$$

$$5) \frac{11^9}{11^7} = 11^{9-7} = \boxed{11^2} = \textcircled{121}$$

$$6) \frac{10^6}{10^3} = 10^{6-3} = \boxed{10^3} = \textcircled{1,000}$$

$$7) \frac{6^8}{6^6} = 6^{8-6} = \boxed{6^2} = \textcircled{36}$$

$$8) \frac{4^4}{4^4} = 4^{4-4} = \boxed{4^0} = \textcircled{1}$$

$$9) \frac{9^6}{9^4} = 9^{6-4} = \boxed{9^2} = \textcircled{81}$$

$$10) \frac{10^{12}}{10^8} = 10^{12-8} = \boxed{10^4} = \boxed{10,000}$$

$$11) \frac{10^7}{10^0} = 10^{7-0} = \boxed{10^7} = \textcircled{10,000,000}$$

$$12) \frac{2^{14}}{2^9} = 2^{14-9} = \boxed{2^5} = \textcircled{32}$$

POWER RULE

EXPONENT RAISED TO AN EXPONENT $\rightarrow (10^2)^3 = 10^{2 \cdot 3}$
 $10^6 = 1,000,000$

$$13) (2^0)^2 = 2^{0 \cdot 2} = 2^0 = \boxed{1}$$

$$14) (2^2)^2 = 2^{2 \cdot 2} = 2^4 = \boxed{16}$$

$$15) (4^2)^2 = 4^{2 \cdot 2} = 4^4 = \boxed{256}$$

$$16) (3^2)^0 = 3^{2 \cdot 0} = 3^0 = \boxed{1}$$

$$17) (3^2)^2 = 3^{2 \cdot 2} = 3^4 = \boxed{81}$$

$$18) (2^3)^2 = 2^{3 \cdot 2} = 2^6 = \boxed{64}$$

19) ~~$(3^2)^2$~~
 $(3^{-2})^{-2} = 3^{-2 \cdot -2} = 3^4 = \boxed{81}$

$$20) (5^0)^2 = 5^{0 \cdot 2} = 5^0 = \boxed{1}$$

$$21) (3^1)^3 = 3^{1 \cdot 3} = 3^3 = \boxed{27}$$

22) ~~4^2~~
 $(4^{-2})^{-1} = 4^{-2 \cdot -1} = 4^2 = \boxed{16}$

$$23) (2^2)^0 = 2^{2 \cdot 0} = 2^0 = \boxed{1}$$

$$24) (2^3)^3 = 2^{3 \cdot 3} = 2^9 = \boxed{512}$$

8.2 Practice C [Standard NAQ.c]

Date _____ Period _____

PRACTICE STANDARD - NAQ.c.1 - NO CALCULATOR ALLOWED

Evaluate a numeric exponential power. Clearly show work (BY EXPRESSING POWER AS A PRODUCT OF FACTORS). Circle FINAL answer.

MUST
SHOW
THIS
STEP

1) $10^5 = 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = \boxed{100,000}$

2) $3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = \boxed{81}$

3) $(-2)^3 = (-2)(-2)(-2) = \boxed{-8}$

4) $(-5)^3 = (-5)(-5)(-5) = \boxed{-125}$

Remember odd exponent then result is NEGATIVE.**PRACTICE STANDARD - NAQ.c.2 - NO CALCULATOR ALLOWED**

Evaluate numeric expressions with positive integer exponents, using the product property. Clearly show work (BY WRITING EXPONENTS WITH ARITHMETIC OPERATIONS).

Simplify the exponent expression; then evaluate. Circle FINAL answer.

MUST
SHOW
THIS
STEP

5) $4^1 \cdot 4^2 = 4^{1+2} = 4^3 = \boxed{64}$

6) $2^3 \cdot 2^2 = 2^{3+2} = 2^5 = \boxed{32}$

7) $(-3)^2 \cdot (-3)^1 = (-3)^{2+1} = (-3)^3 = \boxed{-27}$

8) $(-5)^2 \cdot (-5)^2 = (-5)^{2+2} = (-5)^4 = \boxed{625}$

NEGATIVE NUMBERS MUST BE IN ()'S!

Remember
EVEN**PRACTICE STANDARD - NAQ.c.3 - NO CALCULATOR ALLOWED**

Evaluate complex numeric expressions with whole number exponents demonstrating the ability to use the product, power, and quotient properties. CLEARLY SHOW ALL STEPS TO SIMPLIFY EXPONENTS. Simplify the exponent expression; then evaluate. Circle FINAL answer.

Exponent
THEN
RESULT
Is positive,

9) $(10 \cdot 10^2)^2 = (10^{1+2})^2 = (10^3)^2 = 10^{3 \cdot 2} = 10^6 = \boxed{1,000,000}$

11) $\left(\frac{2^8}{2^6}\right)^3 = (2^{8-6})^3 = (2^2)^3 = 2^{2 \cdot 3} = 2^6 = \boxed{64}$

10) $2^2 \cdot (2^2)^2 = 2^2 \cdot 2^{2 \cdot 2} = 2^2 \cdot 2^4 = 2^{2+4} = 2^6 = \boxed{64}$

12) $\frac{(5^3)^3}{(5^3)^2} = \frac{5^{3 \cdot 3}}{5^{3 \cdot 2}} = \frac{5^9}{5^6} = 5^{9-6} = 5^3 = \boxed{125}$

SECTION 2 - CALCULATOR SECTION - Simplify. Clearly show work. Circle Final Answer. Your answer should contain only positive exponents; variables in ABC order; and numbers left as improper fractions. Follow THESE RULES

13) $3x^3 \cdot 2x^4 \cdot x^3$

$3 \cdot 2 \cdot x^{3+4+3}$
 $6x^{10}$

14) $5x^2 \cdot 8x^4 \cdot 2x$

$5 \cdot 8 \cdot 2$
 80

15) $\frac{4x^3}{6x}$

reduce $\frac{2x^{3-1}}{3} = \boxed{\frac{2x^2}{3}}$

16) $\frac{45x^{12}}{5x^8}$

$\rightarrow 9x^{12-8} = \boxed{9x^4}$

17) $(8x^2)^4$ *power to power distrib 4 and mult exp's*

$8^4 x^{2 \cdot 4} =$
 $4096 x^8$

18) $(6x^4)^3$

$6^3 x^{4 \cdot 3}$
 $216 x^{12}$

19) $7a^3b^3 \cdot 4ba^4 \cdot 3b$

$7 \cdot 4 \cdot 3 a^{3+4} b^{3+1+1}$
 $84 a^7 b^5$ *Remember! put variables in ABC order*

20) $4x^4y^3 \cdot 3xy^2 \cdot 6y^4$

$4 \cdot 3 \cdot 6 x^{4+1} y^{3+2+4}$
 $72 x^5 y^9$

21) $\frac{4x^3y^5}{6x^0y^3}$

reduce $\frac{2x^{3-0}y^{5-3}}{3} = \boxed{\frac{2x^3y^2}{3}}$

22) $\frac{2x^{-4}y^4}{6yx^{-6}}$

reduce $\frac{1x^{-4-(-6)}y^{4-1}}{3} = \boxed{\frac{x^2y^3}{3}}$

23) $(-5x^4y^3)^4$

$(-5)^4 x^{4 \cdot 4} y^{3 \cdot 4}$
 $625 x^{16} y^{12}$

24) $(-5x^2y^4)^3$

$(-5)^3 x^{2 \cdot 3} y^{4 \cdot 3}$
 $-125 x^6 y^{12}$

8.2 Practice D [Standard NAQ.c]

Date _____ Period _____

PRACTICE STANDARD - NAQ.c.1 - NO CALCULATOR ALLOWED

Evaluate a numeric exponential power. Clearly show work (BY EXPRESSING POWER AS A PRODUCT OF FACTORS). Circle FINAL answer.

1) $2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = \boxed{32}$

2) $(-2)^3 = (-2)(-2)(-2) = \boxed{-8}$

PRACTICE STANDARD - NAQ.c.2 - NO CALCULATOR ALLOWED

Evaluate numeric expressions with positive integer exponents, using the product property. Clearly show work (BY WRITING EXPONENTS WITH ARITHMETIC OPERATIONS). Simplify the exponent expression; then evaluate. Circle FINAL answer.

3) $10^2 \cdot 10^3 = 10^{2+3} = 10^5 = \boxed{100,000}$

4) $(-3)^2 \cdot (-3)^2 = (-3)^{2+2} = (-3)^4 = \boxed{81}$
↑ ↑
 MU + USE ()'S

PRACTICE STANDARD - NAQ.c.3 - NO CALCULATOR ALLOWED

Evaluate complex numeric expressions with whole number exponents demonstrating the ability to use the product, power, and quotient properties. CLEARLY SHOW ALL STEPS TO SIMPLIFY EXPONENTS. Simplify the exponent expression; then evaluate. Circle FINAL answer.

5) $(10^2 \cdot 10^3)^2 = (10^{2+3})^2 = (10^5)^2 = 10^{5 \cdot 2} = 10^{10} = \boxed{10,000,000,000}$

6) $(2^2)^2 \cdot 2^2 = 2^{2 \cdot 2} \cdot 2^2 = 2^4 \cdot 2^2 = 2^{4+2} = 2^6 = \boxed{64}$

7) $\left(\frac{3^4}{3^2}\right)^2 = (3^{4-2})^2 = (3^2)^2 = 3^{2 \cdot 2} = 3^4 = \boxed{81}$

8) $\frac{5^6}{(5^2)^2} \rightarrow \frac{5^6}{5^{2 \cdot 2}} = \frac{5^6}{5^4} = 5^{6-4} = 5^2 = \boxed{25}$

SECTION 2 - CALCULATOR SECTION - Simplify. Clearly show work. Circle Final Answer. Your answer should contain only positive exponents; variables in ABC order; and numbers left as improper fractions.

9) $4x^2 \cdot 6x^4 = 4 \cdot 6 x^{2+4} = \boxed{24 x^6}$

10) $7x \cdot 6x^3 \cdot 3x^2 = 7 \cdot 6 \cdot 3 x^{1+3+2} = \boxed{126 x^6}$

11) $\frac{5x^4}{30x^2} = \frac{1}{6} x^{4-2} = \boxed{\frac{x^2}{6}}$
reduce

12) $\frac{-40x^4}{-8x} = 5x^{4-1} = \boxed{5x^3}$

13) $(9n^5)^3$
 $9^3 n^{5 \cdot 3}$
 $\boxed{729 n^{15}}$

14) $(10x^5)^3 =$
 $10^3 x^{5 \cdot 3}$
 $\boxed{1,000 x^{15}}$

15) $16x^5y^7 \cdot 4x^5y^8 \cdot 8x^6y^8 =$
 $16 \cdot 4 \cdot 8 x^{5+5+6} y^{7+8+8}$
 $\boxed{512 x^{16} y^{23}}$

16) $6mn^7 \cdot 5m^3n^2 \cdot 6m^6n^3 =$
 $6 \cdot 5 \cdot 6 m^{1+3+6} n^{7+2+3}$
 $\boxed{180 m^{10} n^{12}}$

17) $\frac{14m^2n^5}{4m^{-7}n^3}$
reduce
 $\frac{7m^{2-(-7)}n^{5-3}}{2} = \frac{7m^9n^2}{2}$
Remember Order of Ops ABC

18) $\frac{72x^{12}y^{10}}{9x^5y^8} =$
 $8x^{12-5}y^{10-8} =$
 $\boxed{8x^7y^2}$

19) $(-8x^6y^7)^3 =$
 $(-8)^3 x^{6 \cdot 3} y^{7 \cdot 3}$
 $\boxed{-512 x^{18} y^{21}}$
remember (-)'s

20) $(-2xy^5)^6 =$
 $(-2)^6 x^{1 \cdot 6} y^{5 \cdot 6}$
 $\boxed{64 x^6 y^{30}}$

21) $\frac{5x^3 \cdot 12x^5}{-10x^6}$
 $\frac{5 \cdot 12 x^{3+5}}{-10x^6} = \frac{60x^8}{-10x^6}$
 $= -6x^{8-6}$
 $= \boxed{-6x^2}$

22) $\frac{6x^4 \cdot -1x^4}{-4x^3}$
 $\frac{6 \cdot -1 \cdot x^{4+4}}{-4x^3} =$
 $\frac{-6x^8}{-4x^3} =$
 $\frac{3x^{8-3}}{2} =$
 $\boxed{\frac{3x^5}{2}}$

Date _____ Period _____

Evaluate a numeric exponential power. Clearly show work (BY EXPRESSING POWER AS A PRODUCT OF FACTORS). Circle FINAL answer.

1) $10^5 = 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 =$
100,000

$$2) (-2)^4 = (-2)(-2)(-2)(-2) = 16$$

Evaluate numeric expressions with positive integer exponents, using the product property. Clearly show work (BY WRITING EXPONENTS WITH ARITHMETIC OPERATIONS). Simplify the exponent expression; then evaluate. Circle FINAL answer.

3) $10^4 \cdot 10^3 = 10^{4+3} = 10^7 = \boxed{1\,000\,000\,0}$

$$4) (-2)^2 \cdot (-2)^3 = (-2)^{2+3} = (-2)^5 = \boxed{-32}$$

Evaluate complex numeric expressions with whole number exponents demonstrating the ability to use the product, power, and quotient properties. CLEARLY SHOW ALL STEPS TO SIMPLIFY EXPONENTS. Simplify the exponent expression; then evaluate. Circle FINAL answer.

$$\begin{aligned} 5) 10 \cdot (10^2 \cdot 10^2)^2 &= \\ 10 \cdot (10^{2+2})^2 &= 10 (10^4)^2 = \\ 10 \cdot 10^{4 \cdot 2} &= 10^1 \cdot 10^8 = 10^9 \rightarrow \\ &= \boxed{1,000,000,000} \end{aligned}$$

$$6) (2^2)^2 \cdot 2^2 = 2^{2 \cdot 2} \cdot 2^2 = 2^4 \cdot 2^2 = 2^{4+2}$$
$$\rightarrow 2^6 = 64$$

$$7) \left(\frac{3^{10}}{3^8}\right)^2 \rightarrow (3^{10-8})^2 = (3^2)^2 = 3^{2 \cdot 2} = 3^4 = 81$$

8) $\frac{5^9}{(5^2)^3}$

$\frac{5^9}{5^{2 \cdot 3}} = \frac{5^9}{5^6} = 5^{9-6}$

$\frac{5^9}{5^6} = 5^3 = 125$

SECTION 2 - CALCULATOR SECTION - Simplify. Clearly show work. Circle Final Answer. Your answer should contain only positive exponents; variables in ABC order; and numbers left as improper fractions.

9) $-7n^4 \cdot -8n^4$

$-7 \cdot -8$ n^{4+4}

$56 n^8$

10) $-5n^3 \cdot 7n^3 \cdot 8n$
 $-5 \cdot 7 \cdot 8 \quad n^{3+3+1}$
 $-280 n^7$

$$11) \frac{2x^6}{4x^4} = \frac{1 \cdot x^{6-4}}{2} = \boxed{\frac{x^2}{2}}$$

$$12) \frac{25x^4}{10x^3} = \frac{5 \cdot x^{4-3}}{2} = \boxed{\frac{5x}{2}}$$

$$13) (3x^2)^3 = 3^3 \cdot x^{2 \cdot 3} = \boxed{27x^6}$$

$$14) (5n^2)^5 = 5^5 \cdot n^{2 \cdot 5} = \boxed{3,125 n^{10}}$$

$$15) 16m^5n^4 \cdot 4m^3n^5 = 16 \cdot 4 \cdot m^{5+3} \cdot n^{4+5} = \boxed{64 m^8 n^9}$$

$$16) 4x^2y^7 \cdot 10x^2y^7 \cdot 3x^4y^5 = 4 \cdot 10 \cdot 3 \cdot x^{2+2+4} \cdot y^{7+7+5} = \boxed{120 x^8 y^{19}}$$

$$17) \frac{50x^{18}y^7}{125x^{14}y^{-3}} = \frac{2 \cdot x^{18-14} \cdot y^{7-(-3)}}{5} = \boxed{\frac{2x^4y^{10}}{5}}$$

$$18) \frac{15x^{15}y^7}{3x^{15}y^2} = \boxed{\text{Remember } x^0 = 1}$$

$$5 \cdot x^{15-15} \cdot y^{7-2} = 5 \cdot x^0 \cdot y^5 = 5 \cdot 1 \cdot y^5 = \boxed{5y^5}$$

implied -1

$$19) (-x^6y^2)^3 = (-1)^3 \cdot x^{6 \cdot 3} \cdot y^{2 \cdot 3} = -1 \cdot x^{18} \cdot y^6 = \boxed{-x^{18}y^6}$$

$$20) (-x^7y^7)^2 = (-1)^2 \cdot x^{7 \cdot 2} \cdot y^{7 \cdot 2} = 1 \cdot x^{14} \cdot y^{14} = \boxed{x^{14}y^{14}}$$

$$21) \frac{4x^3 \cdot 4x^5}{-10x} = \frac{4 \cdot 4 \cdot x^{3+5}}{-10x} = \frac{16x^8}{-10x} = \frac{-8x^{8-1}}{5} = \boxed{\frac{-8x^7}{5}}$$

$$22) \frac{3x^4 \cdot -x \cdot 2x^2}{2x^4} = \frac{-3 \cdot -1 \cdot 2 \cdot x^{4+1+2}}{2x^4} = \frac{6x^7}{2x^4} = \frac{3x^{7-4}}{1} = \boxed{3x^3}$$