

Player ID: _____

Player Type: _____

Computer #: _____

Instruction

You are about to participate in an economics experiment in which you will earn money based on the decisions you and others make. All earnings you make in the experiment are yours to keep. Please do not talk to each other during the experiment. If you have a question, please raise your hand and the experimenter will come and help you.

Overview

- All values and prices will be stated in francs (₣). Each franc you earn can be converted into US currency at the rate specified by the experimenter. The exchange rate is **20 francs (₣) per dollar (\$)**.
- In this experiment, you will participate in an allocation process that allocates time use of a major piece of scientific equipment. The computer will be the coordinator of the process and you will compete against 8 other people in the room.
- If you are allocated a time slot, your earnings will be the value of that time slot. If you do not receive any time slot, your earnings will be zero.

Profit = value of the package you get.

- After each allocation is completed, you will fill out your Worksheet and a monitor will verify your earnings.

Background

You are one of nine scientists who desire access time to a piece of major scientific equipment. Three researchers are conducting big projects, which require at least 3 months of equipment time to complete, while six researchers are conducting smaller experiments that require at least 2 months to complete. The time slots (also called packages) that you will be requesting are composed of consecutive months within a 24-month timeframe. You only have one experiment that you want to run. No matter how many packages you request, you will never be allocated more than one package.

Value Determination

You will have a unique value for each time slot (package) depending on when you are able to start using the equipment as well as the length of time for which you can use your equipment.

The values of the various time slots to different researchers depend on several factors.

- 1). *Value for each minimum package for a small researcher* (2 months) is randomly drawn from the set of integers between 20 and 100, inclusive, where each integer is equally likely to be drawn. A package of fewer than 2 months is worth zero to a small researcher.
- 2). *Value for each minimum package for a big researcher* (3 months) is randomly drawn from the set of integers between 20 and 150, inclusive, where each integer is equally likely to be drawn. A package of fewer than 3 months is worth zero to a big researcher.
- 3). *Value for each additional month* is randomly drawn from the interval between 10 and 20, inclusive. Both sets of researchers get added value from using the equipment for more time than the absolute minimum. Small researchers derive more value from using the equipment for 3 months instead of 2, and the most value from using the equipment for 4 months. Using the equipment for five or more months, however, gives them no more value than just using it for four months. Similarly, large researchers get more value from 4 months of use of the equipment as opposed to 3, and they get the most value from using the equipment for 5 months. More than 5 months of time, however, does not give them any additional value.
- 4). *Starting month*: If your player ID starts with the digit 3, 7, 8, or 9, you prefer to use the equipment earlier rather than later. If your player ID starts with the digit 2, 5, or 6, you are indifferent between starting earlier and later. Finally, if your player id starts with the digit 1 or 4, you prefer to start later rather than earlier.

For each participant, the various components of his or her value will be randomly drawn. Each time that you begin a new allocation process, you will receive a new set of randomly drawn values. Whether you are a big or small researcher, and whether you prefer to start earlier or later will already be taken into account in the values for packages that you see on your screen.

Allocation Process

You will submit rankings of the packages you would like to receive. After everyone has submitted their rankings, you will be informed of what package, if any, you were allocated.

Months and Packages

In the experiment, you can only rank packages, but packages are constructed from individual months. In this case, there are 24 different months. The packages are all the possible ways in which the months can be put together in consecutive order with lengths of 2, 3, 4 for a small researcher and lengths 3, 4, 5 for a big researcher.

The starting month and the length of the package uniquely identify a package. For example, if a package starts on month 1 and lasts for three months, it consists of month 1, month 2, and month 3.

Submitting an Order

The packages will be presented to you in a table format. The different rows will represent different starting months, and the different columns will represent different durations. For example, to find a package that starts on the 4th month, and lasts for 3 months, you will first look for the row that is labeled 4, and find the column that is labeled 3.

To submit your rankings, you will rank packages using integers between 1 and 200. You will be asked to rank fewer than 200 packages, but you are given extra integers so that you have flexibility in how you assign rankings. Specifically, you will assign an integer to each package that you think you want to get. Since these numbers are rankings, if you assign a package “1”, the coordinator will interpret this as your first-choice package. You can choose and rank packages in any order of your preference.

In each cell, you will see the value of that package to you. If you wish to submit a rank for that package, you can type a number in the textbox and then click on the submit button. Note that you will need to click the submit button for each time that you submit a ranking. Refer to Figure 1 below to see how your screen will look during the submission process.

Figure 1: Submission Sample

Ranking submitted.

KS Experiment

Player: 1 (big)

All Done

	Total number of months		
	3	4	5
starting month 1	value: F2.43 rank: 4 Cancel	value: F2.64 rank: <input type="text"/> Submit	value: F2.86 rank: 3 Cancel
starting month 2	value: F2.91 rank: 2 Cancel	value: F3.17 rank: <input type="text"/> Submit	value: F3.43 rank: <input type="text"/> Submit
starting month 3	value: F3.5 rank: 1 Cancel	value: F3.81 rank: <input type="text"/> Submit	value: F4.12 rank: <input type="text"/> Submit
starting month 4	value: F4.19 rank: <input type="text"/> Submit	value: F4.57 rank: <input type="text"/> Submit	value: F4.95 rank: <input type="text"/> Submit
starting month 5	value: F5.03 rank: <input type="text"/> Submit	value: F5.48 rank: <input type="text"/> Submit	value: F5.93 rank: <input type="text"/> Submit

Done

Canceling an Order

You can always cancel a ranking before you click on the “All Done” button. You can do this by clicking on the “Cancel” button for the ranking that you want to cancel.

All Done Button

Once you have submitted all your rankings, please click on the “All Done” button. You do not have to wait until time runs out before pressing the button. You will be instructed to wait until all the other players have clicked on the “All Done” button.

The Solver

After all participants have submitted their rankings, the solver will determine how to allocate the months. The solver goes through the following three steps to do so:

1. translate ranks submitted by a participant into consecutive numbers,
2. convert the consecutive numbers into points, and
3. find the allocation that maximizes the total points.

1. Translation

For each participant, the solver changes the submitted ranks into consecutive numbers.

Example: Suppose that a participant has submitted the following ranks shown in the left column of the table below.

Package	Rank	
	Before translation	After translation
{month1, month2, month3}	5	2
{month2, month3, month4}	2	1
{month2, month3}	6	3
{month1, month2}	10	4

This participant ranks 4 packages with the numbers 5, 2, 6 and 10, or $2 < 5 < 6 < 10$ when sorted in increasing order. These ranks are translated into 1, 2, 3 and 4 based on the order. Thus, the ranking (5, 2, 6, 10) is changed to (2, 1, 3, 4).

When the solver translates submitted ranks, it will not assign two packages the same number. If a participant assigns the same rank to more than one package, the solver will randomly break the tie and translate the rank into two different numbers.

Example: Suppose that a participant has submitted the following ranks shown in the left column of the table below.

Package Package	Rank		
	Before translation	After translation (possibility 1)	After translation (possibility 2)
{month1, month2}	10	4	4
{month2, month3}	5	2	3
{month3, month4}	5	3	2
{month2, month3, month4}	1	1	1

As seen in the table, this participant ranks 2 packages as rank 5. The rank of the package {month2, month3, month4} remains 1, as there is no other package ranked with 1. The solver, however, randomly selects the two packages {month2, month3} and {month3, month4} in sequence and changes the rank into 2 and 3. The table above shows two possible results of this randomization process, and each of the results is equally likely to happen. Finally, the solver changes the rank for package {month1, month 2} into 4.

2. Conversion

The solver converts all numbers into points for each participant based on the translated rank. The package labeled as 1 in the translated rank will get 66 points, and the next package labeled as 2 will get 65 points and so forth. The solver gives points in this way to all of the packages for which a participant has submitted a ranking.

Example: Suppose that a participant has submitted ranks for 4 packages as shown in the table below.

Package	Rank		Points
	Before translation	After translation	
{month1, month2}	5	2	65
{month2, month3}	2	1	66
{month3, month4}	6	3	64
{month2, month3, month4}	10	4	63

The solver assigns 66 points through 63 points to the packages according to the translated ranks.

3. Maximization of Points

After the solver goes through the two steps above for each participant, it selects the allocation that maximizes the aggregate points. For simplicity, in all subsequent examples, we assume that there are only three months, and that the minimum package is one month.

Example: The following rankings have been submitted:

Participant	Package	Points
Participant 1	{month1, month2, month3}	66
	{month1, month2}	65
	{month1}	64
Participant 2	{month2, month3}	66
Participant 3	{month1}	66
	{month2, month3}	65

Note that this table shows only points, omitting the rankings submitted by the participants. The solver can choose to allocate the months in five different ways.

- 1). Give month 1, month 2, and month 3 to Participant 1. The total points are 66.
- 2). Give month 1 and month 2 to Participant 1. The total points are 65.
- 3). Give month 1 to Participant 1 and month 2 and month 3 to Participant 2. The total points are $130 = 64 + 66$.
- 4). Give month 1 to Participant 1 and month 2 and month 3 to Participant 3. The total points are $129 = 64 + 65$.
- 5). Give month 1 to Participant 3 and month 2 and month 3 to Participant 2. The total points are $132 = 66 + 66$.

Since the last allocation gives the highest total points, the solver will allocate month 1 to Participant 3 and month 2 and month 3 to Participant 2.

Timing

You will be given up to 7 minutes to submit your ranking. An experimenter will alert you when your time is up and will ask you to click the “All Done” button if you have not already.

Allocation Results

After an allocation has been completed, please record the package you were allocated, if any, and the value you have for that package.

Special Notes

We do not offer any guarantees that the software will not crash. When the computer crashes there may be some excitement, but there is no need to panic.

Worksheet

Please fill out the worksheet completely as instructed. Your values are private information. Please do not reveal them to anyone.

You will participate in 8 different allocation processes. Your total profit will be the sum of profit in each of the 8 allocations.

Player ID: _____
 Player Type: Big or Small (circle one)
 Computer #: _____

Review Questions:

(You will be **paid** the specified amount for each correct answer.)

Q.1 Number of packages. (\$0.50)

- a) (\$0.25) What is the minimum number of packages you may receive in a single allocation?
- b) (\$0.25) What is the maximum number of packages you may receive in a single allocation?

Q.2 Translation and Conversion (\$1)

Suppose the rankings submitted by a participant are as listed in the table below.

Package	Rank		Points
	Before translation	After translation	
{month1, month2}	10		
{month2, month3}	102		
{month3, month4}	7		
{month5, month6}	4		

- a) (\$0.5) Translate the submitted rank into consecutive numbers and fill in the column labelled “After translation” in the table above.
- b) (\$0.5) Convert the translated ranks into points and fill in the column labeled “Points” in the table above.

Q.3 Conversion (\$0.5) Suppose a participant assigns a rank of 1 to two different packages. Choose one of the following situations that correctly describes the translation and conversion process for those rankings.

- a) Both of the packages get 1 pt.
- b) Both of the packages get 66 pts.
- c) One of the packages is randomly selected and given 66 pts, and the other gets 0 pts.
- d) One of the packages is randomly selected and given 66 pts, and the other gets 65 pts.
- e) One of the packages is randomly selected and given 132 pts, and the other gets 0 pts.

Your Answer _____

Please turn over

Q.4 Allocation (\$1.5)

Suppose the rankings submitted by two participants are as listed in the table below. The following rankings have been submitted:

Participant	Package	Points
Participant 1	{month1, month2, month3}	66
	{month1, month2}	65
	{month1}	64
Participant 2	{month2, month3}	66
	{month1, month2}	65
	{month3}	64

The solver can choose to allocate the months in four different ways.

- Give {month1, month2, month3} to Participant 1. The total points are 66.
- Give {month1} to Participant 1 and {month3} to Participant 2. The total points are $64 + 64 = 128$.
- Give $\left\{ \begin{array}{l} \text{month1, month2, month3} \\ \text{month1, month2} \end{array} \right\}$ to Participant 1
and $\left\{ \begin{array}{l} \text{month3} \\ \text{month1, month2} \end{array} \right\}$ to Participant 2.
The total points are $\left\{ \begin{array}{l} \text{month1, month2, month3} \\ \text{month1, month2} \end{array} \right\} + \left\{ \begin{array}{l} \text{month3} \\ \text{month1, month2} \end{array} \right\} = \left\{ \begin{array}{l} \text{month1, month2, month3} \\ \text{month1, month2, month3} \end{array} \right\}$.
- Give $\left\{ \begin{array}{l} \text{month1, month2, month3} \\ \text{month1, month2} \end{array} \right\}$ to Participant 1
and $\left\{ \begin{array}{l} \text{month3} \\ \text{month1, month2} \end{array} \right\}$ to Participant 2.
The total points are $\left\{ \begin{array}{l} \text{month1, month2, month3} \\ \text{month1, month2} \end{array} \right\} + \left\{ \begin{array}{l} \text{month3} \\ \text{month1, month2} \end{array} \right\} = \left\{ \begin{array}{l} \text{month1, month2, month3} \\ \text{month1, month2, month3} \end{array} \right\}$.

- a) (\$0.5) Find the other two ways of allocation (in any order) and fill in the blank spaces above.
- b) (\$0.5) Compute the total points for each of the two allocations and fill in the blank spaces above.
- c) (\$0.5) Find the allocation that maximizes the total points and fill in the blank space below.
Participant 1 gets $\left\{ \begin{array}{l} \text{month1, month2, month3} \\ \text{month1, month2} \end{array} \right\}$ and
Participant 2 gets $\left\{ \begin{array}{l} \text{month3} \\ \text{month1, month2} \end{array} \right\}$.

Player ID: _____
Player Type: Big or Small (circle one)
Computer #: _____

Review Questions:

(You will be **paid** the specified amount for each correct answer.)

Q.1 Number of packages. (\$0.50)

- a) (\$0.25) What is the minimum number of packages you may receive in a single allocation? **ZERO**
- b) (\$0.25) What is the maximum number of packages you may receive in a single allocation? **ONE**

Q.2 Translation and Conversion (\$1)

Suppose the rankings submitted by a participant are as listed in the table below.

Package	Rank		Points
	Before translation	After translation	
{month1, month2}	10	3	64
{month2, month3}	102	4	63
{month3, month4}	7	2	65
{month5, month6}	4	1	66

- a) (\$0.5) Translate the submitted rank into consecutive numbers and fill in the column labelled "After translation" in the table above.
- b) (\$0.5) Convert the translated ranks into points and fill in the column labeled "Points" in the table above.

Q.3 Conversion (\$0.5) Suppose a participant assigns a rank of 1 to two different packages. Choose one of the following situations that correctly describes the translation and conversion process for those rankings.

- a) Both of the packages get 1 pt.
- b) Both of the packages get 66 pts.
- c) One of the packages is randomly selected and given 66 pts, and the other gets 0 pts.
- d) One of the packages is randomly selected and given 66 pts, and the other gets 65 pts.
- e) One of the packages is randomly selected and given 132 pts, and the other gets 0 pts.

Your Answer **D**

Please turn over

Q.4 Allocation (\$1.5)

Suppose the rankings submitted by two participants are as listed in the table below. The following rankings have been submitted:

Participant	Package	Points
Participant 1	{month1, month2, month3}	66
	{month1, month2}	65
	{month1}	64
Participant 2	{month2, month3}	66
	{month1, month2}	65
	{month3}	64

The solver can choose to allocate the months in four different ways.

- Give {month1, month2, month3} to Participant 1. The total points are 66.
- Give {month1} to Participant 1 and {month3} to Participant 2. The total points are $64 + 64 = 128$.
- Give { **month 1** } to Participant 1
and { **month 2, month 3** } to Participant 2.

The total points are $\{ \quad \} + \{ \quad \} = \{ \mathbf{130} \}$.

- Give { **month 1, month 2** } to Participant 1
and { **month 3** } to Participant 2.

The total points are $\{ \quad \} + \{ \quad \} = \{ \mathbf{129} \}$.

- (\$0.5) Find the other two ways of allocation (in any order) and fill in the blank spaces above.
- (\$0.5) Compute the total points for each of the two allocations and fill in the blank spaces above.
- (\$0.5) Find the allocation that maximizes the total points and fill in the blank space below.

Participant 1 gets { **month 1** } and
Participant 2 gets { **month 2, month3** }.

Player ID: _____

Player Type: Big or Small (circle one)

Computer #: _____

Earning Work Sheet:

Allocation #	Package Received (starting month, package length)	Value
Example	(2,3)	100
Allocation 1		
Allocation 2		
Allocation 3		
Allocation 4		
Allocation 5		
Allocation 6		
Allocation 7		
Allocation 8		
Total	Total Profit=	

$$\left(\frac{\text{Total Profit}}{\text{Exchange Rate}} \right) + \text{Quiz Score} + \text{Show Up Fee} = \text{Total Earning}$$

Player ID: _____
Player Type: Big or Small (circle one)
Computer #: _____

Demographics Information

Age: _____
Gender: _____
Major: _____

Undergrad:

First Year, Second Year, Third Year, Fourth Year, Fifth Year, Six or more
Or

Grad:

First Year, Second Year, Third Year, Fourth Year, Fifth Year, Six or more

Number of Game Theory Classes Taken: _____

Have you discussed auction strategy in any of your courses? Yes or No.
If so, which courses?

Player ID: _____

Computer #: _____

Strategy (record the strategy you used here and on the back):

1. How did you decide which packages to submit a rank for?

2. How did you decide how to rank the packages?

3. Did you consider the valuation of others in determining your rankings?

4. Did you consider your type (big or small) and whether you preferred early or late months in determining your rankings?

5. Additional Comments