Name _____ Date _____

Master 2.20

Extra Practice 4

Lesson 2.4: Exponent Laws 1

1. Write each product as a single power.

a) $4^3 \times 4^2$ **b)** $5^0 \times 5^0$ **c)** $(-2)^2 \times (-2)^4$

d) $-6^3 \times 6^1$ **e)** $(-7)^0 \times (-7)^2$ **f)** $(-9)^6 \times (-9)^3$

2. Write each quotient as a single power.

a) $8^7 \div 8^5$ **b)** $10^4 \div 10^0$ **c)** $(-1)^6 \div (-1)^3$

d) $\dfrac{-3^4}{3^4}$ **e)** $\dfrac{(-9)^{10}}{(-9)^5}$ **f)** $\dfrac{11^9}{11^6}$

3. Express as a single power.

a) $2^3 \times 2^6 \div 2^9$ **b)** $(-5)^8 \div (-5)^4 \times (-5)^3$ **c)** $\dfrac{6^3 \times 6^5}{6^2 \times 6^4}$

4. Simplify, then evaluate.

a) $2^2 - 2^0 \times 2 + 2^3$ **b)** $(-2)^6 \div (-2)^5 - (-2)^5 \div (-2)^3$ **c)** $-2^2(2^3 \div 2^1) - 2^3$

5. Simplify, then evaluate.

a) $4^3 \div 4^2 + 2^4 \times 3^2$ **b)** $3^2 + 4^2 \times 4^1 \div 2^3$ **c)** $\dfrac{3^4}{3^3} + \dfrac{4^2 \times 4^0}{2^4}$

6. Write each relationship as a product of powers or a quotient of powers.

a) One million is 1000 times as great as one thousand.

b) One billion is 1000 times as great as one million.

c) One hundred is one-tenth of one thousand.

d) One is one-millionth of one million.

e) One trillion is 1000 times as great as one thousand million.

7. Identify, then correct any errors in these answers.
Explain how you think the errors occurred.

a) $5^3 \times 5^2 = 5^6$ **b)** $2^3 \times 4^2 = 8^5$ **c)** $(-3)^8 \div (-3)^4 = (-3)^4$

d) $1^2 \times 1^4 - 1^3 = 1^3$ **e)** $\dfrac{4^2 \times 4^4}{4^2 \times 4^1} = 4^2$

Name _____ Date _____

Master 2.23

Extra Practice Sample Answers

6. a)

Exponent	Power	Standard Form
6	10^6	1 000 000
5	10^5	100 000
4	10^4	10 000
3	10^3	1000
2	10^2	100
1	10^1	10
0	10^0	1

b) In the 2nd column, the exponents are decreasing by 1 each time. In the 3rd column, the number of zeros after the 1 decreases by 1; each time we divide by 10 to get the number below, and in the last row: $10 \div 10 = 10^0 = 1$

Extra Practice 3 – Master 2.19

Lesson 2.3

1. **a)** 28 **b)** 22 **c)** 14
d) –4 **e)** 64 **f)** 4
g) 34 **h)** 16

2. **a)** 128 **b)** 32 **c)** 32 **d)** $\frac{1}{2}$
e) 512 **f)** 8 **g)** 512 **h)** 8

3. **a)** 65 **b)** –9 **c)** 55
d) 80 000 **e)** 256 **f)** 1

4. **a)** $15 \div (3 + 2) \times 4^2 - 5 = 43$
b) $15 \div 3 + 2 \times (4^2 - 5) = 27$
c) $(15 \div 3 + 2) \times 4^2 - 5 = 107$
d) $15 \div 3 + (2 \times 4)^2 - 5 = 64$

5. About 6 jars

6. **a)** The correct solution:
$(-4)^2 - 3[(-9) \div 3]^2 = (-4)^2 - 3(-3)^2 = 16 - 3(9) = 16 - 27 = -11$
b) Shane probably thought that $(-3)^2 = -9$; here is a possible incorrect solution:
$(-4)^2 - 3[(-9) \div 3]^2 = (-4)^2 - 3(-3)^2 = 16 - 3(-9) = 16 + 27 = 43$
Aftab probably multiplied –3 and –9 before evaluating in the brackets and applying the exponent. Here is a possible incorrect solution:
$(-4)^2 - 3[(-9) \div 3]^2 = 16 + (27 \div 3)^2 = 16 + 9^2 = 16 + 81 = 97$
Kyra probably squared the 3 before doing any other operation. Here is a possible incorrect solution:
$(-4)^2 - 3[(-9) \div 3]^2 = 16 - 3[(-9) \div 9] = 16 - 3(-1) = 16 + 3 = 19$

Extra Practice 4 – Master 2.20

Lesson 2.4

1. **a)** 4^5 **b)** 5^0 **c)** $(-2)^6$
d) -6^4 **e)** $(-7)^2$ **f)** $(-9)^9$

2. **a)** 8^2 **b)** 10^4 **c)** $(-1)^3$
d) -3^0 **e)** $(-9)^5$ **f)** 11^3

3. **a)** 2^0 **b)** $(-5)^7$ **c)** 6^2

4. **a)** 10 **b)** –6 **c)** –24

5. **a)** $4^3 \div 4^2 + 2^4 \times 3^2 = 4 + 16 \times 9 = 148$
b) $3^2 + 4^2 \times 4^1 \div 2^3 = 9 + 64 \div 8 = 17$
c) $\frac{3^4}{3^3} + \frac{4^2 \times 4^0}{2^4} = 3 + \frac{16}{16} = 3 + 1 = 4$

6. **a)** $1\,000\,000 = 10^3 \times 10^3$
b) $1\,000\,000\,000 = 10^3 \times 10^6$
c) $100 = \frac{10^3}{10^1}$ **d)** $1 = \frac{10^6}{10^6}$
e) $1\,000\,000\,000\,000 = 10^3 \times 10^3 \times 10^6$

7. **a)** The exponents were multiplied instead of added. $5^3 \times 5^2 = 5^5$
b) The bases were multiplied. $2^3 \times 4^2 = 8 \times 16 = 128$
c) This solution is correct.
d) The exponent 3 was subtracted from the sum of exponents 2 and 4.
$1^2 \times 1^4 - 1^3 = 1^6 - 1^3 = 1 - 1 = 0$
e) The exponents were multiplied then divided instead of added and subtracted.
$\frac{4^2 \times 4^4}{4^2 \times 4^1} = \frac{4^6}{4^3} = 4^3$