Math Q114 **Rules for Exponents**

Rule	Example with base 10	Example with base 2
x^n = x multiplied by itself n times	$10^3 = (10)(10)(10) = 1000$	$2^5 = (2)(2)(2)(2)(2) = 32$
$x^1 = x$	$10^1 = 10$	$2^1 = 2$
$x^0 = 1$ (if $x \neq 0$)	$10^0 = 1$	$2^0 = 1$
$x^{-n} = 1/ x^n$	$10^{-3} = 1/10^3 = 1/1000 = .001$	$2^{-5} = 1/2^5 = 1/32$
$(x^n)(x^m) = x^{n+m}$ When base is same, add exponents	$(10^3)(10^5) = 10^{3+5} = 10^8$ $(10^3)(10^{-5}) = 10^{3+-5} = 10^{-2}$	$(2^4)(2^7) = 2^{4+7} = 2^{11}$ $(2^{-4})(2^7) = 2^{-4+7} = 2^3$
$(x^n) \div (x^m) = x^{n-m}$ (if $x \neq 0$) When base is same, subtract exponents	$(10^3) \div (10^5) = 10^{3--5} = 10^{-2}$ $(10^3) \div (10^{-5}) = 10^{3--5} = 10^{3+5} = 10^8$	$(2^9) \div (2^7) = 2^{9-7} = 2^2$ $(2^5) \div (2^7) = 2^{5-7} = 2^{-2}$ $(2^9) \div (2^{-7}) = 2^{9--7} = 2^{9+7} = 2^{16}$
$(x^n)^m = x^{nm}$	$(10^5)^3 = 10^{15}$ $(10^5)^{-3} = 10^{-15}$ or $= 1/10^{15}$	$(2^9)^3 = 2^{27}$ $(2^{11})^{-3} = 2^{-33}$ or $= 1/2^{33}$
$(x^n y^p)^m = x^{nm} y^{pm}$	$(10^5 2^7)^3 = 10^{15} 2^{21}$	$(10^{-5} 2^7)^{-3} = 10^{15} 2^{-21}$ or $= 10^{15}/2^{21}$
$(a/b)^n = a^n/b^n$	$(3/10)^4 = 3^4/10^4$ $= 81/10000$	$(2/5)^3 = 2^3/5^3$ $= 8/125$
$(a/b)^{-n} = b^n/a^n$	$(3/10)^{-4} = (10/3)^4$ $= 10^4/3^4 = 10000/81$	$(2/5)^{-3} = (5/2)^3$ $= 5^3/2^3 = 125/8$

Common Misconceptions about exponent operations:

$10^3 + 10^5 \neq 10^8$ $(10^3)(2^5) \neq 20^8$ $10^8 / 10^5 \neq 1^3$ $2^9 / 2^5 \neq 1^4$