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**Working Paper**

## In broad daylight: Full information and higher-order punishment opportunities promote cooperation

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**Additional Instructions Appendix for**  
**Kamei and Putterman, 2012,**  
**“In Broad Daylight: Full Information and**  
**Higher-order Punishment Opportunities Promote Cooperation”**

This Appendix contains full sets of instructions used in Kamei and Putterman (2012).

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## 1. Reference Treatment

# Instructions

Welcome to our decision-making experiment. Depending on your decisions and the decisions of other participants, you will be able to earn money in addition to the \$5 guaranteed for your participation. Please listen and read the following instructions carefully.

During the experiment you are not allowed to communicate with other participants. You are likewise not allowed to use your cell phone or other communications media, including computer applications other than the experiment software. If you have a question, raise your hand. One of us will come to answer your question.

During the experiment your earnings will be calculated in points. At the end of the experiment, points will be converted to U.S. dollars at the rate

$$20 \text{ points} = \$1$$

This means each point will exchange for 5 cents of real money. At the end of the experiment your total earnings (including the \$5 participation fee) will be paid out to you privately in cash to the nearest one cent.

In the experiment, each participant is randomly assigned to a **group of 4**. This means that you will be in a group with three other participants. **You will be part of the same group throughout the entire experiment.** You will not be told which other participants are in your group, nor will you be informed who was in which group after the experiment ends.

In this experiment, participants and their groups interact together for a total of **15 periods**. Every period, each group member, yourself included, begins with an **endowment of 20 points**. Each period consists of two stages.

### *Stage 1: allocation decisions*

At the beginning of each period, you and the three others in your group simultaneously decide how to use your endowments. There are two possibilities:

- 1. You can allocate points to a group account.**
- 2. You can allocate points to a private account.**

You will be asked to indicate the number of points you want to allocate to the group account. Only integers between 0 and 20 are allowed for this purpose. The remaining

points will automatically be allocated to your private account. Your earnings depend on the total number of points in the group account, and the number of points in your private account.

### *Calculating earnings from the allocation decisions*

Your earnings from your private account are equal to the number of points you allocate to it. That is, **for each point you allocate to your private account you get 1 point as earnings**. The points you allocate to your private account do not affect the earnings of the others in your group.

Your earnings from the group account equal the **sum** of points allocated to the group account by all 4 group members multiplied by 0.4. **For each point you allocate to the group account you and all others in your group each get 0.4 points as earnings**. For example, if the sum of points in the group account is 30, then your earnings from the group account and the earnings of each of the others in your group from the group account are equal to  $0.4 * 30 = 12$  points.

Your earnings can be calculated with the following formula:

$$(20 - \text{points you allocated to the group account}) + 0.4 * (\text{sum of points allocated by all group members to the group account})$$

Note that you get 1 point as earnings for each point you allocate to your private account. If you instead allocate 1 extra point to the group account, your earnings from the group account increase by  $0.4 * 1 = 0.4$  points and your earnings from your private account decrease by 1 point. However, by allocating 1 extra point to the group account, the earnings of each of the other 3 group members also increase by 0.4 points. Therefore, the total group earnings increase by  $0.4 * 4 = 1.6$  points. Note that you also obtain earnings from points allocated to the group account by others. You obtain 0.4 points for each point allocated to the group account by another member.

After each member completes their allocation decision, they will be aware of other members' allocation decisions. You will be shown the amount allocated to the group account by each of the others in your group, in an order that remains the same for all 15 periods.

### Example

Suppose you allocate 10 points to the group account, the second member of your group allocates 20 points to the group account, the third member allocates 15 points and the remaining member allocates 0 points to the account. In this case, the sum of points in the group account is  $10 + 20 + 15 + 0 = 45$  points. Each group member gets earnings of  $0.4 * 45 = 18$  points from the group account. In this situation,

Your total earnings are:  $(20 - 10) + (0.4 * 45) = 10 + 18 = 28$  points.

The second member's earnings are:  $(20 - 20) + (0.4 * 45) = 0 + 18 = 18$  points.

The third member's earnings are:  $(20 - 15) + (0.4 * 45) = 5 + 18 = 23$  points.

The fourth member's earnings are:  $(20 - 0) + (0.4 * 45) = 20 + 18 = 38$  points.

Another set of decisions will follow after the allocation decisions in each period, so your earnings for the period are not yet final at this stage. Before we describe the next stage, we'll pause to help you make sure you've understood the first one.

### *Comprehension questions*

Please answer the following questions. Raise your hand if you need help. A member of the experiment team will come to help you and will check your answers when you are done.

**1.** Suppose all four individuals in your group allocate 0 points to the group account.

a) How much do you earn? \_\_\_\_\_ points

b) How much do the others each earn? \_\_\_\_\_ points

**2.** Suppose all four allocate 20 points to the group account.

a) How much do you earn? \_\_\_\_\_ points

b) How much do the others each earn? \_\_\_\_\_ points

**3.** Suppose the others in your group allocate 30 points in total to the group account.

a) How much do you earn if you allocate 0 points to the group account? \_\_\_\_\_ points

b) How much do you earn if you allocate 10 points to the group account? \_\_\_\_\_ points

c) How much do you earn if you allocate 20 points to the group account? \_\_\_\_\_ points

## Stage 2: reduction decisions

After the first stage of each period, you will be shown the amount allocated to the group account by each of the others in your group, in an order that remains the same for all 15 periods. In a box to the right of the allocation information, you will be asked to enter a whole number of points (if any) that you wish to use to reduce the earnings of the individual who made that allocation decision. Each point you allocate to reducing another's earnings **reduces your own earnings by 1 point** and **reduces that individual's earnings by 3 points**. Your own earnings can be reduced in the same way by the decisions of others in your group. You are free to leave any or all others' earnings unchanged by entering 0's in the relevant boxes.

An example of what your screen will look like at the beginning of each period's Stage 2 follows.

Player	Alloc. to group acct.	Points to reduction
You	5	
Player 1	15	<input type="text"/>
Player 3	10	<input type="text"/>
Player 4	20	<input type="text"/>

Remember that the earnings of other group members are reduced by 3 times the amounts you enter. To leave an individual's earnings unchanged, enter 0.

Submit

Note: Numbers shown are for illustration only.

There are several things to keep in mind regarding the reduction stage.

First, earnings reductions directed at you in this stage cannot bring your earnings for the period to less than zero. For example, if your first stage earnings were 15 points and the other members of your group devoted six points in total to reducing your earnings, you would not lose the  $6 * 3 = 18$  points that would otherwise be deducted from your earnings for the periods, but would lose only the maximum possible in this case, 15 points.

However, the **cost of giving reductions** to others is always fully born by you even if it makes your period earnings negative. For instance, suppose that in the above example in

which you incurred the maximum possible earnings reductions by others, you yourself had given, say, 3 reduction points to others. Then your earnings for the period would be  $-3$ . If you lose points in a period, they are deducted from those you accumulate in other periods. Thus, final earnings for a period can be calculated as follows:

$$\left\{ \begin{aligned} & \text{The greater of } [(20 - (\text{points you allocate to group account}) + 0.4 * (\text{sum of points} \\ & \text{allocated by all in group to group account}) - \\ & 3 * (\text{sum of reduction points directed at you by others in your group})] \text{ and } 0 \} \\ & - (\text{points you use to reduce others' earnings}) \end{aligned} \right.$$

At the end of the reduction stage, you will learn by what amount, in total, others decided to reduce your earnings (possibly 0), but you will not be told which individuals reduced your earnings or by how much any given individual reduced your earnings. Others will also not know who in particular reduced their earnings by how much.

In addition to the fact that earnings from the allocation stage and reductions received cannot go below zero, the earnings reduction process is subject to two limits. First, your reduction points must be an integer. Second, you cannot assign more than 10 reduction points to any one individual in your group.

Remember that if no reductions are imposed (the reduction boxes are filled in with 0's), earnings after the reduction stage are the same as those before it.

### *Comprehension questions*

Please answer the following questions. Raise your hand if you need help. A member of the experiment team will come to help you and will check your answers when you are done.

- 1) How much does it cost you to reduce the earnings of another group member by 6 points? \_\_\_\_\_ points
- 2) Suppose that an individual earns 10 points from the allocation stage, spends 2 points on reducing others' earnings, and incurs no earnings reductions from others. What are the individual's earnings for this period? \_\_\_\_\_ points
- 3) Suppose that an individual earns 14 points from the allocation stage, spends 1 point on reducing others' earnings, and that others spend a total of 5 points to reduce her earnings. What are the individual's earnings for this period? \_\_\_\_\_ points

## *Summary*

You will interact with three other individuals whose identities will not be made known to you either during or after the experiment, for a total of fifteen periods. Each period, you and each other member of your group receives an endowment of 20 points and decides on its allocation between a private and a group account. Points allocated to the group account raise each group member's earnings by 0.4 points, while points allocated to the private accounts raise the allocator's earnings by 1 point with no effect on others' earnings. Once each group member has made his or her allocation decisions, each sees how much each other has allocated to the group account and has an opportunity to reduce his or her earnings at a cost of 1 point to the assigner per 3 points lost by the recipient of the reduction.

During the experiment, you are welcome to write down notes on scratch paper if you want to do so, to help you recall more detailed information.

After fifteen repetitions of this process, the experiment will be over, and you will be asked to answer a few questions while the experimenters count out payments based on each person's accumulated earnings and the rate  $\$1 = 20$  points, plus a show-up fee of \$5 for each participant. A member of the experiment team will then come to your desk to deliver your payment to you privately in a sealed envelope.

Please raise your hand now if you have any questions. Once all questions have been answered, the experiment will begin.



## 2. Treatment E3n

# Instructions

Welcome to our decision-making experiment. Depending on your decisions and the decisions of other participants, you will be able to earn money in addition to the \$5 guaranteed for your participation. Please listen to and read the following instructions carefully.

During the experiment you are not allowed to communicate with other participants. You are likewise not allowed to use your cell phone or other communications media, including computer applications other than the experiment software. If you have a question, raise your hand. One of us will come to answer your question.

During the experiment your earnings will be calculated in points. At the end of the experiment, points will be converted to U.S. dollars at the rate

$$20 \text{ points} = \$1$$

This means each point will exchange for 5 cents of real money. At the end of the experiment, your total earnings (including the \$5 participation fee) will be paid out to you privately in cash to the nearest one cent.

In the experiment, each participant is randomly assigned to a **group of 4**. This means that you will be in a group with three other participants. **You will be part of the same group throughout the entire experiment.** You will not be told which other participants are in your group, nor will you be informed who was in which group after the experiment ends.

In this experiment, participants and their groups interact together for a total of **15 periods**. Every period, each group member, yourself included, begins with an **endowment of 20 points**. Each period consists of three stages.

### *Stage 1: allocation decisions*

At the beginning of each period, you and the three others in your group simultaneously decide how to use your endowments. There are two possibilities:

- 1. You can allocate points to a group account.**
- 2. You can allocate points to a private account.**

You will be asked to indicate the number of points you want to allocate to the group account. Only integers between 0 and 20 are allowed for this purpose. The remaining

points will automatically be allocated to your private account. Your earnings depend on the total number of points in the group account, and the number of points in your private account.

### *Calculating earnings from the allocation decisions*

Your earnings from your private account are equal to the number of points you allocate to it. That is, **for each point you allocate to your private account you get 1 point as earnings**. The points you allocate to your private account do not affect the earnings of the others in your group.

Your earnings from the group account equal the **sum** of points allocated to the group account by all 4 group members multiplied by 0.4. **For each point you allocate to the group account you and all others in your group each get 0.4 points as earnings**. For example, if the sum of points in the group account is 30, then your earnings from the group account and the earnings of each of the others in your group from the group account are equal to  $0.4 * 30 = 12$  points.

In summary, your earnings can be calculated with the following formula:

$$(20 - \text{points you allocated to the group account}) + 0.4 * (\text{sum of points allocated by all group members to the group account})$$

Note that you get 1 point as earnings for each point you allocate to your private account. If you instead allocate 1 extra point to the group account, your earnings from the group account increase by  $0.4 * 1 = 0.4$  points and your earnings from your private account decrease by 1 point. However, by allocating 1 extra point to the group account, the earnings of each of the other 3 group members also increase by 0.4 points. Therefore, the total group earnings increase by  $0.4 * 4 = 1.6$  points. Note that you also obtain earnings from points allocated to the group account by others. You obtain 0.4 points for each point allocated to the group account by another member.

After each member completes their allocation decision, they will be informed of other members' allocation decisions. You will be shown the amount allocated to the group account by each of the others in your group, in an order that changes randomly from one period to the next.

### *Example*

Suppose you allocate 10 points to the group account, the second member of your group allocates 20 points to the group account, the third member allocates 15 points and the remaining member allocates 0 points to the account. In this case, the sum of points in the group account is  $10 + 20 + 15 + 0 = 45$  points. Each group member gets earnings of  $0.4 * 45 = 18$  points from the group account. In this situation,

Your total earnings are:  $(20 - 10) + (0.4 * 45) = 10 + 18 = 28$  points.

The second member's earnings are:  $(20 - 20) + (0.4 * 45) = 0 + 18 = 18$  points.

The third member's earnings are:  $(20 - 15) + (0.4 * 45) = 5 + 18 = 23$  points.

The fourth member's earnings are:  $(20 - 0) + (0.4 * 45) = 20 + 18 = 38$  points.

Another set of decisions will follow after the allocation decisions in each period, so your earnings for the period are not yet final at this stage. Before we describe the next stage, we'll pause to help you make sure you've understood the first one.

### *Comprehension questions*

Please answer the following questions. Raise your hand if you need help. A member of the experiment team will come to help you and will check your answers when you are done.

**1.** Suppose all four individuals in your group allocate 0 points to the group account.

a) How much do you earn? \_\_\_\_\_ points

b) How much do the others each earn? \_\_\_\_\_ points

**2.** Suppose all four allocate 20 points to the group account.

a) How much do you earn? \_\_\_\_\_ points

b) How much do the others each earn? \_\_\_\_\_ points

**3.** Suppose the others in your group allocate 30 points in total to the group account.

a) How much do you earn if you allocate 0 points to the group account? \_\_\_\_\_ points

b) How much do you earn if you allocate 10 points to the group account? \_\_\_\_\_ points

c) How much do you earn if you allocate 20 points to the group account? \_\_\_\_\_ points

## Stage 2: reduction decisions

After the first stage of each period, you will be shown the amount allocated to the group account by each of the others in your group, identified as Player 1, Player 2, Player 3 or Player 4. These numbers will be randomly reassigned each period, so that the individual identified as, say, Player 2 this period is equally likely to be identified by any of the four numbers next period. In a box to the right of the allocation information, you will be asked to enter a whole number of points (if any) that you wish to use to reduce the earnings of the individual who made that allocation decision. Each point you allocate to reduce another's earnings **reduces your own earnings by 1 point** and **reduces that individual's earnings by 3 points**. Your own earnings can be reduced in the same way by the decisions of others in your group. You are free to leave any or all others' earnings unchanged by entering 0's in the relevant boxes.

Here is an example of what your screen will look like at the beginning of Stage 2.

Player	Alloc. to group acct.	Points to reduction
You	15	
Player 1	5	<input type="text"/>
Player 2	10	<input type="text"/>
Player 4	20	<input type="text"/>

Remember that the earnings of other group members are reduced by 3 times the amounts you enter.  
To leave an individual's earnings unchanged, enter 0.

Submit

Note: Numbers shown are for illustration only.

There are several things to keep in mind regarding the reduction stage.

First, earnings reductions directed at you in this stage cannot bring your earnings for the period to less than zero. For example, if your first stage earnings were 15 points and the other members of your group devoted six points in total to reducing your earnings, you would not lose the  $6 * 3 = 18$  points that would otherwise be deducted from your earnings for the period, but would lose only the maximum possible in this case, 15 points.

However, the **cost of giving reductions** to others is always fully born by you even if it makes your period earnings negative. For instance, suppose that in the above example in which you incurred the maximum possible earnings reductions by others, you yourself had given, say, 3 reduction points to others. Then your earnings for the period would be  $-3$ . If you lose points in a period, they are deducted from those you accumulate in other periods. Thus, final earnings for a period can be calculated as follows:

$$\left\{ \begin{aligned} & \text{The greater of } [(20 - (\text{points you allocate to group account}) + 0.4 * (\text{sum of points allocated by} \\ & \quad \text{all in group to group account}) - \\ & \quad 3 * (\text{sum of reduction points directed at you by others in your group})] \text{ and } 0 \} \\ & - (\text{points you use to reduce others' earnings}) \end{aligned} \right.$$

At the end of the reduction stage, you will learn by what amount, in total, others decided to reduce your earnings (possibly 0).

In addition to the fact that earnings from the allocation stage and reductions received cannot go below zero, the earnings reduction process is subject to two limits. First, your reduction points must be an integer. Second, you cannot assign more than 10 reduction points to any one individual in your group.

Remember that if no reductions are imposed (the reduction boxes are filled in with 0's), earnings after the reduction stage are the same as those before it.

### *Comprehension questions*

Please answer the following questions. Raise your hand if you need help. A member of the experiment team will come to help you and will check your answers when you are done.

- 1) How much does it cost you to reduce the earnings of another group member by 6 points? \_\_\_\_\_ points
- 2) Suppose that an individual earns 10 points from the allocation stage, spends 2 points on reducing others' earnings, and incurs no earnings reductions from others. What are the individual's earnings for this period? \_\_\_\_\_ points
- 3) Suppose that an individual earns 14 points from the allocation stage, spends 1 point on reducing others' earnings, and that others spend a total of 5 points to reduce her earnings. What are the individual's earnings for this period?

*Stage 3: another set of reduction decisions*

After each group member has made their allocation decision and their initial reduction decisions, there is a final stage in each period during which you will see the number of reduction points, if any, that each other group member assigned to you in the second stage and you will have the opportunity to reduce their earnings should you wish to. The reduction process is the same as in Stage 2 in that you must enter an integer between 0 and 10 into a box in the row for the relevant member or members of your group, and each 1 point you spend on reducing another member's earnings causes that person's earnings for the period to decline by 3 points (unless the sum of reductions from others in Stages 2 and 3 have already brought his or her earnings for the period to zero). As with Stage 2, your own earnings are always reduced by the number of reduction points you assign to others, even if this causes your earnings for the period to become negative (or, if they were negative already, to become a still larger negative number).

Your final earnings for the period as a whole are equal to your earnings from the allocation stage minus your total losses from reductions assigned to you by other group members in stages 2 and 3 (or zero if that result is negative) minus the total number of points you assign to reduce others' earnings in stages 2 and 3. (A negative earnings total in one period will be made up out of the positive earnings totals of other periods.) In other words, your final earnings are:

$$\left\{ \begin{aligned} & \text{The greater of } [20 - (\text{points you allocate to group account}) + 0.4 * (\text{sum of points allocated by all} \\ & \quad \text{in group to group account}) - \\ & \quad 3 * (\text{sum of reduction points directed at you by others in your group in the two reduction stages})] \\ & \quad \text{and } 0 \end{aligned} \right\} \\ - (\text{sum of points you use to reduce others' earnings in the two reduction stages}).$$

An example of the screen on which you enter your Stage 3 reduction decisions is shown below. Notice that the column to the left of the boxes in which you can enter reduction points shows the number of reduction points assigned to you in Stage 2 by the group member indicated in the row heading.

Period		1 out of 15
Player	1st Stage Reduction Points from Row Player	2nd stage reduction points
You	--	
Player 1	1	<input type="text" value=""/>
Player 3	2	<input type="text" value=""/>
Player 4	0	

Remember that the earnings of other group members are reduced by 3 times the amounts you enter. To leave an individual's earnings unchanged, enter 0.

Note: Numbers shown are for illustration only.

After Stage 3 is over, you will learn the total number of points, if any, by which your own earnings were reduced by other group members in Stage 3, but not the number of points that particular group members assigned to you. The information on your Stage 3 reductions will be part of an overall summary of actions taken and your resulting earnings in the period.

### *Summary*

You will interact with three other individuals whose identities will not be made known to you either during or after the experiment, for a total of fifteen periods. Each period, you and each other member of your group will receive an endowment of 20 points and decides on its allocation between a private and a group account. Points allocated to the group account raise each group member's earnings by 0.4 points, while points allocated to the private accounts raise the allocator's earnings by 1 point with no effect on others' earnings. Once each group member has made his or her allocation decisions, each will see how much each other has allocated to the group account and will have an opportunity to reduce his or her earnings at a cost of 1 point to the assigner per 3 points lost by the recipient of the reduction. Each period, group members will be randomly assigned one of the identifications Player 1, 2, 3 or 4 (which is reshuffled each period). Each period then has a third and final stage in which group members learn by how much (if at all) their earnings were reduced by each other group member and each has a second opportunity to reduce the earnings of those who had reduced their own earnings, at the same cost of 1 point per 3 points lost. At the end of each period, a summary of allocation and reduction decisions and your earnings for the period will be displayed.

During the experiment, you are welcome to write down notes on scratch paper if you want to do so, to help you recall more detailed information.

After fifteen repetitions of this process, the experiment will be over, and you will be asked to answer a few questions while the experimenters count out payments based on each person's accumulated earnings and the rate  $\$1 = 20$  points, plus a show-up fee of \$5 for each participant. A member of the experiment team will then come to your desk to deliver your payment to you privately in a sealed envelope.

Please raise your hand now if you have any questions. Once all questions have been answered, the experiment will begin.



### 3. Treatment F3n

## Instructions

Welcome to our decision-making experiment. Depending on your decisions and the decisions of other participants, you will be able to earn money in addition to the \$5 guaranteed for your participation. Please listen to and read the following instructions carefully.

During the experiment you are not allowed to communicate with other participants. You are likewise not allowed to use your cell phone or other communications media, including computer applications other than the experiment software. If you have a question, raise your hand. One of us will come to answer your question.

During the experiment your earnings will be calculated in points. At the end of the experiment, points will be converted to U.S. dollars at the rate

$$20 \text{ points} = \$1$$

This means each point will exchange for 5 cents of real money. At the end of the experiment, your total earnings (including the \$5 participation fee) will be paid out to you privately in cash to the nearest one cent.

In the experiment, each participant is randomly assigned to a **group of 4**. This means that you will be in a group with three other participants. **You will be part of the same group throughout the entire experiment.** You will not be told which other participants are in your group, nor will you be informed who was in which group after the experiment ends.

In this experiment, participants and their groups interact together for a total of **15 periods**. Every period, each group member, yourself included, begins with an **endowment of 20 points**. Each period consists of three stages.

#### *Stage 1: allocation decisions*

At the beginning of each period, you and the three others in your group simultaneously decide how to use your endowments. There are two possibilities:

- 1. You can allocate points to a group account.**
- 2. You can allocate points to a private account.**

You will be asked to indicate the number of points you want to allocate to the group account. Only integers between 0 and 20 are allowed for this purpose. The remaining

points will automatically be allocated to your private account. Your earnings depend on the total number of points in the group account, and the number of points in your private account.

### *Calculating earnings from the allocation decisions*

Your earnings from your private account are equal to the number of points you allocate to it. That is, **for each point you allocate to your private account you get 1 point as earnings**. The points you allocate to your private account do not affect the earnings of the others in your group.

Your earnings from the group account equal the **sum** of points allocated to the group account by all 4 group members multiplied by 0.4. **For each point you allocate to the group account you and all others in your group each get 0.4 points as earnings**. For example, if the sum of points in the group account is 30, then your earnings from the group account and the earnings of each of the others in your group from the group account are equal to  $0.4 * 30 = 12$  points.

In summary, your earnings can be calculated with the following formula:

$$(20 - \text{points you allocated to the group account}) + 0.4 * (\text{sum of points allocated by all group members to the group account})$$

Note that you get 1 point as earnings for each point you allocate to your private account. If you instead allocate 1 extra point to the group account, your earnings from the group account increase by  $0.4 * 1 = 0.4$  points and your earnings from your private account decrease by 1 point. However, by allocating 1 extra point to the group account, the earnings of each of the other 3 group members also increase by 0.4 points. Therefore, the total group earnings increase by  $0.4 * 4 = 1.6$  points. Note that you also obtain earnings from points allocated to the group account by others. You obtain 0.4 points for each point allocated to the group account by another member.

After each member completes their allocation decision, they will be informed of other members' allocation decisions. You will be shown the amount allocated to the group account by each of the others in your group, in an order that remains the same for all 15 periods.

### *Example*

Suppose you allocate 10 points to the group account, the second member of your group allocates 20 points to the group account, the third member allocates 15 points and the remaining member allocates 0 points to the account. In this case, the sum of points in the group account is  $10 + 20 + 15 + 0 = 45$  points. Each group member gets earnings of  $0.4 * 45 = 18$  points from the group account. In this situation,

Your total earnings are:  $(20 - 10) + (0.4 * 45) = 10 + 18 = 28$  points.

The second member's earnings are:  $(20 - 20) + (0.4 * 45) = 0 + 18 = 18$  points.

The third member's earnings are:  $(20 - 15) + (0.4 * 45) = 5 + 18 = 23$  points.

The fourth member's earnings are:  $(20 - 0) + (0.4 * 45) = 20 + 18 = 38$  points.

Another set of decisions will follow after the allocation decisions in each period, so your earnings for the period are not yet final at this stage. Before we describe the next stage, we'll pause to help you make sure you've understood the first one.

### *Comprehension questions*

Please answer the following questions. Raise your hand if you need help. A member of the experiment team will come to help you and will check your answers when you are done.

**1.** Suppose all four individuals in your group allocate 0 points to the group account.

a) How much do you earn? \_\_\_\_\_ points

b) How much do the others each earn? \_\_\_\_\_ points

**2.** Suppose all four allocate 20 points to the group account.

a) How much do you earn? \_\_\_\_\_ points

b) How much do the others each earn? \_\_\_\_\_ points

**3.** Suppose the others in your group allocate 30 points in total to the group account.

a) How much do you earn if you allocate 0 points to the group account? \_\_\_\_\_ points

b) How much do you earn if you allocate 10 points to the group account? \_\_\_\_\_ points

c) How much do you earn if you allocate 20 points to the group account? \_\_\_\_\_ points

## Stage 2: reduction decisions

After the first stage of each period, you will be shown the amount allocated to the group account by each of the others in your group, identified to you by numbers (Player 1, Player 2, etc.) that are randomly assigned to them but then remain fixed for the duration of the experiment. In a box to the right of the allocation information, you will be asked to enter a whole number of points (if any) that you wish to use to reduce the earnings of the individual who made that allocation decision. Each point you allocate to reduce another's earnings **reduces your own earnings by 1 point and reduces that individual's earnings by 3 points**. Your own earnings can be reduced in the same way by the decisions of others in your group. You are free to leave any or all others' earnings unchanged by entering 0's in the relevant boxes.

Here is an example of what your screen will look like at the beginning of Stage 2.

Period  
1 out of 15

Player	Alloc. to group acct.	Points to reduction
You	15	
Player 1	5	<input type="text"/>
Player 2	10	<input type="text"/>
Player 4	20	<input type="text"/>

Remember that the earnings of other group members are reduced by 3 times the amounts you enter.  
To leave an individual's earnings unchanged, enter 0.

Submit

Note: Numbers shown are for illustration only.

There are several things to keep in mind regarding the reduction stage.

First, earnings reductions directed at you in this stage cannot bring your earnings for the period to less than zero. For example, if your first stage earnings were 15 points and the other members of your group devoted six points in total to reducing your earnings, you would not lose the  $6 * 3 = 18$  points that would otherwise be deducted from your earnings for the period, but would lose only the maximum possible in this case, 15 points.

However, the **cost of giving reductions** to others is always fully born by you even if it makes your period earnings negative. For instance, suppose that in the above example in which you incurred the maximum possible earnings reductions by others, you yourself had given, say, 3 reduction points to others. Then your earnings for the period would be  $-3$ . If you lose points in a period, they are deducted from those you accumulate in other periods. Thus, final earnings for a period can be calculated as follows:

$$\left\{ \begin{aligned} & \text{The greater of } [(20 - (\text{points you allocate to group account}) + 0.4 * (\text{sum of points allocated by} \\ & \quad \text{all in group to group account}) - \\ & \quad 3 * (\text{sum of reduction points directed at you by others in your group})] \text{ and } 0 \} \\ & - (\text{points you use to reduce others' earnings}) \end{aligned} \right.$$

At the end of the reduction stage, you will learn by what amount, in total, others decided to reduce your earnings (possibly 0).

In addition to the fact that earnings from the allocation stage and reductions received cannot go below zero, the earnings reduction process is subject to two limits. First, your reduction points must be an integer. Second, you cannot assign more than 10 reduction points to any one individual in your group.

Remember that if no reductions are imposed (the reduction boxes are filled in with 0's), earnings after the reduction stage are the same as those before it.

### *Comprehension questions*

Please answer the following questions. Raise your hand if you need help. A member of the experiment team will come to help you and will check your answers when you are done.

- 1) How much does it cost you to reduce the earnings of another group member by 6 points? \_\_\_\_\_ points
- 2) Suppose that an individual earns 10 points from the allocation stage, spends 2 points on reducing others' earnings, and incurs no earnings reductions from others. What are the individual's earnings for this period? \_\_\_\_\_ points
- 3) Suppose that an individual earns 14 points from the allocation stage, spends 1 point on reducing others' earnings, and that others spend a total of 5 points to reduce her earnings. What are the individual's earnings for this period?

*Stage 3: another set of reduction decisions*

After each group member has made their allocation decision and their initial reduction decisions, there is a final stage in each period during which you will see the number of reduction points, if any, that each group member assigned to each other group member in the second stage and you will have the opportunity to reduce their earnings should you wish to. The information on Stage 2 reductions will appear as a block of numbers near the right side of your screen, as illustrated by the example below. In this example, the 2 in the first column, third row indicates that Player 2 (row heading) gave 2 reduction points to You (column heading) in Stage 2. The number 3 in the first row, second column means that You (row heading) gave 3 reduction points to Player 1 (column heading) in Stage 2. The number 1 on the right end of the bottom row indicates that Player 4 gave 1 reduction point to Player 2 in Stage 2.

The reduction process in Stage 3 is the same as in Stage 2 in that you must enter integers between 0 and 10 into the boxes in the rows for the relevant members of your group, and each 1 point you spend on reducing another member’s earnings causes that person’s earnings for the period to decline by 3 points (unless the sum of reductions from others in Stages 2 and 3 have already brought his or her earnings for the period to zero). As with Stage 2, your own earnings are always reduced by the number of reduction points you assign to others, even if this causes your earnings for the period to become negative (or, if they were negative already, to become a still larger negative number).

Your final earnings for the period as a whole are equal to your earnings from the allocation stage minus your total losses from reductions assigned to you by other group members in stages 2 and 3 (or zero if that result is negative) minus the total number of points you assign to reduce others’ earnings in stages 2 and 3. (A negative earnings total in one period will be made up out of the positive earnings totals of other periods.) In other words, your final earnings are:

$$\left\{ \begin{aligned} &\text{The greater of } [20 - (\text{points you allocate to group account}) + 0.4 * (\text{sum of points allocated by all} \\ &\quad \text{in group to group account}) - \\ &3 * (\text{sum of reduction points directed at you by others in your group in the two reduction stages})] \\ &\quad \text{and } 0 \end{aligned} \right\} \\ - (\text{sum of points you use to reduce others’ earnings in the two reduction stages}).$$

Period  
1 out of 15

1st Stage Reduction Points from Row Player to Col. Player

Player	Alloc. to group acct.	You	P1	P2	P4	Points to reduction (2nd reduction stage)
You	15		3	2	1	
Player 1	5	0		1	1	<input type="text"/>
Player 2	10	2	0		1	<input type="text"/>
Player 4	20	0	0	1		<input type="text"/>

Remember that the earnings of other group members are reduced by 3 times the amounts you enter.  
To leave an individual's earnings unchanged, enter 0.

Submit

Note: Numbers shown are for illustration only.

After Stage 3 is over, you will learn the total number of points, if any, by which your own earnings were reduced by other group members in Stage 3, but unlike in Stage 2, you will not be shown detailed information on the reductions assigned by specific individuals either to you or to the other group members. The information on your Stage 3 reductions will be part of an overall summary of actions taken and your resulting earnings in the period.

### Summary

You will interact with three other individuals whose identities will not be made known to you either during or after the experiment, for a total of fifteen periods. Each period, you and each other member of your group will receive an endowment of 20 points and decide on its allocation between a private and a group account. Points allocated to the group account raise each group member's earnings by 0.4 points, while points allocated to the private accounts raise the allocator's earnings by 1 point with no effect on others' earnings. Once each group member has made his or her allocation decisions, each will see how much each other has allocated to the group account, in a fixed order, and will have an opportunity to reduce his or her earnings at a cost of 1 point to the assigner per 3 points lost by the recipient of the reduction. Each period then has a third and final stage in which group members learn how many reduction points each group member received from each other member and each has a second opportunity to reduce the earnings of the others should she wish to, at the same cost of 1 point per 3 points lost. At the end of each period, a summary of allocation and reduction decisions and your earnings for the period will be displayed.

During the experiment, you are welcome to write down notes on scratch paper if you want to do so, to help you recall more detailed information.

After fifteen repetitions of this process, the experiment will be over, and you will be asked to answer a few questions while the experimenters count out payments based on each person's accumulated earnings and the rate  $\$1 = 20$  points, plus a show-up fee of \$5 for each participant. A member of the experiment team will then come to your desk to deliver your payment to you privately in a sealed envelope.

Please raise your hand now if you have any questions. Once all questions have been answered, the experiment will begin.



## 4. Treatment E2

# Instructions

Welcome to our decision-making experiment. Depending on your decisions and the decisions of other participants, you will be able to earn money in addition to the \$5 guaranteed for your participation. Please listen and read the following instructions carefully.

During the experiment you are not allowed to communicate with other participants. You are likewise not allowed to use your cell phone or other communications media, including computer applications other than the experiment software. If you have a question, raise your hand. One of us will come to answer your question.

During the experiment your earnings will be calculated in points. At the end of the experiment, points will be converted to U.S. dollars at the rate

$$20 \text{ points} = \$1$$

This means each point will exchange for 5 cents of real money. At the end of the experiment your total earnings (including the \$5 participation fee) will be paid out to you in cash to the nearest one cent.

In the experiment, each participant is randomly assigned to a **group of 4**. This means that you will be in a group with three other participants. **You will be part of the same group throughout the entire experiment.** You will not be told which other participants are in your group, nor will you be informed who was in which group after the experiment ends.

In this experiment, participants and their groups interact together for a total of **15 periods**. Every period, each group member, yourself included, begins with an **endowment of 20 points**. Each period consists of two stages.

### *Stage 1: allocation decisions*

At the beginning of each period, you and the three others in your group simultaneously decide how to use your endowments. There are two possibilities:

1. **You can allocate points to a group account.**
2. **You can allocate points to a private account.**

You will be asked to indicate the number of points you want to allocate to the group account. Only integers between 0 and 20 are allowed for this purpose. The remaining points will automatically be allocated to your private account. Your earnings depend on the total number of points in the group account, and the number of points in your private account.

### *Calculating earnings from the allocation decisions*

Your earnings from your private account are equal to the number of points you allocate to it. That is, **for each point you allocate to your private account you get 1 point as earnings**. The points you allocate to your private account do not affect the earnings of the others in your group.

Your earnings from the group account equal the **sum** of points allocated to the group account by all 4 group members multiplied by 0.4. **For each point you allocate to the group account you and all others in your group each get 0.4 points as earnings**. For example, if the sum of points in the group account is 30, then your earnings from the group account and the earnings of each of the others in your group from the group account are equal to  $0.4 * 30 = 12$  points.

Your earnings can be calculated with the following formula:

$$(20 - \text{points you allocated to the group account}) + 0.4 * (\text{sum of points allocated by all group members to the group account})$$

Note that you get 1 point as earnings for each point you allocate to your private account. If you instead allocate 1 extra point to the group account, your earnings from the group account increase by  $0.4 * 1 = 0.4$  points and your earnings from your private account decrease by 1 point. However, by allocating 1 extra point to the group account, the earnings of each of the other 3 group members also increase by 0.4 points. Therefore, the total group earnings increase by  $0.4 * 4 = 1.6$  points. Note that you also obtain earnings from points allocated to the group account by others. You obtain 0.4 points for each point allocated to the group account by another member.

After each member completes their allocation decision, they will be informed of other members' allocation decisions. You will be shown the amount allocated to the group account by each of the others in your group, in an order that changes randomly from one period to the next.

### *Example*

Suppose you allocate 10 points to the group account, the second member of your group allocates 20 points to the group account, the third member allocates 15 points and the

remaining member allocates 0 points to the account. In this case, the sum of points in the group account is  $10 + 20 + 15 + 0 = 45$  points. Each group member gets earnings of  $0.4 * 45 = 18$  points from the group account. In this situation,

Your total earnings are:  $(20 - 10) + (0.4 * 45) = 10 + 18 = 28$  points.

The second member's earnings are:  $(20 - 20) + (0.4 * 45) = 0 + 18 = 18$  points.

The third member's earnings are:  $(20 - 15) + (0.4 * 45) = 5 + 18 = 23$  points.

The fourth member's earnings are:  $(20 - 0) + (0.4 * 45) = 20 + 18 = 38$  points.

Another set of decisions will follow after the allocation decisions in each period, so your earnings for the period are not yet final at this stage. Before we describe the next stage, we'll pause to help you make sure you've understood the first one.

### *Comprehension questions*

Please answer the following questions. Raise your hand if you need help. A member of the experiment team will come to help you and will check your answers when you are done.

**1.** Suppose all four individuals in your group allocate 0 points to the group account.

a) How much do you earn? \_\_\_\_\_ points

b) How much do the others each earn? \_\_\_\_\_ points

**2.** Suppose all four allocate 20 points to the group account.

a) How much do you earn? \_\_\_\_\_ points

b) How much do the others each earn? \_\_\_\_\_ points

**3.** Suppose the others in your group allocate 30 points in total to the group account.

a) How much do you earn if you allocate 0 points to the group account? \_\_\_\_\_ points

b) How much do you earn if you allocate 10 points to the group account? \_\_\_\_\_ points

c) How much do you earn if you allocate 20 points to the group account? \_\_\_\_\_ points

## Stage 2: reduction decisions

After the first stage of each period, you will be shown the amount allocated to the group account by each of the others in your group in a random order. Each member, yourself included, will be identified as Player 1, Player 2, Player 3 or Player 4, although the label “You” rather than a player number will identify you on your own screen. This means that the group member identified to you as Player 2 in a certain period is equally likely to have any of the four player numbers in the next period. (The same holds for the presentation of information about your decisions to the others.) In a box to the right of the allocation information, you will be asked to enter a whole number of points (if any) that you wish to use to reduce the earnings of the individual who made that allocation decision. Each point you allocate to reduce another’s earnings **reduces your own earnings by 1 point and reduces that individual’s earnings by 3 points**. Your own earnings can be reduced in the same way by the decisions of others in your group. You are free to leave any or all others’ earnings unchanged by entering 0’s in the relevant boxes.

Here is an example of what your screen will look like at the beginning of Stage 2 of the first period:

Player	Alloc. to group acct.	Points to reduction	Row player's alloc. to group acct. last period	Your reduction points from row player last period
You	15			
Player 1	10	<input type="text"/>		
Player 3	5	<input type="text"/>		
Player 4	20	<input type="text"/>		

Remember that the earnings of other group members are reduced by 3 times the amounts you enter. To leave an individual's earnings unchanged, enter 0.

Note: Numbers shown are for illustration only.

There are several things to keep in mind regarding the reduction stage.

First, earnings reductions directed at you in this stage cannot bring your earnings for the period to less than zero. For example, if your first stage earnings were 15 points and the

other members of your group devoted six points in total to reducing your earnings, you would not lose the  $6 * 3 = 18$  points that would otherwise be deducted from your earnings for the period, but would lose only the maximum possible in this case, 15 points.

However, the **cost of giving reductions** to others is always fully born by you even if it makes your period earnings negative. For instance, suppose that in the above example in which you incurred the maximum possible earnings reductions by others, you yourself had given, say, 3 reduction points to others. Then your earnings for the period would be  $-3$ . If you lose points in a period, they are deducted from those you accumulate in other periods. Thus, final earnings for a period can be calculated as follows:

$$\left\{ \begin{aligned} & \text{The greater of } [(20 - \text{points you allocate to group account}) + 0.4 * (\text{sum of points} \\ & \quad \text{allocated by all in group to group account}) - \\ & \quad 3 * (\text{sum of reduction points directed at you by others in your group})] \text{ and } 0 \end{aligned} \right\} \\ - (\text{points you use to reduce others' earnings})$$

At the end of the reduction stage, you will learn by what amount, in total, others decided to reduce your earnings (possibly 0).

In addition to the fact that earnings from the allocation stage and reductions received cannot go below zero, the earnings reduction process is subject to two limits. First, your reduction points must be an integer. Second, you cannot assign more than 10 reduction points to any one individual in your group.

Remember that if no reductions are imposed (the reduction boxes are filled in with 0's), earnings after the reduction stage are the same as those before it.

### *Comprehension questions*

Please answer the following questions. Raise your hand if you need help. A member of the experiment team will come to help you and will check your answers when you are done.

- 1) How much does it cost you to reduce the earnings of another group member by 6 points? \_\_\_\_\_ points
  
- 2) Suppose that an individual earns 10 points from the allocation stage, spends 2 points on reducing others' earnings, and incurs no earnings reductions from others. What are the individual's earnings for this period? \_\_\_\_\_ points

- 3) Suppose that an individual earns 14 points from the allocation stage, spends 1 point on reducing others' earnings, and that others spend a total of 5 points to reduce her earnings. What are the individual's earnings for this period? \_\_\_\_\_ points

*Later periods and additional information*

In later periods, the 2<sup>nd</sup> stage screen of each period will contain more information than in the example above. Specifically, in addition to showing the amounts allocated to the group account by each other group member in the current period, the screen will also show the amounts (if any) by which each group member reduced your earnings in the previous period, and the amount allocated to the group account last period by any group member who reduced your earnings (that is, assigned you a positive number of reduction points). This information will be displayed as you decide how much if at all you wish to reduce each other group member's earnings this period. In the example shown below, for instance, the number 1 in the middle of the right column indicates that the subject identified to you this period as Player 2 allocated 1 point to reducing your earnings last period, while the number 15 to the left of that entry indicates that that subject allocated 15 points to the group account last period. Note that while player numbers change randomly from period to period, the information in each row concerns one specific group member, and the current period number is used to identify that individual so as to avoid confusion. Note also that in the next to last column, last period allocations to the group account are shown only for those who assigned a positive number of reduction points to you.

Here is an example of a screen in the Period 2 reduction stage:

Period  
2 out of 15

Player	Alloc. to group acct.	Points to reduction	Row player's alloc. to group acct. last period	Your reduction points from row player last period
You	3		5	
Player 1	5	<input type="text"/>		0
Player 2	10	<input type="text"/>	15	1
Player 3	8	<input type="text"/>		0

Remember that the earnings of other group members are reduced by 3 times the amounts you enter. To leave an individual's earnings unchanged, enter 0.

Submit

Note: Numbers shown are for illustration only.

## Summary

You will interact with three other individuals whose identities will not be made known to you either during or after the experiment, for a total of fifteen periods. Each period, you and each other member of your group will receive an endowment of 20 points and decide on its allocation between a private and a group account. Points allocated to the group account raise each group member's earnings by 0.4 points, while points allocated to the private accounts raise the allocator's earnings by 1 point with no effect on others' earnings. Once each group member has made his or her allocation decisions, each will see how much each other has allocated to the group account and will have an opportunity to reduce his or her earnings at a cost of 1 point to the assigner per 3 points lost by the recipient of the reduction. In the second and later periods, information on reductions of your earnings by others in your group in the previous period will also be displayed during each reduction stage. Information regarding other group members will be presented in a random order using the identifications Player 1 2, 3 or 4. These numbers are reshuffled each period, so that the information about a given group member is equally likely to be identified by any of the numbers this period, regardless of which number it was associated with during the previous period. The 2<sup>nd</sup> stage screen refers to each individual by their current period number only.

During the experiment, you are welcome to write down notes on scratch paper if you want to do so, to help you recall more detailed information.

After fifteen repetitions of this process, the experiment will be over, and you will be asked to answer a few questions while the experimenters count out payments based on each person's accumulated earnings and the rate  $\$1 = 20$  points, plus a show-up fee of \$5 for each participant. A member of the experiment team will then come to your desk to deliver your payment to you privately in a sealed envelope.

Please raise your hand now if you have any questions. Once all questions have been answered, the experiment will begin.



## 5. Treatment F2

# Instructions

Welcome to our decision-making experiment. Depending on your decisions and the decisions of other participants, you will be able to earn money in addition to the \$5 guaranteed for your participation. Please listen and read the following instructions carefully.

During the experiment you are not allowed to communicate with other participants. You are likewise not allowed to use your cell phone or other communications media, including computer applications other than the experiment software. If you have a question, raise your hand. One of us will come to answer your question.

During the experiment your earnings will be calculated in points. At the end of the experiment, points will be converted to U.S. dollars at the rate

$$20 \text{ points} = \$1$$

This means each point will exchange for 5 cents of real money. At the end of the experiment your total earnings (including the \$5 participation fee) will be paid out to you in cash to the nearest one cent.

In the experiment, each participant is randomly assigned to a **group of 4**. This means that you will be in a group with three other participants. **You will be part of the same group throughout the entire experiment.** You will not be told which other participants are in your group, nor will you be informed who was in which group after the experiment ends.

In this experiment, participants and their groups interact together for a total of **15 periods**. Every period, each group member, yourself included, begins with an **endowment of 20 points**. Each period consists of two stages.

### *Stage 1: allocation decisions*

At the beginning of each period, you and the three others in your group simultaneously decide how to use your endowments. There are two possibilities:

- 1. You can allocate points to a group account.**
- 2. You can allocate points to a private account.**

You will be asked to indicate the number of points you want to allocate to the group account. Only integers between 0 and 20 are allowed for this purpose. The remaining

points will automatically be allocated to your private account. Your earnings depend on the total number of points in the group account, and the number of points in your private account.

### *Calculating earnings from the allocation decisions*

Your earnings from your private account are equal to the number of points you allocate to it. That is, **for each point you allocate to your private account you get 1 point as earnings**. The points you allocate to your private account do not affect the earnings of the others in your group.

Your earnings from the group account equal the **sum** of points allocated to the group account by all 4 group members multiplied by 0.4. **For each point you allocate to the group account you and all others in your group each get 0.4 points as earnings**. For example, if the sum of points in the group account is 30, then your earnings from the group account and the earnings of each of the others in your group from the group account are equal to  $0.4 * 30 = 12$  points.

In summary, your earnings can be calculated with the following formula:

$$(20 - \text{points you allocated to the group account}) + 0.4 * (\text{sum of points allocated by all group members to the group account})$$

Note that you get 1 point as earnings for each point you allocate to your private account. If you instead allocate 1 extra point to the group account, your earnings from the group account increase by  $0.4 * 1 = 0.4$  points and your earnings from your private account decrease by 1 point. However, by allocating 1 extra point to the group account, the earnings of each of the other 3 group members also increase by 0.4 points. Therefore, the total group earnings increase by  $0.4 * 4 = 1.6$  points. Note that you also obtain earnings from points allocated to the group account by others. You obtain 0.4 points for each point allocated to the group account by another member.

After each member completes their allocation decision, they will be informed of other members' allocation decisions. You will be shown the amount allocated to the group account by each of the others in your group, in an order that remains the same for all 15 periods.

### *Example*

Suppose you allocate 10 points to the group account, the second member of your group allocates 20 points to the group account, the third member allocates 15 points and the remaining member allocates 0 points to the account. In this case, the sum of points in the group account is  $10 + 20 + 15 + 0 = 45$  points. Each group member gets earnings of  $0.4 * 45 = 18$  points from the group account. In this situation,

Your total earnings are:  $(20 - 10) + (0.4 * 45) = 10 + 18 = 28$  points.

The second member's earnings are:  $(20 - 20) + (0.4 * 45) = 0 + 18 = 18$  points.

The third member's earnings are:  $(20 - 15) + (0.4 * 45) = 5 + 18 = 23$  points.

The fourth member's earnings are:  $(20 - 0) + (0.4 * 45) = 20 + 18 = 38$  points.

Another set of decisions will follow after the allocation decisions in each period, so your earnings for the period are not yet final at this stage. Before we describe the next stage, we'll pause to help you make sure you've understood the first one.

### *Comprehension questions*

Please answer the following questions. Raise your hand if you need help. A member of the experiment team will come to help you and will check your answers when you are done.

**1.** Suppose all four individuals in your group allocate 0 points to the group account.

a) How much do you earn? \_\_\_\_\_ points

b) How much do the others each earn? \_\_\_\_\_ points

**2.** Suppose all four allocate 20 points to the group account.

a) How much do you earn? \_\_\_\_\_ points

b) How much do the others each earn? \_\_\_\_\_ points

**3.** Suppose the others in your group allocate 30 points in total to the group account.

a) How much do you earn if you allocate 0 points to the group account? \_\_\_\_\_ points

b) How much do you earn if you allocate 10 points to the group account? \_\_\_\_\_ points

c) How much do you earn if you allocate 20 points to the group account? \_\_\_\_\_ points

## Stage 2: reduction decisions

After the first stage of each period, you will be shown the amount allocated to the group account by each of the others in your group, with each identified by numbers (Player 1, Player 2, etc.) that are randomly assigned to them but then remain fixed for the duration of the experiment. In a box to the right of the allocation information, you will be asked to enter a whole number of points (if any) that you wish to use to reduce the earnings of the individual who made that allocation decision. Each point you allocate to reduce another's earnings **reduces your own earnings by 1 point** and **reduces that individual's earnings by 3 points**. Your own earnings can be reduced in the same way by the decisions of others in your group. You are free to leave any or all others' earnings unchanged by entering 0's in the relevant boxes.

Here is an example of what your screen will look like at the beginning of Stage 2.

Period		Reduction Points from Row Player to Col. Player Last Period							Average reduction points from row player to col. player (earlier periods)				
Player	Alloc. to group acct.	Points to reduction	Alloc. to group acct.	You	P1	P2	P4	Alloc. to group acct.	You	P1	P2	P4	
You	15												
Player 1	5	<input type="text"/>											
Player 2	10	<input type="text"/>											
Player 4	20	<input type="text"/>											

Remember that the earnings of other group members are reduced by 3 times the amounts you enter. To leave an individual's earnings unchanged, enter 0.

Note: Numbers shown are for illustration only.

There are several things to keep in mind regarding the reduction stage.

First, earnings reductions directed at you in this stage cannot bring your earnings for the period to less than zero. For example, if your first stage earnings were 15 points and the other members of your group devoted six points in total to reducing your earnings, you would not lose the  $6 * 3 = 18$  points that would otherwise be deducted from your earnings for the period, but would lose only the maximum possible in this case, 15 points.

However, the **cost of giving reductions** to others is always fully born by you even if it makes your period earnings negative. For instance, suppose that in the above example in which you incurred the maximum possible earnings reductions by others, you yourself had given, say, 3 reduction points to others. Then your earnings for the period would be  $-3$ . If you lose points in a period, they are deducted from those you accumulate in other periods. Thus, final earnings for a period can be calculated as follows:

$$\left\{ \begin{aligned} & \text{The greater of } [(20 - (\text{points you allocate to group account}) + 0.4 * (\text{sum of points} \\ & \text{allocated by all in group to group account}) - \\ & 3 * (\text{sum of reduction points directed at you by others in your group})] \text{ and } 0 \} \\ & - (\text{points you use to reduce others' earnings}) \end{aligned} \right.$$

At the end of the reduction stage, you will learn by what amount, in total, others decided to reduce your earnings (possibly 0).

In addition to the fact that earnings from the allocation stage and reductions received cannot go below zero, the earnings reduction process is subject to two limits. First, your reduction points must be an integer. Second, you cannot assign more than 10 reduction points to any one individual in your group.

Remember that if no reductions are imposed (the reduction boxes are filled in with 0's), earnings after the reduction stage are the same as those before it.

### *Comprehension questions*

Please answer the following questions. Raise your hand if you need help. A member of the experiment team will come to help you and will check your answers when you are done.

- 1) How much does it cost you to reduce the earnings of another group member by 6 points? \_\_\_\_\_ points
- 2) Suppose that an individual earns 10 points from the allocation stage, spends 2 points on reducing others' earnings, and incurs no earnings reductions from others. What are the individual's earnings for this period? \_\_\_\_\_ points
- 3) Suppose that an individual earns 14 points from the allocation stage, spends 1 point on reducing others' earnings, and that others spend a total of 5 points to reduce her earnings. What are the individual's earnings for this period? \_\_\_\_\_ points

### Later periods and additional information

In later periods, the 2<sup>nd</sup> stage screen of each period will contain more information than in the example above. The additional information concerns actions in previous periods, with the block of numbers in the middle reflecting the most recent period, and the block of numbers on the right reflecting any periods before that. Consider the left-most of the new columns in the middle block in the example below. As the heading suggests, it shows the amount each group member allocated to the group account during the previous period. The remaining columns of the middle block show the number of reduction points each player gave to each other group member in that period. For example, the 2 in the second column, third row indicates that Player 2 (row heading) gave 2 reduction points to You (column heading) last period. The 3 in the first row, third column means that You (row heading) gave 3 reduction points to Player 1 (column heading) last period. The 0 on the right end of the bottom row indicates that Player 4 gave 0 reduction points to Player 2 last period.

Here is an example of a screen in the Period 2 reduction stage:

Period		2 out of 15		Reduction Points from Row Player to Col. Player Last Period						Average reduction points from row player to col. player (earlier periods)			
Player	Alloc. to group acct.	Points to reduction	Alloc. to group acct.	You	P1	P2	P4	Alloc. to group acct.	You	P1	P2	P4	
You	10		15		3	2	1						
Player 1	3	<input type="text"/>	5	0		1	1						
Player 2	8	<input type="text"/>	10	2	0		1						
Player 4	5	<input type="text"/>	20	10	0	0							

Remember that the earnings of other group members are reduced by 3 times the amounts you enter. To leave an individual's earnings unchanged, enter 0.

Note: Numbers shown are for illustration only.

During the third and later periods under the scheme, the right block will contain corresponding information about periods before the most recent period. For example, suppose that you have reached the 2<sup>nd</sup> stage of period seven. In that case, the middle block will reflect what happened during period six, while the right block will reflect average actions during periods one through five. As shown in the example, the number

9.8 in the first column of the right block in the bottom row means that Player 4 (row heading) assigned an average of 9.8 points to the group account during the first through fifth periods. The 1.0 in the third column, first row of the right block means that You (row heading) assigned an average of 1.0 reduction point per period to Player 1 (column heading) during the first five periods.

Here is an example of a screen in the Period 7 reduction stage:

Period 7 out of 15

Player	Reduction Points from Row Player to Col. Player Last Period				Average reduction points from row player to col. player (earlier periods)							
	Alloc. to group acct.	Points to reduction	Alloc. to group acct.	You	P1	P2	P4	Alloc. to group acct.	You	P1	P2	P4
You	1		11	0	2	0		9.0	1.0	1.0	0.6	
Player 1	4	<input type="text"/>	0	0		0	1	8.2	0.8		0.6	2.2
Player 2	8	<input type="text"/>	1	0	1		1	8.6	1.6	0.2		1.0
Player 4	11	<input type="text"/>	4	0	3	0		9.8	2.4	0.4	0.4	

Remember that the earnings of other group members are reduced by 3 times the amounts you enter. To leave an individual's earnings unchanged, enter 0.

Submit

Note: Numbers shown are for illustration only.

## Summary

You will interact with three other individuals whose identities will not be made known to you either during or after the experiment, for a total of fifteen periods. Each period, you and each other member of your group will receive an endowment of 20 points and decide on its allocation between a private and a group account. Points allocated to the group account raise each group member's earnings by 0.4 points, while points allocated to the private accounts raise the allocator's earnings by 1 point with no effect on others' earnings. Once each group member has made his or her allocation decisions, each will see how much each other has allocated to the group account and have an opportunity to reduce his or her earnings at a cost of 1 point to the assigner per 3 points lost by the recipient of the reduction. In later periods, information on past reduction decisions and past allocations will be displayed during each reduction stage.

During the experiment, you are welcome to write down notes on scratch paper if you want to do so, to help you recall more detailed information.

After fifteen repetitions of this process, the experiment will be over, and you will be asked to answer a few questions while the experimenters count out payments based on each person's accumulated earnings and the rate  $\$1 = 20$  points, plus a show-up fee of \$5 for each participant. A member of the experiment team will then come to your desk to deliver your payment to you privately in a sealed envelope.

Please raise your hand now if you have any questions. Once all questions have been answered, the experiment will begin.



## 6. Treatment E3h

# Instructions

Welcome to our decision-making experiment. Depending on your decisions and the decisions of other participants, you will be able to earn money in addition to the \$5 guaranteed for your participation. Please listen and read the following instructions carefully.

During the experiment you are not allowed to communicate with other participants. You are likewise not permitted to use your cell phone or other communications media, including computer applications other than the experiment software. If you have a question, raise your hand. One of us will come to answer your question.

During the experiment your earnings will be calculated in points. At the end of the experiment, points will be converted to U.S. dollars at the rate

$$20 \text{ points} = \$1$$

This means each point will exchange for 5 cents of real money. At the end of the experiment your total earnings (including the \$5 participation fee) will be paid out to you in cash to the nearest one cent.

In the experiment, each participant is randomly assigned to a **group of 4**. This means that you will be in a group with three other participants. **You will be part of the same group throughout the entire experiment.** You will not be told which other participants are in your group, nor will you be informed who was in which group after the experiment ends.

In this experiment, participants and their groups interact together for a total of **15 periods**. Every period, each group member, yourself included, begins with an **endowment of 20 points**. Each period consists of three stages.

### *Stage 1: allocation decisions*

At the beginning of each period, you and the three others in your group simultaneously decide how to use your endowments. There are two possibilities:

- 1. You can allocate points to a group account.**
- 2. You can allocate points to a private account.**

You will be asked to indicate the number of points you want to allocate to the group account. Only integers between 0 and 20 are allowed for this purpose. The remaining

points will automatically be allocated to your private account. Your earnings depend on the total number of points in the group account, and the number of points in your private account.

### *Calculating earnings from the allocation decisions*

Your earnings from your private account are equal to the number of points you allocate to it. That is, **for each point you allocate to your private account you get 1 point as earnings**. The points you allocate to your private account do not affect the earnings of the others in your group.

Your earnings from the group account equal the **sum** of points allocated to the group account by all 4 group members multiplied by 0.4. **For each point you allocate to the group account you and all others in your group each get 0.4 points as earnings**. For example, if the sum of points in the group account is 30, then your earnings from the group account and the earnings of each of the others in your group from the group account are equal to  $0.4 * 30 = 12$  points.

In summary, your earnings can be calculated with the following formula:

$$(20 - \text{points you allocated to the group account}) + 0.4 * (\text{sum of points allocated by all group members to the group account})$$

Note that you get 1 point as earnings for each point you allocate to your private account. If you instead allocate 1 extra point to the group account, your earnings from the group account increase by  $0.4 * 1 = 0.4$  points and your earnings from your private account decrease by 1 point. However, by allocating 1 extra point to the group account, the earnings of each of the other 3 group members also increase by 0.4 points. Therefore, the total group earnings increase by  $0.4 * 4 = 1.6$  points. Note that you also obtain earnings from points allocated to the group account by others. You obtain 0.4 points for each point allocated to the group account by another member.

After each member completes their allocation decision, they will be aware of other members' allocation decisions. You will be shown the amount allocated to the group account by each of the others in your group, in an order that changes randomly from one period to the next.

### *Example*

Suppose you allocate 10 points to the group account, the second member of your group allocates 20 points to the group account, the third member allocates 15 points and the remaining member allocates 0 points to the account. In this case, the sum of points in the group account is  $10 + 20 + 15 + 0 = 45$  points. Each group member gets earnings of  $0.4 * 45 = 18$  points from the group account. In this situation,

Your total earnings are:  $(20 - 10) + (0.4 * 45) = 10 + 18 = 28$  points.

The second member's earnings are:  $(20 - 20) + (0.4 * 45) = 0 + 18 = 18$  points.

The third member's earnings are:  $(20 - 15) + (0.4 * 45) = 5 + 18 = 23$  points.

The fourth member's earnings are:  $(20 - 0) + (0.4 * 45) = 20 + 18 = 38$  points.

Another set of decisions will follow after the allocation decisions in each period, so your earnings for the period are not yet final at this stage. Before we describe the next stage, we'll pause to help you make sure you've understood the first one.

### *Comprehension questions*

Please answer the following questions. Raise your hand if you need help. A member of the experiment team will come to help you and will check your answers when you are done.

**1.** Suppose all four individuals in your group allocate 0 points to the group account.

a) How much do you earn? \_\_\_\_\_ points

b) How much do the others each earn? \_\_\_\_\_ points

**2.** Suppose all four allocate 20 points to the group account.

a) How much do you earn? \_\_\_\_\_ points

b) How much do the others each earn? \_\_\_\_\_ points

**3.** Suppose the others in your group allocate 30 points in total to the group account.

a) How much do you earn if you allocate 0 points to the group account? \_\_\_\_\_ points

b) How much do you earn if you allocate 10 points to the group account? \_\_\_\_\_ points

c) How much do you earn if you allocate 20 points to the group account? \_\_\_\_\_ points

## Stage 2: reduction decisions

After the first stage of each period, you will be shown the amount allocated to the group account by each of the others in your group in a random order. Each member, yourself included, will be identified as Player 1, Player 2, Player 3 or Player 4, although the label “You” rather than a player number will identify you on your own screen. These identification numbers are fixed for one period only and then randomly changed. This means that the group member identified to you as Player 2 in a certain period is equally likely to have any of the four player numbers in the next period. (The same holds for the presentation of information about your decisions to the others.) In a box to the right of the allocation information, you will be asked to enter a whole number of points (if any) that you wish to use to reduce the earnings of the individual who made that allocation decision. Each point you allocate to reducing another’s earnings **reduces your own earnings by 1 point and reduces that individual’s earnings by 3 points**. Your own earnings can be reduced in the same way by the decisions of others in your group. You are free to leave any or all others’ earnings unchanged by entering 0’s in the relevant boxes.

Here is an example of what your screen will look like at the beginning of Stage 2 of the first period. For the moment, focus on the three left columns only; the third column is the one with the boxes into which reduction decisions are entered.

Period		Last period choices					Avg. earlier period choices	
Player	Alloc. to group acct.	Points to reduction	Alloc. to group acct.	Reduc. pts. to You	Alloc. to group acct.	Reduc. pts. to You		
You	10							
Player 1	5	<input type="text"/>						
Player 2	15	<input type="text"/>						
Player 4	20	<input type="text"/>						

Remember that the earnings of other group members are reduced by 3 times the amounts you enter.  
To leave an individual's earnings unchanged, enter 0.

Note: Numbers shown are for illustration only.

There are several things to keep in mind regarding the reduction stage.

First, earnings reductions directed at you in this stage cannot bring your earnings for the period to less than zero. For example, if your first stage earnings were 15 points and the other members of your group devoted six points in total to reducing your earnings, you would not lose the  $6 * 3 = 18$  points that would otherwise be deducted from your earnings for the period, but would lose only the maximum possible in this case, 15 points.

However, the **cost of giving reductions** to others is always fully born by you even if it makes your period earnings negative. For instance, suppose that in the above example in which you incurred the maximum possible earnings reductions by others, you yourself had given, say, 3 reduction points to others. Then your earnings for the period would be  $-3$ . If you lose points in a period, they are deducted from those you accumulate in other periods. Thus, final earnings for a period can be calculated as follows:

$$\left\{ \begin{aligned} & \text{The greater of } [(20 - (\text{points you allocate to group account}) + 0.4 * (\text{sum of points} \\ & \text{allocated by all in group to group account}) - \\ & 3 * (\text{sum of reduction points directed at you by others in your group})] \text{ and } 0 \} \\ & - (\text{points you use to reduce others' earnings}) \end{aligned} \right.$$

At the end of the reduction stage, you will learn by what amount, in total, others decided to reduce your earnings (possibly 0).

In addition to the fact that earnings from the allocation stage and reductions received cannot go below zero, the earnings reduction process is subject to two limits. First, your reduction points must be an integer. Second, you cannot assign more than 10 reduction points to any one individual in your group.

Remember that if no reductions are imposed (the reduction boxes are filled in with 0's), earnings after the reduction stage are the same as those before it.

### *Comprehension questions*

Please answer the following questions. Raise your hand if you need help. A member of the experiment team will come to help you and will check your answers when you are done.

- 1) How much does it cost you to reduce the earnings of another group member by 6 points? \_\_\_\_\_ points

- 1) Suppose that an individual earns 10 points from the allocation stage, spends 2 points on reducing others' earnings, and incurs no earnings reductions from others. What are the individual's earnings for this period? \_\_\_\_\_ points
  
- 2) Suppose that an individual earns 14 points from the allocation stage, spends 1 point on reducing others' earnings, and that others spend a total of 5 points to reduce her earnings. What are the individual's earnings for this period?  
\_\_\_\_\_points

*Additional information in Stage 2 during later periods*

In later periods, the 2<sup>nd</sup> stage screen of each period will contain more information than in the example above. The additional information concerns actions in previous periods, with the block of numbers in the middle reflecting the most recent period, and the block of numbers on the right reflecting any periods before that. Consider the left of the pair of new columns in the middle block in the example below. As the heading suggests, it shows the amount each group member allocated to the group account during the previous period. The right column of the middle block shows the number of reduction points each player gave to you in that period. For example, the 2 in the second row indicates that Player 2 (row heading) gave 2 reduction points to you last period. In those cases in which the group member in question assigned no reduction points to you last period, i.e. the reduction column shows a 0, the allocation column next to it will be left empty, as in the bottom row in the example.

An example of a screen in Stage 2 of Period 2.

Period		2 out of 15					
Last period choices					Avg. earlier period choices		
Player	Alloc. to group acct.	Points to reduction	Alloc. to group acct.	Reduc. pts. to You	Alloc. to group acct.	Reduc. pts. to You	
You	3		5				
Player 2	8	<input type="text" value=""/>	10	2			
Player 3	10	<input type="text" value=""/>	15	3			
Player 4	5	<input type="text" value=""/>		0			
<p style="color: red; font-size: small;">Remember that the earnings of other group members are reduced by 3 times the amounts you enter. To leave an individual's earnings unchanged, enter 0.</p>							
						<input type="button" value="Submit"/>	

Note: Numbers shown are for illustration only.

During the third and later periods, the right block will contain corresponding information for periods before the most recent period. For example, suppose that you have reached the 2<sup>nd</sup> stage of period seven. In that case, the middle block will reflect what happened during period six, while the right block will reflect average actions during the first five periods. As shown in the example, the number 4.2 in the first column of the right block in the Player 1 row means that that group member assigned an average of 4.2 points to the group account during the first five periods. The 1.2 in the second column and the row labeled Player 3 means that Player 3 assigned an average of 1.2 reduction points per period to you during the first five periods.

## An example of a screen in Stage 2 of Period 7.

Period		Last period choices			Avg. earlier period choices	
Player	Alloc. to group acct.	Points to reduction	Alloc. to group acct.	Reduc. pts. to You	Alloc. to group acct.	Reduc. pts. to You
You	1		14		10.2	
Player 1	11	<input type="text"/>		0	4.2	1.8
Player 3	4	<input type="text"/>		0	9.8	1.2
Player 4	0	<input type="text"/>	12	3	6.4	1.8

Remember that the earnings of other group members are reduced by 3 times the amounts you enter. To leave an individual's earnings unchanged, enter 0.

Note: Numbers shown are for illustration only.

### *Stage 3: another set of reduction decisions*

After each group member has made their allocation decision and their initial reduction decisions, there is a final stage in each period during which each may have an additional opportunity to reduce others' earnings should he or she wish to. Specifically, you will be shown the amounts, if any, by which other group members reduced your earnings during Stage 2, and you will have an opportunity in Stage 3 to reduce the earnings of those individuals who reduced your own earnings in Stage 2. The reduction process is the same as in Stage 2 in that you must enter an integer between 0 and 10 into a box in the row for the relevant group member or members, and each 1 point you spend on reducing another member's earnings causes that person's earnings for the period to decline by 3 points (unless the sum of reductions from others in stages 2 and 3 have already brought his or her earnings for the period to zero). As with Stage 2, your own earnings are always reduced by the number of reduction points you assign to others, even if this causes your earnings for the period to become negative (or, if they were negative already, to become a still larger negative number). (Note that if no group member reduces your earnings in Stage 2 of a certain period, there is no one whose earnings you can reduce in Stage 3 of that period, so you will have no decision to make at that time.)

Your final earnings for the period as a whole are equal to your earnings from the allocation stage minus your total losses from reductions assigned to you by other group



members in stages 2 and 3 (or zero if that result is negative) minus the total number of points you assign to reduce others' earnings in stages 2 and 3. (A negative earnings total in one period will be made up out of the positive earnings totals of other periods.) In other words, your final earnings are:

$$\left\{ \begin{aligned} & \text{The greater of } [20 - (\text{points you allocate to group account}) + 0.4 * (\text{sum of points} \\ & \quad \text{allocated by all in group to group account}) - \\ & 3 * (\text{sum of reduction points directed at you by others in your group in the two reduction} \\ & \quad \text{stages})] \text{ and } 0 \end{aligned} \right\} \\ - (\text{sum of points you use to reduce others' earnings in the two reduction stages}).$$

An example of the screen on which you enter your Stage 3 reduction decisions is shown below. In addition to the reduction points that you received in Stage 2, shown in the column to the left of the decision box or boxes, the screen will also show the average reduction points (if any) by which each group member reduced your earnings in earlier periods, and the average amount allocated to the group account in those earlier periods by any group member who reduced your earnings at least once in earlier periods. (Earlier reduction amounts are the *sum* of Stage 2 and Stage 3 reductions.) For example, if it is now period 7, the right two columns show average allocations to the group account and average reduction points directed at you during the first six periods. In Period 1, these right two columns will be blank since there is no history at that moment.

Period 7 out of 15

Avg. earlier period choices (including last period)

Player	Reduc. pts. to You this period	Points to reduction (2nd reduction stage)	Alloc. to group acct.	Reduc. pts. to You
You			5.7	
Player 2	2	<input type="text"/>	10.8	1.8
Player 3	0		10.7	1.2
Player 4	0		7.3	0.8

Remember that the earnings of other group members are reduced by 3 times the amounts you enter. To leave an individual's earnings unchanged, enter 0.

Note: Numbers shown are for illustration only.

At the end of Stage 3, you'll see a summary of your earnings for the period and how they were calculated, which will include information on the total number of points (if any) that were deducted from your earnings due to points directed at you by others in Stage 3.

Note again that when reduction points of past periods are displayed during future periods, first and second stage reduction points are added together.

### *Summary*

You will interact with three other individuals whose identities will not be made known to you either during or after the experiment, for a total of fifteen periods. Each period, you and each other member of your group will receive an endowment of 20 points and will decide on its allocation between a private and a group account. Points allocated to the group account raise each group member's earnings by 0.4 points, while points allocated to the private accounts raise the allocator's earnings by 1 point with no effect on others' earnings. Once each group member has made his or her allocation decision, each will see how much each other has allocated to the group account and will have an opportunity to reduce his or her earnings at a cost of 1 point to the assigner per 3 points lost by the recipient of the reduction. Each period then has a third and final stage in which group members learn one another's reduction decisions and each has a second opportunity to reduce earnings of those who reduced his or her earnings in Stage 2 at a cost of 1 point to the assigner per 3 points lost by the recipient of the reduction. In later periods, information on reductions of your earnings by others in your group and past allocations by any group member who reduced your earnings in the period(s) will be displayed during each reduction stage, with reductions of both the first and second reduction stages of a given past period being added together for ease of display. In the experiment, information regarding other group members will be presented in a random order using the identifications Player 1, 2, 3 or 4. These numbers are reshuffled each period, so that the information about a given group member is equally likely to be identified by any of the numbers this period, regardless of which number it was associated with during the previous period.

During the experiment, you are welcome to write down notes on scratch paper if you want to do so, to help you recall more detailed information.

After fifteen repetitions of this process, the experiment will be over, and you will be asked to answer a few questions while the experimenters count out payments based on each person's accumulated earnings and the rate \$1 = 20 points, plus a show-up fee of \$5 for each participant. A member of the experiment team will then come to your desk to deliver your payment to you privately in a sealed envelope.

Please raise your hand now if you have any questions. Once all questions have been answered, the experiment will begin.

## 7. Treatment F3h

# Instructions

Welcome to our decision-making experiment. Depending on your decisions and the decisions of other participants, you will be able to earn money in addition to the \$5 guaranteed for your participation. Please listen and read the following instructions carefully.

During the experiment you are not allowed to communicate with other participants. You are likewise not allowed to use your cell phone or other communications media, including computer applications other than the experiment software. If you have a question, raise your hand. One of us will come to answer your question.

During the experiment your earnings will be calculated in points. At the end of the experiment, points will be converted to U.S. dollars at the rate

$$20 \text{ points} = \$1$$

This means each point will exchange for 5 cents of real money. At the end of the experiment your total earnings (including the \$5 participation fee) will be paid out to you in cash to the nearest one cent.

In the experiment, each participant is randomly assigned to a **group of 4**. This means that you will be in a group with three other participants. **You will be part of the same group throughout the entire experiment.** You will not be told which other participants are in your group, nor will you be informed who was in which group after the experiment ends.

In this experiment, participants and their groups interact together for a total of **15 periods**. Every period, each group member, yourself included, begins with an **endowment of 20 points**. Each period consists of three stages.

### *Stage 1: allocation decisions*

At the beginning of each period, you and the three others in your group simultaneously decide how to use your endowments. There are two possibilities:

- 1. You can allocate points to a group account.**
- 3) You can allocate points to a private account.**

You will be asked to indicate the number of points you want to allocate to the group account. Only integers between 0 and 20 are allowed for this purpose. The remaining

points will automatically be allocated to your private account. Your earnings depend on the total number of points in the group account, and the number of points in your private account.

### *Calculating earnings from the allocation decisions*

Your earnings from your private account are equal to the number of points you allocate to it. That is, **for each point you allocate to your private account you get 1 point as earnings**. The points you allocate to your private account do not affect the earnings of the others in your group.

Your earnings from the group account equal the **sum** of points allocated to the group account by all 4 group members multiplied by 0.4. **For each point you allocate to the group account you and all others in your group each get 0.4 points as earnings**. For example, if the sum of points in the group account is 30, then your earnings from the group account and the earnings of each of the others in your group from the group account are equal to  $0.4 * 30 = 12$  points.

In summary, your earnings can be calculated with the following formula:

$$(20 - \text{points you allocated to the group account}) + 0.4 * (\text{sum of points allocated by all group members to the group account})$$

Note that you get 1 point as earnings for each point you allocate to your private account. If you instead allocate 1 extra point to the group account, your earnings from the group account increase by  $0.4 * 1 = 0.4$  points and your earnings from your private account decrease by 1 point. However, by allocating 1 extra point to the group account, the earnings of each of the other 3 group members also increase by 0.4 points. Therefore, the total group earnings increase by  $0.4 * 4 = 1.6$  points. Note that you also obtain earnings from points allocated to the group account by others. You obtain 0.4 points for each point allocated to the group account by another member.

After each member completes their allocation decision, they will be aware of other members' allocation decisions. You will be shown the amount allocated to the group account by each of the others in your group, in an order that remains the same for all 15 periods.

### *Example*

Suppose you allocate 10 points to the group account, the second member of your group allocates 20 points to the group account, the third member allocates 15 points and the remaining member allocates 0 points to the account. In this case, the sum of points in the group account is  $10 + 20 + 15 + 0 = 45$  points. Each group member gets earnings of  $0.4 * 45 = 18$  points from the group account. In this situation,

Your total earnings are:  $(20 - 10) + (0.4 * 45) = 10 + 18 = 28$  points.

The second member's earnings are:  $(20 - 20) + (0.4 * 45) = 0 + 18 = 18$  points.

The third member's earnings are:  $(20 - 15) + (0.4 * 45) = 5 + 18 = 23$  points.

The fourth member's earnings are:  $(20 - 0) + (0.4 * 45) = 20 + 18 = 38$  points.

Another set of decisions will follow after the allocation decisions in each period, so your earnings for the period are not yet final at this stage. Before we describe the next stage, we'll pause to help you make sure you've understood the first one.

### *Comprehension questions*

Please answer the following questions. Raise your hand if you need help. A member of the experiment team will come to help you and will check your answers when you are done.

**1.** Suppose all four individuals in your group allocate 0 points to the group account.

a) How much do you earn? \_\_\_\_\_ points

b) How much do the others each earn? \_\_\_\_\_ points

**2.** Suppose all four allocate 20 points to the group account.

a) How much do you earn? \_\_\_\_\_ points

b) How much do the others each earn? \_\_\_\_\_ points

**3.** Suppose the others in your group allocate 30 points in total to the group account.

a) How much do you earn if you allocate 0 points to the group account? \_\_\_\_\_ points

b) How much do you earn if you allocate 10 points to the group account? \_\_\_\_\_ points

c) How much do you earn if you allocate 20 points to the group account? \_\_\_\_\_ points

## Stage 2: reduction decisions

After the first stage of each period, you will be shown the amount allocated to the group account by each of the others in your group, in an order that remains the same for all 15 periods. In a box to the right of the allocation information, you will be asked to enter a whole number of points (if any) that you wish to use to reduce the earnings of the individual who made that allocation decision. Each point you allocate to reducing another's earnings **reduces your own earnings by 1 point** and **reduces that individual's earnings by 3 points**. Your own earnings can be reduced in the same way by the decisions of others in your group. You are free to leave any or all others' earnings unchanged by entering 0's in the relevant boxes.

Here is an example of what your screen will look like at the beginning of Stage 2. For the moment, focus on the three left columns only; the third column is the one with the boxes into which reduction decisions are entered.

Period		Reduction Points from Row Player to Col. Player (last period)							Average reduction points from row player to col. player (earlier periods)			
Player	Alloc. to group acct.	Points to reduction	Alloc. to group acct.	You	P1	P2	P4	Alloc. to group acct.	You	P1	P2	P4
You	15											
Player 1	5	<input type="text"/>										
Player 2	10	<input type="text"/>										
Player 4	20	<input type="text"/>										

Remember that the earnings of other group members are reduced by 3 times the amounts you enter.  
To leave an individual's earnings unchanged, enter 0.

Note: Numbers shown are for illustration only.

There are several things to keep in mind regarding the reduction stage.

First, earnings reductions directed at you in this stage cannot bring your earnings for the period to less than zero. For example, if your first stage earnings were 15 points and the other members of your group devoted six points in total to reducing your earnings, you would not lose the  $6 * 3 = 18$  points that would otherwise be deducted from your earnings for the period, but would lose only the maximum possible in this case, 15 points.

However, the **cost of giving reductions** to others is always fully born by you even if it makes your period earnings negative. For instance, suppose that in the above example in which you incurred the maximum possible earnings reductions by others, you yourself had given, say, 3 reduction points to others. Then your earnings for the period would be  $-3$ . If you lose points in a period, they are deducted from those you accumulate in other periods. Thus, final earnings for a period can be calculated as follows:

$$\left\{ \begin{aligned} & \text{The greater of } [(20 - (\text{points you allocate to group account}) + 0.4 * (\text{sum of points} \\ & \text{allocated by all in group to group account}) - \\ & 3 * (\text{sum of reduction points directed at you by others in your group})] \text{ and } 0 \} \\ & - (\text{points you use to reduce others' earnings}) \end{aligned} \right.$$

At the end of the reduction stage, you will learn by what amount, in total, others decided to reduce your earnings (possibly 0).

In addition to the fact that earnings from the allocation stage and reductions received cannot go below zero, the earnings reduction process is subject to two limits. First, your reduction points must be an integer. Second, you cannot assign more than 10 reduction points to any one individual in your group.

Remember that if no reductions are imposed (the reduction boxes are filled in with 0's), earnings after the reduction stage are the same as those before it.

### *Comprehension questions*

Please answer the following questions. Raise your hand if you need help. A member of the experiment team will come to help you and will check your answers when you are done.

- 1) How much does it cost you to reduce the earnings of another group member by 6 points? \_\_\_\_\_ points
- 2) Suppose that an individual earns 10 points from the allocation stage, spends 2 points on reducing others' earnings, and incurs no earnings reductions from others. What are the individual's earnings for this period? \_\_\_\_\_ points
- 3) Suppose that an individual earns 14 points from the allocation stage, spends 1 point on reducing others' earnings, and that others spend a total of 5 points to reduce her earnings. What are the individual's earnings for this period?  
\_\_\_\_\_ points



### *Additional information in Stage 2 during later periods*

In later periods, the 2<sup>nd</sup> stage screen of each period will contain more information than in the example above. The additional information concerns actions in previous periods, with the block of numbers in the middle reflecting the most recent period, and the block of numbers on the right reflecting any periods before that. Consider the left-most of the new columns in the middle block in the example below. As the heading suggests, it shows the amount each group member allocated to the group account during the previous period. The remaining columns of the middle block show the number of reduction points each player gave to each other group member in that period. For example, the 1 in the second column, third row indicates that Player 2 (row heading) gave 1 reduction point to You (column heading) last period. The 2 in the first row, fourth column shows that You (row heading) gave 2 reduction points to Player 2 (column heading) last period. The 2 in the second row, second column means that Player 1 (row heading) gave 2 reduction points to You (column heading) last period.

An example of a screen in Stage 2 of Period 2.

Period		Reduction Points from Row Player to Col. Player (last period)							Average reduction points from row player to col. player (earlier periods)			
Player	Alloc. to group acct.	Points to reduction	Alloc. to group acct.	You	P1	P2	P3	Alloc. to group acct.	You	P1	P2	P3
You	5		20	0	2	1						
Player 1	3	<input type="text" value="1"/>	5	2		1	1					
Player 2	8	<input type="text"/>	10	1	2		3					
Player 3	10	<input type="text"/>	15	1	4	5						

Remember that the earnings of other group members are reduced by 3 times the amounts you enter. To leave an individual's earnings unchanged, enter 0.

Note: Numbers shown are for illustration only.

During the third and later periods, the right block will contain corresponding information for periods before the most recent period. For example, suppose that you have reached the 2<sup>nd</sup> stage of period seven. In that case, the middle block will reflect what happened during period six, while the right block will reflect average actions during periods one through five. As shown in the example, the number 6.4 in the second row, first column of the right block means that Player 1 (row heading) assigned an average of 6.4 points to the group account during the first five periods. The 1.0 in the first row, third column

means that You (row heading) assigned an average of 1.0 reduction points per period to Player 1 (column heading) during the first five periods.

An example of a screen in Stage 2 of Period 7.

Period 7 out of 15

Player	Alloc. to group acct.	Points to reduction	Reduction Points from Row Player to Col. Player (last period)				Average reduction points from row player to col. player (earlier periods)			
			Alloc. to group acct.	You	P1	P2	P3	Alloc. to group acct.	You	P1
You	4		15	2	1	2	9.8	1.0	2.0	1.8
Player 1	0	<input type="text"/>	12	1	3	3	6.4	3.0	1.2	1.4
Player 2	11	<input type="text"/>	13	5	2	0	4.2	1.2	2.6	2.8
Player 3	1	<input type="text"/>	14	1	3	1	10.2	0.6	1.8	3.6

Remember that the earnings of other group members are reduced by 3 times the amounts you enter. To leave an individual's earnings unchanged, enter 0.

Submit

Note: Numbers shown are for illustration only.

### Stage 3: another set of reduction decisions

After each group member has made their allocation decision and their initial reduction decisions, there is a final stage in each period during which each has an additional opportunity to reduce others' earnings should he or she wish to. The reduction process is the same as in Stage 2 in that you must enter an integer between 0 and 10 into a box in the row for each other member of your group, and each 1 point you spend on reducing another member's earnings causes that person's earnings for the period to decline by 3 points (unless the sum of reductions from others in stages 2 and 3 have already brought his or her earnings for the period to zero). As with Stage 2, your own earnings are always reduced by the number of reduction points you assign to others, even if this causes your earnings for the period to become negative (or, if they were negative already, to become a still larger negative number).

Your final earnings for the period as a whole are equal to your earnings from the allocation stage minus your total losses from reductions assigned to you by other group members in stages 2 and 3 (or zero if that result is negative) minus the total number of

points you assign to reduce others' earnings in stages 2 and 3. (A negative earnings total in one period will be made up out of the positive earnings totals of other periods.) In other words, your final earnings are:

$$\left\{ \begin{aligned} & \text{The greater of } [20 - (\text{points you allocate to group account}) + 0.4 * (\text{sum of points} \\ & \quad \text{allocated by all in group to group account}) - \\ & 3 * (\text{sum of reduction points directed at you by others in your group in the two reduction} \\ & \quad \text{stages})] \text{ and } 0 \} \\ & - (\text{sum of points you use to reduce others' earnings in the two reduction stages}). \end{aligned} \right.$$

An example of the screen on which you enter your Stage 3 reduction decisions is shown below. Notice that the middle block of numbers shows the numbers of points that each group member has used to reduce the earnings of each other group member in Stage 2 of the current period. For example, the 2 in the first row, second column means that You (row heading) assigned 2 points to reducing the earnings of Player 2 (column heading) during Stage 2 of this period. The right block shows the averages of past reductions given and past allocation decisions from the first period to the most recent period. For example, if it is now period 7, the right block shows average allocations during the first six periods.

An example of a screen in Stage 3 of Period 7.

Period		2nd stage reduction points from row player to col. player					Average past reduction points from row player to col. player in previous periods				
Player	Alloc. to group acct.	You	P1	P2	P4	Points to reduction (2nd reduction stage)	Alloc. to group acct.	You	P1	P2	P4
You	1		0	2	0		10.8	2.3	2.8	0.7	
Player 1	0	0		0	1	<input type="text"/>	7.3	1.8	1.5	2.7	
Player 2	11	0	1		1	<input type="text"/>	5.7	2.5	2.0	2.2	
Player 4	4	0	3	0		<input type="text"/>	10.7	1.8	1.0	1.7	

Remember that the earnings of other group members are reduced by 3 times the amounts you enter. To leave an individual's earnings unchanged, enter 0.

Note: Numbers shown are for illustration only.

At the end of the third stage, you will see a summary of your earnings for the period and how they were calculated, which will include information on the total number of points (if any) that were deducted from your earnings due to points directed at you by others in the third stage.

Note that when reduction points of past periods are displayed during future periods, first and second stage reduction points are added together.

### *Summary*

You will interact with three other individuals whose identities will not be made known to you either during or after the experiment, for a total of fifteen periods. Each period, you and each other member of your group will receive an endowment of 20 points and decide on its allocation between a private and a group account. Points allocated to the group account raise each group member's earnings by 0.4 points, while points allocated to the private accounts raise the allocator's earnings by 1 point with no effect on others' earnings. Once each group member has made his or her allocation decision, each will see how much each other has allocated to the group account and will have an opportunity to reduce his or her earnings at a cost of 1 point to the assigner per 3 points lost by the recipient of the reduction. Each period then has a third and final stage in which group members learn one another's reduction decisions and each has a second opportunity to reduce each other's earnings at the same cost of 1 point per 3 points lost. In later periods, information on past reduction decisions and past allocations will be displayed during each reduction stage, with reductions of both the first and second reduction stages of a given past period being added together for ease of display.

During the experiment, you are welcome to write down notes on scratch paper if you want to do so, to help you recall more detailed information.

After fifteen repetitions of this process, the experiment will be over, and you will be asked to answer a few questions while the experimenters count out payments based on each person's accumulated earnings and the rate \$1 = 20 points, plus a show-up fee of \$5 for each participant. A member of the experiment team will then come to your desk to deliver your payment to you privately in a sealed envelope.

Please raise your hand now if you have any questions. Once all questions have been answered, the experiment will begin.