Place of Power

Please **read carefully**. Answer the questions and **reread** **the problems carefully** to be sure that you have followed the directions. **Show your work and explain your answers!**

1. Use the properties of exponents to simplify the expressions.

$a^8 \cdot a^{-15}$	$5^2 \cdot 5^3 \cdot 5^{10}$	$(m^4)^3$
$2 \cdot 4^{-2}$	$(5mn^3p)(2m^6n^5)$	$\left(\dfrac{4c^5}{12c^6} \right)$
$(7xy^3)^2$	$\dfrac{(31x^9)^0}{x^9}$	$\dfrac{7^5 \cdot f^4}{7^3 \cdot f^2}$

2. Let m be a whole number.

a. Use the properties of exponents to simplify the expression (write an equivalent expression that is a product of unique primes, each raised to an integer power).

$$\frac{14^{12} \cdot 10^6}{70^6}$$

b. Use the properties of exponents to simplify the following expression:

$$\frac{14^{2m} \cdot 10^m}{70^m}$$

c. What value of m could be substituted into the expression in part (b) to find the answer to part (a)?

3. a. In Rajah's Rice, Chandra asks the Rajah to put 2 grains of rice on the first square of the board, 4 grains on the second, and doubling every square until the last square of the board. Complete the chard to show how many grains of rice are on each square. Express your answers in exponential notation.

b. How many grains of rice are there altogether after the 5th square? Write your answer in standard form.

Square	Number of Grains of Rice
1	
2	
3	
4	
30	
n	

4. a. Jill writes $3^3 \cdot 25^3 = 75^6$ and the teacher marked it wrong. Explain Jill's error.

b. Find n so that the number sentence below is true:
$5^3 \cdot 25^4 = 5^3 \cdot 5^n$

c. Use the definition of exponential notation to demonstrate why $5^3 \cdot 25^4 = 5^{11}$ is true.

d. You write $2^2 \cdot 2^{-5} = 2^{-3}$. Keisha challenges you, "Prove it!" Show why your answer is correct.

Sample answers

1.

$\dfrac{1}{a^7}$	5^{15}	m^{12}
$\dfrac{1}{2^3}$	$10m^7 n^8 p$	$\dfrac{1}{3c}$
$7^2 x^2 y^6$	$\dfrac{1}{x^9}$	$7^2 f^2$

2a. $2^{12} \cdot 7^6$

b. $2^{2m} \cdot 7^m$

c. $m = 6$

3a.

Square	Number of Grains of Rice
1	2^1
2	2^2
3	2^3
4	2^4
30	2^{30}
n	2^n

b. 62 grains

4a. Jill should not have multiplied the bases with different powers.

b. $n = 8$

c. $5^3 \cdot 25^4 = 5^3 \cdot (5^2)^4$

$= 5^3 \cdot 5^2 \cdot 5^2 \cdot 5^2 \cdot 5^2 = (5 \cdot 5 \cdot 5) \cdot (5 \cdot 5)$
$\cdot (5 \cdot 5) \cdot (5 \cdot 5) \cdot (5 \cdot 5)$

$= 5^{11}$

d.You can show this by writing 2 factors of 2 in a numerator and 5 factors of 2 in a denominator and simplifying to 1 over 2 to the third power.