

Program Description I

Program Title Objective

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Program Description, Equations, Variables When the program is initiated all of the tanks are randomly placed on a 20 x 20 km field. The high command is placed at the origin (0,0). In order to move, two pieces of information are needed; the course and the distance. The course is the angle from the positive X axis (east). The distance can be any amount up to 2 km. To shoot, the calculator needs two angles. The first is the angle of swing (same as course). The second is the angle of elevation, the angle the gun makes with respect to the horizontal.

This game was designed to be very hard to beat. The enemy tanks all have a greater speed than you so you cant out run them. The tanks also form a strong defensive pattern around the high command. They will eventually surround you if you are not careful.

EQUATIONS:

$$\text{prob} = ae^{-k^2x^2}$$

$$\text{range} = (\text{max. rang}) \sin 2\alpha$$

Operating Limits and Warnings

This program has been verified only with respect to the numerical example given in *Program Description II*. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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Program Description II

Sketch(es)	Move

Sample Problem(s) Using a seed of 0.0 attack the high command.

SOLUTION:

Enter Card 1 sides 1&2 0.
 A 5170***, 6562***
 An enemy tank is located at 2413***, 8705***
 (6562, 5170) and you are at the 24
 point (8705, 2413)

Enter card 2 sides 1&2 24
 128 ENTER↑ 22, B "6."
 Shoot the tank that is in range.

R/S 6.
 195 ENTER↑ 2000, A 45***, 7273***
 Another enemy tank is in range. 22.

Solution(s) It is at the point (7273, 45).

-75 ENTER↑ 11, B "5."
 Shoot the tank that is in range.

R/S 5.
 195 ENTER↑ 2000, A -2511***, 5608***
 Again move. Well, you got your- 2955***, 3408***
 self into a mess, there are four 1941***, 3926***
 enemy tanks in range, it looks 416***, 715***
 like you have had it! 22.

Reference(s)

Program Description II

Sketch(es)	Shoot

Sample Problem(s) Cont.

Enter Card 3 sides 1&2 22.00

You decide to ask for help.

A .52***

52% chance of surviving, it is .01
not hopeless.

B 1.00***

Almost a 100% chance of sur- 26.23
viving this shot

$X \neq Y$ -78.85

$X \neq Y$ 26.23

Look at the direction of the
shot (-78.85°).

Enter Card 2 sides 1&2 26.

Solution(s) B "4"

R/S 4.

-167 ENTER 29, B Error

Shouldn't have shot with out
aid. You got yourself killed.

Reference(s)

Card 1

Objective!

1

2

Simp

Hard

Short

Reduce Tanks

[illegible]

[illegible]

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBL f A	32 25 11	Random number generator $ X < 10,000$		STO I	35 33	Show all tanks that are in range
	RCL E	34 15			*LBL 8	31 25 08	
	π	35 73			RCL (1)	34 24	
	+	61		060	DSZ I	31 33	
	x^2	32 54			RCL (1)	34 24	
	FRAC	32 83			ISZ I	31 34	
	STO E	33 15			ISZ I	31 34	
	2	02			ISZ I	31 34	
	EEX	43			GSB E	31 22 15	
010	4	04			RCL I	35 34	
	x	71	Basic game store seed		2	02	Show routine
	EEX	43			4	04	
	4	04			X>Y?	32 81	
	-	51		070	GTO 8	22 08	
	RTN	35 22			RTN	35 22	
	*LBL A	31 25 11			*LBL E	31 25 15	
	STO E	33 15			STO 1	33 01	
	8	08			X=Y	35 52	
	STO I	35 33			STO 2	33 02	
020	2	02			X=Y	35 52	
	0	00	Your maximum speed		GSB f B	32 22 12	In range? If not then return If so then show the tank
	0	00			5	05	
	1	01			EEX	43	
	STO 4	33 04		080	3	03	
	1	01			X<Y?	32 71	
	.	83			RTN	35 22	
	5	05			RCL 2	34 02	
	x	71			PRINT x	31 84	
	STO 3	33 03			RCL 1	34 01	
030	9	09			PRINT x	31 84	
	.	83	Store win signal		RTN	35 22	Range to player routine
	9	09			*LBL f B	32 25 12	
	9	09			RCL D	34 14	
	9	09		090	RCL C	34 13	
	9	09			X<Y	35 52	
	9	09			R↑	35 54	
	9	09			-	51	
	9	09			R↓	35 53	
	9	09			-	51	
040	9	09			R↑	35 54	
	EEX	43	Store number of tanks		→P	32 72	Hard game
	9	09			RTN	35 22	
	9	09			*LBL B	31 25 12	
	STO 0	33 00		100	GSB f A	32 22 11	
	7	07			FRAC	32 83	
	STO 7	33 07			x	71	
	*LBL 9	31 25 09			FRAC	32 83	
	GSB f A	32 22 11			STO E	33 15	
	STO (1)	33 24			8	08	
050	ISZ I	31 34			STO I	35 33	
	RCL I	35 34	Store co-ord of all tanks		2	02	Your maximum speed
	2	02			0	00	
	4	04			0	00	
	X>Y?	32 81		110	1	01	
	GTO 9	22 09			STO 4	33 04	
	9	09			1	01	

REGISTERS

0 Win Signal	1 Used	2 Used	3 Calc. Max Speed	4 Your Max Speed	5	6	Number of Tanks	8 Tnk 1 x	9 Tnk 1 y
S0 Tnk 2 x	S1 Tnk 2 y	S2 Tnk 3 x	S3 Tnk 3 y	S4 Tnk 4 x	S5 Tnk 4 y	S6 Tnk 5 x	S7 Tnk 5 y	S8 Tnk 6 x	S9 Tnk 6 y
A Tnk 7 x	B Tnk 7 y	C Your x	D Your y	E Seed	I Used				

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
	.	83	speed		x	32 54	
	7	07		170	FRAC	32 83	
	5	05			STO E	33 15	
	x	71			7	07	
	STO 3	33 03			x	71	
	7	07	Number of tanks		1	01	
	STO 7	33 07			+	61	
120	9	09	Win signal		INT	31 83	
	.	83			2	02	
	9	09			x	71	
	9	09			7	07	
	9	09		180	+	61	
	9	09			RCL I	35 34	
	9	09			X=Y?	32 51	Was this tank pick-
	9	09			GTO 5	22 05	ed before?
	9	09			X≠Y	35 52	If so then choose
	9	09			STO I	35 33	again
130	9	09			EEX	43	Destroy the tank
	EEX	43			3	03	
	9	09			0	00	
	9	09			STO (i)	33 24	
	STO 0	33 00		190	DSZ I	31 33	
	*LBL 7	31 25 07	Store co-ord of all		STO (i)	33 24	
	GSB f A	32 22 11	tanks		ISZ I	31 34	
	1	01			F2 ?	35 71 02	First or second
	0	00			GTO 5	22 05	tank?
	x	71			0	00	
140	STO (i)	33 24			STO I	35 33	Hide evidence
	ISZ I	31 34			2	02	
	RCL I	35 34			STO - 7	33 51 07	Update tank counter
	2	02			RCL 7	34 07	
	5	05		200	RTN	35 22	
	X>Y?	32 81			*LBL D	31 25 14	Remove many tanks
	GTO 7	22 07			STO 1	33 01	Save number to be
	9	09			STO - 7	33 51 07	removed and update
	STO I	35 33			EEX	43	counter.
	*LBL 6	31 25 06	Show all tanks that		3	03	
150	RCL (i)	34 24	are in range		0	00	
	DSZ I	31 33			STO 2	33 02	Store destruct
	RCL (i)	34 24			8	08	
	ISZ I	31 34			*LBL 4	31 25 04	Destroy the given
	ISZ I	31 34		210	X≠I	35 24	number of tanks
	ISZ I	31 34			RCL 2	34 02	
	GSB E	31 22 15			STO (i)	33 24	
	RCL I	35 34			ISZ I	31 34	
	2	02			STO (i)	33 24	
	5	05			ISZ I	31 34	
160	X>Y?	32 81			1	01	
	GTO 6	22 06			X≠I	35 24	
	RTN	35 22			DSZ (i)	32 33	
	*LBL C	31 25 13	Short game		GTO 4	22 04	
	SF 2	35 51 02	(remove 2 tanks)	220	9	09	
	*LBL 5	31 25 05	Pick a random tank		STO I	35 33	
	RCL E	34 15			GSB 8	31 22 08	Show all tanks that
	π	35 73			RCL 7	34 07	remain in range
	+	61			RTN	35 22	

LABELS					FLAGS	SET STATUS		
A Basic Gm	B Hard Gm	C Short	D Remove	E	0	FLAGS TRIG DISP		
a Random	b Range	c	d	e	1	ON OFF	DEG <input checked="" type="checkbox"/>	FIX <input checked="" type="checkbox"/>
0	1	2	3	4 Remove	2 Tank 1 ?	0 <input type="checkbox"/> <input checked="" type="checkbox"/>	GRAD <input type="checkbox"/>	SCI <input type="checkbox"/>
5 Remove	6 Show	7 Store	8 Show	9 Store	3	1 <input type="checkbox"/> <input checked="" type="checkbox"/>	RAD <input type="checkbox"/>	ENG <input type="checkbox"/>
						2 <input type="checkbox"/> <input checked="" type="checkbox"/>		n 0
						3 <input type="checkbox"/> <input checked="" type="checkbox"/>		

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBL A	31 25 11	Move		0	00	
	RCL 4	34 04			X≤Y?	32 71	Was the high-
	X≤Y?	32 71	Moving too far?		GTO 0	22 00	command hit?
	GTO 6	22 06	If so then "ERROR"	060	GTO 4	22 04	If so then "WIN"
	R↓	35 53			*LBL 0	31 25 00	Init. loop
	→R	31 72			9	09	
	RCL C	34 13	Move the tank		STO I	35 33	
	+	61			*LBL 9	31 25 09	Check to see if a
	STO C	33 13			RCL (i)	34 24	tank was hit
010	X≠Y	35 52			DSZ I	31 33	Recall tank
	RCL D	34 14			RCL (i)	34 24	
	+	61			GSB f C	32 22 13	Have the tank shoot
	STO D	33 14			RCL 6	34 06	
	9	09		070	RCL 5	34 05	
	STO I	35 33			GSB f A	32 22 11	Find distance from
	*LBL 8	31 25 08	Move all other tanks		EEX	43	tank to hit
	RCL (i)	34 24	Recall tank		2	02	
	DSZ I	31 33			X>Y?	32 81	Was the tank hit?
	RCL (i)	34 24			GSB 7	31 22 07	If so then destroy
020	GSB D	31 22 14	Move the tank		ISZ I	31 34	it
	GSB f C	32 22 13	Have the tank shoot		ISZ I	31 34	
	GSB E	31 22 15	Show the tank if it		ISZ I	31 34	
	STO (i)	33 24	is in range		2	02	
	R↓	35 53	Store new Co-ord	080	2	02	
	ISZ I	31 34			RCL I	35 34	
	STO (i)	33 24			X≤Y?	32 71	Last tank?
	ISZ I	31 34			GTO 9	22 09	
	ISZ I	31 34			RTN	35 22	If so then stop
	RCL I	35 34			*LBL 7	31 25 07	Tank destroy
030	2	02			EEX	43	
	2	02			3	03	
	X>Y?	32 81	Last tank?		0	00	
	GTO 8	22 08			STO (i)	33 24	Move the tank to
	RTN	35 22	If so then stop	090	ISZ I	31 34	infinity
	*LBL B	31 25 12	Shoot		STO (i)	33 24	
	2	02	Calculate the		DSZ I	31 33	
	x	71	location that the		GTO 5	22 05	Show the number of
	SIN	31 62	shell fell		*LBL f C	32 25 13	remaining tanks
	5	05			STO 1	33 01	Calc tank shoot
040	EEX	43			X≠Y	35 52	
	3	03			STO 2	33 02	
	x	71			X≠Y	35 52	
	→R	31 72			GSB f B	32 22 12	Find distance
	RCL C	34 13		100	GSB f D	32 22 14	Find probability
	+	61			GSB f E	32 22 15	Get random #
	STO 5	33 05			X≤Y?	32 71	Was player hit?
	X≠Y	35 52			GTO 6	22 06	If so "LOSE"
	RCL D	34 14			RCL 2	34 02	
	+	61			RCL 1	34 01	
050	STO 6	33 06			RTN	35 22	
	X≠Y	35 52			*LBL 6	31 25 06	Lose
	0	00	See if the High-		CL x	44	Display "ERROR"
	ENTER↑	41	command was hit		1/x	35 62	
	GSB f A	32 22 11		110	*LBL E	31 25 15	Show
	1	01			STO 1	33 01	
	0	00			X≠Y	35 52	

REGISTERS

0 Win	1 Used	2 Used	3 Calc. Tnk Spd	4 Your Tnk Spd	5 Used	6 Used	7 # Tanks	8 Tnk 1 X	9 Tnk 1 Y
S0 Tnk 2 X	S1 Tnk 2 Y	S2 Tnk 3 X	S3 Tnk 3 Y	S4 Tnk 4 X	S5 Tnk 4 Y	S6 Tnk 5 X	S7 Tnk 5 Y	S8 Tnk 6 X	S9 Tnk 6 Y
A Tnk 7 X	B Tnk 7 Y	C Your X	D Your Y	E Seed	I Used				

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
	STO 2	33 02			/	81	
	X \leftrightarrow Y	35 52		170	GTO 2	22 02	
	GSB f B	32 22 12			*LBL 0	31 25 00	The player is the destination
	5	05			RCL C	34 13	
	EEX	43			RCL D	34 14	
	3	03			*LBL 2	31 25 02	Given the destination move the tank
	X \leq Y?	32 71	Is tank in range?		RCL 1	34 01	
120	GTO 0	22 00			-	51	
	RCL 2	34 02	If it is then show co-ord		X \leftrightarrow Y	35 52	
	PRINT x	31 84			RCL 2	34 02	
	RCL 1	34 01			-	51	
	PRINT x	31 84		180	\rightarrow P	32 72	
	RTN	35 22			CL x	44	
	*LBL 0	31 25 00	Restore co-ord		RCL 3	34 03	
	RCL 2	34 02			\rightarrow R	31 72	
	RCL 1	34 01			STO + 2	33 61 02	
	RTN	35 22			CL x	44	
130	*LBL f D	32 25 14	Calculate probability of being hit given the distance		RCL 1	34 01	
	x ²	32 54			+	61	
	6	06			RCL 2	34 02	
	.	83			RTN	35 22	
	8	08		190	*LBL f E	32 25 15	Generate a random number
	8	08			RCL E	34 15	
	9	09			γ	35 73	
	EEX	43			+	61	
	7	07			x ²	32 54	
	CHS	42			FRAC	32 83	
140	x	71			STO E	33 15	
	CHS	42			RTN	35 22	
	e ^x	32 52			*LBL f B	32 25 12	Distance to player
	RTN	35 22			RCL D	34 14	
	*LBL D	31 25 14	Move calc tank	200	RCL C	34 13	
	STO 2	33 02			*LBL f A	32 25 11	Given two sets of co-ord calculate the distance between the points
	X \leftrightarrow Y	35 52			X \leftrightarrow Y	35 52	
	STO 1	33 01			R \uparrow	35 54	
	X \leftrightarrow Y	35 52			-	51	
	GSB f B	32 22 12			R \downarrow	35 53	
150	EEX	43	Based on the range find the destination of the tank		-	51	
	4	04			R \uparrow	35 54	
	X>Y?	32 81			\rightarrow P	32 72	
	GTO 0	22 00			RTN	35 22	
	1	01		210	*LBL C	31 25 13	Save the game
	.	83			W/DATA	31 41	
	6	06			PAUSE	35 72	
	x	71			RTN	35 22	
	X>Y?	32 81			*LBL 4	31 25 04	High command dest.
	GTO 1	22 01			RCL 0	34 00	
160	0	00	High command is the destination.		*LBL 3	31 25 03	Show code
	ENTER \uparrow	41			PAUSE	35 72	
	GTO 2	22 02			GTO 3	22 03	
	*LBL 1	31 25 01	Between the high command and the player is the destination		*LBL 5	31 25 05	Calc tank destroyed
	RCL C	34 13		220	1	01	
	2	02			STO - 7	33 51 07	
	/	81			RCL 7	34 07	
	RCL D	34 14			GTO 3	22 03	
	2	02			R/S	84	

LABELS					FLAGS	SET STATUS		
A Move	B Shoot	C St. Game	D Cal Move	E Show?	0	FLAGS	TRIG	DISP
a Dist.	b Dist You	c Cal Shoot	d Prob.	e Random	1	ON OFF		
0 Used	1 Used	2 Used	Hit Displ	4H Cmd Hit	2	0 <input type="checkbox"/> <input checked="" type="checkbox"/>	DEG <input checked="" type="checkbox"/>	FIX <input checked="" type="checkbox"/>
5 Tnk Hit	6 Lose	7 Tnk Dest	8 Move Lp	9 Shoot Lp	3	1 <input type="checkbox"/> <input checked="" type="checkbox"/>	GRAD <input type="checkbox"/>	SCI <input type="checkbox"/>
						2 <input type="checkbox"/> <input checked="" type="checkbox"/>	RAD <input type="checkbox"/>	ENG <input type="checkbox"/>
						3 <input type="checkbox"/> <input checked="" type="checkbox"/>		n <u>0</u>

STEP	KEY ENTRY	KEY CODE	COMMENTS	STEP	KEY ENTRY	KEY CODE	COMMENTS
001	*LBL A	31 25 11	Find chance of surviving.		1	01	
	SF 1	35 51 01			8	08	
	9	09			0	00	
	STO I	35 33		060	+	61	
	1	01	Initiate R1		X=Y	35 52	
	STO 1	33 01			5	05	
	*LBL 9	31 25 09			EEX	43	
	RCL (i)	34 24			3	03	
	DSZ I	31 33	Look at each tank and find probability of being hit		/	81	
010	RCL (i)	34 24			ARC SIN	32 62	
	ISZ I	31 34			2	02	
	ISZ I	31 34			/	81	
	ISZ I	31 34	Find distance		X=Y	35 52	
	GSB f B	32 22 12		070	*LBL 0	31 25 00	
	GSB f D	32 22 14			9	09	
	1	01			STO I	35 33	
	-	51	Find probability of being hit		*LBL 8	31 25 08	
	CHS	42			RCL (i)	34 24	
	STO x 1	33 71 01			DSZ I	31 33	
020	RCL I	35 34			RCL (i)	34 24	
	2	02	Accumulate the probability of surviving		GSB f B	32 22 12	
	2	02			5	05	
	X>Y?	32 81			EEX	43	
	GTO 9	22 09		080	3	03	
	RCL 1	34 01	Show chances		X>Y?	32 81	
	PRINT x	31 84			GTO 0	22 00	
	.	83			ISZ I	31 34	
	0	00			ISZ I	31 34	
	1	01	If less than 1% then automatically give help		ISZ I	31 34	
030	X≤Y?	32 71			2	02	
	RTN	35 22			2	02	
	*LBL B	31 25 12			RCL I	35 34	
	FO ?	35 71 00	Help routine Did B call A as a subroutine? If so then return		X≤Y?	32 71	
	RTN	35 22		090	GTO 8	22 08	
	RCL D	34 14			RCL D	34 14	
	RCL C	34 13			RCL C	34 13	
	→P	32 72			→P	32 72	
	5	05			CLx	44	
	EEX	43			1	01	
040	3	03	Within range of the high command?		8	08	
	X≤Y?	32 71			0	00	
	GTO 0	22 00			+	61	
	F1 ?	35 71 01			2	02	
	GTO 0	22 00	If so was Help called after Chance?	100	EEX	43	
	SF 0	35 51 00			3	03	
	GSB A	31 22 11			RTN	35 22	
	CF 0	35 61 00	If not then find the chances		*LBL 0	31 25 00	
	CLx	44			GSB f D	32 22 14	
	.	83			1	01	
	5	05			-	51	
050	X>Y?	32 81	50-50 chance or better?		CHS	42	
	GTO 0	22 00			PRINT x	31 84	
	RCL D	34 14			RCL (i)	34 24	
	RCL C	34 13		110	RCL C	34 13	
	→P	32 72	If so calculate angles for shooting		-	51	
	X=Y	35 52			ISZ I	31 34	

REGISTERS									
0	1 Used	2	3	4	5	6	7	8 Tnk 1 X	9 Tnk 1 Y
S0 Tnk 2 X	S1 Tnk 2 Y	S2 Tnk 3 X	S3 Tnk 3 Y	S4 Tnk 4 X	S5 Tnk 4 Y	S6 Tnk 5 X	S7 Tnk 5 Y	S8 Tnk 6 X	S9 Tnk 6 Y
A Tnk 7 X	B Tnk 7 Y	C Your x	D Your y	E	I Used				

LABELS					FLAGS	SET STATUS		
A	B	C	D	E		ON OFF		
Chance	Help				0			
a	b Dist.	c	d Prob.	e	1	0 <input type="checkbox"/>	DEG <input checked="" type="checkbox"/>	FIX <input checked="" type="checkbox"/>
0 Used	1	2	3	4	2	1 <input type="checkbox"/>	GRAD <input type="checkbox"/>	SCI <input type="checkbox"/>
5	6	7	8 Tnk Find	9 Chance Lp	3	2 <input type="checkbox"/>	RAD <input type="checkbox"/>	ENG <input type="checkbox"/>
						3 <input type="checkbox"/>		n <u>2</u>