

Calculation of geometric mean

Guidance document

Problem

Find the geometric mean of the following fecal coliform results:

450, 175, 0, <20

1. Convert all single digit zeros to 1. Example: 0 becomes 1.




450 175 1 <20

2. Drop all < symbols. For any “TNTC” (too numerous to count) results, contact lab for actual value.




Example: < 20 becomes 20.

450 175 1 20


3. Multiply all numbers: **$450 * 175 * 1 * 20 = 1,575,000$** .

4. Using a calculator with a  or  or  key.

(**Note: Some calculators may not follow this procedure. Consult your manual for specific instructions).

- a. Push the  or  or  key.

- b. Enter inverse of numbers used in Step #3, multiplied 4 numbers; inverse of 4 is 1/4 or 0.25.

- c. Push  key.

- d. Answer displayed is 35.43.

5. Using a calculator with a square root  (also known as the “radical” key)

- a. In that you multiplied four numbers, push the square root key **twice**.

- b. If you multiplied only two numbers, push the square root key **once**.

- c. The square root key will only work for either two or four numbers.

Conversion of numbers multiplied to its inverse

Numbers multiplied	Inverse
2	$1/2 = 0.500$
3	$1/3 = 0.333$
4	$1/4 = 0.250$
5	$1/5 = 0.200$
6	$1/6 = 0.167$
7	$1/7 = 0.143$
8	$1/8 = 0.125$
9	$1/9 = 0.111$
10	$1/10 = 0.100$
11	$1/11 = 0.091$
12	$1/12 = 0.083$
13	$1/13 = 0.077$
14	$1/14 = 0.071$
15	$1/15 = 0.067$

What is the geometric mean for the following fecal coliform results?

a. < 10 250 1250 0

Solution:

Adjust results to be: 10, 250, 1250, 1

Multiply results: $10 * 250 * 1250 * 1 = 3,125,000$

Solution 1: $3,125,000^{0.250} = 42.04$

Solution 2: $3,125,000^{\sqrt[4]{}}} = 42.04$

Answer: 42.04

b. 10 400

Answer: 63.24

c. 80 130 100

Answer: 100.84 (if you used 0.333 as the inverse of 1/3).

Download MPCA's geometric mean calculation spreadsheet:
<https://www.pca.state.mn.us/sites/default/files/wq-wwtp7-34.xls>.