ACSL

American Computer Science League

**All-Star #2**

**008 2015 - 2016**

**BINARY FRACTIONS**

**PROBLEM:** Convert a decimal fraction to a binary fraction. As an example, to convert 1/3 to binary means: 1/3 = 0 × **2−1** + 1 × **2−2** + 0 × **2−3** + 1 × **2−4** + ... = 0.0101…2 = 0.25 +0.0625+… = 0.3125 + ... In this case an exact value cannot be found with a sum of a finite number of inverse powers of two, the zeros and ones in the binary representation of 1/3 alternate forever. The point in binary fraction is called a radix point.

**INPUT:** There will be 5 lines of input. Each line will contain 2 natural numbers that represent a rational number in a/b form. That is 1, 2 represents 1/2.

**OUTPUT:** For each line of input write the represented rational number as a radix binary number with 6 radix places and the 6 decimal place value of that binary radix number. Both answers must be correct to earn the point. Note that all answers have a digit to the left of the radix or decimal point.

Sample Input #1asks that 3/10 be converted to binary with 6 radix places and then to convert that number back to a decimal number truncated to 6 decimal places.

**SAMPLE INPUT SAMPLE OUTPUT**  
  
1. 3, 10 1. 0.010011, 0.296875   
2. 1, 4 2. 0.010000, 0.250000  
3. 3, 5 3. 0.100110, 0.593750  
4. 5, 8 4. 0.101000, 0.625000  
5. 33, 25 5. 1.010100, 1.312500

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**TEST DATA**

**TEST INPUT TEST OUTPUT**  
1. 3, 4 1. 0.110000, 0.750000

2. 5, 12 2. 0.011010, 0.406250

3. 4, 50 3. 0.000101, 0.078125

4. 7, 9 4. 0.110001, 0.765625

5. 38, 5 5. 111.100110, 7.593750