```
[1]
     <PROGRAM>
                           → <IDENT><ENV><DATA><PROC>
[2]
                              identification division <END INST> program-id.
     <IDENT>
                               ID<END INST> author. <WORDS><END INST>
                               date-written. <WORDS><END INST>
[3]
     <WORDS>
                           \rightarrow ID <WORDS LR>
[4]
                           → INTEGER < WORDS LR
[5]
     <WORDS LR>
                           \rightarrow ID <WORDS LR>
[6]
                              INTEGER < WORDS LR
[7]
     <\!\!\mathrm{END\_INST}\!\!>
[8]
                           → .\n
[9]
     <ENV>
                               environment division<END INST> configuration
                               section<END INST> source-computer.
                               <WORDS><END_INST> object-computer.
                               <WORDS><END INST>
                               data division<END INST> working-storage
[10]
     <DATA>
                               section<END INST> <VAR LIST>
[11]
     <VAR LIST>
                               <VAR DECL> <VAR LIST>
[12]
[13]
     <VAR DECL>
                           \rightarrow <LEVEL> ID pic IMAGE <VAR DECL TAIL>
     <VAR_DECL_TAIL>
                           \rightarrow value INTEGER<END INST>
[14]
                           \rightarrow <END INST>
[15]
[16]
     <LEVEL>
                           → INTEGER
[17]
     <PROC>
                               procedure division<END_INST> ID
                               section < END INST > < LABELS > end program ID.
[18]
                              <LABEL><END INST> <INSTRUCTION LIST>
     <LABELS>
                               <LABELS LR>
[19]
     <LABELS_LR>
                               <LABEL><END_INST> <INSTRUCTION_LIST>
                               <LABELS LR>
[20]
                           \rightarrow \varepsilon
[21]
     <LABEL>
                                ID
[22]
     <INSTRUCTION LIST>
                                 <INSTRUCTION> <INSTRUCTION LIST>
[23]
[24]
                                <ASSIGNATION>
    <INSTRUCTION>
[25]
                             \rightarrow <IF>
[26]
                                <CALL>
[27]
                                \langle READ \rangle
[28]
                                <WRITE>
[29]
                                 stop run<END INST>
[30]
                                move <EXPRESSION> to ID<END_INST>
     <ASSIGNATION>
[31]
                                 compute ID = <EXPRESSION><END INST>
[32]
                                 add <EXPRESSION> to ID<END INST>
[33]
                                 subtract <EXPRESSION> from ID<END INST>
[34]
                                 multiply <ASSIGN END><END INST>
[35]
                                divide <ASSIGN END><END INST>
[36]
     <ASSIGN END>
                                <EXPRESSION>,<EXPRESSION> giving ID
[37]
     <EXPRESSION>
                             \rightarrow <EXP AND> <EXPRESSION LR>
     <EXPRESSION_LR>
[38]
                             \rightarrow or <EXP_AND> <EXPRESSION_LR>
[39]
```

```
\rightarrow \quad <\! \mathrm{EXP} \quad \mathrm{EQUAL}\! > <\! \mathrm{EXP} \_ \mathrm{AND} \_ \mathrm{LR}\! >
[40]
     \langle \text{EXP\_AND} \rangle
[41]
     <EXP AND LR>
                                \rightarrow and \langleEXP EQUAL\rangle \langleEXP AND LR\rangle
[42]
     <EXP EQUAL>
[43]
                                 \rightarrow <EXP ADD> <EXP EQUAL LR>
     <EXP\_EQUAL\_LR>
                                 \rightarrow = \langle \text{EXP\_ADD} \rangle
[44]
                                 \rightarrow < < EXP_ADD>
[45]
                                 \rightarrow > <EXP ADD>
[46]
[47]
                                 \rightarrow <= <EXP ADD>
[48]
                                    >= <EXP ADD>
[49]
[50]
     <EXP ADD>

ightarrow <EXP MULT> <EXP ADD LR>
[51]
     <EXP ADD LR>
                                 \rightarrow + <EXP MULT> <EXP ADD LR>
                                    [52]
[53]
                                 \rightarrow \varepsilon
     <EXP MULT>
                                    <EXP NOT> <EXP MULT LR>
[54]
[55]
     <EXP MULT LR>
                                 \rightarrow / <EXP NOT> <EXP MULT LR>
[56]
[57]
[58]
     <EXP NOT>
                                     -<EXP NOT>
                                 \rightarrow not <EXP NOT>
[59]
[60]
                                     <EXP PARENTHESIS>
[61]
     <EXP PARENTHESIS>
                                 \rightarrow (\langle EXPRESSION \rangle)
                                    <EXP\_TERM>
[62]
                                 \rightarrow
[63]
     <EXP_TERM>
                                 \rightarrow ID
                                 → INTEGER
[64]
[65]
                                    \operatorname{true}
[66]
                                 \rightarrow false
     <IF>
                                    if <EXPRESSION> then <INSTRUCTION LIST>
[67]
                                     <IF END>
[68]
     <IF_END>
                                     else <INSTRUCTION LIST> end-if
[69]
                                     end-if
[70]
     <CALL>
                                     perform ID < CALL TAIL>
[71]
     <CALL TAIL>
                                     until <EXPRESSION><END INST>
                                     <END INST>
[72]
[73]
     <READ>
                                 \rightarrow accept ID<END_INST>
[74]
     <WRITE>
                                \rightarrow display <WRITE TAIL>
[75]
     <WRITE_TAIL>
                                 \rightarrow <EXPRESSION><END INST>
[76]
                                 → STRING<END INST>
```

Variable	${ m First}^1$	$\mathrm{Follow}^1$	
<program></program>	identification		
<IDENT $>$	identification	environment	
<WORDS $>$	ID, INTEGER		
<WORDS LR $>$	ID, INTEGER, $\varepsilon$		

<end_inst></end_inst>		program-id, date-written, environment, configuration, source-computer, object-computer, data, working-storage, INTEGER, $\varepsilon$ , ID, move, compute, add, substract, multiply, divide, if, perform, accept, display, stop
<env></env>	environment	data
<data></data>	data	procedure
<var list=""></var>	INTEGER, $\varepsilon$	<del>-</del>
<var_list></var_list>	INTEGER, E INTEGER	procedure
<del>_</del>		INTEGER, $\varepsilon$
<var_decl_tail></var_decl_tail>	value, .	INTEGER, $\varepsilon$
<level></level>	INTEGER	ID
<proc></proc>	procedure	1
<labels></labels>	ID	end
<labels_lr></labels_lr>	$ID, \varepsilon$	end
<label></label>	ID	·
<instruction_list></instruction_list>	move, compute, add, substract, multiply, divide, if, perform, accept, display, stop, $\varepsilon$	ID, $\varepsilon$
<instruction></instruction>	move, compute, add, substract,	move, compute, add, substract, mul-
	multiply, divide, if, perform,	tiply, divide, if, perform, accept, dis-
	accept, display, stop	play, stop, $\varepsilon$
<assignation></assignation>	move, compute, add, substract,	move, compute, add, substract, mul-
(118818111111111)	multiply, divide	tiply, divide, if, perform, accept, dis-
	maroipi, arvide	play, stop, $\varepsilon$
<assign end=""></assign>	-, not, (, ID, INTEGER, true, false	piaj, stop, c
<expression></expression>	-, not, (, ID, INTEGER, true, false	to, ., from, , , giving, ), then
<expression lr=""></expression>	or, $\varepsilon$	to, ., from, , , giving, ), then
<exp and=""></exp>	-, not, (, ID, INTEGER, true, false	or, $\varepsilon$
<exp and="" lr=""></exp>	and, $\varepsilon$	or, $\varepsilon$
<exp equal=""></exp>	-, not, (, ID, INTEGER, true, false	and, $\varepsilon$
<u> </u>		_^
<exp_equal_lr> <exp_add></exp_add></exp_equal_lr>	$=,<,>,<=,>=,\varepsilon$ -, not, (, ID, INTEGER, true, false	and, $\varepsilon$
<exp_add_lr></exp_add_lr>	$+$ , $-$ , $\varepsilon$	
<exp mult=""></exp>		$=,<,>,<=,>=,\varepsilon$
<u> </u>	-, not, (, ID, INTEGER, true, false	$+$ , -, $\varepsilon$
<exp_mult_lr></exp_mult_lr>	*, /, ε	+, -, ε * / -
<exp_not></exp_not>	-, not, (, ID, INTEGER, true, false	*, /, ε
<exp_parenthesis></exp_parenthesis>	(, ID, INTEGER, true, false	*, /, ε
<exp_term></exp_term>	ID, INTEGER, true, false	*,/,arepsilon
<if></if>	if	move, compute, add, substract, mul-
		tiply, divide, if, perform, accept, dis-
ID DND	1 1.0	play, stop, $\varepsilon$
<if_end></if_end>	else, end-if	move, compute, add, substract, mul-
		tiply, divide, if, perform, accept, dis-
		play, stop, $\varepsilon$

<CALL>perform move, compute, add, substract, multiply, divide, if, perform, accept, display, stop,  $\varepsilon$ <CALL TAIL>until, . move, compute, add, substract, multiply, divide, if, perform, accept, display, stop,  $\varepsilon$ <READ> move, compute, add, substract, mulaccept tiply, divide, if, perform, accept, display, stop,  $\varepsilon$ <WRITE>display move, compute, add, substract, multiply, divide, if, perform, accept, display, stop,  $\varepsilon$ <WRITE\_TAIL>STRING, -, not, (, ID, INTEGER, move, compute, add, substract, multrue, false tiply, divide, if, perform, accept, display, stop,  $\varepsilon$ 

	identification	ID		environment	data	INTEGER	value
<program></program>	1						
<IDENT $>$	$\parallel$ 2						
<WORDS $>$		3					
<WORDS LR $>$		4	7				
$<$ END $\overline{\text{INST}}>$			8				
$\langle \mathrm{ENV} \stackrel{-}{>}$				9			
<data></data>					10		
<VAR LIST $>$					11		12
<var decl=""></var>					11		
<var decl="" tail=""></var>			15				14
<LEVEL $>$						16	
<proc></proc>							
<LABELS $>$		18					
<LABELS LR $>$		19					
<LABEL $>$		21					
<instruction list=""></instruction>		23					
<instruction></instruction>							
<assignation></assignation>							
<ASSIGN END $>$		36				36	
<expression></expression>		37				37	
<expression lr=""></expression>			39				
$<$ EXP AND $>$ $^-$		40				40	
<exp and="" lr=""></exp>						-	
$<$ EXP $^-$ EQU $^-$ L $>$		43				43	
<exp equal="" lr=""></exp>							
<exp_add></exp_add>		50				50	
<exp add="" lr=""></exp>							
<exp mult=""></exp>		54				54	
<exp lr="" mult=""></exp>							
2 <exp_not></exp_not>		60				60	
<exp parenthesis=""></exp>		61				61	
<exp_term></exp_term>		63				64	
<if></if>						<b>V</b> -	
<if_end></if_end>							
<call></call>							
<call tail=""></call>							
<read></read>							
<write></write>							
<write_tail></write_tail>		75				75	
_	II						

	procedure	move	compute	add	substract	multiply	divide
<program></program>			-				
<IDENT $>$							
<words></words>							
<words lr=""></words>							
<end inst=""></end>							
<env></env>							
<data></data>							
<var list=""></var>	12						
<var decl=""></var>	12						
<var decl="" tail=""></var>							
<level></level>							
<proc></proc>	15						
<labels></labels>	10						
<labels lr=""></labels>							
<label></label>							
<instruction list=""></instruction>		22	22	22	22	22	22
<instruction _="" list=""></instruction>		24	24	24	24	24	$\frac{22}{24}$
<assignation></assignation>		30	31	32	33	34	35
<assign end=""></assign>		30	91	02	33	01	50
<expression></expression>							
<expression lr=""></expression>							
<exp and=""></exp>							
<exp_and_lr></exp_and_lr>							
<exp equal=""></exp>							
<exp equal="" lr=""></exp>							
<exp add=""></exp>							
<exp add="" lr=""></exp>							
<exp mult=""></exp>							
<exp lr="" mult=""></exp>							
<exp_not></exp_not>							
<exp parenthesis=""></exp>							
<exp_term></exp_term>							
<if></if>							
<if_end></if_end>							
<call></call>							
<call tail=""></call>							
<read></read>							
<read> <write></write></read>							
<write> <write_tail></write_tail></write>							
/WILLE_IAIL/							

	perform	accept	display	stop	_	not	(	true	false
<program></program>	-	-		-			`		
<ident></ident>									
<words></words>									
<words lr=""></words>									
<end inst=""></end>									
<env></env>									
<data></data>									
<var list=""></var>									
_									
<var_decl tails<="" td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></var_decl>									
<var_decl_tail></var_decl_tail>									
<level></level>									
<proc></proc>									
<labels></labels>									
<labels_lr></labels_lr>									
<LABEL $>$									
<instruction_list></instruction_list>	22	22	22	22					
<instruction></instruction>	26	27	28	29					
<assignation></assignation>									
$<$ ASSIGN_END $>$					36	36	36	36	36
<expression></expression>					37	37	37	37	37
<expression_lr></expression_lr>									
<exp_and></exp_and>					40	40	40	40	40
$<$ EXP_AND_LR $>$									
$<$ EXP $\_$ EQUAL $>$					43	43	43	43	43
$<$ EXP $\_$ EQUAL $\_$ LR $>$									
$\langle \text{EXP\_ADD} \rangle$					50	50	50	50	50
$<$ EXP_ADD_LR $>$					52				
$\langle \text{EXP}^{-} \text{MULT} \rangle$					54	54	54	54	54
<exp lr="" mult=""></exp>					57				
<exp not=""></exp>					58	59	60	60	60
<exp parenthesis=""></exp>							61	62	62
<exp_term></exp_term>								65	66
<if></if>									
<if_end></if_end>									
<call></call>	70								
<call tail=""></call>									
<read></read>		72							
<write></write>			73						
<write_tail></write_tail>					75	75	75	75	75
	l						. •		

	or	and	=	<	>	<=	>=	*	/	if	else	end-if	+	until
<program></program>									,					
<IDENT $>$														
<WORDS $>$														
$<$ WORDS_LR $>$														
$<$ END_INST $>$														
<env></env>														
<data></data>														
<var_list></var_list>														
<var_decl></var_decl>														
<var_decl_tail></var_decl_tail>														
<level></level>														
<proc></proc>														
<labels> <labels lr=""></labels></labels>														
<labels_lk></labels_lk>														
<instruction list=""></instruction>										22				
<instruction_list></instruction_list>										$\frac{22}{25}$				
<assignation></assignation>										20				
<assign end=""></assign>														
<expression></expression>														
<expression lr=""></expression>	38													
$<$ EXP AND $>$ $^-$														
<exp and="" lr=""></exp>	42	41												
$<$ EXP $^-$ EQU $^-$ L $>$														
$<$ EXP $\_$ EQUAL $\_$ LR $>$		49	44	45	46	47	48							
$<$ EXP $\_$ ADD $>$														
$<$ EXP $\_$ ADD $\_$ LR $>$			53	53	53	53	53						51	
$<$ EXP $\_$ MULT $>$														
$<$ EXP $\_$ MULT $\_$ LR $>$								55	56				57	
$<$ EXP $\_$ NOT $>$														
<exp_parenthesis></exp_parenthesis>														
$<$ EXP $\_$ TERM $>$														
<IF $>$										67				
<if_end></if_end>											68	69		
<call></call>														
<call_tail></call_tail>														71
<read></read>														
<write></write>														
$<$ WRITE_TAIL $>$														

```
until STRING , to from giving ) then
<PROGRAM>
<IDENT>
<WORDS>
<WORDS LR>
<END_INST>
<ENV>
<DATA>
<VAR LIST>
<VAR_DECL>
<VAR DECL TAIL>
<LEVEL>
<PROC>
<LABELS>
<LABELS LR>
<LABEL>
<INSTRUCTION_LIST>
<INSTRUCTION>
<ASSIGNATION>
<ASSIGN END>
<EXPRESSION>
                                   39 39
<EXPRESSION_LR>
                                                 39
                                           39
                                                      39
                                                          39
\langle \text{EXP\_AND} \rangle
<EXP AND LR>
<EXP\_EQU\overline{A}L>
<EXP_EQUAL_LR>
\langle \text{EXP\_ADD} \rangle
<EXP_ADD_LR>
<EXP\_MULT>
<EXP NOT>
<EXP PARENTHESIS>
<EXP_TERM>
<IF>
<IF_END>
<CALL>
<CALL_TAIL>
                      71
<READ>
<WRITE>
<WRITE_TAIL>
                             76
```