ALGORITHM 93
GENERAL ORDER ARITHMETIC
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procedure arithmetic (a, b, c, op);
integer a, b, c, op;
comment This procedure will perform different order arithmetic
operations with b and c, putting the result in a. The order of the
operation is given by op. For op = 1 addition is performed. For
op = 2 multiplication, repeated addition, is done. Beyond these
the operations are non-commutative. For op = 3 exponentiation,
repeated multiplication, is done, raising b to the power c. Beyond
these the question of grouping is important. The innermost
implied parentheses are at the right. The hyper-exponent is
always c. For op = 4 tetration, repeated exponentiation, is
done. For op = 5, 6, 7, etc., the procedure performs pentation,
hexation, heptation, etc., respectively.

The routine was originally programmed in FORTRAN for the
Control Data 160 desk-size computer. The original program
was limited to tetration because subroutine recursiveness in
Control Data 160 FORTRAN has been held down to four levels in
the interests of economy.

The input parameter, b, c, and op, must be positive integers,
not zero;
begin own integer d, e, f, drop;
  if op = 1 then
    begin a := b + c; go to 1
  end if op = 2 then d := 0;
  else d := 1; e := c; drop := op - 1;
  for f := 1 step 1 until e do
    begin arithmetic (a, b, d, drop);
    d := a
  end;
1: end arithmetic

CERTIFICATION OF ALGORITHM 93
GENERAL ORDER ARITHMETIC [Millard H. Per-
stein, Comm. ACM (June 1962)]
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Algorithm 93 was programmed for the IBM 1620, using
"FORTRAN-recursion" (i.e., generous use of the copy rule). The
program ran without any modifications and was tested through
tetration. Further levels were available, but were too time-
consuming to reach.