Name _____ Date _____

Master 2.15a

Unit Test: Unit 2 Powers and Exponent Laws

1. Complete this table.

Power	Base	Exponent	Repeated Multiplication	Standard Form
3^5				
$(-2)^4$				
	10	3		
			$-(2 \times 2 \times 2 \times 2 \times 2 \times 2)$	

2. Write as a power of 10.

a) ten _____

b) $10 \times 10 \times 10 \times 10$ _____

c) -1 _____

d) 10 000 000 _____

3. Write each expression as a product or quotient of powers.

a) $(2 \times 3)^5$ _____

b) $\left(\frac{1}{3}\right)^2$ _____

c) $(12 \div 4)^3$ _____

4. Write each power of a power as a single power, then evaluate it.

a) $(9^8)^0$ _____

b) $[(-2)^4]^2$ _____

c) $-(3^2)^3$ _____

5. Write each expression as a power, then evaluate it.

a) $3^3 \times 3^2$

b) $(-2)^4 \times (-2)^0$

c) $5^{11} \div 5^{10}$

d) $10^8 \times 10^2 \div 10^6$

e) $\dfrac{(-3)^5 \times (-3)^6}{(-3)^7 \times (-3)^1}$

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Unit Test continued

6. **a)** For each pair of powers, which power is greater?

i) 8^3 or 3^8 _____ **ii)** 2^{10} or 10^2 _____ **iii)** 5^1 or 1^5 _____

b) How could you answer part a without calculating the value of both powers?

_____

_____

7. **a)** Evaluate each power.

i) -2^4 _____ **ii)** (-2^4) _____ **iii)** $(-2)^4$ _____

b) Explain why all the powers in part a do not have the same value.

_____

_____

8. Evaluate each expression. Show your work.

a) $(-14 - 6)^2 + 11$

b) $8 \div (-2) + (4 \times 2)^2$

c) $[7 - (-3)]^4 - (30 \div 6)^4$

d) $[(4 - 10)^3 \times (3 + 3)^5]^0$

e) $(6 - 8)^5 \div (-4)$

f) $-40 - (8 - 3)^3$

g) $2^4 \times 2^1 - 2^3 \times 2^2$

h) $4^2 \times 4 + 3^3 \times 3^2$

i) $(-4)^3 \div (-4)^2 \times (-4)^0 + (-4)^2 \div (-4)$

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Unit Test continued

9. Insert brackets to make this equation correct.

$5 \times 4^2 - 2^3 + 3^3 \div 3 = 49$

10. Both Hayley and Gavin evaluated this expression: $(-3^4 \times 4 - 1) \div (-5)^2$
Hayley's answer was 13 and Gavin's answer was –13.
Who is correct?
What is the likely error the other student made?

11. One square metre measures 1 m by 1 m.

a) Write 1 m^2 in square centimetres as a product of powers and as a single power.

_____

b) Write 1 m^2 in square millimetres as a product of powers and as a single power.

_____

12. Simplify, then evaluate each expression. Show your work.

a) $[(-3)^3]^3 \times [(-4)^0]^3 - [(-3)^5]^0$ **b)** $[(-4) \times (-5)]^4 + [(-4)^2]^2 - [(-2)^8 \div (-2)^7]^3$

13. On a test, Randy used his calculator to evaluate this expression: $\frac{9^4}{9^2 + (-9)^2}$

The answer that was displayed was 162.

a) Is this answer correct? _____

b) If your answer is no, what error did Randy make? _____

c) Show the solution to the problem to verify your answer in part a.

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Master 2.16a

Unit 2 Test Sample Answers

1.

Power	Base	Exponent	Repeated Multiplication	Standard Form
3^5	3	5	$3 \times 3 \times 3 \times 3 \times 3$	243
$(-2)^4$	-2	4	$(-2)(-2)(-2)(-2)$	16
10^3	10	3	$10 \times 10 \times 10$	1000
$-(2^6)$	2	6	$-(2 \times 2 \times 2 \times 2 \times 2 \times 2)$	-64

2. **a)** 10^1 **b)** 10^4
c) -10^0 **d)** 10^7

3. **a)** $2^5 \times 3^5$ **b)** $\frac{1^2}{3^2}$
c) $12^3 \div 4^3$

4. **a)** $9^0 = 1$ **b)** $(-2)^8 = 256$
c) $-(3^6) = -729$

5. **a)** $3^5 = 243$ **b)** $(-2)^4 = 16$
c) $5^1 = 5$ **d)** $10^4 = 10\,000$
e) $(-3)^3 = -27$

6. **a) i)** 3^8 is greater.
b) i) $8^3 = 8 \times 8 \times 8$
$3^8 = (3 \times 3) \times (3 \times 3) \times (3 \times 3) \times (3 \times 3)$
$= 9 \times 9 \times 9 \times 9 = 9^4$
Both the base and exponent of 9^4 are greater than those of 8^3.
a) ii) 2^{10} is greater.
b) ii) $10^2 = 100$
$2^{10} = 2^3 \times 2^3 \times 2^3 \times 2 = 8 \times 8 \times 8 \times 2$; since $8 \times 8 = 64$, then $8 \times 8 \times 8$ is much greater than 100.
a) iii) 5^1 is greater.
b) iii) When a power has a base 1, its value is always 1, so 5^1 is greater than 1^5.

7. **a), b) i)** $-2^4 = -2 \times 2 \times 2 \times 2 = -16$; the base is 2, so 2^4 is 16; the power is negative, so $-2^4 = -16$
ii) (-2^4); this is the same expression as in part a, but without the brackets. The brackets are not needed. So, $(-2^4) = -16$
iii) $(-2)^4 = (-2) \times (-2) \times (-2) \times (-2) = 16$; the base is -2 and an even number of negative factors gives a positive product.

8. **a)** 411 **b)** 60
c) 9375 **d)** 1
e) 8 **f)** -165
g) 0 **h)** 307
i) -8

9. $5 \times (4^2 - 2^3) + 3^3 \div 3$

10. Gavin is correct. Here is the correct solution.
$(-3^4 \times 4 - 1) \div (-5)^2 = (-81 \times 4 - 1) \div (-5)^2 =$
$(-324 - 1) \div 25 = (-325) \div 25 = -13$
Hayley might have included the negative sign in the second power.
Here is Hayley's possible solution.
$(-34 \times 4 - 1) \div (-5)2 = = (-81 \times 4 - 1) \div (-5)^2$
$= (-324 - 1) \div (-25) = (-325) \div (-25) = 13$

11. **a)** $1\ m^2 = 10^2\ cm \times 10^2\ cm = 10^4\ cm^2$
b) $1\ m^2 = 10^3\ mm \times 10^3\ mm = 10^6\ mm^2$

12. **a)** $-19\,684$ **b)** 160 264

13. **a)** No
b) Randy forgot to insert brackets around the expression in the divisor.
c) $\frac{9^4}{9^2 + (-9)^2} = \frac{9^4}{(9^2 + (-9)^2)}$
He could key in:
9 ^ 4 ÷ (9 ^ 2 + ((–) 9) ^ 2) to get 40.5