

1.	171'	✓	8' 200
i)	[0 0 0 0 0 0 0 0 0   0 0 1 1 1 1   1 0 0 0 0   1 0 0 1 0 0 0 0 0 0]		
ii)	[0 1 0 0 0 1 0 0 0   0 0 0 0 0 0   0 0 1 0 0 0 1 1 0 0 0 0 0   1 0 0 0 0 1]		102' 6 ✓
iii)	[1 0 0 1 0 1 0 1 1 1 1   1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 1 1]	11' 191 ✓	113' ✓

6.

2. Input tape - Blanks ( go telecode ch. )

Store in Locs. 10-24. Assume 6 ch each.

128) 100' 17, 11' ~~E17~~ <sup>-13</sup>

Reject blanks, find open bracket - set count.

129) 10', , 102' 6 <sup>8' 30</sup>

Put count in 1151

130) 102' 6, 10' 23/1

Start off IAR for 6 ch, store + B line 1.

loop

131) 12' 130, 104'

After completion, move remaining contents of IAR to Acc.

6.

132) 10' 24 8' 133

Total to Loc 24. Dynamic Reg.

133) 8' 133

3. Constants required in K Register.  
from notes.

i) 4 digits of yards required /  $\times \frac{1}{3}$  Base = 36.

$$\underline{\text{Constant}} = 10^3 \times 36 \times 2^{-31}$$

$$= 1000 \times 36 \times 2^{-31}$$

$$= \underline{36,000 \times 2^{-31}}$$



ii) 3 digits of £'s per shillings & pence from pence ( $2^{-31}$ )

£ Constant =  $10^2 \times 240 \times 2^{-31}$

(3 digits) =  $100 \times 240 \times 2^{-31}$

$$= 24,000 \times 2^{-31}$$

$$\underline{24,000 \times 2^{-31}}$$



Shgs Constant =  $10^1 \times 12 \times 2^{-31} \times 10^2$

(2 digits) =  $120 \times 2^{-31} \times 10^2$

$$= 12,000 \times 2^{-31}$$

$$\underline{12,000 \times 2^{-31}}$$



Pence Constant =  $10^1 \times 1 \times 2^{-31} \times 10^3$

(2 digits) =  $10,000 \times 2^{-31}$

$$\underline{10,000 \times 2^{-31}}$$



<u>3 digits of tons, then arts, gms, lbs, cgs from cgs <math>\times 2^{-31}</math></u>		
<u>3(iii)</u>	<u>Ops.</u>	<u>Digits</u>
Ton	35,840	3
Cwt	1792	2
Gms	448	1
lbs	16	2
cgs	1	2

$$\text{Tons Constant} = 10^2 \times 35840 \times 2^{-31}$$

$$(3 \text{ digits}) = 100 \times 35840 \times 2^{-31}$$

$$= 3584000 \times 2^{-31}$$

$$\underline{3584,000 \times 2^{-31}}$$

$$\text{Cwts Constant} = 10^1 \times 1792 \times 2^{-31} \times 10^2$$

$$(2 \text{ digits}) = 17920 \times 2^{-31} \times 10^2$$

$$= 1792000 \times 2^{-31}$$

$$\underline{1,792,000 \times 2^{-31}}$$

$$\text{Gms Constant} = 10^0 \times 448 \times 2^{-31} \times 10^3$$

$$(1 \text{ digit}) = 448,000 \times 2^{-31}$$

$$\underline{448,000 \times 2^{-31}}$$

$$\text{lbs Constant} = 10^1 \times 16 \times 2^{-31} \times 10^3$$

$$(2 \text{ digits}) = 160 \times 2^{-31} \times 10^3$$

$$= 160000 \times 2^{-31}$$

$$\underline{160,000 \times 2^{-31}}$$

18

$$\text{Ounces Constant} = 10^1 \times 1 \times 2^{-31} \times 10^4$$

$$(2 \text{ digits})$$

$$\underline{100,000 \times 2^{-31}}$$

		<u>Constants</u>	
4.	Requirements :- £ 3 digits =	24,000	} See answer to question 3(ii)
	1 2 " =	12,000	
	d 2 " =	10,000	

Pence held in 1AS 3. Start in d4.

Program.

- 64) 110'27 , 11'[24,000]      Output five shifts.  
       Set up £ constant in d.
- 65) 113' , 11'3      Set K Reg. for £5.  
       Transfer total pence from 1AS 3 to d.
- 66) 114'3 , 111'2      Output 3 integers (£5)  
       Output 2 spaces
- 67) 11'[12,000] , 113'      Set up shillings constant in d.  
       Reset K Reg. for shillings.
- 68) 116'2 , 111'2      Output 2 characters (shillings)  
       Output 2 spaces.
- 69) 11'[10,000] , 113'      Set up pence constant in d.  
       Reset K Reg. for pence.
- 70) 116'2 , 8'  
     8'0/1      Output 2 characters (pence).  
                     Back to main program.

12.

## 5. Requirements

1. Bring Sector 20 (price increases) into WS. (Say locs. 448-511)
2. " " 50 (Price, code + Stock Level) into WS. (Say locs 128-191)
3. Compare 1 and 2 above, location by location, until code numbers match.
4. Then add the increment to the present price (both at  $2^{-15}$ ) to give amended price & store in say 320-383.
5. Extract stock level (from basic date  $2^{-31}$ ) and multiply by increment (from preceding data at  $2^{-15}$ ) and store the answers (Say in locs. 384-447)
6. When a sign digit is reached, go on to next deposit's data. )
7. Transfer total contents of locations 384-447 (the increments) to AS 3 at  $2^{-15}$ . ~~10000000~~

Program on next sheet

S. (Continued) (Say Program starts in 64.)

Program. (All locations &amp; Acc. assumed to be clear).

Position  
Program in  
64 etc.

64) 120'20 , 128 = 448

Bring Sector 20 (price increase) into W's.

65) 144 = 464 , 160 = 480

Transfer whole sector (4 lines) to end of W's as constants.

66) 176 = 456 , 8' 67

Start main routine at 67

67) 120'50 , 8' 68

Bring down Sector 50 (first deposit info) to locs. 128-151 of W's

68) 11' [-63] , 10' 2

Set count for above locs 128-151

69) 11' 191/2 Bring  
Nov 1st  
value 5' 9

Put count in 1AS2

70) 1 [ ] , 10' 1

Put (C) 191 to  $\bar{D}$ .

71) 11' 448 , 10' 3

Left Shift to 2-11

72) 11' 3 , 5' 9

Collate -Code No extracted

73) 2' 1 , 12' 68

Put code no in 1AS1

74) 4' 0 , 8' 75

Put (C) 448 to  $\bar{D}$ .

75) 11' 3 , 13' 16

Copy to 1AS3 for ref.

76) 10' 1 , 11' 191

Copy back to  $\bar{D}$ 

77) 13' 16 , 0' 1

Leftshift 9 times to isolate code no.

78) 10' 383 , 8' 79

Subtract 1AS1 (Code) from  $\bar{D}$  (Code)

So back to 68 until codes match.

Clear  $\bar{D}$ .

Rewrite to appropriate sectors and sector order.

Copy 1AS3 to  $\bar{D}$  (C loc 448)

Routine required to (a) multiply stock level by movement to stores

R shift 16 times to get rid of code

(b) provide for "sign digit" function.

Put 191 to  $\bar{D}$ Put 191 to  $\bar{D}$ 

R shift 16 time.

Add 1AS1 to  $\bar{D}$  to get updated value.

Put total updated value in 383.

and sector order.

Sorry I have left it too late to complete.. D.S. 21/07/61

Modulo sum, Red  
Word Times - Parallel

1.	(a) 12 140)	10 0	11 144, 10 200	13 16)	10 0	10 2
	(b) 13 141)	11 2	13 5, 10 201	(c) 14 16)	11 2	33 11 6 331

(c) 200)	17 1 14 33,	17 2 14 50
201)	17 3 14 67	1 1 8 16

	(a)	(b)	(c)
Start. →	Segment 12	Segment 13	Segment 8
1. Order to OR.	1	1	1
2. Adds. come with :-	0	11	1
3. Function	1	1	17
4. Adds. come with :-	8	7	2
5. Function	1	1	17
6. Adds. come with → 13	14	14	9
7. Order to OR, →	1	1	1
8. adds come with :- 5	7	0	3
9. Function	6	1	17
90. Adds. come with :- 9	6	11	1
16. Function	1	33	1
	56	59	92

✓

X

X

 SEE SUGGESTED  
ANSWERS

Selway

**NATIONAL-ELLIOTT 405 PROGRAMME SHEET**

LABEL : Revision Exercise 3. Question 2. SHEET No.:

ORDERS							NOTES	
Address	F'	A	/	B	F'	A	/	
0 64	4	11	0		105	6		Clear Acc Test Parity
1 65	10	1			4	7	0	Clear 1AS1
2 66	10	2			4	8	0	Clear 1AS2
3 67	10	3			4	9	0	Clear 1AS3
4 68	120	11			11	191		Read in Sector 11 to 128 - 191. Put 191 into Acc.
5 69	11	[F63-2-12]			10	1		Set Count = 63. Put -63 count in 1AS1
6 70	4	0			8	71		Clear Acc
7 71	0	191	1		12	71		Put 191/1 in Acc. If 1AS1 non zero, go to 71 + add 1 to 1AS1
8 72	0	3			10	3		Put 1AS3 in Acc (Empty at start) " " back to 1AS3
9 73	11	64			0	[1]		Copy loca 64 to Acc - Add 1 to Acc
10 74	9	[ ]			10	64		Test negative.
11 75	8	68	?		8	76		
12 76	100	17			8	77		Reject Blanks or find open bracket
13 77	102	1			104	3		Input (
14 78						4		
15 79						5		
0 80						6		
1 81						7		
2 82						8		
3 83						9		
4 84						10		
5 85						11		
6 86						12		
7 87						13		
8 88						14		
9 89						15		
10 90						0		
11 91						1		
12 92						2		
13 93						3		
14 94						4		
15 95						5		

SIZE SUGGESTED

Answers

*Sorry for  
dark &  
reflected in  
glass*

*Read in  
tape & then  
tape off tape  
(first 64)  
(first loca  
in loca  
384 - 464)*

	<u>word Time</u>	<u>Reason</u>
1.(a)		
1	order to OR	12 - 7
1	wait	7 - 2
1	1st function	2 - 13
1	2 <sup>nd</sup> function	13 - 8
15	wait for Add Coin.	8 - 13

140) 11 144

	Work	Answers	Work
140)	1	Order to OR.	12-7
	11	Adds Coins	
	1 ✓	Function	
	7	Adds Coins	
	1 ✓	Calculator	
	1	Order to OR	
	13	Adds Coins	
	6 ✓	Calculator	
	14	Adds Coins	
	1 ✓	Calculator	

(12) 1(a) 140) 11' 144 . . . 10' 200  
           141) 13' 5        10' 201

		<u>word times</u>
15	1 Orders OR	1
1	2 Adds coincidence with 0	11
1	3 Function	1
15	4 Adds coincidence with 8	8
1	5 Function	1
15	6 Order to OR	1
1	7 Adds coincidence with 5	5
1	8 Function	6
15	9 Adds coincidence with 9	11
1	10 Function	1

<del>Order to OR</del>	(9)	153)	11' 63	10' 1	(15)
<del>Adds coincid.</del>	(10)	154)	10 15	10 255	(15)

Order to OR  
 Adds coincid. (15)  
 Function 1  
 Function 2  
 Adds coincid. 0  
 Wait for Add  
 Order to OR  
 Adds coincid. (15)  
 Function 1

(9)	<u>Start 9</u>
Order to OR	1      4
Adds coincid. (15)	1      15
Function 1	1      10
Adds coincid. 0	—      10
Function 2	1      5
Wait for order to OR (10)	15      10
Order to OR	1      5
Adds coincid. (15)	14      15
Function	1      10
Adds coincid. (15)	15      15

80  
59  
72  
  
J 1  
16 (153)  
14 4  
5  
13 6  
14 1  
15 (63) 16 (63)  
48 15  
16 (255)  
16 95  
80 15

Module	8	16 (45)	16 (200)	16 (140)	16 (200)
for	16 (140)	16 (45)	16 (200)	16 (140)	16 (200)
Adds Const	128	32	100	14	16
Final	12	13	72	40	32
Adds Const			-8		84
Final					
OR					
Adds Const					
Final					
Wait					

Order No	153)	9
Wait		
First order	10	1
First Address	63	15
2nd order	10	1
2nd Address	1	-

order to OR 9-4  
wait  
function 1  
first address

Ways

1  
1  
1

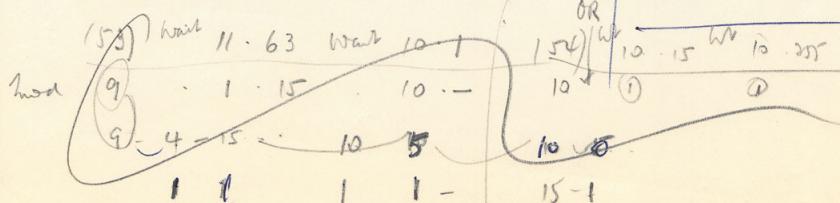
Module

Order No	153)	9	4 - 4
Wait		1	4 - 45
First order	10	*	15 10
First Address	63	15	
2nd order	10	*	
2nd Address	1	-	

Order No.

153) 9-10-63	1
11	
15	
10	
-	

Orders to OR  
Wait  
Final 1  
Final 2  
Wait  
Order R 1  
Add Const  
Final 1  
Add Const  
Final 2  
Add Const



(a)

work Time    modules    Reason

1	+	Order to OR Wait Time	12 - 7
		Function ①	7 - 2
		Wait Time	.
		Function ②	.
		Wait Time (next order)	.

		To new Rep	T				
153)	11	63		10	1		
modules	9		15				
Work Times		*	*				
	1	1		1	1		

<u>Order</u>	<u>Orders to</u>	<u>Wait adds</u>	<u>work adds</u>	<u>Wait adds</u>
153)	Order Rep	comes	comes	comes
			10	1
1	9		15	-
work times		1	1	1
hours	9	14	15	5

154)			10	15		10	205
10			15	15	-	1	15
15	1	14	1	15	-	1	3
hours	10	5	15	10	15	10	11

155)							
11							