

Date \_\_\_\_\_

Name Answer key**Review: Powers and Exponent Laws**

1. Complete the following table.

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	$(-2) \times (-2) \times (-2) \times (-2)$	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. Write as a power of 10.

a) ten 10

b)  $10 \times 10 \times 10 \times 10$   $10^4$

c) -1  $-10^0$

d) 10 000 000  $10^7$

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

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

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

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

4. Write each expression as a single power and then
- evaluate
- it.

a)  $(9^8)^0$   $9^0 = 1$

b)  $[(-2)^4]^2$   $(-2)^8 = 256$

c)  $-(3^2)^3$   $-3^6 = -729$

5. Write each expression as a single power and then evaluate it.

a)  $3^3 \times 3^2$   $3^5 = 243$

b)  $(-2)^4 \times (-2)^0$   $(-2)^4 = 16$

c)  $5^{11} \div 5^{10}$   $5^1 = 5$

d)  $10^8 \times 10^2 \div 10^6$   $10^{10} \div 10^6 = 10^4 = 10000$

e)  $\frac{(-3)^5 \times (-3)^6}{(-3)^7 \times (-3)^1}$   $\frac{(-3)^{11}}{(-3)^8} = (-3)^3 = -27$

6. a) For each group of powers, which represents the biggest number?

i)  $8^3$  or  $3^8$   $3^8$

ii)  $2^{10}$  or  $10^2$   $2^{10}$

iii)  $5^1$  or  $1^5$   $5^1$

7. a) Evaluate each expression.

i)  $-2^4$   $-16$

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

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

b) Explain why all the above expressions don't have the same value.

• in iii) the "-2" is in brackets so (-2) is multiplied  
 • in i) & ii) "2" is the base and then we add the negative sign

8. Evaluate each expression. Show your work.

a)  $(-14 - 6)^2 + 11$   
 $(-20)^2 + 11$   
 $400 + 11$   
 $= \boxed{411}$

b)  $8 \div (-2) + (4 \times 2)^2$   
 $(-4) + 8^2$   
 $-4 + 64 = \boxed{60}$

c)  $[7 - (-3)]^4 - (30 \div 6)^4$   
 $10^4 - 5^4$   
 $10000 - 625$   
 $= \boxed{9375}$

d)  $[(4 - 10)^3 \times (3 + 3)^5]^0$   
 $[(-6)^3 \times 6^5]^0 = \boxed{1}$

e)  $(6 - 8)^5 \div (-4)$   
 $(-2)^5 \div (-4)$   
 $(-32) \div (-4) = \boxed{8}$

f)  $-40 - (8 - 3)^3$   
 $-40 - 5^3$   
 $-40 - 125 = \boxed{-165}$

g)  $2^4 \times 2^1 - 2^3 \times 2^2$   
 $2^5 - 2^5 = \boxed{0}$

h)  $4^2 \times 4^1 + 3^3 \times 3^2$   
 $4^3 + 3^5$   
 $64 + 243 = \boxed{307}$

i)  $(-4)^3 \div (-4)^2 \times (-4)^0 + (-4)^2 \div (-4)$   
 $(-4)^{3-2+0} + (-4)^{2-1}$   
 $(-4)^1 + (-4)^1$   
 $-4 - 4 = \boxed{-8}$

9. Add brackets to make the expression correct.

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

$$(-81 \times 4 - 1) \div 25 = (-324 - 1) \div 25$$

10. Danielle and Sara each solved this expression:  $(-3^4 \times 4 - 1) \div (-5)^2$   
Danielle found 13 for her answer and Sara found -13 for her answer.

Who was right? Sara

What was the error of the student who had the wrong answer?

She might have thought  $(-5)^2 = -25$

11. A square metre is 1 m by 1 m.

$$= 100\text{cm} \times 100\text{cm}$$

- a) Write  $1\text{ m}^2$  in square centimetres a) as a product of powers of 10  
and b) as a single power of 10.

$$10^2 \times 10^2 = 10^4$$

- b) Write  $1\text{ m}^2$  in square millimetres a) as a product of powers of 10  
and b) as a single power of 10.

$$10^3 \times 10^3 = 10^6$$

12. Simplify each expression using exponent laws. Evaluate each expression. Show all your work.

a)  $[(-3)^3]^3 \times [(-4)^0]^3 - [(-3)^5]^0$

$$(-3)^9 \times (-4)^0 - (-3)^0$$

$$(-19683) \times 1 - 1 = \boxed{-19684}$$

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

$$20^4 + (-4)^4 - [(-2)^1]^3$$

$$20^4 + (-4)^4 - (-2)^3$$

$$160000 + 256 + 8 = \boxed{160264}$$

13. Mr. Zucchini used his calculator to evaluate the expression:  $\frac{9^4}{9^2 + (-9)^2}$

He got 1 for his answer.

- a) Is he right? NO

- b) If not, what was his mistake? He multiplied  $9^2 \times (-9)^2$ . You can't do this. He should have added

- c) Show a complete solution to this problem.

$$\frac{9^4}{9^2 + (-9)^2} = \frac{6561}{81 + 81} = \frac{6561 \div 81}{162 \div 81} = \frac{81}{2}$$

or  $40\frac{1}{2}$

14. Simplify then evaluate :

$$\text{a) } \frac{(5^2 \times 5^4 \times 3^4 \times 3^3 \times 5^2)}{3^2 \times 5^3 \times 3^2 \times 5^2} = \frac{5^8 \times 3^7}{5^5 \times 3^4} = 5^3 \times 3^3 = 125 \times 27 = \boxed{3375}$$

$$\text{b) } \frac{(-2)^3 \times 3^7 \times (-2)^6 \times 3^2 \times 7^9 \times 7^5 \times 3 \times (-2)^2}{3^4 \times 7^4 \times (-2)^4 \times (-2)^4 \times 3^5 \times 7^7 \times 7^2} = \frac{(-2)^{11} \times 3^{10} \times 7^{14}}{(-2)^8 \times 3^9 \times 7^{13}} = (-2)^3 \times 3 \times 7 = -8 \times 3 \times 7 = \boxed{-168}$$