PROGRAM TITLE: RECOMP II Polynomial Ratio Program

PROGRAM CLASSIFICATION: General

AUTHOR: A. E. Sheue
                        Autonetics

PURPOSE: It is often desired to compute a polynomial
                        ratio with an indefinite number of terms;
                        as when inverting Z transform functions.
                        This program computes and types out the
                        coefficient and exponent of each term of
                        that ratio.

DATE: 7 March 1961

RECOMP II Polynomial Ratio Program

1. **INTRODUCTION**

It is often desired to compute a polynomial ratio with an indefinite number of terms; as when inverting Z transform functions. This program computes and types out the coefficient and exponent of each term of that ratio.

2. **METHOD**

2.1   Given the divisor $b_n Z^n + b_{n-1} Z^{n-1} \ldots + b_1 Z^1 + b_0 Z^0$

$+b_{-1} Z^{-1} \ldots + b_{-n} Z^{-n}$ and the dividend $a_m Z^m$

$+a_{m-1} Z^{m-1} \ldots + a_1 Z^1 + a_0 Z^0 + a_{-1} Z^1 \ldots a_{-m} Z^{-m}$,

this program computes the quotient. The coefficients of the quotient are computed one at a time by long division.

3. **RESTRICTIONS**

3.1   The input coefficients must be in mixed number format.

3.2   The polynomials must be entered in descending power. Any missing terms must be replaced with zeros.

3.3   The maximum number of terms acceptable, for either the dividend or the divisor, is 767_{10}.

3.4   Components required.

3.4.1   The photoreader and typewriter are required.

4. **USAGE**

4.1   Problem set up and operating instructions.

4.1.1   Read and verify program tape.

4.1.2   Set typewriter tab defeat switch in tab position. Set margins at 5 and 90; set tabs at 12, 32, 52 and 72 only.

4.1.3   Place all sense switches off (up).

4.1.4   Press START-1 to set up location 0776.0.

4.2   Data input.

4.2.1   In integer format enter the highest power of the dividend in location 0776.0 followed by the lowest power in location 0777.0.

4.2.2   Starting at location 1000.0 enter the coefficients of the dividend in descending powers.

4.2.3   Press START-2 to set up location 3776.0.

4.2.4   In integer form enter the highest power of the divisor in location 3776.0 followed by the lowest power in location 3777.0.

4.2.5   Starting at location 4000.0 enter the coefficients of the divisor in descending power.

4.2.6   The data may be entered by any of the following methods:

     1. Through the console in the number fill mode;

     2. Through the typewriter in the number fill mode;

     3. Through the photoreader by means of a data tape (punched in number fill mode with special spacing).

4.3   Computations.

4.3.1   After all data has been entered, press START-3 to initiate computations. The powers and coefficients of the quotient will be computed and typed out.

4.3.2   Type out may be terminated at the end of a line by placing sense switch D down (on). To continue, place sense switch D up (off) and press the start button.

5.   **EXAMPLE**

5.1   Divide $z^1 + 3 z^0 + 5.6z^{-1}$ by $1.9 z^3 - 0.6z^2 + 5.$

5.2   Input data

dividend	divisor
+1.	+3.
-1.	+0.
+1.0	+1.9
+3.0	-0.6
+5.6	+0.0
	+5.0

5.3   Output format

Z=2	Z=3	Z=4	Z=5
+.526315578947 + 0	+.157894773684 + 1	+.156232668698 + 1	-.415512246537 + 1
Z=6	Z=7	Z=8	Z=9
-.41113864995 + 1	+.10934538563 + 2	+.10819438157 + 2	-.287751101481 + 2
Z=10	Z=11	Z=12	Z=13
-.28472205675 + 2	+.75723951264 + 2	+.74926857040 + 2	-.19927355596 + 3
Z=14	Z=15	Z=16	Z=17
-.19717593958 + 3	+.52440409463 + 3	+.51888405153 + 3	-.13800107753 + 4
Z=18	Z=19	Z=20	Z=21
-.13654843461 + 4	+.36316073035 + 4	+.35933798582 + 4	-.95568613250 + 4
Z=22	Z=23	Z=24	Z=25
-.94562627848 + 4	+.25149635066 + 5	+.24884902065 + 5	-.66183250173 + 5
Z=26	Z=27	Z=28	Z=29
-.65486584383 + 5	+.17416644783 + 6	+.17233311680 + 6	-.45833275744 + 6
Z=30	Z=31	Z=32	Z=33
-.45350820210 + 6	+.12061388354 + 7	+.11934426371 + 7	-.31740495668 + 7
Z=34	Z=35	Z=36	Z=37
-.31406385187 + 7	+.83527620178 + 7	+.82648382070 + 7	-.21980952679 + 8
Z=38	Z=39	Z=40	Z=41
-.21749574229 + 8	+.57844612312 + 8	+.57235721655 + 8	-.15222266398 + 9
Z=42	Z=43	Z=44	Z=45
-.15062032015 + 9	+.40058595784 + 9	+.39636926354 + 9	-.10541735733 +10
Z=46	Z=47	Z=48	Z=49
-.10430770093 +10	+.27741409823 +10	+.27449394982 +10	-.73003710060 +10

6.   CODING INFORMATION

6.1   Extent of storage requirements.

Location	Function
0000 - 0152	Main Program
0250 - 0312	Fixed decimal to floating binary conversion subroutine R.U.G. 1048
0320 - 0557	Floating decimal output An-014
0776 - 7757	Data

A. E. Sheue
Information Processing Unit

AES:vls