

# The Fortran 77 riddle

At the European Geosciences Union General Assembly 2018 in Vienna, the journal Geoscientific Model Development (GMD, <https://www.geoscientific-model-development.net>) offered three T-shirts to “real programmers” who were able to predict and explain the result of this FORTRAN77 code:

```
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
PROGRAM OBFUSCATE
CONSTANT = 5.
INVERSE = 1./CONSTANT
photo1 = 5.*INVERSE + 5.
pH = CONSTANT + 3.
X = photo1 * pH
C      strange combination of pH and photolysis...
GOTO 1
X = X + 17.
1      CONTINUE
IF (X .LT. 60.) THEN X = X + 7.
PRINT *, 'RESULT=', X
STOP
END
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
```

(<http://www.rolf-sander.net/res/obfuscate.f>)

Ten people participated (from Australia, Brasil, Britain, France, Germany, Japan, Spain, and Taiwan). Most supplied the correct answer 42 (of course) but 47, 53, and 64 were also suggested. The lucky winners of the GMD T-shirts have already been informed.

Here is an explanation why the FORTRAN77 code of the riddle does what it does. It contains three mean traps:

1. Implicit type declaration

```
INVERSE = 1./CONSTANT
```

Here, although  $1./CONSTANT$  should be 0.2, the value 0 is assigned to the variable `INVERSE` because all variables starting with the letter “I” are `INTEGER`.

2. Continuation line

```
          X = photo1 * pH
C      strange combination of pH and photolysis...
GOTO 1
```

The second line is a comment, it is ignored. The third line contains a non-blank in column 6, therefore the remainder of this line is a continuation of the previous command line. Merging the two lines, we get:

```
X = photo1 * pH OT0      1
```

As FORTRAN77 ignores spaces, this is identical to:

```
X = photo1*photo1
```

### 3. Logical IF statement

```
IF (X .LT. 60.) THEN X = X + 7.
```

Only a multi-line IF block needs the keyword THEN. Here, we have a one-line (logical) IF statement that works without “THEN”. However, this code line is neither illegal nor inactive, as a few contestants claimed. Instead, spaces are ignored and a new variable “THENX” is defined via the instruction THENX = X + 7.

Congratulations to all who found the correct (or at least almost correct) explanation!

Rolf Sander (GMD executive editor)

ps: Last but not least, I should mention that one participant pointed out to me the strict FORTRAN77 syntax which allows only six characters for the length of variable names. Thus, the GMD riddle does not present a valid piece of standard f77 code after all. Shame on me!

pps: I really hope that you are not using FORTRAN77 in your research anymore and instead write well-structured code together with a model description paper in GMD ☺.