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

ightarrow <EXP EQUAL> <EXP AND LR>
[38]
[39]
     <EXP AND LR>
                                 and <EXP EQUAL> <EXP AND LR>
```

```
[40]
[41]
     <EXP EQUAL>
                             \rightarrow <EXP ADD> <EXP EQUAL LR>
[42]
     <EXP EQUAL LR>
                             \rightarrow = <EXP ADD> <EXP EQUAL LR>
[43]

ightarrow < <EXP ADD> <EXP EQUAL LR>
                             \rightarrow > <EXP ADD> <EXP EQUAL LR>
[44]
[45]
                                <= <EXP_ADD> <EXP_EQUAL_LR>
                                >= <EXP ADD> <EXP EQUAL LR>
[46]
[47]
    <EXP ADD>
                                <EXP MULT> <EXP ADD LR>
[48]
     <EXP\_ADD\_LR>
                             \rightarrow + <EXP MULT> <EXP ADD LR>
[49]
[50]
                             \rightarrow - <EXP MULT> <EXP ADD LR>
[51]
[52]
     <EXP_NOT> <EXP_MULT_LR>
                             [53]
     <EXP_MULT_LR>
                                / < EXP NOT > < EXP MULT LR >
[54]
                             \rightarrow
[55]
[56]
     <EXP_NOT>
                             \rightarrow -<EXP NOT>
[57]
                                not <EXP_NOT>
[58]
                                <EXP PARENTHESIS>
[59]
     <EXP PARENTHESIS>
                             \rightarrow (\langle EXPRESSION \rangle)
[60]

ightarrow <EXP TERM>
     <\!\!\mathrm{EXP\_TERM}\!\!>
[61]
                             \rightarrow ID
[62]
                                INTEGER
                             \rightarrow
[63]
                             \rightarrow true
[64]
                                false
[65]
    \langle IF \rangle
                                if <EXPRESSION> then <INSTRUCTION_LIST>
                                 <IF END>
[66]
     <IF END>
                                else <INSTRUCTION LIST> end-if
[67]
                                end-if
[68]
    <CALL>
                                perform ID < CALL_TAIL>
                                until <EXPRESSION><END INST>
[69]
     <CALL_TAIL>
                                <END INST>
[70]
[71]
    <READ>
                                accept ID<END INST>
[72]
                                display <WRITE TAIL>
     <WRITE>
[73]
     <WRITE_TAIL>
                                <EXPRESSION><END_INST>
[74]
                                STRING<END INST>
```

Variable	First^1	$Follow^1$
<program></program>	identification	
<IDENT $>$	identification	environment
<WORDS $>$	ID	
$<$ WORDS_LR $>$	ID, ε	

<end_inst></end_inst>		program-id, date-written, environment, configuration, source-computer, object-computer, data, working-storage, INTEGER, ε , ID, move, compute, add, substract, multiply, divide, if, perform, accept, display, stop
<env></env>	environment	data
<data></data>	data	procedure
<var list=""></var>	INTEGER, ε	-
<var_list></var_list>	INTEGER, E INTEGER	procedure
_		INTEGER, ε
<var_decl_tail></var_decl_tail>	value, .	INTEGER, ε
<level></level>	INTEGER	ID
<proc></proc>	procedure	1
<labels></labels>	ID	end
<labels_lr></labels_lr>	ID, ε	end
<label></label>	ID	·
<instruction_list></instruction_list>	move, compute, add, substract, multiply, divide, if, perform, accept, display, stop, ε	ID, ε
<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, ε
<assignation></assignation>	move, compute, add, substract,	move, compute, add, substract, mul-
(11001011111011)	multiply, divide	tiply, divide, if, perform, accept, dis-
	maroipi, arvide	play, stop, ε
<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, ε	to, ., from, , , giving,), then
<exp and=""></exp>	-, not, (, ID, INTEGER, true, false	or, ε
<exp and="" lr=""></exp>	and, ε	or, ε
<exp equal=""></exp>	-, not, (, ID, INTEGER, true, false	and, ε
<u> </u>		_^
<exp_equal_lr> <exp_add></exp_add></exp_equal_lr>	$=,<,>,<=,>=,\varepsilon$ -, not, (, ID, INTEGER, true, false	and, ε
<exp_add_lr></exp_add_lr>	$+$, $-$, ε	
<exp mult=""></exp>		$=,<,>,<=,>=,\varepsilon$
<u> </u>	-, not, (, ID, INTEGER, true, false	$+$, -, ε
<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, ε
<if_end></if_end>	else, end-if	move, compute, add, substract, mul-
		tiply, divide, if, perform, accept, dis-
		play, stop, ε

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

PROGRAM> 1 IDENT> 2 WORDS> 3 WORDS_LR> 4 5 END_INST> 6 ENV> 7 DATA> 8 VAR_LIST> 9 10 VAR_DECL> 11 VAR_DECL_TAIL> 13 12 LEVEL> 14 14 PROC> 16 17 LABELS_LR> 17 18 LABEL> 19 10 INSTRUCTION_LIST> 21 11 ASSIGNATION> 34 34 ASSIGN_END> 35 35 EXPRESSION_LR> 37 38 EXP_AND_LR> 38 38		identification	ID		environment	data	INTEGER	value
<words> 3 <words_lr> 4 5 <end_inst> 6 <env> 7 <data> 8 <var_list> 9 10 <var_decl> 11 <var_decl_tail> 13 12 <level> 14 <proc> 14 <labels_lr> 17 <label> 19 <instruction_list> 21 <instruction> 34 <assign_end> 34 <expression_lr> 35 <expression_lr> 37 <exp_and< td=""> 38 <exp_and_lr></exp_and_lr></exp_and<></expression_lr></expression_lr></assign_end></instruction></instruction_list></label></labels_lr></proc></level></var_decl_tail></var_decl></var_list></data></env></end_inst></words_lr></words>	<program></program>	1						
<words_lr> 4 5 <end_inst> 6 <env> 7 <data> 8 <var_list> 9 10 <var_decl> 11 <var_decl_tail> 13 12 <level> 14 14 <proc> 16 17 18 <labels_lr> 17 19 10 <instruction_list> 21 11 11 <instruction> 21 34 34 34 <expression> 35 35 35 <expression_lr> 37 38 38 <exp_and_lr> 38 38</exp_and_lr></expression_lr></expression></instruction></instruction_list></labels_lr></proc></level></var_decl_tail></var_decl></var_list></data></env></end_inst></words_lr>	<IDENT $>$	\parallel 2						
<end_inst> 6 <env> 7 <data> 8 <var_list> 9 10 <var_decl> 11 <var_decl_tail> 13 12 <level> 14 <proc> 14 <labels> 16 <labels_lr> 17 <label> 19 <instruction_list> 21 <instruction> 34 34 <assign_end> 35 35 <expression_lr> 37 37 <exp_and< td=""> 38 38 <exp_and_lr> 38 38</exp_and_lr></exp_and<></expression_lr></assign_end></instruction></instruction_list></label></labels_lr></labels></proc></level></var_decl_tail></var_decl></var_list></data></env></end_inst>	<WORDS $>$		3					
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<env> 7 <data> 8 <var_list> 9 10 <var_decl> 11 12 <var_decl_tail> 13 12 <level> 14 14 <proc> 16 17 <labels_lr> 17 17 <label> 19 11 <instruction_list> 21 11 <instruction> 21 34 <assign_end> 34 34 <expression_lr> 37 35 <exp_and> 38 38 <exp_and_lr> 38 38</exp_and_lr></exp_and></expression_lr></assign_end></instruction></instruction_list></label></labels_lr></proc></level></var_decl_tail></var_decl></var_list></data></env>	<u>—</u>			6				
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<proc> 16 <labels_lr> 17 <label> 19 <instruction_list> 21 <instruction> 34 <assignation> 34 <expression> 35 <expression_lr> 37 <exp_and> 38 <exp_and_lr> 38</exp_and_lr></exp_and></expression_lr></expression></assignation></instruction></instruction_list></label></labels_lr></proc>							14	
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<exp_and_lr></exp_and_lr>	-		38				38	
$\langle \text{EXP EQUAL} \rangle$ 41	$<$ EXP $^-$ EQU $^-$ L $>$		41				41	
<exp equal="" lr=""></exp>								
$\langle \text{EXP_ADD} \rangle$ 48			48				48	
<exp add="" lr=""></exp>								
$\langle \text{EXP}^{-}\text{MULT} \rangle$ 52			52				52	
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<write_tail> 73</write_tail>			73				73	
— n	_	П						

	procedure	move	compute	add	substract	multiply	divide
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\WIGHT_IMIL/	I						

	perform	accept	display	stop	_	not	(true	false
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<words></words>									
<words lr=""></words>									
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$<$ EXP $_$ EQUAL $>$					41	41	41	41	41
$<$ EXP $_$ EQUAL $_$ LR $>$									
$\langle \text{EXP_ADD} \rangle$					48	48	48	48	48
$<$ EXP_ADD_LR $>$					50				
$<$ EXP $_$ MULT $>$					52	52	52	52	52
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<exp parenthesis=""></exp>							59	60	60
<exp_term></exp_term>								63	64
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$<$ C $\overline{\text{CALL}}>$	68								
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<write></write>		. –	72						
<write_tail></write_tail>			. –		73	73	73	73	73
	I				. ~	. •		. •	. •

	or	and	=	<	>	<=	>=	*	/	if	else	end-if	+	until
<PROGRAM $>$,					
<IDENT $>$														
<WORDS $>$														
<words lr=""></words>														
<end inst=""></end>														
<env></env>														
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<if></if>										65				
$\langle IF_END \rangle$											66	67		
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<call_tail></call_tail>														69
<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>
<EXPRESSION_LR>
                                   37 37
                                           37
                                                37
                                                     37
                                                         37
\langle \text{EXP\_AND} \rangle
<EXP AND LR>
<EXP\_EQU\overline{A}L>
<EXP_EQUAL_LR>
\langle \text{EXP\_ADD} \rangle
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<EXP_TERM>
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<IF_END>
<CALL>
<CALL_TAIL>
                      69
<READ>
<WRITE>
<WRITE_TAIL>
                             74
```