Program Description I

Program Title ARITHMETIC PROGRESSIONS

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Program Description, Equations, Variables

THE BASIC EQUATIONS USED ARE:

$\ell = a + (n - 1) * d$

$S_n = n * (a + \frac{1}{2} * d * (n - 1))$

$= \frac{1}{2} * n * (a + l)$

AND VARIATIONS, WHERE:

a IS THE FIRST TERM OF THE ARITHMETIC PROGRESSION

n IS THE NUMBER OF TERMS IN THE PROGRESSION

d IS THE INCREMENT (DIFFERENCE BETWEEN TERMS IN THE PROGRESSION)

ℓ IS THE LAST TERM OF THE PROGRESSION

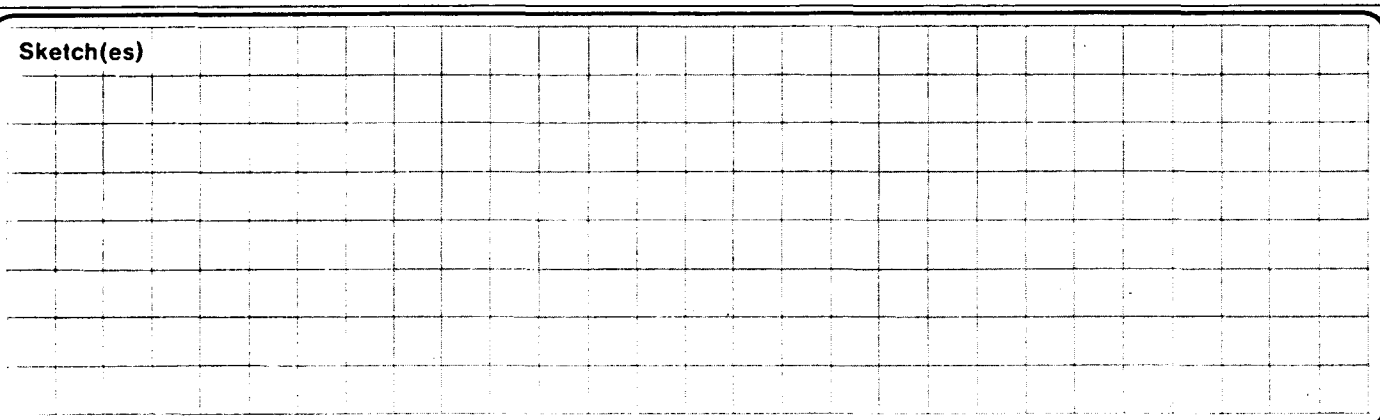
S_n IS THE SUM OF THE TERMS IN THE PROGRESSION

Operating Limits and Warnings IF THREE QUANTITIES ARE NOT GIVEN THE RESULTS ARE MEANINGLESS.

FLAG 3 IS USED TO DECIDE WHETHER TO STORE OR SOLVE FOR A QUANTITY. HENCE, PRESS NUMERIC KEYS TO ENTER a,n,d,ℓ,S_n. BUT DO NOT PRESS ANY KEY OTHER THAN A,...,E ANTER KNOWN QUANTITIES ARE ENTERED, UNTIL BOTH UNKNOWNS ARE FOUND.

Program Description II

Sketch(es)



Sample Problem(s)

(1) GIVEN THE ARITHMETIC PROGRESSION 1,2,3,4,5,6,7,8,9, FIND ITS SUM AND THE NUMBER OF TERMS.

SOLN: HERE, a = 1, ℓ = 9, d = 1

ANSWERS: SUM = S_n = 45; NUMBER OF TERMS = n = 9

(2) GIVEN THE ARITHMETIC PROGRESSION WITH 9 TERMS EACH DIFFERING BY 2, ARRANGED IN DECREASING ORDER, THAT SUMS TO -27, FIND ITS FIRST AND LAST TERMS.

SOLN: HERE, S_n = 27, n = 9, d = -2

ANSWERS : FIRST TERM = a = 5; LAST TERM = ℓ = -11.

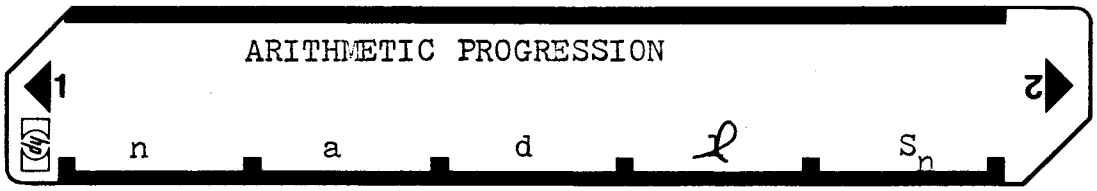
Solution(s)

(1) f CLREG
1 B --- 1
1 C --- 1
9 D --- 9
A --- 9 (n)
E --- 45 (S_n)

(2) f CLREG 9 A --- 9
2 CHS C --- -2
27 CHS E --- -27
B --- 5 (a)
D --- -11 (ℓ)

Reference(s)

User Instructions



STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS		OUTPUT DATA/UNITS
1	LOAD PROGRAM				
2	INITIALIZE		f	CLREG	
3	ENTER: (ANY THREE)				
	NUMBER OF TERMS	n	A		n
	FIRST TERM	a	B		a
	DIFFERENCE BETWEEN TERMS	d	C		d
	LAST TERM	ℓ	D		l
	SUM OF ARITHMETIC PROGRESSION	S_n	E		S_n
	BE SURE TO PRESS THE NUMERIC KEYS				
	EACH TIME.				
4	FIND: (THE REMAINING TWO)				
	NUMBER OF TERMS n		A		n
	FIRST TERM a		B		a
	DIFFERENCE OF TERMS d		C		d
	LAST TERM l		D		ℓ
	SUM OF ARITHMETIC PROGRESSION S_n		E		S_n
	DO NOT PRESS ANY KEYS OTHER THAN A,B,C,				
	D,E. IF YOU DO, IMMEDIATELY CLEAR FLAG 3.				
5	FOR A NEW CASE GO TO 2				

STEP	KEY ENTRY	KEY CODE	COMMENTS
001	f LBL A	31 25 11	n
	h F? 3	35 71 03	if n given,
	GTO 0	22 00	go to 0
	f LBL 5	31 25 05	if n not given:
	RCL B	34 12	if a is given
	f x ≠ 0	22 05	go on
	GTO 5	05	
	RCL 3	34 03	if not find n
	2	02	from d,ℓ,S
010	x	71	
	RCL 2	34 02	
	+	61	
	ENTER	41	
	g x**2	32 54	
	RCL 2	34 02	
	8	08	
	x	71	
	RCL 4	34 04	
	x	71	
020	-	51	
	f $x^{**\frac{1}{2}}$	31 54	
	-	51	
	2	02	
	/	81	
	RCL 2	34 02	
	/	81	
	GTO 0	22 00	
	f LBL 5	31 25 05	if a,d given
	RCL C	34 13	go on
030	f x≠0	31 61	
	GTO 5	22 05	
	RCL 4	34 04	if d not given
	2	02	find n from a,
	x	71	ℓ,S
	RCL 3	34 03	
	RCL 1	34 01	
	+	61	
	/	81	
	GTO 0	22 00	
040	f LBL 5	31 25 05	if a,d,ℓ given
	RCL D	34 14	go on
	f x≠0	31 61	
	GTO 5	22 05	
	RCL 1	34 01	if ℓ not given
	2	02	find n from a,
	x	71	d,S
	RCL 2	34 02	
	-	51	
	CHS	42	
050	STO 5	33 05	
	g x**2	32 54	
	RCL 2	34 02	
	RCL 4	34 04	
	x	71	
	8	08	
	x	71	
	+	61	
	f x<>y	31 54	
	RCL 2	34 02	
060	STO / 5	33 81 05	
	/	81	
	2	02	
	STO / 5	33 81 05	
	/	81	
	RCL 5	34 05	
	h xEXy	35 52	
	+	61	
	f xLT 0	31 71	
	g GSB fd	32 22 14	
070	GTO 0	22 00	
	f LBL 5	31 25 05	find n from a,d,
	RCL 3	34 03	ℓ
	RCL 1	34 01	
	-	51	
	RCL 2	34 02	
	/	81	
	1	01	
	+	61	
	f LBL 0	31 25 00	store n and
080	STO 0	33 00	indicator
	1	01	
	STO A	33 11	
	GTO 9	22 09	
	f LBL B	31 25 12	a
	h F? 3	35 71 03	if a given go to
	GTO 1	22 01	1
	f LBL 6	31 25 06	else
	RCL A	34 11	if n not given
	f x=0	31 51	find it
090	f GSB 5	31 22 05	else go on
	RCL C	34 13	if d given go
	f x≠0	31 61	on
	GTO 6	22 06	
	RCL 4	34 04	if not get a
	RCL 0	34 00	from n,ℓ,S
	/	81	
	2	02	
	x	71	
	RCL 3	34 03	
100	-	51	
	GTO 1	22 01	
	f LBL 6	31 25 06	if ℓ given go
	RCL D	34 14	on
	f x≠0	31 61	
	GTO 6	22 06	
	RCL 4	34 04	if not find a
	RCL 0	34 00	from n,d,S
	/	81	
	RCL 0	34 00	
110	1	01	
	-	51	
	RCL 2	34 02	

REGISTERS

0	1	2	3	4	5	6	7	8	9
n	a	d	ℓ	S_n	USED				
S0	S1	S2	S3	S4	S5	S6	S7	S8	S9

A	B	C	D	E	I
USED	USED	USED	USED	USED	

STEP	KEY ENTRY	KEY CODE	COMMENTS
	x	71	
	2	02	
	/	81	
	-	51	
	GTO 1	22 01	
	f LBL 6	31 25 06	
	RCL 3	34 03	find a from
120	RCL 0	34 00	n, d, l
	1	01	
	-	51	
	RCL 2	34 02	
	x	71	
	-	51	
	f LBL 1	31 25 01	store a and in-
	STO 1	33 01	dicator
	2	02	
	STO B	33 12	
130	GTO 9	22 09	
	f LBL C	31 25 13	d
	h F? 3	35 71 03	if d given
	GTO 2	22 02	store it
	f LBL 7	31 25 07	if n not given
	RCL A	34 11	find it
	f x=0	31 51	
	f GSB 5	31 22 05	
	RCL B	34 12	if a not given
	f x=0	31 51	
140	f GSB 6	31 22 06	
	RCL D	34 14	if l is given
	f x≠0	31 61	go on
	GTO 7	22 07	
	RCL 4	34 04	if not, find d
	RCL 0	34 00	from n, a, S_n
	/	81	
	RCL 1	34 01	
	-	51	
	RCL 0	34 00	
150	1	01	
	-	51	
	/	81	
	2	02	
	x	71	
	GTO 2	22 02	
	f LBL 7	31 25 07	find d from n,a,
	RCL 3	34 03	l
	RCL 1	34 01	
	-	51	
160	RCL 0	34 00	
	1	01	
	-	51	
	/	81	
	f LBL 2	31 25 02	store d and in-
	STO 2	33 02	
	3	03	
	STO C	33 13	
	GTO 9	22 09	

STEP	KEY ENTRY	KEY CODE	COMMENTS
	f LBL D	31 25 14	l
170	h F? 3	35 71 03	if l is given
	GTO 3	22 03	store it
	f LBL 8	31 25 08	if n not given
	RCL A	34 11	find it
	f x=0	31 51	
	f GSB 5	31 22 05	
	RCL B	34 12	if a not given
	f x=0	31 51	find it
	f GSB 6	31 22 06	
	RCL C	34 13	if d not given
180	f x=0	31 51	find it
	f GSB 7	31 22 07	
	RCL 2	34 02	find l from
	RCL 0	34 00	n,a,d
	1	01	
	-	51	
	x	71	
	RCL 1	34 01	
	+	61	
	f LBL 3	31 25 03	store l and in-
190	STO 3	33 03	dicator
	4	04	
	STO D	33 14	
	GTO 9	22 09	
	f LBL E	31 25 15	S_n
	h f? 3	35 71 03	if S_n given,
	GTO 4	22 04	store it
	RCL A	34 11	if n not given
	f x=0	31 51	find it
	f GSB 5	31 22 05	
200	RCL B	34 12	if a not given
	f x=0	31 51	find it
	f GSB 6	31 22 06	
	RCL C	34 13	
	f x=0	31 51	if d not given
	f GSB 7	31 22 07	find it
	RCL 0	34 00	
	RCL 1	34 01	find S_n from n,
	RCL 3	34 03	a,d
	+	61	
210	x	71	
	2	02	
	/	81	
	f LBL 4	31 25 04	store S_n and in-
	STO 4	33 04	dicator
	5	05	
	STO E	33 15	
	f LBL 9	31 25 09	display answer
	h x ex y	35 52	
	h RTN	35 22	
220	g LBL id	32 25 14	
	RCL 5	34 05	
	h LSTX	35 82	
	-	51	
	h RTN	35 22	

LABELS

A n	B a	C d	D l	E S_n
a	b	c	d used	e
0 end of n	1 end of a	2 end of d	3 end of l	4 end of S
5 find n	6 find a	7 find d	8 find l	9 find S

FLAGS

0	
1	
2	
3 data in?	

SET STATUS

FLAGS			TRIG	DISP
	ON	OFF		
0	☐	☒	DEG ☒	FIX ☒
1	☐	☒	GRAD ☐	SCI ☐
2	☐	☒	RAD ☐	ENG ☐
3	☐	☒		n 2