Curriculum Outcome

(N1) Demonstrate an understanding of powers with integral bases (excluding base 0) and whole number exponents by: representing repeated multiplication using powers; using patterns to show that a power with an exponent of zero is equal to one; solving problems involving powers.

(N2) Demonstrate an understanding of operations on powers with integral bases (excluding base 0) and whole number exponents.

Student Friendly:
“Laws of exponents :
What happens to the exponent when you multiply like bases?"

Grade 9 Warm Up

Get those brain muscles pumping!!!

Without your calculators evaluate the following expressions:

1) $\dfrac{3^2(5^0+2+2^2)}{2(5+4^2)}$

Top: $3^2(5^0+2+2^2)$

$3^2(1+2+4)$

$3^2(\ 7\ )$

9×7

63

bottom

$2(5+4^2)$

$2(5+16)$

$2(21)$

42

$\dfrac{\text{Top}}{\text{Bot}} = \dfrac{63}{42} = \dfrac{3}{2} = 1.5$

Grade 9 Warm Up

Get those brain muscles pumping!!!

Without your calculators evaluate the following expressions:

2) $\dfrac{4^2(3^4 \div 2^0)}{2^4(3^4 - 2^0)}$

Top: $4^2(3^4 \div 2^0)$

$4^2(81 \div 1)$

$4^2(81)$

$(16)(81)$

$= 1296$

Bottom: $2^4(3^4 - 2^0)$

$2^4(81 - 1)$

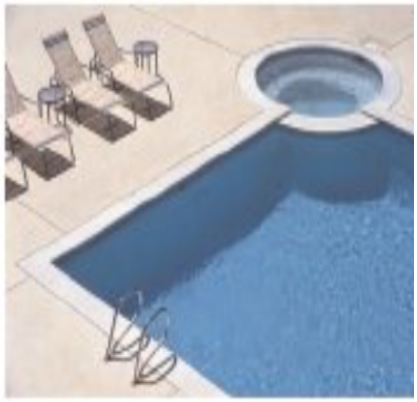
$16(80)$

$= 1280$

$\dfrac{\text{Top}}{\text{Bot}} = \dfrac{1296}{1280} = \dfrac{81}{80} = 1.0125$

Lyn has a square swimming pool, 2 m deep with side length 4 m. The swimming pool is joined to a circular hot tub, 1 m deep with diameter 2 m. Lyn adds 690 g of chlorine to the pool and hot tub each week. This expression represents how much chlorine is present per 1 m^3 of water:

$$\frac{690}{2 \times 4^2 + \pi \times 1^3}$$



The suggested concentration of chlorine is 20 g/m^3 of water.
What is the concentration of chlorine in Lyn's pool and hot tub?
Is it close to the suggested concentration?

$$\frac{690}{2 \times 4^2 + \pi \times 1^3} = \frac{690}{2 \times 16 + 3.14 \times 1}$$

$$= \frac{690}{32 + 3.14}$$

$$= \frac{690}{35.14}$$

$$\doteq 19.6$$

Class/Homework

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3 (a, c, e)
4 (a, c, e,)
5 (e, g)
8 (a, c, e)
10(a,c,e)
15
16(acf)

- SHOW WORK

3. Evaluate.

a) $3^2 + 1$ = 9 + 1 = 10

c) $(3 + 1)^2$ = $(4)^2$ = 16

e) $2^2 + 4$ = 4 + 4 = 8

4. Evaluate. Check using a calculator.

a) $2^3 \times 5 = 8 \times 5 = 40$

c) $(2 \times 5)^3 = 10^3 = 1000$

e) $(-10)^3 \div 5 = -1000 \div 5$

$= -200$

5. Evaluate.

e) $2^3 \div (-1)^3$

$= 8 \div (-1)$

$= -8$

g) $2^3 \times (-2)^3$

$= 8 \times (-8)$

$= -64$

8. State which operation you will do first, then evaluate.

a) $(7)(4) - (5)^2$

$(7)(4) - 25$

$28 - 25$

$= 3$

c) $(-3)^2 + (4)(7)$

$= 9 + 28$

$= 37$

e) $10^2 \div [10 \div (-2)]^2$

$10^2 \div [-5]^2$

$100 \div 25$

$= 4$

10. Evaluate.

a) $(3 + 4)^2 \times (4 - 6)^3$

$(7)^2 \times (-2)^3$

$49 \times (-8)$

$= -392$

c) $4^3 \div [8(6^0 - 2^1)]$

$4^3 \div [8(1-2)]$

$4^3 \div [8(-1)]$

$4^3 \div (-8)$

$64 \div (-8)$

$= -8$

e) $(2^2 \times 1^3)^2$

$= (4 \times 1)^2$

$= (4)^2$

$= 16$

15. This student got the correct answer, but she did not earn full marks. Find the mistake this student made. Explain how it is possible she got the correct answer. Write a more efficient solution for this problem.

$-(24 - 3 \times 4^2)^0 \div (-2)^3$

$= -(24 - 12^2)^0 \div (-8)$

$= -(24 - 144)^0 \div (-8)$

$= -(-120)^0 \div (-8)$

$= -1 \div (-8)$

$= \frac{1}{8}$

$-(24 - 3 \times 4^2)^0 \div (-2)^3$

$-(\ 3\ )^0 \div (-2)^3$

$-(\ 1\ ) \div (-2)^3$

$-1 \div -8$

$= \frac{-1}{-8}$

$= \frac{1}{8}$

16. Use a calculator to evaluate. Write the key strokes you used.

a) $(14 + 10)^2 \times (21 - 28)^3$

$= (24)^2 \times (-7)^3$

$= 576 \times -343$

$= -197\,568$

b) $(36 \div 2^2 + 11)^3 - 10^5$

$(36 \div 4 + 11)^3 - 10^5$

$(9 + 11)^3 - 10^5$

$20^3 - 10^5$

$8000 - 100000$

$= -92\,000$

c) $\dfrac{12^3}{36(12^0 - 13^1)}$

$= \dfrac{1728}{36(1-13)}$

$= \dfrac{1728}{36(-12)}$

$= \dfrac{1728}{-432}$

$= -4$

d) $\dfrac{81^2}{9^2 + (-9)^2}$

$= \dfrac{6561}{81 + 81}$

$= \dfrac{6561}{162}$

$= \dfrac{81}{2}$

$= 40.5$

e) $(14^2 + 6^3)^2$

$= (196 + 216)^2$

$= (412)^2$

$= 169\,744$

f) $(11^3 + 25^2)^0 + (27^2 - 33^4)$

$(1) + (729 - 1\,185\,921)$

$1 + (-1\,185\,192)$

$= -1\,185\,191$

Mid Unit Review

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Questions

1,2ade, 4,5,6,8,9,10

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Mid-Unit Review

2.1

1. Write each power in standard form.

a) 14^2 b) 5^1 c) -8^3

d) $-(-4)^4$ e) $(-6)^3$ f) $(-2)^8$

2. Copy and complete this table.

	Power	Base	Exponent	Repeated Multiplication	Standard Form
a)	4^3				
b)	2^5				
c)	8^6				
d)		7	2		
e)				$3 \times 3 \times 3 \times 3$	

3. a) Evaluate the first 8 powers of 7. Copy and complete this table.

Power of 7	Standard Form
7^1	
7^2	
7^3	
7^4	
7^5	
7^6	
7^7	
7^8	

b) What pattern do you see in the ones digits of the numbers in the second column?

c) Verify that the pattern continues by extending the table for as many powers of 7 as your calculator displays.

d) Use the pattern. Predict the ones digit of each power of 7. Explain your strategy.

i) 7^{12} ii) 7^{14}

iii) 7^{17} iv) 7^{22}

2.2

4. Write in standard form.

a) 10^6 b) 10^0 c) 10^8 d) 10^4

5. Write as a power of 10.

a) one billion b) one

c) 100 d) 100 000

6. Evaluate.

a) $(-5)^0$ b) 25^0 c) -6^0 d) 9^0

7. The area of land is measured in hectares (ha). One hectare is the area of a square with side length 100 m. Write the number of square metres in 1 ha as a power.

2.3

8. Evaluate. State which operation you do first.

a) $(-21 - 6)^2 + 14$

b) $6 \div (-2) + (2 \times 3)^2$

c) $[5 - (-4)]^3 - (21 \div 7)^4$

d) $[(6 - 21)^3 \times (2 + 2)^6]^0$

e) $(3 - 5)^5 \div (-4)$

f) $-30 - (7 - 4)^3$

9. Both Sophia and Victor evaluated this expression: $-2^4 \times 5 + 16 \div (-2)^3$ Sophia's answer was -82 and Victor's answer was 78. Who is correct? Find the likely error made by the other student.

10. Identify, then correct, any errors in the student work below. How do you think the errors occurred?