Unit 3: Exponents Practice Test

Math 9 Principles

Name: _____ Block: ____

Please initial this box to indicate you carefully read over your test and checked your work for simple mistakes.

	What I can do in this unit	Level
3-1	I can convert powers between exponential form, expanded form, and standard form and evaluate using integer, fractions, and decimal bases.	
3-2	I can use the exponent laws for products and quotients. (add exponents for products of same bases, subtract for quotients).	
3-3	I can use the power of a power exponent law and apply it to coefficients and variables. (multiply exponents when taking the power of a power)	
3-4	I can convert a negative power to a positive power and evaluate a zero power with integer and fraction bases.	

Code	Value	Description
N	Not Yet Meeting Expectations	I just don't get it.
MM	Minimally Meeting Expectations	Barely got it, I need some prompting to help solve the question.
M	Meeting Expectations	Got it, I understand the concept without help or prompting.
E	Exceeding Expectations	Wow, nailed it! I can use this concept to solve problems I may have not seen in practice. I also get little details that may not be directly related to this target correct.

3-1: I can convert powers between exponential form, expanded form, and standard form and evaluate using integer, fractions, and decimal bases.

Complete the table:

#	Exponential Form	Expanded Form	Standard Form
1)	2^3	$2\cdot2\cdot2$	8
2)	-3^4	$-3\cdot3\cdot3\cdot3$	-81
3)	$(-2)^5$	$(-2)(-2)(-2)(-2)(-2)$	-32
4)	x^5	$x\cdot x\cdot x\cdot x\cdot x$	Cannot

Write each of the following in exponential form in as many ways as indicated. Do not use a power of 1.

#	Standard Form	Exponential Form
5)	125	5^3
6)	64	$2^6, 4^3, 8^2$
7)	1 000 000	$10^6, 100^3, 1000^2$
8)	$x\cdot x\cdot x\cdot x\cdot x\cdot x\cdot x$	x^7

Evaluate each expression

9) $3^4 - 2^3 + 1^{20}$

$=81-8+1=74$

10) $-5^2 + (-2)^3$

$=-25-8=-33$

11) $(5-20)^0 - (-5)^2$

$=1-25=-24$

12) $\left(\frac{1}{2}\right)^3 \div \left(\frac{3}{4}\right)^3$

$\left(\frac{1}{8}\right) \div \left(\frac{27}{64}\right) = \left(\frac{1}{8}\cdot\frac{64}{27}\right) = \frac{8}{27}$

Rewrite in standard form as a fraction or integer (no decimals)

13) $-(-3)^4$ (5 neg signs)

$=-81$

14) $\left(\frac{5}{3}\right)^4$

$=\frac{625}{81}$

15) $\left(-\frac{3}{4}\right)^3$

$=-\frac{27}{64}$

16) $\left(-1\frac{1}{3}\right)^2$

$=\left(-\frac{4}{3}\right)^2=\frac{16}{9}$

17) $(0.4)^3$

$=\left(\frac{2}{5}\right)^3=\frac{2^3}{5^3}=\frac{8}{125}$

18) $(1.5)^4$

$\left(\frac{3}{2}\right)^4=\frac{81}{16}$

3-2: I can use the exponent laws for products and quotients.

19) $5^2 \cdot 5^7$ $= 5^9$	20) $\frac{x^9}{x}$ $= x^8$	21) $(-2)^4 \cdot (-2)^3$ $= (-2)^7 = -2^7$ $= -128$
22) $\frac{3^6 \cdot 3^2 \cdot 3}{3^3 \cdot 3^4}$ $= \frac{3^9}{3^7} = 3^2 = 9$	23) $\frac{(-4)^5(-4)^4}{(-4)^6(-4)^3}$ $= \frac{(-4)^9}{(-4)^9} = (-4)^0$ $= 1$	24) $\frac{x^5 \cdot x \cdot x^2}{x^4 \cdot x^7}$ $\frac{x^8}{x^{11}} = \frac{1}{x^3}$

25) Rewrite each number with a base 2, then simplify. $\frac{256 \cdot 1024}{64 \cdot 16}$

$$\frac{2^8 \cdot 2^{10}}{2^6 \cdot 2^4} = \frac{2^{18}}{2^{10}} = 2^8$$

26) If a spaceship can travel at a rate of about 10^6 km per second, how long, in seconds, would it take to reach a star that is 10^{15} km away?

$$t = \frac{d}{r} = \frac{10^{15}}{10^6} = 10^9 s$$

27) There are approximately 10^9 grains of sand in one cubic meter of sand. If a beach contains 10^5 cubic meters of sand, how many grains of sand are on the beach?

$$(10^9)(10^5) = 10^{14} \text{ grains}$$

28) A space probe can travel at 10^{16} km in 10^7 hours. How far can it travel (in km) in 10^{21} hours? (Hint: First convert its speed to km/h.)

$$r = \frac{d}{t} = \frac{10^{16}}{10^7}$$

$$r = 10^9 \text{ km/h}$$

$$d = rt$$

$$= 10^9(10^{21})$$

$$= 10^{30} \text{ km}$$

3-3: I can use the power of a power exponent law and apply it to coefficients and variables.

29) $(3^5)^2$

$= 3^{10}$

30) $(2^4)^5$

$= 2^{20}$

31) $(a^7)^3(a^2)^4$

$= a^{21} \cdot a^8$

$= a^{29}$

32) $\frac{(3^3)^3(3^6)^2}{(3^4)^2}$

$= \frac{3^9 \cdot 3^{12}}{3^8}$

$= \frac{3^{21}}{3^8}$

$= 3^{13}$

33) $(5x^3)^4$

$= 5^4 x^{12}$

34) $\frac{(5x^2)^3(5x^3)^7}{(5x^3)^4}$

$= \frac{5^3 x^6 \, 5^7 x^{21}}{5^4 x^{12}}$

$= \frac{5^{10} x^{27}}{5^4 x^{12}}$

$= 5^6 x^{15}$

35) $\frac{(6x^{12})^3}{(6x^6)^2}$

$= \frac{6^3 x^{36}}{6^2 x^{12}}$

$= 6x^{24}$

36) $\frac{(256x^5)^4(128x^3)^6}{(1024x^5)^3}$

$= \frac{(2^8 x^5)^4 (2^7 x^3)^6}{(2^{10} x^5)^3}$

$= \frac{2^{32} x^{20} \cdot 2^{42} x^{18}}{2^{30} x^{15}}$

$= 2^{44} x^{23}$

37) $\frac{(243x^2)^3(81x^6)^4}{(2187x^8)^2}$

$= \frac{(3^5 x^2)^3 \cdot (3^4 x^6)^4}{(3^7 x^8)^2}$

$= \frac{3^{15} x^6 \, 3^{16} x^{24}}{3^{14} x^{16}}$

$= 3^{17} x^{14}$

3-4: ***I can convert a negative power to a positive power and evaluate a zero power with integer and fraction bases.***

38) 5^{-2}

$= \frac{1}{25}$

39) $(-x)^{-17}$

$= \frac{1}{(-x)^{17}} = -\frac{1}{x^{17}}$

40) -3^{-4}

$= -\frac{1}{3^4} = -\frac{1}{81}$

41) $(2x^3)^0$

$= 1$

42) $27x^0$

$= 27 \cdot 1$

$= 27$

43) $-(-4)^{-3}$

$= -\frac{1}{(-4)^3}$

$= \frac{1}{64}$

44) $(2^{-3})^2 \cdot (2^2)^{-4}$

$= 2^{-6}2^{-8}$

$= 2^{-14}$

$= \frac{1}{2^{14}}$

45) $\frac{1}{3^{-5}} \cdot 3^{-8}$

$= \frac{3^{-8}}{3^{-5}}$

$= 3^{-3}$

$= \frac{1}{3^3} = \frac{1}{27}$

46) $\frac{(2^3)^{-4} \cdot (2^{-5})^{-2}}{(2^{-3})^3}$

$= \frac{2^{-12} \cdot 2^{10}}{2^{-9}}$

$= \frac{2^{-2}}{2^{-9}}$

$= 2^7$