Exponents

Rules of Exponents	
To the power of 0:	$a^0 = 1$
Product of powers (same base):	$a^m \times a^n = a^{m+n}$
Product of powers (same exponent):	$a^n \times b^n = (ab)^n$
Quotient of powers (same base):	$a^m \div a^n = a^{m-n}$
Quotient of powers (same exponent):	$a^n \div b^n = (a/b)^n$
Power of power:	$(a^m)^n = a^{mn}$
Power of reciprocal:	$(1/a)^n = (1/(a^n))$
Negation in exponent:	$a^{-n} = 1/(a^n)$
Power of negation: If ***n* is even**, then	$(-a)^n = a^n$
If ***n* is odd**, then	$(-a)^n = -(a^n)$

Questions:

Souce: Art of Problem Solving, *Prealgebra,* Chapter 2

1. Simplify $180 - 5 \cdot 2^2$

Problem 2.1

2. How many positive integers x satisfy the inequality $x^2 + x < 100$?

3. Let $a \# b = a^2 - b^2$ what is the value of $(3 \# 2) - (4 \# 3)$?

4. Evaluate the following expression $8 + 6(3 - 8)^2$.

Problem 2.1.1a

5. Evaluate the following expression $(7 + 5)^2 + 7^2 - 5^2$.

Problem 2.1.2a

6. What is the value of the expression $x^2 + 2x - 6$ when $x = 3$?

Problem 2.1.3

7. Evaluate $(-1)^{(5^2)} + 1^{(2^5)}$

Problem 2.12/MATHCOUNTS

8. Express $5^{17} + 5^{17} + 5^{17} + 5^{17} + 5^{17}$ as a power of 5.

Problem 2.16/MATHCOUNTS

9. Express each of the following as a power of 2:

Problem 2.19

a. $(2^7 \times 2^8)/2^3$

b. $(2^6)^4 / 2^7$

c. $4^6/8^2$

10. Let $A = 2^5$, $B = 3^4$, $C = 4^3$, $D = 5^2$. Write A, B, C, and D in order from smallest to largest.

Problem 2.2.1

11. Evaluate the following expressions:

Problem 2.28

a. 1^{-5}

b. 2^{-3}

c. $56 * 2^{-3}$

12. Let x and y be nonzero numbers. Simplify $(x^4y^{-2})(x^{-1}y^5)$. Express your answer as a power of x times a power of y.

Problem 2.36/MATHCOUNTS

13. The squares of two consecutive positive integers differ by 67. What is the smaller of the two integers?

Problem 2.57

14. What is the value of x in the equation $(2^{x})(30^{3}) = (2^{3})(3^{3})(4^{3})(5^{3})$?

Problem 2.72/MATHCOUNTS

15. Express $2^{2} \times 4^{2} \times 8^{2} \times 16^{2} \times \ldots \times 1024^{2}$ as a power of 2

Problem 2.62/MATHCOUNTS

16. Let n be a positive integer. If $(1 + 2 + 3 + 4 + 5 + 6)^2 = 1^3 + 2^3 + n^3$, what is the value of n?

Problem 2.45/MATHCOUNTS

17. When the expression $8^{10} \times 5^{22}$ is multiplied out, how many digits does the number have?

Problem 2.63/MATHCOUNTS

18. What is the positive integer N for which $22^2 \times 55^2 = 10^2 \times N^2$?

Problem 2.67/MATHCOUNTS