Zeros in Numbers

Although a zero is worth nothing, it can change the value of a number depending on where it is placed. Look at the examples below:

Whole Numbers

When writing whole numbers, remember that …

1. **Zeros at the end of a whole number change the value of the number.**

   - The number **2100** is very different from **21**.
     - The expanded form of 2100 is 2 thousands + 1 hundred + 0 tens + 0 ones.
     - The expanded form of 21 is 2 tens + 1 one.

2. **Zeros between digits change the value of the number.**

   - The number **2001** is very different from **21**.
     - The expanded form of 2001 is 2 thousands + 0 hundreds + 0 tens + 1 one.
     - The expanded form of 21 is 2 tens + 1 one.

3. **Zeros placed before the digits do not change the value of the number.**

   - This number **21** is the same as **0021**.
     - The expanded form of 21 is 2 tens + 1 one.
     - The expanded form of 0021 is 2 tens + 1 one.

DECIMAL NUMBERS

When writing decimal numbers, remember that …

1. **Zeros between the digits and the decimal point change the value of the number.**

   - The number 0**.0021** is very different from **.21**.
     - The expanded form of 0.0021 is 0 tenths + 0 hundredths + 2 thousandths + 1 ten thousandth.

- The expanded form of 0.21 is 2 tenths + 1 hundredth.

2. Zeros between the digits in a decimal number change the value of the number.

- The number 0**.2001** is very different from 0**.21**.
  - The expanded form of 0.2001 is 2 tenths + 0 hundredths + 0 thousandths + 1 ten
  - The expanded form of 0.21 is simply 2 tenths + 1 hundredth.

4. Zeros on the extreme right of a decimal do not change its value.

- The number 0**.24** is the same as 0**.240000.**
  - The expanded form of 0.24 = 2 tenths + 4 hundredths.
  - The expanded form of 0.2400000 = 2 tenths + 4 hundredths + 0 thousandths + 0 ten-
  - A whole number, such as 8, could be written as 8**.**0 or 8.00 or 8.0000000.

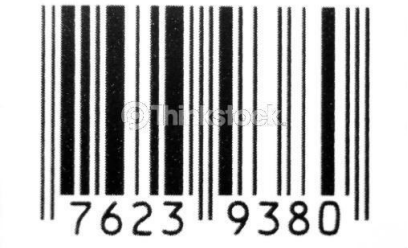
Consider the examples below that show when zero is necessary or unnecessary.

a) 5**.**6000 = 5**.**6 (zeros not necessary)

b) 08 = 8 (zero not necessary)

c) 0 **.**08 (zero necessary)

d) 204**.**006 (zero necessary)



Can you explain why the zero is or is not necessary on each of these?