

NAME

closest – Find the rational fraction closest to a given decimal fraction.

SYNOPSIS

```
#{HOME}/bin/exe/closest .1234 [denmax]
```

DESCRIPTION

The decimal whose rational fraction is to be found must be between zero and plus one, and the maximum denominator to be considered must be a positive integer. If the number of command-line parameters is less than 1 or more than 2, the program writes usage information and stops with return code 1. Otherwise it gets the first parameter and reads it as the decimal value to be found or approximated. If the optional second parameter is present the program gets it and reads denmax as the largest denominator to be considered; otherwise it defaults this value to 999.

Then the program considers denominators 1..denmax. If the decimal to be approximated is x and a rational fraction has denominator d , then its numerator is ideally $n=d*x$. To find the integer numerator that comes closest to this value, the program computes $d*x$ and rounds it to the nearest whole number. Next it computes the ratio of the integers, $y=n/d$, and finds the error $|y-x|$. The first denominator yielding the smallest error is then used with the corresponding numerator to form the rational fraction reported as the answer.

OPTIONS

Specifying a denominator in the command-line parameter causes the program to consider only fractions having denominators no larger than that.

UNITS and FILES

0 error messages
6 output

DIAGNOSTICS

If no errors occur the program stops with return code 0. In the event of an error an appropriate message is written and the program stops with one of these return codes.

- 1 usage information was written
- 2 the decimal fraction is not in the interval (0,1)
- 3 denmax is given but it is not positive
- 4 there was an error in reading a parameter value

AUTHOR

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EXAMPLES

```
unix[1] closest 0.12345 64
      7/ 57 = 0.12281 - 0.12345 = -6.429825E-04
unix[2] closest 0.125
      1/ 8 = 0.12500 - 0.12500 = 0.000000E+00
unix[3]
```