**Instructions for Common Pool Resource Game
Used by the World Bank EDI/ISSER Regional TOT Workshop
Akosombo, Ghana, February 25 to March 1, 1997
Based on experiments designed by James Walker, Roy Gardner, and Elinor Ostrom
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Introduction

This game has the same structure as a renewable common pool resource such as a forest, an offshore fishery, or an irrigation system. As participants in this game, you may imagine that you are fishermen, fishing for fish or local villagers needing to find firewood.

Each of you have been assigned randomly to one of three, equal-sized groups. Each of the three groups is harvesting an identical, but distinct resource. The number of persons in each group is

_____.

If you have not already done so, write your name at the top of your identification sheet and at the top of your individual record sheet. Once you have done this, hand in your identification sheet to one of the monitors.

In this game, you will have the opportunity to earn cash benefits. What you earn will depend upon the decisions that you make and upon the decisions that others in your group make.

This game consists of six rounds, each round corresponding to one "season." At the end of the sixth round, the cash benefits that you have earned in all six rounds will be totaled and will be paid to you in privacy.

If you have any questions as we go through these instructions, feel free to raise your hand and to ask your question. Do you have any questions so far?

Ordering Tokens

In each round, you will place an order for tokens on the order sheet with which you have been provided for that round. You may consider that each token represents, say, one ton of fish or one load of firewood. Therefore, the number of tokens that you order represents the quantity that you, individually, decide to harvest from the resource in that season.

In each round, the **net benefits** that you earn from the number of tokens that you order will be equal to the difference between (1) the **gross benefits** that you receive from "selling" the fish or the trees that you harvest in that round and (2) the **total costs** that you incur in harvesting this quantity of resources:

Net benefits=Gross benefits - total costs.

In each round, your token orders will be anonymous, known only to yourself and to the monitors. Similarly, the net benefits that you earn will be private information to you and to the monitors.

That is, throughout this game, no one else in your group will know how much you harvested in each round or how much you earned from harvesting this quantity.

Gross Benefits from Ordering Tokens

In each round, the **gross benefits** that you will receive from the number of tokens that you order will be given in the table with which you have been provided, entitled "Schedule of Benefits." For example, if you order 6 tokens, your gross benefits from ordering 6 tokens will be _____. If you order 12 tokens, your gross benefits will be _____.

Study this table carefully. Every participant in every group has received the same table. In every round of this game, every participant will earn gross benefits according to this same schedule. If you have any questions about this table, please raise your hand at this time.

Costs of Ordering Tokens

In each round, the **costs** that you will incur from the number of tokens that you order will be equal to the product of (1) the **number of tokens** that you order and (2) the **average cost** of each token:

Total token cost = No. of tokens x Average token cost.

We are studying an increasing cost process. Each catch of fish or load of firewood costs more to obtain than the previous one. Therefore, the **average token cost** of ordering tokens will increase as you and the other members of your group order more and more tokens.

The first token that your group orders will have a **base cost** of $0.01. Then, the second token that your group orders will cost $0.02. And, the third token will cost $0.03, and so on. That is, each additional token will cost $0.01 more than the previous token ordered.

For example, suppose that your group orders 30 tokens in a given round. The total cost of all the tokens ordered by your group will equal:

$0.01 + $0.02 + $0.03 + . . . + $0.30=$4.65.

But you do not need to perform this calculation. To calculate **your total costs**, you only need to know the **average token cost** of the 30 tokens, which is easily calculated as follows:

Average token cost = $\frac{\text{(Cost of the first token + Cost of the last token)}}{2}$

$$= \frac{(\$0.01 + \$0.30)}{2} = \$0.155.$$

In every round, your **average token cost** will always be half way between the base cost of $0.01 and the cost of the last token ordered, and your **total token cost** will always equal **the number of tokens** that you order multiplied by this **average token cost**. In this example:

Total token cost = No. of tokens x Average token cost = 6 x $0.155 = $0.930.

Do you have any questions about the costs of ordering tokens?

Net Benefits from Ordering Tokens

In each round, the **net benefits** that you will earn from ordering tokens is given by:

Net benefits = Gross benefits - Total token cost
= Gross benefits - (No. of tokens ordered x Average token cost)

To conclude the above example, in which you ordered 6 out of the 30 tokens ordered by your group:

Your net benefits = $4.31 - (6 x $0.155) = $4.31 - $0.930 = $3.38

This is summarized in the following table:

No. of Tokens Ordered	Total Gross Benefits	Base Token Cost	Average Token Cost	Total Token Cost	Net Benefit
6	$4.31	0.01	$0.155	$0.930	$3.38

Two More Practice Examples

In the first round of the game, suppose that you place an order for 10 tokens and the other members of your group order 56 tokens -- for a total group order of 66 tokens. What would be your **net benefit** from this round?

No. of Tokens Ordered	Total Gross Benefit	Base Token Cost	Average Token Cost	Total Token Cost	Net Benefit
10	$6.91	0.01	0.285	2.85	$6.91 -$2.85 =$4.06

In the fourth round of the game, suppose that you place an order for 2 tokens and the other members of your group order 16 tokens -- for a total group order of 18 tokens. What would be your **net benefit** from this round?

No. of Tokens Ordered	Total Gross Benefit	Base Token Cost	Average Token Cost	Total Token Cost	Net Benefit
2	$1.49	0.01	$0.095	$0.18	$1.49 - $0.18 = $1.31

Summary

This game will last 6 rounds, corresponding to 6 "seasons." At the beginning of each round, you will be asked how many tokens you want to order. You will decide how many tokens you want to order and you will write this order (1) on your individual record sheet, and (2) on your order sheet for that round. Once you have written down your order, you will give your order **privately** to one of the monitors.

The "Schedule of Benefits" that you will receive from ordering tokens in the same for all participants. However, the average token cost of ordering tokens will increase as you and the other members of your group order more and more tokens. Each token that you order increases the **average token cost** to you and to all the other members of your group.

Each round is totally separate. You cannot carry tokens from one round into future rounds. After all the participants have placed their orders, then the monitors will quickly tabulate and

inform you of (1) the **number of tokens ordered,** (2) the average **token cost,** and (3) the **total net benefits** for each of the three groups.

Then, from this information and from the "Schedule of Benefits," you will calculate for yourself and record the following on your individual record sheet for this round, your:

| Total | Average | Total | Net Benefit |
| Gross Benefit | Token Cost | Token Cost | |

At the end of the sixth round, you will add up the net benefits that you have earned in each round in order to derive your total net benefits. As a check; the monitors will also calculate on their computer your total net benefits. In this game (although not in real life!), if you earned negative net benefits in any of the six rounds, this loss will be rounded up to zero. **No one will** lose any **money in this game.**

Changing the Rules

The resource from which you are harvesting is a renewable resource that is fully replenished at the beginning of each season. Therefore, the base token cost will remain $0.01 for each round, and the cost of each additional token will also remain $0.01.

But, in order to help you improve your net benefits in subsequent rounds, the monitors will change the rules of the game between rounds 2 and 3, and again between rounds 4 and 5.

For the first two rounds, the rules of the game are:

> **No communication with any other participant,**
> **either in your own group, or in any other group.**

Do you have any final questions before we begin the first round?

A SECOND SET OF RULES:

For the next two rounds, the rules of the game are changed. You are now allowed to have a ten-minute open discussion among all members of all groups in one room. You may discuss the experiment in any way that you would like except that you may not use any threats or promises of side payments. All other rules discussed in the initial instructions remain the same.

We will time this discussion and tell you when 10 minutes has elapsed. Then, you must stop communication and make your individual decisions.

This rule will be in effect for Rounds 3 and 4.

A THIRD SET OF RULES

For the last two rounds, you will meet with the other members of your group in a room that will be announced by the monitor. Each group should assemble in its room and spend ten minutes in a face-to-face discussion within your own group. You may discuss the experiment in any way that you would like except that you may not use any threats or promises of side payments. All other rules discussed in the initial instructions remain the same.

We will time this discussion and tell you when 10 minutes has elapsed. Then, you must stop communication and make your individual decisions.

After Round 6, we will tally your net payoffs across all rounds and pay you in private what you have made.

CONSENT FORM

You are invited to participate in a decision making situation conducted to investigate individual decision making. Funding for this decision-making situation has been provided by several agencies of the Federal Government of the U.S. This experiment is scheduled to last about one hour.

Your participation in this decision situation involves making investment decisions as described in the instructions. Your individual decisions will remain anonymous to the group. Your identity will never be identified as part of the published results.

If you have any questions concerning the decision-making situation, please feel free to ask Elinor Ostrom.

Your participation is voluntary. You may decline to participate without penalty. If you decide to participate, you may withdraw from the experiment at any time without penalty. If you decide to withdraw, however, you will not be eligible to have your name in the set of names form which one will be chosen randomly to receive cash earnings.

CONSENT

I have read and understand the above information. I have received a copy of this form, I agree to participate in this decision situation.

Signed _____   Date _____

Home Address: _____

_____

If you wish further information concerning this experiment, contact:

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Schedule of Benefits

Tokens	Benefits	Tokens	Benefits	Tokens	Benefits
1	0.75	21	12.87	41	19.41
2	1.49	22	13.31	42	19.58
3	2.22	23	13.75	43	19.75
4	2.93	24	14.18	44	19.93
5	3.63	25	14.65	45	20.07
6	4.31	26	15.04	46	20.19
7	4.98	27	15.43	47	20.30
8	5.64	28	15.82	48	20.38
9	6.28	29	16.17	49	20.46
10	6.91	30	16.53	50	20.55
11	7.52	31	16.80	51	20.58
12	8.12	32	17.07	52	20.61
13	8.71	33	17.34	53	20.64
14	9.28	34	17.61	54	20.66
15	9.84	35	17.88	55	20.68
16	10.38	36	18.15	56	20.63
17	10.91	37	18.42	57	20.58
18	11.43	38	18.69	58	20.53
19	11.63	39	18.96	59	20.48
20	12.42	40	19.24	60	20.46

TOKEN COSTS
THIS TABLE DISPLAYS THE SPECIFIC COST PER TOKEN FOR TOKENS PURCHASED BY THE GROUP

TOKEN NUMBER (COST)

1 ($0.01)	57 ($0.57)	113 ($1.13)	169 ($1.69)	225 ($2.25)	281 ($2.81)	337 ($3.37)	393 ($3.93)	449 ($4.49)
2 ($0.02)	58 ($0.58)	114 ($1.14)	170 ($1.70)	226 ($2.26)	282 ($2.82)	338 ($3.38)	394 ($3.94)	450 ($4.50)
3 ($0.03)	59 ($0.59)	115 ($1.15)	171 ($1.71)	227 ($2.27)	283 ($2.83)	339 ($3.39)	395 ($3.95)	451 ($4.51)
4 ($0.04)	60 ($0.60)	116 ($1.16)	172 ($1.72)	228 ($2.28)	284 ($2.84)	340 ($3.40)	396 ($3.96)	452 ($4.52)
5 ($0.05)	61 ($0.61)	117 ($1.17)	173 ($1.73)	229 ($2.29)	285 ($2.85)	341 ($3.41)	397 ($3.97)	453 ($4.53)
6 ($0.06)	62 ($0.62)	118 ($1.18)	174 ($1.74)	230 ($2.30)	286 ($2.86)	342 ($3.42)	398 ($3.98)	454 ($4.54)
7 ($0.07)	63 ($0.63)	119 ($1.19)	175 ($1.75)	231 ($2.31)	287 ($2.87)	343 ($3.43)	399 ($3.99)	455 ($4.55)
8 ($0.08)	64 ($0.64)	120 ($1.20)	176 ($1.76)	232 ($2.32)	288 ($2.88)	344 ($3.44)	400 ($4.00)	456 ($4.56)
9 ($0.09)	65 ($0.65)	121 ($1.21)	177 ($1.77)	233 ($2.33)	289 ($2.89)	345 ($3.45)	401 ($4.41)	457 ($4.57)
10 ($0.10)	66 ($0.66)	122 ($1.22)	178 ($1.78)	234 ($2.34)	290 ($2.90)	346 ($3.46)	402 ($4.02)	458 ($4.58)
11 ($0.11)	67 ($0.67)	123 ($1.23)	179 ($1.79)	235 ($2.35)	291 ($2.91)	347 ($3.47)	403 ($4.03)	459 ($4.59)
12 ($0.12)	68 ($0.68)	124 ($1.24)	180 ($1.80)	236 ($2.36)	292 ($2.92)	348 ($3.48)	404 ($4.04)	460 ($4.60)
13 ($0.13)	69 ($0.69)	125 ($1.25)	181 ($1.81)	237 ($2.37)	293 ($2.93)	349 ($3.49)	405 ($4.05)	461 ($4.61)
14 ($0.14)	70 ($0.70)	126 ($1.26)	182 ($1.82)	238 ($2.38)	294 ($2.94)	350 ($3.50)	406 ($4.06)	462 ($4.62)
15 ($0.15)	71 ($0.71)	127 ($1.27)	183 ($1.83)	239 ($2.39)	295 ($2.95)	351 ($3.51)	407 ($4.07)	433 ($4.63)
16 ($0.16)	72 ($0.72)	128 ($1.28)	184 ($1.84)	240 ($2.40)	296 ($2.96)	352 ($3.52)	408 ($4.08)	464 ($4.64)
17 ($0.17)	73 ($0.73)	129 ($1.29)	185 ($1.85)	241 ($2.41)	297 ($2.97)	353 ($3.53)	409 ($4.09)	465 ($4.65)
18 ($0.18)	74 ($0.74)	130 ($1.30)	186 ($1.86)	242 ($2.42)	298 ($2.98)	354 ($3.54)	410 ($4.10)	466 ($4.66)
19 ($0.19)	75 ($0.75)	131 ($1.31)	187 ($1.87)	243 ($2.43)	299 ($2.99)	355 ($3.55)	411 ($4.11)	467 ($4.67)
20 ($0.20)	76 ($0.76)	132 ($1.32)	188 ($1.88)	244 ($2.44)	300 ($3.00)	356 ($3.56)	412 ($4.12)	468 ($4.68)
21 ($0.21)	77 ($0.77)	133 ($1.33)	189 ($1.89)	245 ($2.45)	301 ($3.00)	357 ($3.57)	413 ($4.13)	469 ($4.69)
22 ($0.22)	78 ($0.78)	134 ($1.34)	190 ($1.90)	246 ($2.46)	302 ($3.02)	358 ($3.58)	414 ($4.14)	470 ($4.70)
23 ($0.23)	79 ($0.79)	135 ($1.35)	191 ($1.91)	247 ($2.47)	303 ($3.03)	359 ($3.59)	415 ($4.15)	471 ($4.71)
24 ($0.24)	80 ($0.80)	136 ($1.36)	192 ($1.92)	248 ($2.48)	304 ($3.04)	360 ($3.60)	416 ($4.16)	472 ($4.72)
25 ($0.25)	81 ($0.81)	137 ($1.37)	193 ($1.93)	249 ($2.49)	305 ($3.05)	361 ($3.61)	417 ($4.17)	473 ($4.73)
26 ($0.26)	82 ($0.82)	138 ($1.38)	194 ($1.94)	250 ($2.50)	306 ($3.06)	362 ($3.62)	418 ($4.18)	474 ($4.74)
27 ($0.27)	83 ($0.83)	139 ($1.39)	195 ($1.95)	251 ($2.51)	307 ($3.07)	633 ($3.63)	419 ($4.19)	475 ($4.75)
28 ($0.28)	84 ($0.84)	140 ($1.40)	196 ($1.96)	252 ($2.52)	308 ($3.08)	364 ($3.64)	420 ($4.20)	476 ($4.76)
29 ($0.29)	85 ($0.85)	141 ($1.41)	197 ($1.97)	253 ($2.53)	309 ($3.09)	365 ($3.65)	421 ($4.21)	477 ($4.77)
30 ($0.30)	86 ($0.86)	142 ($1.42)	198 ($1.98)	254 ($2.54)	310 ($3.10)	366 ($3.66)	422 ($4.22)	478 ($4.78)
31 ($0.31)	87 ($0.87)	143 ($1.43)	199 ($1.99)	255 ($2.55)	311 ($3.11)	367 ($3.67)	423 ($4.23)	479 ($4.79)
32 ($0.32)	88 ($0.88)	144 ($1.44)	200 ($2.00)	256 ($2.56)	312 ($3.12)	368 ($3.68)	424 ($4.24)	480 ($4.80)
33 ($0.33)	89 ($0.89)	145 ($1.45)	201 ($2.01)	257 ($2.57)	313 ($3.13)	369 ($3.69)	425 ($4.25)	481 ($4.81)
34 ($0.34)	90 ($0.90)	146 ($1.46)	202 ($2.02)	258 ($2.58)	314 ($3.14)	370 ($3.70)	426 ($4.26)	482 ($4.82)
35 ($0.35)	91 ($0.91)	147 ($1.47)	203 ($2.03)	259 ($2.59)	315 ($3.15)	371 ($3.71)	427 ($4.27)	483 ($4.83)
36 ($0.36)	92 ($0.92)	148 ($1.48)	204 ($2.04)	260 ($2.60)	316 ($3.16)	372 ($3.72)	428 ($4.28)	484 ($4.84)
37 ($0.37)	93 ($0.93)	149 ($1.49)	205 ($2.05)	261 ($2.61)	317 ($3.17)	373 ($3.73)	429 ($4.29)	485 ($4.85)
38 ($0.38)	94 ($0.94)	150 ($1.50)	206 ($2.06)	262 ($2.62)	318 ($3.18)	374 ($3.74)	430 ($4.30)	486 ($4.86)
39 ($0.39)	95 ($0.95)	151 ($1.51)	207 ($2.07)	263 ($2.63)	319 ($3.19)	375 ($3.75)	431 ($4.31)	487 ($4.87)
40 ($0.40)	96 ($0.96)	152 ($1.52)	208 ($2.08)	264 ($2.64)	320 ($3.20)	376 ($3.76)	432 ($4.32)	488 ($4.88)
41 ($0.41)	97 ($0.97)	153 ($1.53)	209 ($2.09)	265 ($2.65)	321 ($3.21)	377 ($3.77)	433 ($4.33)	489 ($4.89)
42 ($0.42)	98 ($0.98)	154 ($1.54)	210 ($2.10)	266 ($2.66)	322 ($3.22)	378 ($3.78)	434 ($4.34)	490 ($4.90)
43 ($0.43)	99 ($0.99)	155 ($1.55)	211 ($2.11)	267 ($2.67)	323 ($3.23)	379 ($3.79)	435 ($4.35)	491 ($4.91)
44 ($0.44)	100 ($1.00)	156 ($1.56)	212 ($2.12)	268 ($2.68)	324 ($3.24)	380 ($3.80)	436 ($4.36)	492 ($4.92)
45 ($0.45)	101 ($1.01)	157 ($1.57)	213 ($2.13)	269 ($2.69)	325 ($3.25)	381 ($3.81)	437 ($4.37)	493 ($4.93)
46 ($0.46)	102 ($1.02)	158 ($1.58)	214 ($2.14)	270 ($2.70)	326 ($3.26)	382 ($3.82)	438 ($4.38)	494 ($4.94)
47 ($0.47)	103 ($1.03)	159 ($1.59)	215 ($2.15)	271 ($2.71)	327 ($3.27)	383 ($3.83)	439 ($4.39)	495 ($4.95)
48 ($0.48)	104 ($1.04)	160 ($1.60)	216 ($2.16)	272 ($2.72)	328 ($3.28)	384 ($3.84)	440 ($4.40)	496 ($4.96)
49 ($0.49)	105 ($1.05)	161 ($1.61)	217 ($2.17)	273 ($2.73)	329 ($3.29)	385 ($3.85)	441 ($4.41)	497 ($4.97)
50 ($0.50)	106 ($1.06)	162 ($1.62)	218 ($2.18)	274 ($2.74)	330 ($3.30)	386 ($3.86)	442 ($4.42)	498 ($4.98)
51 ($0.51)	107 ($1.07)	163 ($1.63)	219 ($2.19)	275 ($2.75)	331 ($3.31)	387 ($3.87)	443 ($4.43)	499 ($4.99)
52 ($0.52)	108 ($1.08)	164 ($1.64)	220 ($2.20)	276 ($2.76)	332 ($3.32)	388 ($3.88)	444 ($4.44)	500 ($5.00)
53 ($0.53)	109 ($1.09)	165 ($1.65)	221 ($2.21)	277 ($2.77)	333 ($3.33)	389 ($3.89)	445 ($4.45)	
54 ($0.54)	110 ($1.10)	166 ($1.66)	222 ($2.22)	278 ($2.78)	334 ($3.34)	390 ($3.90)	446 ($4.46)	
55 ($0.55)	111 ($1.11)	167 ($1.67)	223 ($2.23)	279 ($2.79)	335 ($3.35)	391 ($3.91)	447 ($4.47)	
56 ($0.56)	112 ($1.12)	168 ($1.68)	224 ($2.24)	280 ($2.80)	336 ($3.36)	392 ($3.92)	448 ($4.48)	

PARTICIPANT NUMBER _____
TOKEN ORDER FORM

PARTICIPANT COMPLETES THESE TWO COLUMNS | EXPERIMENT MONITOR COMPLETES THESE COLUMNS

ROUND	BASE TOKEN COST THIS ROUND	MY TOKEN ORDER THIS ROUND		GROUP TOKEN ORDER THIS ROUND	COST PER TOKEN THIS ROUND	TOTAL BENEFITS THIS ROUND	TOTAL COSTS THIS ROUND	TOTAL PROFITS THIS ROUND
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

MONITOR WORKSHEET

EXPERIMENT NUMBER_____

	SUBJECT ORDER BY SUBJECT NUMBER											
	1	2	3	4	5	6	7	8	9	10		
ROUND											BASE COST	AVE COST
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

MONITOR WORKSHEET

PROFITS SUMMARY

EXPERIMENT NUMBER _____

	SUBJECT PROFIT BY SUBJECT NUMBER									
	1	2	3	4	5	6	7	8	9	10
RD										
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										