

UNIVERSITY OF ILLINOIS
DIGITAL COMPUTER

AUXILIARY LIBRARY ROUTINE M 30 - 296

TITLE: Williams Memory Routine for Linear Programming by
the Simplex Method-Modified for a Variable Resource
 b_1 (SADOI or DOI)

TYPE: Complete Floating Point Program.

REFERENCE: Method is described in an article by Candler in the
Journal of Farm Economics 39; 409-428, 1957.

DESCRIPTION: This routine is suitable for maximization problems
only. The general problem is treated in much the
same way as described in the write-up for Routine
M 15 - 183. However, the resource in the first row
is set equal to zero. The program will then supply
a negative number in its place which will get larger
in the magnitude with each iteration.

The interpretation of this negative number is: If
the original value, of the resource being varied,
had been equal to the absolute value of the negative
number, then the current solution would have been
optimal.

PREPARATION OF THE TAPES:

The coefficient tape is prepared as described in the
write-up for M 15 - 183.

The parameter tape is prepared as follows:

005+
00F 00jF
00F 00iF
0019+
00F 00tF
00F 00F
24999N

where

j = number of activities (excluding slack and P_0)

i = number of restraints

t = frequency of intermediate print-out

(Note the omission of the max-min parameter)

$$4(i + j + 1) + ij \leq 682$$

CAPACITY:

TIMING:

The time required per iteration is comparable to that of M 15 - 183. However, there will generally be more iterations than if all the coefficients were constant.

EXAMPLE:

The following is the coefficient tape, parameter tape, and output tape for a problem described in complete detail on pp. 232-243 of the book, "Linear Programming Methods" by Heady and Candler, referred to in the write-up of M 15 - 183.

PARAMETER TAPE:

005+
00F 005F (5 structural vectors)
00F 005F (5 basis vectors)
0019+
00F 001F (t = 1)
00F 00F
24999N

COEFFICIENT TAPE:

+0+00
+12+03
+15+02 P₀
+0+00
+0+00
+6+00
+3+01
+0+00 P₁
-2+01
-14+01
+6+00
+4+01
+0+00 P₂
-25+01
-15+01

+1+01

+0+00

+0+00

P_3

+8+00

+5+00

+11+01

+0+00

+1+01

P_4

+12+01

+11+01

+5-01

+0+00

+0+00

P_5

-1+01

+0+00

+0+00

-5+02

-7+02

C_0, C_1, \dots, C_{10}

+7+02

+22+03

-5+01

+0+00

+0+00

+0+00

+0+00

+13+03

OUTPUT:

006	+000000000	-64	} 1st iteration
007	+120000000	+03	
008	+150000000	+02	
009	+000000000	-64	
00+	+000000000	-64	
000	+000000000	-64	
001	-132000000	+03	
002	-125000000	+03	
003	-499999998	+01	
004	-770000000	+02	
005	+500000000	+01	
006	-240000000	+02	} 2nd iteration
001	+400000000	+02	
008	+150000000	+02	
009	+800000000	+02	
00+	+560000000	+02	
000	+528000000	+04	
007	+440000001	+02	
002	+510000002	+02	
003	-499999998	+01	
004	-770000000	+02	
005	+500000000	+01	
006	-405000000	+02	} 3rd iteration
001	+400000000	+02	
004	+150000000	+02	
009	+620000001	+02	
00+	+395000000	+02	
000	+643500001	+04	
007	+440000001	+02	
002	+510000002	+02	
003	-499999998	+01	
008	+770000001	+02	
005	+500000000	+01	
006	-118000000	+03	} 4th iteration
001	+400000000	+02	
004	+150000000	+02	
003	+775000001	+02	
00+	+749999969	+00	
000	+682250000	+04	
007	+481666667	+02	
002	+520416669	+02	
009	+624999997	+01	
008	+695000002	+02	
005	-124999997	+01	

006	-119560000	+03	} 5th iteration
001	+400000000	+02	
004	+150000000	+02	
003	+790000000	+02	
005	+119999995	+01	
000	+682400000	+04	
007	+482666667	+02	
002	+525666668	+02	
009	+500000001	+01	
008	+688000002	+02	
00+	+200000010	+01	

DATE	<u>May 24, 1960</u>
CODED BY	<u>L. Isaacson</u>
WRITE-UP BY	<u>R. W. Hacken</u>
APPROVED BY	<u>J. K. [Signature]</u>

LOCATION	ORDER	NOTES	PAGE 1	M30
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LOCATION	ORDER	NOTES	PAGE 2	M 30
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LOCATION	ORDER	NOTES	PAGE 3	M 30
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LOCATION	ORDER	NOTES PAGE 4 M 30
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LOCATION	ORDER	NOTES PAGE 5 M 30
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LOCATION	ORDER	NOTES	PAGE 6	M 30
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LOCATION	ORDER	NOTES	PAGE 8	M 30
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LOCATION	ORDER	NOTES	PAGE 9	M 30
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LOCATION	ORDER	NOTES PAGE 10 M 30
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LOCATION	ORDER	NOTES	PAGE 11	M 30
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LOCATION	ORDER	NOTES PAGE 12 M 30
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LOCATION	ORDER	NOTES PAGE 13 M 30
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LOCATION	ORDER	NOTES PAGE 14 M 30
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LOCATION	ORDER	NOTES PAGE 15 M 30
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LOCATION	ORDER	NOTES	PAGE 17	M 30
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LOCATION	ORDER	NOTES PAGE 20 M 30
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