

Name \_\_\_\_\_

Date \_\_\_\_\_

1. Write the following in exponential form (e.g.,  $100 = 10^2$ ).

a.  $10,000 = 10^4$

b.  $1000 = 10^3$

c.  $10 \times 10 = 10^2$

d.  $100 \times 100 = 10^4$

e.  $1,000,000 = 10^6$

f.  $1000 \times 1000 = 10^6$

$10^3 \rightarrow$  exponent

$10^1 \rightarrow$  1 shift

$10^2 \rightarrow$  2 shifts

$10^3 \rightarrow$  3 shifts

2. Write the following in standard form (e.g.,  $5 \times 10^2 = 500$ ).

a.  $9 \times 10^3 = 9,000$

b.  $39 \times 10^4 = 390,000$

c.  $7200 \div 10^2 = 72$

d.  $7,200,000 \div 10^3 = 7,200$

e.  $4.025 \times 10^3 = 4025 \rightarrow 4,025$

f.  $40.25 \times 10^4 = 402,500 \rightarrow 402,500$

g.  $725 \div 10^3 = 0.725 \rightarrow 0.725$

h.  $7.2 \div 10^2 = 0.072 \rightarrow 0.072$

3. Think about the answers to Problem 2(a–d). Explain the pattern used to find an answer when you multiply or divide a whole number by a power of 10. <sup>a power of</sup> When multiplying by 10, I add zeros onto my whole number that equals my exponent. When dividing by a power of 10, I subtract zeros from my whole number that equals my exponent.

4. Think about the answers to Problem 2(e–h). Explain the pattern used to place the decimal in the answer when you multiply or divide a decimal by a power of 10. When multiplying by a power of 10, I move the decimal point to the right equal to my exponent to make my answer larger. When dividing by a power of 10, I move the decimal point to the left equal to my exponent to make my answer smaller.

5. Complete the patterns.

- $\times 10$  a. 0.03   0.3   3.0   30   300   3000  $\rightarrow$  increase 1 shift
- $\div 100$  b. 6,500,000   65,000   650   6.5   0.065  $\rightarrow$  decrease 2 shifts
- $\div 100$  c. 94,300   9,430   943   94.3   9.43   0.943  $\rightarrow$  decrease 2 shifts
- $\times 10$  d. 999   9990   99,900   999,000   9,990,000   99,900,000  $\rightarrow$  increase 1 shift
- $\times 100$  e. 0.075   7.5   750   75,000   750,000   750,000,000  $\rightarrow$  increase 2 shifts

- f. Explain how you found the missing numbers in set (b). Be sure to include your reasoning about the number of zeros in your numbers and how you placed the decimal. *The next number in the pattern had 2 zeros less, so the numbers were being divided by  $10^2$  which makes it smaller by 2 places.*
- g. Explain how you found the missing numbers in set (d). Be sure to include your reasoning about the number of zeros in your numbers and how you placed the decimal. *The whole numbers added one zero, so the numbers were being multiplied by  $10^1$  which makes it larger by one place or column each time in the pattern.*
6. Shaunnie and Marlon missed the lesson on exponents. Shaunnie incorrectly wrote  $10^5 = 50$  on her paper, and Marlon incorrectly wrote  $2.5 \times 10^2 = 2.500$  on his paper.

- a. What mistake has Shaunnie made? Explain using words, numbers, and pictures why her thinking is incorrect and what she needs to do to correct her answer. *Shaunnie thinks  $10^5$  is  $10 \times 5$  which is 50, but  $10^5$  means  $10 \times 10 \times 10 \times 10 \times 10$  which equals 100,000.*
- b. What mistake has Marlon made? Explain using words, numbers, and pictures why his thinking is incorrect and what he needs to do to correct his answer. *Marlon made the mistake of adding two zeros at the end of 2.5. That would have worked for a whole number, but 2.5 is a decimal so he needs to move the decimal point to the right two shifts making 250.*