

ASSEMBLY LISTING

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0000          00010          PROG MACHIN
          00020          ORG 0
          00030          ADMODE2
          00040*
          00050* CALCULATE PI USING MACHIN'S FORMULA
          00060*
          00070* USES HALF CHARACTER PACKING IN THE STORAGE AREA
          00080* AND A CODE SCRIPT SUPERIMPOSED ON THE MAIN PROGRAM CODE
          00090*
3777          00100 TOP EQU 2047          TOP OF MEMORY
          00110*
          00120* -----SUB-LOOP B-----          CALCULATES ONE DIGIT OF EACH TERM
          00130*          OF BOTH ARCCOT COMPONENTS AND
          00140*          DOES 2N-1 DIVISION TO ADJUST PI
          00150*
0000 W 3410571103          00160 LOOPB BA TWO, DIV2N          INCREASE 2N-1 DIVISOR FOR NEXT TERM
0005 W 650023          00170 POWSW B GETPOW
0010 W 1511161143          00180          LCA PWQUOT, DIVID
0015 W 351116          00190          BS PWQUOT
0020 W 650054          00200          B GET2N
0023 W 650377          00210 GETPOW B GET          GET NEXT VALUE FROM STORE
0026 W 1511531143          00220 CALCPW LCA REMX10, DIVID
0033 W 3411161143          00230          BA PWQUOT, DIVID          ADD IN THE PREVIOUS QUOTIENT
0040 W 151134          00240          LCA PDIVIS
0043 W 650320          00250          B DIV          DO THE POWER DIVISION
0046 W 321105111617          00260          SST QUOT, PWQUOT, 17          STRIP OFF DECIMAL SIGN DURING MOVE
          00270*
          00280* -----END OF POWER PROCESS AND START OF 2N-1 PROCESS
          00290*
0054 W 650377          00300 GET2N B GET          GET NEXT VALUE
0057 W 3310611150          00310          C FIVE, REMX10-3          CHECK FOR A MARKER
0064 W 65010041          00320          BCT GOPUT-1, 41          SKIP MARKER ROUTINE IF NONE
0070 W 3510611150          00330 GOTMRK BS FIVE, REMX10-3          REMOVE THE MARKER
0075 W 220105          00340          SW GOSCPT          TURN ON THE SCRIPT ENTRY POINT
0100 W 40          00350 NOP NOP
0101 W 650636          00360 GOPUT B PUT          STORE THE POWER REMAINDER
0104 W 40          00370          NOP
0105 W 650224          00380 GOSCPT B SCRIPT          ENTER THE SCRIPT READER
          00390*
          00400* -----CALCULATE 2N-1 QUOTIENT AND ADJUST PI BY THAT AMOUNT-----
          00410*
0110 W 1511531143          00420 CALC2N LCA REMX10, DIVID          SET UP OLD REMAINDER TIMES 10
0115 W 3411161143          00430 SUBPOW BA PWQUOT, DIVID          ADJUSTED BY POWER QUOTIENT
          00440*          MAY BE ADDED OR SUBTRACTED
0122 W 151103          00450          LCA DIV2N          SET DIVISOR
0125 W 650320          00460          B DIV          DO THE 2N-1 DIVISION

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00470* -----ADJUST PI-----
0130 W 3611051130 00480 ADDSUB A QUOT,PI ON ALTERNATE TERMS THIS LINE
0135 W 3010550130 00490 HA ONE,ADDSUB FLIPS BETWEEN ADD AND SUBTRACT
00500* -----
0142 W 650636 00510 B PUT STORE 2N-1 REMAINDER
0145 W 650000 00520 B LOOPB RETURN TO PROCESS NEXT TERM
00530*
00540* -----SECOND PART OF POWER PROCESSING END ROUTINE-----
00550*
0150 W 230101 00560 PWEND2 CW GOPUT STOP STORING POWER REMAINDERS
0153 W 220643 00570 SW PUTMRK ADD A MARKER TO THE NEXT REMAINDER
0156 W 540110040710 00580 BCC CALC2N,GETNUL,10 LAST TIME THROUGH SO LEAVE SCRIPT ON
0164 W 1410760252 00590 MCW SCRSET,SCRGET+4 NOT LAST TIME SO RESTART THE SCRIPT...
0171 W 230105 00600 CW GOSCPT ...AND TURN IT OFF FOR NOW
0174 W 650110 00610 B CALC2N RESUME PROCESSING
00620*
00630* -----FIRST PART OF POWER PROCESSING END ROUTINE-----
00640*
0177 W 230005 00650 PWEND1 CW POWSW TURN OFF POWER DATA RETRIEVAL
0202 W 220407 00660 PWENDN SW GETNUL TURNS OFF GET ROUTINE...
00670* ...BUT ONLY ON ALTERNATE PASSES
0205 W 3310531116 00680 C ZERO,PWQUOT CHECK FOR A POWER QUOTIENT...
0212 W 65011045 00690 BCT CALC2N,45 ...AND GO ROUND AGAIN IF THERE IS
00700* DROP BACK INTO THE SCRIPT READER - NO BRANCH REQUIRED
00710*
00720* -----SCRIPT READER - EXECUTES INSTRUCTIONS OVERLAID ONTO CODE
00730* ...AS PATTERNS OF ITEM MARKS
00740*
0216 W 40 00750 NOP SPACE FOR COMPLETION MARKER
0217 1515151515 00760 DC #5 INSTRUCTION IS COMPILED HERE
0224 W 350223 00770 SCRIPT BS *-1 CLEAR THE INSTRUCTION
0227 W 320100022377 00780 SST NOP,SCRIPT-1,77 INSERT INSTRUCTION COMPLETION MARKER
0235 W 540217021602 00790 BCC SCRIPT-5,SCRIPT-6,02 EXECUTE INSTRUCTION WHEN COMPLETE
0243 W 340223 00800 BA SCRIPT-1 SHIFT UP ONE BIT
0246 W 540261000020 00810 SCRGET BCC *+11,0,20 TEST CODE CHARACTER FOR ITEM MARK
0254 W 3010550223 00820 HA ONE,SCRIPT-1 IF NOT SET BOTTOM BIT
0261 W 3410550252 00830 BA ONE,*-7 MOVE TO NEXT CODE CHARACTER
0266 W 650235 00840 B SCRIPT+9 LOOP BACK FOR NEXT BIT
00850*
00860* -----MAIN LOOP A-----
00870*
0271 W 661112110200 00880 STARTA PDT PIPRIN,11,02,00 PRINT CHARACTER
0277 W 640277110210 00890 PCB *,11,02,10 WAIT UNTIL PRINTING FINISHED
00900*
00910* -----RESTART LOOPB-----
00920*
0305 W 1510551103 00930 LCA ONE,DIV2N SET 2N-1 DIVISOR TO 1

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0312	W	230407	00940	CW	GETNUL	
0315	W	650054	00950	B	GET2N	
			00960*			
			00970*		-----DIVIDE DIVID BY DIVIS GIVING QUOT-----	
			00980*		-----REMAINDER IS ALWAYS POSITIVE EVEN WHEN QUOT IS NEGATIVE----	
			00990*			
0320	W	24037670	01000	DIV	SCR	DIVX+2,70
0324	W	1510541105	01010		LCA	ZERO+1,QUOT
0331	W	540354114002	01020	DIV1	BCC	DIV2,DIVID-3,02
0337	W	3511371143	01030		BS	DIVIS,DIVID
0344	W	3610551105	01040	ADDOP	A	ONE,QUOT
0351	W	650331	01050		B	DIV1
0354	W	3411371143	01060	DIV2	BA	DIVIS,DIVID
0361	W	3710551105	01070		S	ONE,QUOT
0366	W	540354114002	01080		BCC	DIV2,DIVID-3,02
0374	W	650000	01090	DIVX	B	0
			01100*			
			01110*		-----GET A VALUE FROM STORE USING THREE BIT UNPACKING-----	
			01120*		-----RETURNS THE VALUE IN GETVAL AND TEN TIMES IT IN REMX10-----	
			01130*			
0377	W	24063570	01140	GET	SCR	GETX+2,70
0403	W	351153	01150		BS	REMX10
0406	W	40	01160		NOP	
0407	W	650633	01170	GETNUL	B	GETX
0412	W	14114711110	01180		MCW	GETCHR,GETVAL+1
0417	W	153777	01190	GETGET	LCA	TOP
0422	W	24042167	01200		SCR	GETGET+2,67
0426	W	3304211070	01210		C	GETGET+2,LOWADD
0433	W	65044741	01220		BCT	GETOK,41
0437	W	1410720421	01230		MCW	GETHI,GETGET+2
0444	W	220703	01240		SW	PUTOK
0447	W	351145	01250	GETOK	BS	GETCT
0452	W	3610551145	01260		A	ONE,GETCT
0457	W	540475110710	01270		BCC	GETSET,GETVAL,10
0465	W	1511111112	01280		LCA	GETVAL+2,GETVAL+3
0472	W	650452	01290		B	GETOK+3
0475	W	1411071147	01300	GETSET	MCW	GETVAL,GETCHR
0502	W	540511110720	01310		BCC	*+7,GETVAL,20
0510	W	40	01320		NOP	
0511	W	321053110770	01330	GETOVR	SST	ZERO,GETVAL,70
0517	W	231107	01340		CW	GETVAL
0522	W	151053	01350		LCA	ZERO
0525	W	540561111020	01360	GETSHF	BCC	GETEXP,GETVAL+1,20
0533	W	3710551145	01370		S	ONE,GETCT
0540	W	65061060	01380		BCT	GETADD,60
0544	W	1511121161	01390		LCA	GETVAL+3,GETWRK
0551	W	1511611111	01400		LCA	GETWRK,GETVAL+2

STORE THE RETURN ADDRESS
CLEAR THE RESULT
NEXT INSTRUCTION IS SWITCHABLE
RETURN A ZERO DUMMY VALUE
RESTORE PREVIOUS CHARACTER
GET NEXT VALUE
STORE NEXT VALUE ADDRESS
TEST FOR BOTTOM OF STORE
IF SO CONTINUE AT THE TOP AND...
TELL PUT STORE IS EMPTY TO THE BOTTOM
CLEAR SHIFT COUNTER
INCREMENT SHIFT COUNTER
EXIT RIGHT SHIFT WHEN AT LEFT OF VALUE
SHIFT RIGHT ONE CHARACTER
RETURN TO CHECK FOR ANOTHER SHIFT
SAVE TOP CHARACTER FOR NEXT TIME
CHECK FOR OVERLAPPED FIELDS...
...AND REMOVE OVERLAPPED BITS
REMOVE CURRENT WORDMARK...
AND ATTACH ANOTHER CHARACTER
CHECK FOR A PACKED CHARACTER
DECREMENT SHIFT COUNTER
END SHIFTING IF BACK AT START
MOVE OUT TO WORK AREA...
...AND RETURN SHIFTED LEFT

0556	W	650525	01410	B	GETSHF	RETURN TO CHECK AGAIN
0561	W	321110114607	01420	GETEXP SST	GETVAL+1,GETLOW,07	STORE BOTTOM THREE BITS
0567	W	341110	01430	BA	GETVAL+1	SHIFT LEFT...
0572	W	341110	01440	BA	GETVAL+1	
0575	W	341110	01450	BA	GETVAL+1	...THREE BITS
0600	W	1411461110	01460	MCW	GETLOW,GETVAL+1	RESTORE BOTTOM THREE BITS
0605	W	650533	01470	B	GETSHF+6	RETURN TO SHIFT LOOP
0610	W	3411071153	01480	GETADD BA	GETVAL,REMX10	ADD THE VALUE INTO THE RESULT
0615	W	341153	01490	GETMODBA	REMX10	MULTIPLY REMAINDER BY TEN
0620	W	341153	01500	BA	REMX10	
0623	W	3411071153	01510	BA	GETVAL,REMX10	
0630	W	341153	01520	BA	REMX10	
0633	W	650000	01530	GETX B	0	EXIT FROM THE GET SUBROUTINE
			01540*			
			01550*		-----PUT A VALUE INTO STORE USING THREE BIT PACKING-----	
			01560*			
0636	W	24104170	01570	PUT SCR	PUTX+2,70	STORE THE RETURN ADDRESS
0642	W	40	01580		NOP	
0643	W	3401001141	01590	PUTMRK BA	NOP,DIVID-2	ADD A MARKER TO THE VALUE...
0650	W	230643	01600		CW PUTMRK	...AND PREVENT ANY MORE
0653	W	540774114420	01610		BCC PUTPK,DIVID+1,20	DO PACKING IF A CHARACTER IS WAITING
			01620*		-----	
0661	W	3310231070	01630	PUTMEM C	PUTPUT+4,LOWADD	TEST FOR BOTTOM OF STORE.
0666	W	65070241	01640		BCT PUTOK-1,41	IF SO NOTE THAT...
0672	W	230703	01650		CW PUTOK	STORE ISN'T EMPTY TO THE BOTTOM...
0675	W	1410741023	01660		MCW PUTHI,PUTPUT+4	AND CONTINUE AT THE TOP OF MEMORY.
			01670*		-----TEST WHETHER THE STORE IS FULL---	
0702	W	40	01680		NOP	THIS SKIPS THE NEXT INSTRUCTION...
0703	W	650731	01690	PUTOK B	PUTMOV	IF WE NEED TO TEST FOR SPACE.
0706	W	1410231100	01700		MCW PUTPUT+4,PUTCHK	CHECK FOR AVAILABLE EMPTY MEMORY...
0713	W	3510601100	01710		BS FOUR,PUTCHK	BETWEEN GET AND PUT POINTERS.
0720	W	3304211100	01720		C GETGET+2,PUTCHK	IF MEMORY IS FULL...
0725	W	65105041	01730		BCT ENDNOW,41	TERMINATE THE PROGRAM.
			01740*		-----	
0731	W	1511431144	01750	PUTMOV LCA	DIVID,DIVID+1	MOVE THE VALUE OVER ONE.
0736	W	3310531143	01760		C ZERO,DIVID	CHECK FOR LEADING ZEROES...
0743	W	65075245	01770		BCT *+7,45	
0747	W	221144	01780		SW DIVID+1	AND IF SO TRUNCATE THE VALUE.
0752	W	3311441062	01790		C DIVID+1,SEVEN	CHECK FOR EMPTY HALF CHARACTER...
0757	W	65101741	01800		BCT PUTPUT,41	
0763	W	201144	01810		SI DIVID+1	AND IF SO MARK FOR PACKING...
0766	W	541037114410	01820		BCC PUTX,DIVID+1,10	BUT IF THE END OF THE VALUE EXIT
0774	W	341143	01830	PUTPK BA	DIVID	START PACKING...
0777	W	341143	01840		BA DIVID	BY MOVING UP THREE BITS...
1002	W	341143	01850		BA DIVID	
1005	W	321143114470	01860		SST DIVID,DIVID+1,70	ADDING THE THREE NEW BITS IN...
1013	W	14	01870		MCW	AND MOVING THE REST BACK...

1014 W	141053	01880	MCW	ZERO	WITH A LEADING ZERO.	
1017 W	1511443777	01890	PUTPUT	LCA	DIVID+1, TOP	STORE THE CHARACTER PLUS A FEW...
1024 W	3510551023	01900	BS	ONE, *-1	BUT ONLY RECORD ONE AS STORED.	
1031 W	540661114430	01910	BCC	PUTMEM, DIVID+1, 30	IF LAST CHARACTER OF PREVIOUS VALUE...	
		01920*		...CHECK FOR	EMPTY SPACE BEFORE STORING THE NEW VALUE	
1037 W	540000114410	01930	PUTX	BCC	0, DIVID+1, 10	IF THIS IS THE LAST CHARACTER EXIT
1045 W	650731	01940	B	PUTMOV	OTHERWISE RETURN TO PROCESS THE NEXT.	
		01950*				
		01960*		-----END THE PROGRAM-----		
		01970*				
1050		01980	ENDNOW	EQU	*	
1050 W	451050	01990	H	ENDNOW	HALT LOCKS INTO END ROUTINE	
1053		02000	ENDSCP	EQU	*	END OF THE SAFE AREA FOR SCRIPTS
		02010*			FROM THIS POINT ON ITEM MARKS MAY APPEAR ON DATA	
		02020*				
		02030*		-----CONSTANTS-----		
		02040*				
1053 W	0000	02050	ZERO	DCW	#2B0	DON'T MAKE THIS ANY LONGER
1055	01	02060	ONE	DC	#1B1	KEEP THIS AFTER ZERO FOR A LONG ONE
1056 W	@A@	02070	PLSONE	DCW	#1AA	
1057 W	02	02080	TWO	DCW	#1B2	
1060 W	04	02090	FOUR	DCW	#1B4	FOR PUT STORE EMPTY SPACE CHECK
1061 W	05	02100	FIVE	DCW	#1B5	
1062 W	07	02110	SEVEN	DCW	#1B7	
1063 W	10	02120	EIGHT	DCW	#1B8	
1064 W	157470	02130	DIVMOD	DCW	#3B57144	EXCLUSIVE OR OF 25 AND 57121
1067 R	1165	02140	LLOWADD	DSA	BOTTOM+3	LOWEST RIGHT-HAND END OF STORED VALUE
		02150*				
		02160*		- THE FOLLOWING ADDRESSES FOR CODE MODIFICATION PRESERVE ITEM MARKS		
		02170*				
1071 W	0000	02180	GETHI	DSA	0	
1073 W	0000	02190	PUTHI	DSA	0	
1075 W	0000	02200	SCRSET	DSA	0	
		02210*				
		02220*		-----REUSABLE AREA-----		
		02230*		CONTAINS DIFFERENT FIELDS AT DIFFERENT TIMES		
		02240*		ROUTINES MUST SET THEIR OWN PUNCTUATION HERE		
		02250*		IF ANOTHER ROUTINE AFFECTS IT		
1077		02260	REUSE	EQU	*	
		02270*				
		02280*	LOOPB	FIELDS		
1077		02290	ORG	REUSE		
1077 W	1515	02300	PUTCHK	DCW	#2	WORK FIELD FOR PUT FREE SPACE CHECK
1101 W	151515	02310	DIV2N	DCW	#3	DIVISOR FOR 2N-1 DIVISION
1104 W	1515	02320	QUOT	DCW	#2	QUOTIENT FROM DIV ROUTINE
1106	1515	02330	GETVAL	DC	#2	GET ROUTINE WORK AREA - OVERLAPS QUOT
1110	151515	02340	DC	#3		GET ROUTINE SHIFTING SPACE

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02350* LOOPA FIELDS
1077      02360      ORG      REUSE
1077      02370      PITEMP RESV 11      USED TO SHIFT PI UP
1112      02380      PIPRIN RESV 1      START OF PRINT LINE
02390*
02400* -----FIXED FIELDS-----
02410*
02420* -----THE NEXT CHARACTER HAS A RECORD MARK TO END PRINTING-----
1113 R 3777      02430 LHIADD DSA TOP      TOP OF DATA STORE
1115 W 0000      02440 PWQUOT DCW #2B0      QUOTIENT FROM POWER DIVISION
1117 W 1515151515151515+02450 PI DCW #10      LAST 10 DIGITS OF PI (NOT ACCURATE)
1131 15      02460 DC #1      THIS EXTRA SPACE IS USED TO SHIFT PI
02470*
1132 W 000031      02480 PDIVIS DCW #3B25      DIVISOR FOR POWER DIVISION
02490*
02500* -----THE FOLLOWING THREE FIELDS MUST STAY TOGETHER-----
1135 W 151515      02510 DIVIS DCW #3      DIVISOR FOR DIV ROUTINE
1140 W 00000000      02520 DIVID DCW #4B0      DIVIDEND FOR ALL DIVISIONS AND...
02530*      ...ALSO DATA AREA FOR PUT ROUTINE
1144 15      02540 DC #1      STORE FOR PARTIALLY PACKED CHARACTER
02550*
1145 W 15      02560 GETCT DCW #1      SHIFT COUNTER FOR GET ROUTINE
1146 W 00      02570 GETLOW DCW #1B0      WORK AREA FOR BOTTOM THREE BITS
1147 W 15      02580 GETCHR DCW #1      STORE FOR PARTIALLY UNPACKED CHARACTER
1150 W 15151515      02590 REMX10 DCW #4      REMAINDER TIMES TEN FROM GET ROUTINE
1154      02600 GETWRK RESV 6      GET ROUTINE SHIFT LEFT WORK SPACE
02610*
02620* -----
1162      02630 BOTTOM EQU *      BOTTOM OF DATA STORAGE AREA
02640*
02650* -----INITIALISATION-----
02660* THE ENTIRE AREA FOLLOWING IS OVERWRITTEN BY THE DATA LATER
02670* -----
02680*
02690* ----THIS PEDANTIC ROUTINE CALCULATES THE FIRST DECIMAL PLACES OF PI ---
02700* IT CAN COPE WITH THE SPECIAL CONDITIONS ARISING DURING EARLY
02710* CALCULATION CYCLES BUT IT WASTES STORAGE SPACE.
02720* ONCE THE MAIN LOOPS A & B HAVE TAKEN CONTROL IT IS OVERWRITTEN BY DATA
02730* -----
02740*
1162 W 1402521076      02750 INIT MCW SCRGET+4,SCRSET      SET CORRECT ITEM MARKS FOR RESET
1167 W 1404211072      02760 MCW GETGET+2,GETHI      DITTO
1174 W 1410231074      02770 MCW PUTPUT+4,PUTHI      DITTO
02780*
02790* -----SET UP THE INITIAL DATA STORE-----
02800*
1201 W 1520121143      02810 LCA REM1,DIVID      FIRST POWER REMAINDER

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1206 W	650636	02820	B	PUT	STORE IT	
1211 W	1520161143	02830	LCA	REM2,DIVID	SECOND POWER REMAINDER	
1216 W	650636	02840	B	PUT	STORE IT	
1221 W	1520161143	02850	LCA	REM2,DIVID	RESET DIVID TO FOUR CHARACTERS	
1226 W	351143	02860	BS	DIVID	2N-1 REMAINDER IS ZERO	
1231 W	650636	02870	B	PUT	STORE IT	
		02880*				
		02890*	-----STARTUP LOOP-----			
		02900*				
1234 W	230407	02910	LOOPI	CW	GETNUL	ENABLE GETTING VALUES
1237 W	3710552002	02920		S	ONE,COUNTI	DECREMENT LOOP COUNTER
1244 W	65154160	02930		BCT	LASTI,60	CHECK FOR LAST TIME THROUGH
1250 W	1511311111	02940		LCA	PI+1,PITEMP	MOVE DIGITS TO PRINT AREA
1255 W	1411111130	02950		MCW	PITEMP,PI	SHIFT PI DIGITS UP ONE
1262 W	1510551103	02960		LCA	ONE,DIV2N	SET 2N-1 DIVISOR TO 1
1267 W	1403441454	02970		MCW	ADDOP,ADSUBI	SET FIRST PI ADJUSTMENT TO ADD
		02980*				
		02990*	-----STARTUP TERMS LOOP-----			PROCESSES EACH STORED TERM
		03000*				
1274 W	650377	03010	TERMSI	B	GET	GET POWER REMAINDER TIMES TEN
1277 W	1511531143	03020		LCA	REMX10,DIVID	
1304 W	3417771143	03030		BA	QUOT1,DIVID	ADD IN PREVIOUS QUOTIENT FOR 25
		03040*	-----DIVIDE BY 25-----			
1311 W	1520171137	03050		LCA	DIVIS1,DIVIS	
1316 W	650320	03060		B	DIV	
1321 W	321105177717	03070		SST	QUOT,QUOT1,17	
		03080*	-----STORE THE REMAINDER-----			
1327 W	650636	03090		B	PUT	
		03100*	-----PROCESS THE SECOND POWER-----			
1332 W	650377	03110	NOW25	B	GET	
1335 W	1511531143	03120		LCA	REMX10,DIVID	
1342 W	3420001143	03130		BA	QUOT2,DIVID	ADD IN PREVIOUS QUOTIENT FOR 57121
		03140*	-----DIVIDE BY 57121-----			
1347 W	1520221137	03150		LCA	DIVIS2,DIVIS	
1354 W	650320	03160		B	DIV	
1357 W	321105200017	03170		SST	QUOT,QUOT2,17	
		03180*	-----CHECK WHETHER SIGNIFICANT FIGURES ARE PRESENT YET-----			
1365 W	3310531143	03190		C	ZERO,DIVID	CHECK FOR ZERO REMAINDER
1372 W	65141442	03200		BCT	PUT239,42	IF SO SKIP THE COUNTER UPDATE
1376 W	3320041103	03210		C	CNT239,DIV2N	CHECK WHETHER HIGHER THAN BEFORE
1403 W	65141443	03220		BCT	PUT239,43	AND SKIP UPDATE IF NOT
1407 W	1411032004	03230		MCW	DIV2N,CNT239	ELSE UPDATE THE COUNTER
		03240*	-----STORE THE REMAINDER-----			
1414 W	650636	03250	PUT239	B	PUT	
		03260*	-----PROCESS THE 2N-1 TERM-----			
1417 W	650377	03270	D02NI	B	GET	
1422 W	1511531143	03280		LCA	REMX10,DIVID	

1427 W	3417771143	03290	BA	QUOT1, DIVID	ADD IN QUOTIENT FOR 25
1434 W	3520001143	03300	BS	QUOT2, DIVID	SUBTRACT QUOTIENT FOR 57121
		03310*	-----DIVIDE BY 2N-1 -----		
1441 W	1511031137	03320	LCA	DIV2N, DIVIS	
1446 W	650320	03330	B	DIV	
		03340*	-----STORE THE REMAINDER-----		
1451 W	650636	03350	B	PUT	
		03360*	-----ADJUST PI-----		
1454 W	3611051130	03370	ADSUBI	A QUOT, PI	ON ALTERNATE TERMS THIS LINE
1461 W	3010551454	03380	HA	ONE, ADSUBI	FLIPS BETWEEN ADD AND SUBTRACT
		03390*	-----		
1466 W	3320061103	03400	C	CNT25, DIV2N	TEST FOR LAST OLD TERM
1473 W	3410571103	03410	BA	TWO, DIV2N	INCREASE 2N-1 DIVISOR FOR NEXT TERM
1500 W	65127441	03420	BCT	TERMSI, 41	RETURN TO PROCESS NEXT TERMS
1504 W	3310532000	03430	C	ZERO, QUOT2	CHECK FOR MORE 239 TERMS NEEDED
1511 W	65152644	03440	BCT	*+13, 44	IF SO GO TO ADD MORE TERMS
1515 W	3310531777	03450	C	ZERO, QUOT1	CHECK FOR MORE 25 TERMS NEEDED
1522 W	65123442	03460	BCT	LOOPI, 42	EXIT TERMS LOOP IF NOT
1526 W	1411032006	03470	MCW	DIV2N, CNT25	UPDATE 25 COUNTER
1533 W	220407	03480	SW	GETNUL	STOP GETTING OLD VALUES
1536 W	651274	03490	B	TERMSI	RETURN TO CREATE MORE TERMS
		03500*			
		03510*	-----LAST PASS TO REMOVE UNWANTED REMAINDERS-----		
		03520*			
1541 W	1420260617	03530	LASTI	MCW GETONE, GETMOD	CHANGE GET TO GET ONCE TIMES VALUE
1546 W	1510551103	03540		LCA ONE, DIV2N	SET 2N-1 DIVISOR TO 1
1553 W	650377	03550	LST1	B GET	GET 25 REMAINDER
1556 W	1511531143	03560		LCA REMX10, DIVID	PREPARE TO REWRITE IT
1563 W	40	03570		NOP	
1564 W	651605	03580	LST2	B LST3	SKIPS THE ZERO TEST LATER
1567 W	3310531153	03590		C ZERO, REMX10	CHECK FOR ZERO
1574 W	65161042	03600		BCT LST3+3, 42	IGNORE IF SO
1600 W	2206431564	03610		SW PUTMRK, LST2	ELSE SET A MARKER AND SKIP TEST
1605 W	650636	03620	LST3	B PUT	STORE THE 25 REMAINDER
1610 W	650377	03630		B GET	GET 57121 REMAINDER
1613 W	1511531143	03640		LCA REMX10, DIVID	PREPARE TO REWRITE IT
1620 W	3320041103	03650		C CNT239, DIV2N	CHECK FOR SIGNIFICANT VALUE
1625 W	65166544	03660		BCT LST5+3, 44	IGNORE IF NOT
1631 W	65164641	03670		BCT LST4, 41	STORE IF NOT THE LAST ONE
1635 W	650636	03680		B PUT	STORE IT
1640 W	220643	03690		SW PUTMRK	SET MARKER ON THE NEXT VALUE
1643 W	651665	03700		B LST5+3	SKIP TO NEXT VALUE
1646 W	3310551103	03710	LST4	C ONE, DIV2N	CHECK FOR FIRST VALUE
1653 W	65166244	03720		BCT LST5, 44	SKIP SETTING MARKER IF NOT
1657 W	220643	03730		SW PUTMRK	SET MARKER ON THE VALUE
1662 W	650636	03740	LST5	B PUT	STORE THE VALUE
1665 W	650377	03750		B GET	GET 2N-1 REMAINDER


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1670 W 1511531143      03760      LCA  REMX10,DIVID      PREPARE TO REWRITE IT
1675 W 3320061103      03770      C    CNT25,DIV2N      CHECK FOR LAST VALUE
1702 W 65172142        03780      BCT  LST6,42          IF SO SKIP TO END ROUTINE
1706 W 650636          03790      B    PUT              STORE THE VALUE
1711 W 3410571103      03800      BA   TWO,DIV2N        INCREMENT 2N-1 DIVISOR
1716 W 651553          03810      B    LST1             RETURN FOR NEXT TERMS
1721 W 220643          03820  LST6  SW   PUTMRK        SET MARKER
1724 W 650636          03830      B    PUT              STORE LAST VALUE
1727 W 1406220617      03840      MCW  GETMOD+3,GETMOD   RESET GET TO MULTIPLY BY TEN
03850*
03860* -----END OF THE STARTUP PROCESS-----
03870* -----SO PRINT THE CURRENT FIGURES-----
03880*
1734 W 1511311111      03890  ENDI  LCA  PI+1,PITEMP      MOVE DIGITS TO PRINT AREA
1741 W 1411111130      03900      MCW  PITEMP,PI         SHIFT PI DIGITS UP ONE
1746 W 1410771112      03910      MCW  PITEMP-10,PIPRIN  MOVE FIRST DIGIT TO PRINT AREA
1753 W 661112110200    03920      PDT  PIPRIN,11,02,00    PRINT CHARACTER
1761 W 641761110210    03930      PCB  *,11,02,10        WAIT UNTIL PRINTING FINISHED
1767 W 1420231112      03940      MCW  DPOINT,PIPRIN    INSERT A DECIMAL POINT TO PRINT
1774 W 650271          03950      B    STARTA           TRANSFER CONTROL TO THE MAIN LOOP
03960*
03970* -----DATA USED BY THE STARTUP ROUTINE ONLY-----
03980*
1777 W 00              03990  QUOT1  DCW  #1B0          QUOTIENT FROM PREVIOUS DIVISION BY 25
2000 W 06              04000  QUOT2  DCW  #1B6          QUOTIENT FROM PREVIOUS DIVISION BY 57121
04010* NEEDS 6 TO MAKE THE FIRST DIVIDEND 956
2001 W @11@           04020  COUNTI DCW  #2A11        STARTUP LOOP COUNTER
2003 W 0001           04030  CNT239 DCW  #2B1          2N-1 VALUE OF LAST NON-ZERO 57121 REMAINDER
2005 W 0001           04040  CNT25  DCW  #2B1          2N-1 VALUE OF LAST 25 REMAINDER
04050* -----CONSTANTS-----
2007 W 00000010       04060  REM1   DCW  #4B8          INITIAL REMAINDER FOR DIVISION BY 25
2013 W 00000137       04070  REM2   DCW  #4B95        INITIAL REMAINDER FOR DIVISION BY 57121
2017 W 31             04080  DIVIS1 DCW  #1B25        25 DIVISOR
2020 W 157441         04090  DIVIS2 DCW  #3B57121     57121 DIVISOR
2023 W @.@            04100  DPOINT DCW  #1A.         DECIMAL POINT
2024 W 650633         04110  GETONEB GETX          MODIFIER TO GET ONCE TIMES THE VALUE
04120*
04130* -----START OF PROGRAM - REMOVE UNWANTED WORD MARKS-----
04140*
2027 W 2301010643     04150  START  CW   GOPUT,PUTMRK
2034 W 2315640511     04160      CW   LST2,GETOVR
04170*
04180* -----SUPERIMPOSE THE SCRIPT ON THE PROGRAM CODE-----
04190*
2041 W 542052213702   04200  SCRST1 BCC  *+9,SCRCOD-4,02  TEST TOP BIT AND...
2047 W 200000          04210      SI   0                  ...SET ITEM MARK IF ZERO
2052 W 3410552051     04220      BA   ONE,*-1           MOVE TO NEXT CODE CHARACTER

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2057	W	342143	04230	BA	SCRCOD	MOVE TO NEXT BIT
2062	W	3710552132	04240	S	ONE,BITCNT	DECREMENT BIT COUNTER
2067	W	65207660	04250	BCT	*+7,60	EXIT LOOP WHEN ZERO
2073	W	652041	04260	B	SCRST1	LOOP BACK FOR NEXT BIT
2076	W	3710552136	04270	S	ONE,SCRCNT	DECREMENT INSTRUCTION COUNTER
2103	W	65116260	04280	BCT	INIT,60	EXIT LOOP WHEN ZERO
2107	W	1421502143	04290	MCW	SCRCOD+5,SCRCOD	GET NEXT INSTRUCTION
2114	W	3410612111	04300	BA	FIVE,*-3	MOVE TO NEXT INSTRUCTION
2121	W	1421342132	04310	MCW	BITRES,BITCNT	RESET BIT COUNTER
2126	W	652041	04320	B	SCRST1	LOOP BACK TO DO NEXT INSTRUCTION
			04330*			
2131	W	@30@	04340	BITCNT DCW	#2A30	BIT COUNTER
2133	W	@30@	04350	BITRES DCW	#2A30	NUMBER OF BITS PER INSTRUCTION
2135	W	@18@	04360	SCRCNT DCW	#2A18	NUMBER OF SCRIPT INSTRUCTIONS
			04370*			
			04380*	-----SCRIPT CODE - ONLY FIVE CHARACTER INSTRUCTIONS ALLOWED-----		
			04390*			
			04400*	--START POWER CALCULATIONS SCRIPT--		
2137	W	2200050005	04410	SCRCODSW	POWSW,POWSW	
2144	W	3010550202	04420	HA	ONE,PWENDN	
2151	W	3010661134	04430	HA	DIVMOD,PDIVIS	
2156	W	3010550115	04440	HA	ONE,SUBPOW	
2163	W	6500260000	04450	B	CALCPW,00,00	
2170	W	3310531143	04460	C	ZERO,DIVID	
2175	W	6501104242	04470	BCT	CALC2N,42,42	
2202	W	2206430101	04480	SW	PUTMRK,GOPUT	
2207	W	2301050105	04490	CW	GOSCPT,GOSCPT	
2214	W	6501010000	04500	B	GOPUT,00,00	
			04510*	--STOP POWER CALCULATIONS SCRIPT--		
2221	W	6501770000	04520	B	PWEND1,00,00	
2226	W	6501500000	04530	B	PWEND2,00,00	
			04540*	--LOOP A END / START SCRIPT--		
2233	W	1511311111	04550	LCA	PI+1,PITEMP	MOVE DIGITS TO PRINT AREA
2240	W	1411111130	04560	MCW	PITEMP,PI	SHIFT PI DIGITS UP ONE
2245	W	1410771112	04570	MCW	PITEMP-10,PIPRIN	MOVE FIRST DIGIT TO PRINT AREA
2252	W	3103440130	04580	EXT	ADDOP,ADDSUB	SET FIRST PI ADJUSTMENT TO ADD
2257	W	6502710000	04590	B	STARTA,00,00	GO TO PRINT LOOP A
2264	W	1410760252	04600	MCW	SCRSET,SCRGET+4	RESTART THE SCRIPT
			04610*	-----		
2027			04620	END	START	

Emulation started -----

3.14159265358979323846264338327950288419716939937510582097494459230781640628620899862803482534211706798214808651328230664709384460
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Emulation completed -----

Elapsed H200 processor time 0:14: 1.9 772 characters printed

FINAL OCTAL MEMORY DUMP - 32 CHARACTERS PER LINE - R=RECORD MARK, W=WORD MARK, I=ITEM MARK

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R34 10 I57 I11 03 I65 I00 I23 R15 I11 I16 I11 I43 R35 I11 16 R65 00 I54 R65 I03 I77 R15 I11 I53 I11 I43 W34 I11 16 I11 43
W15 I11 I34 R65 I03 I20 W32 I11 I05 I11 16 I17 W65 03 I77 W33 I10 I61 I11 I50 W65 I01 I00 I41 R35 I10 61 I11 I50 W22 01 I05
R40 I65 I06 I36 W40 I65 I02 I24 W15 11 I53 11 43 R35 I11 I16 11 I43 R15 11 I03 W65 03 20 R36 I11 I05 11 30 R30 I10 I55
I01 I30 W65 I06 I36 R65 00 I00 W23 01 I01 W22 I06 I43 R54 I01 I10 04 I07 I10 W14 10 I76 02 52 W23 I01 05 R65 01 I10 R23
I00 I05 R23 I04 I07 W33 I10 53 11 I16 R65 I01 I10 I45 R40 I65 I01 I50 I00 I00 R35 I02 I23 W32 01 I00 02 23 I77 R54 02 I17
I02 I16 02 R34 02 I23 W54 02 I61 I00 00 I20 R30 10 55 I02 I23 R34 10 55 02 52 R65 02 I35 W66 I11 I12 I11 I02 I00 W64
I02 I77 11 I02 I10 R15 10 I55 I11 I03 W23 I04 07 R65 I00 I54 W24 I03 I76 70 R15 I10 54 I11 I05 R54 I03 54 11 I40 02 R35
I11 I37 11 43 R36 I10 I55 I11 I05 W65 I03 I31 R34 I11 I37 11 I43 W37 I10 I55 11 05 R54 I03 I54 I11 I40 02 R65 I01 I30 W24
I06 35 I70 R35 I11 I53 R40 65 I06 I33 R14 11 I47 11 10 W15 I20 04 R24 04 I21 I67 R33 I04 I21 10 I70 R65 I04 I47 I41 W14
I10 I72 I04 I21 R22 I07 I03 R35 I11 I45 R36 I10 55 11 I45 W54 I04 75 I11 I07 I10 R15 I11 11 11 12 W65 04 52 W14 I11 I07
I11 I47 R54 I05 I11 I11 I07 I20 R40 I32 10 53 I11 07 I70 W23 I11 I07 R15 I10 I53 W54 05 I61 11 I10 I20 R37 I10 I55 I11 I45
R65 I06 I10 I60 R15 I11 I12 I11 I61 R15 11 61 I11 11 R65 I05 25 R32 I11 10 I11 46 07 R34 I11 10 R34 I11 10 R34 I11 10
R14 I11 46 I11 I10 W65 I05 I33 W34 11 I07 I11 I53 R34 11 I53 R34 11 I53 R34 11 I07 I11 53 R34 I11 53 R65 I00 57 R24 10
 41 I70 R40 I34 I01 I00 11 41 R23 I06 I43 R54 07 I74 I11 I44 20 W33 10 23 10 70 R65 I07 02 I41 R23 07 I03 R14 10 I74
10 I23 R40 65 07 I31 R14 10 I23 I11 I00 R35 10 60 11 I00 R33 04 I21 I11 I00 R65 I10 I50 I41 W15 I11 43 11 I44 R33 I10
 53 11 I43 W65 I07 52 I45 R22 I11 I44 W33 I11 44 10 62 R65 I10 17 I41 R20 I11 I44 R54 I10 I37 I11 I44 I10 R34 I11 I43 R34
11 43 R34 I11 I43 R32 11 I43 I11 I44 70 W14 W14 10 53 R15 I11 I44 I20 I07 W35 I10 55 I10 23 R54 06 I61 11 44 30 W54
 01 45 11 44 10 W65 07 31 W45 10 50 W00 00 01 W21 W02 W04 W05 W07 W10 W15 74 70 R11 65 R37 77 R37 I77 R00 00 R20
I03 W00 10 53 W00 23 W02 52 02 31 31 R37 77 W00 00 W02 11 07 10 00 04 11 11 07 27 15 W15 74 41 W00 10 53
W00 00 00 04 R30 W20 W02 W25 W00 00 32 44 W00 W00 I02 43 10 31 W14 W00 00 W00 R00 R11 47 R70 R31 65 R41 R71 56 R42
R64 30 W27 W26 R73 W12 72 W26 W57 R60 R70 I76 W21 W12 42 W17 W14 50 W15 W12 27 W30 W45 R50 R51 24 R72 W55 R10 R21 31 R10
R11 36 R41 R21 44 R51 R21 11 R71 R66 15 W14 W12 55 W13 W13 76 W16 W34 R65 W21 R40 R61 11 R56 W10 65 W20 W43 R60 R35 60
W24 W21 R61 R23 33 W14 W63 R20 R21 50 R02 W55 R21 R27 73 W15 W56 R62 R00 I35 W14 W12 26 W10 W11 R20 R70 I12 R61 W36 R52 W62
R20 R46 24 W20 W34 R12 R00 I33 W20 W40 R41 R61 15 R62 R53 47 W14 W65 R32 R56 52 W13 W17 R20 R71 31 R72 R64 32 W21 W11 11
W20 W11 62 W10 W47 R22 R20 I36 W22 W53 W20 W64 R37 W35 R40 R01 25 R20 R41 46 R32 W10 17 W26 W45 R31 R23 77 W14 W54 R32 R25
 42 W16 W63 R62 R30 I13 R21 R45 27 W11 W43 R40 R01 21 R76 W70 R31 R72 R12 R21 42 R02 R12 72 W30 W34 R52 R71 14 R02 R46 75
W16 W11 15 W12 W57 R01 R14 73 W16 W51 R12 R41 41 R62 R01 23 R74 I00 10 W12 30 W10 55 W53 R61 67 W11 73 W53 R35 64 W10
 60 W32 R41 34 R42 14 W54 R75 62 W13 30 W57 W12 32 W20 R07 21 W40 R44 75 W70 R61 60 W11 54 W35 R31 36 W35 R40 I14 R53
 72 W35 R41 24 R21 40 W67 R31 30 R65 35 W10 71 W13 R20 I12 R51 37 W64 R43 62 W46 W67 R66 51 W50 R61 25 R70 I11 R51 34
W25 R71 17 R21 14 R32 W64 R36 51 W36 R21 42 W53 R00 I13 R16 R21 12 R12 26 W14 R51 I12 W51 R70 R53 10 W14 R00 I20 W31 R00
I15 R11 I00 W10 14 W20 R70 I13 R41 17 R01 10 R31 47 W24 R70 W11 R61 14 R64 54 W47 W12 R01 61 W46 R31 10 R20 I63 W11 30
W37 R67 23 W76 R60 I12 R20 I72 W75 R71 75 W10 R71 10 R73 10 W71 R24 47 W14 R56 42 W62 R03 57 W30 R57 11 W11 R23 R17 31
W14 R20 I12 R03 56 W25 W00 00 R30 I11 R41 20 W53 R07 36 W20 R74 R60 I12 R60 I64 W12 R01 63 W16 R32 44 W10 R12 55 W65 R17
 42 W64 R40 I56 W51 R01 37 W16 R76 16 W70 R74 23 W66 R31 32 W27 W20 R55 50 W51 R75 33 W37 R13 57 W60 R11 R75 77 W30 W22
R22 R41 75 W51 R66 10 W16 R61 57 W21 R40 I66 W47 R55 52 W34 R21 20 W35 R73 22 W31 W26 R35 55 W46 R12 55 W54 R13 55 W63
R22 56 W60 R43 65 W65 R21 75 W61 R65 26 W76 W51 R44 47 W31 R65 R72 13 W16 R75 17 W34 W30 R40 I50 W34 W10 R15 R11 R61 46
W21 R15 17 W50 W57 R41 50 W36 R51 75 W10 W20 R10 R23 33 W13 R71 34 W32 R25 R64 53 W17 R50 I21 W16 R74 10 W24 R40 R52 56
W15 R74 R37 R44 16 W31 R06 R50 I40 12 R01 33 R63 63 W57 15 R57 R74 51 W44 W14 27 63 W15 R61 35 34 R40 I26 W24 35 R54
R71 I06 R12 33 W15 13 75 W25 R74 74 51 W10 R74 I31 R34 60 W10 45 76 W40 R51 40 63 R04 26 W13 24 72 W47 W25 I04 W20
R51 56 47 R76 R41 22 37 R63 43 W10 31 16 W30 W13 41 R65 R51 53 40 W16 R01 24 31 R01 43 W74 37 W25 R07 24 45 W20
R11 36 53 R22 72 W13 17 W20 R70 I10 67 R43 24 W11 10 62 W20 R50 I37 65 W33 R31 34 76 R24 13 W61 43 R33 51 W11 45
 16 W20 W26 36 R43 47 W32 30 R51 11 W12 32 75 W23 R42 54 27 W15 R61 36 30 R12 21 W12 11 61 W30 R75 65 50 W10 R07
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R70 I14 16 R33 R07 40 60 W26 R01 30 54 R21 14 W64 25 R31 77 W75 57 R06 R13 76 22 W24 R57 26 62 W30 W37 I06 W13 R16

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44	63	W13	R31	26	13	R74	W11	41	62	W30	W13	70	57	W32	W13	36	R12	21	W14	53	75	W16	R11	13	53	R32	72	W43	I54	W23	R20
I46	74	W17	R11	16	21	R00	I27	W14	61	66	W12	W46	25	R01	60	W41	57	W12	R53	I13	R62	R33	41	65	W26	W10	13	R47	R56	31	17
W67	W74	61	R04	W65	67	W11	R65	20	R11	23	W10	25	40	W23	R61	27	55	W15	R71	50	20	R20	R41	40	24	R12	32	W10	16	54	W13
R41	37	I40	W12	R00	I61	24	W16	W57	10	W20	R11	10	55	R71	R31	33	56	R70	R41	35	14	W71	W33	30	R21	12	W76	I73	W17	R37	57
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I33	R61	11	W44	67	R46	R41	53	72	R35	R07	11	R11	33	W66	71	R42	R61	45	53	R11	R31	44	67	W12	R67	77	30	W15	R24	12	10
W37	W14	42	16	W11	R23	56	75	W25	W13	I21	R62	R21	44	65	R15	R21	40	76	R20	I13	W15	66	R45	W15	50	30	W73	W14	30	63	W65
W14	50	41	W24	W11	I26	R66	R41	11	73	W57	W15	63	33	W30	W66	75	R41	R00	I25	26	W10	R70	I71	R57	R51	77	43	W26	W65	61	R43
W15	71	W73	W37	I30	W71	W16	67	R75	R35	I67	R16	W13	24	51	W37	W15	66	14	W52	W13	54	14	W56	W15	65	32	W44	W32	44	R10	R72
47	47	W45	W42	22	R45	R41	51	76	R61	R01	36	62	W11	W11	27	42	W43	W13	27	54	W11	W16	53	R64	R11	51	15	R34	R35	44	R63
R40	I64	74	W13	W14	I20	R51	R37	16	37	W30	W13	42	40	W27	W11	77	36	W13	W52	27	R67	W14	11	43	W21	W51	63	R70	R01	32	73
R21	R01	13	35	R70	R45	74	23	W13	W20	22	R30	R61	26	70	R41	R01	44	13	R40	R31	51	25	R30	R44	I01	R31	W56	51	R00	W52	21
20	W40	I00	R00	R70	R73	W26	R20	R06	W25	W56	R32	R41	76	R31	R11	13	R42	R11	31	R70	R41	41	R41	R67	40	W14	W20	70	W21	W55	R72
R71	56	R02	W11	15	W26	W37	R11	R31	24	R63	R01	R11	R61	63	R20	R41	35	R02	R10	I23	R21	R50	I26	R10	R01	27	R40	R14	35	W10	W17
46	W13	W56	R11	R52	50	W11	W53	R01	R57	R00	R61	13	R40	R40	I20	R33	W15	44	W10	W57	R27	W13	54	W20	W11	R60	R21	I26	W30	W16	R01
R22	R40	R11	56	R41	R31	72	R40	R31	47	R51	R21	43	R00	R34	76	W16	W12	77	W11	W27	R62	R41	46	R13	W16	31	W26	W42	R00	R11	60
R70	R47	45	W20	W16	12	W10	W17	R11	R31	61	R20	R41	56	W22	W43	R60	R61	I56	W15	W33	R22	R16	R47	W26	R61	R10	R64	W55	R62	R71	41
R51	R76	63	W30	W16	77	W23	W65	R02	R76	55	W10	W14	31	W17	W10	R61	R71	62	R46	W42	R21	R01	I35	W16	W15	R61	R61	34	R31	R37	50
W30	W14	R10	R71	64	R61	R11	61	R56	W37	R30	R22	37	W27	W27	R60	R47	47	W25	W14	R37	W36	R21	W57	R42	W12	R50	R21	41	R30	R51	57