

## Instructions to Subjects for the Laboratory Experiment

You are going 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. At any point, if you have a question, just raise your hand and the experimenter will come and assist you.

In this experiment, you will act as a bidder in an auction. The computer will be the auctioneer. Soon you will be given a complete description of the market followed by a test of the concepts that you learn in the instructions.

### 1. Type of Auction

In this experiment you will participate in a type of auction called a **combinatorial auction**. Unlike traditional auctions, where items are sold individually, a combinatorial auction allows multiple items to be sold together. Bidders are allowed to bid on each individual item as well as combinations of items. For example, if two items A and B are sold in a combinatorial auction, you can place bids on the single item A, the single item B as well as the combination AB. Further, a combinatorial auction can have multiple winners, e.g., a bidder winning item A and another winning item B.

### 2. Market Organization

In each auction, there will be THREE bidders competing for SIX property lots around a lake that are available for sale. That is, in each auction, you will compete with two other bidders to buy one or more of the six lots. As shown in Figure 1, the lots are adjoining and successively labeled A through F, so that lots A and F are also adjoining.

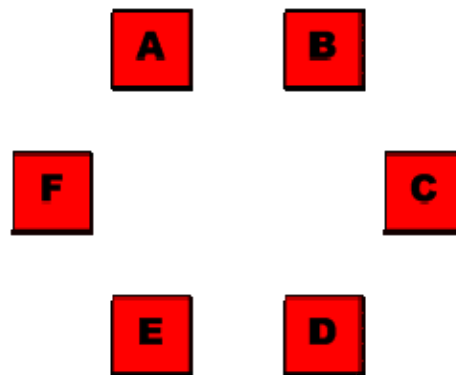


Figure 1. Auction Market

### 3. Values of Lots

In the auction, all values and prices will be stated in francs (F). The exchange rate specified by the experimenter is 5 francs (F) = 1 US dollar (\$). Your value of each lot will be a random

number between €5 and €100. The value denotes how much the lot is worth to you. For example, in Figure 2 below, the value of Lot A is €30.

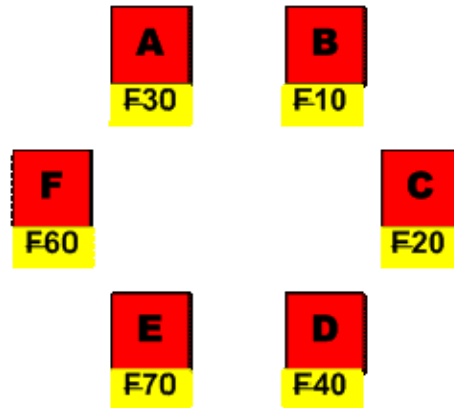


Figure 2. Example of lot values.

The value of combinations of the lots will not always be the sum of the values of the individual lots. If the lots are adjacent (e.g., ABC), then your value of the combination will be the sum of the values of the individual lots plus 10% for every set of adjacent lots. We will explain this with several examples using the individual lot values shown in Figure 2:

Table 1. Example of lot-combination values.

Example	Combination	Value	Explanation
1.	AC	$(30+20) = \text{€}50.00$	No adjacent lots
2.	AB	$(30+10) + 10\% \text{ of } (40) = \text{€} 44.00$	1 set of adjacent lots
3.	AF	$(30+60) + 10\% \text{ of } (90) = \text{€} 99.00$	1 set of adjacent lots
4.	BCD	$(10+20+40) + 20\% \text{ of } (70) = \text{€} 84.00$	2 sets of adjacent lots
5.	BCE	$(10 + 20 + 70) + 10\% \text{ of } (30) = \text{€} 103.00$	1 set adjacent; 1 non-adjacent

Thus, in general acquiring two or more adjacent lots will be more valuable to you than acquiring separated lots. Also note that the total value of all the six lots will be the same for all bidders competing in the auction.

You do not need to remember the values shown in Table 1 since they will be provided to you at all times during the course of the auction.

#### 4. Bids

A *bid* is the amount of money you are ready to pay for a lot or a lot-combination. You can place as many bids as you want on as many lots you want. Depending on the outcome of the auction, you may win none, some, or all of the lots.

## 5. Your Earnings

You will be paid based on your profits from the auction. If you do not win any item, your profit will be zero. If you win any lot(s), your profit will be calculated as follows:

$$\text{Profit} = \text{your value of the lot(s)} - \text{your final bid on the lot(s) you win}$$

You will be given a starting capital balance of ₦50.00. Any profit you earn in the auction will be added to your starting balance. Similarly, any losses will be subtracted from it. When the auction ends, you will be paid based on your final balance.

Suppose you win the lot-combination BCE. Below are some examples of your final earning under different scenarios:

**Table 2.** Earning Calculation

Example	You Win	Your Value	Your Final Bid	Your Profit	Your Balance	Your Earning
1.	BCE	₦103	₦50	₦53	$₦50 + ₦53 = ₦103$	$103/5 = \$20.6$
2.	BCE	₦103	₦100	₦3	$₦50 + ₦3 = ₦53$	$53/5 = \$10.6$
3.	BCE	₦103	₦103	₦0	$₦50 + ₦0 = ₦50$	$50/5 = \$10.0$
4.	BCE	₦103	₦120	- ₦17	$₦50 - ₦17 = ₦33$	$33/5 = \$6.6$
5.	BCE	₦103	₦160	- ₦57	$₦50 - ₦57 = - ₦7$	0.0

## 6. Determining Winning Bids

When the auction ends, the combination of bids that maximize the total revenue will be declared winners. For instance, if the five bids shown in Table 3 have been placed in the auction, the winning bids will be the underlined bids, Bid 3 and Bid 5, because these two bids combine to generate the maximum revenue of ₦110.

**Table 3.** Winning Bids Calculation

Bid	Item(s)	Bid
1.	A	₦ 20
2.	BC	₦ 30
3.	DEF	<u>₦ 50</u>
4.	ABCDEF	₦ 100
5.	ABC	<u>₦ 60</u>

Note that, unlike traditional auctions, where once a bid is losing, it can never win the auction again, in combinatorial auctions, a losing bid may end up winning by virtue of another bid. For example, in Table 3, Bid 1 (₦20 on A) is losing. But if the bid on BC (Bid 2) is revised to ₦45, then the winning bids will be Bid 1, Bid 2 and Bid 3 because they will together generate ₦115, which

is greater than the current revenue of €110. Thus, Bid 1 on A will end up winning the auction even though the bid was losing and was not updated.

Now, we will explain the auction interface in detail.

## 7. Finding your Values of Lots

Once the auction starts, your values for the six individual lots will be displayed on the screen at all times as shown in Figure 3.1. The amounts denote how much each lot is worth to you as mentioned earlier. For example, your value of Lot A is €73.

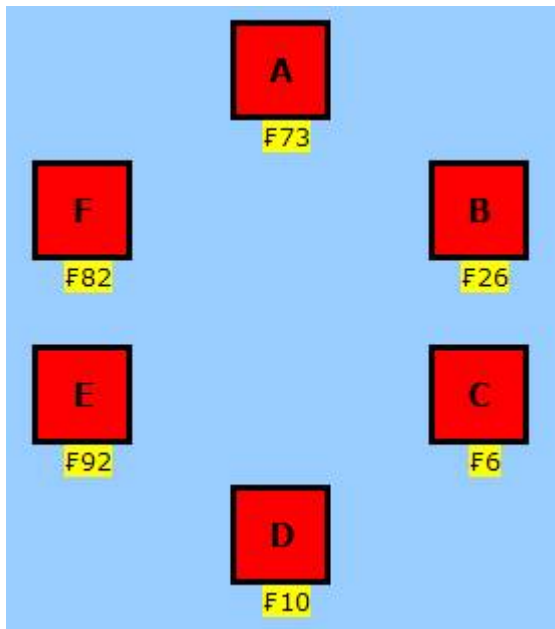


Figure 3.1. Finding values of individual items

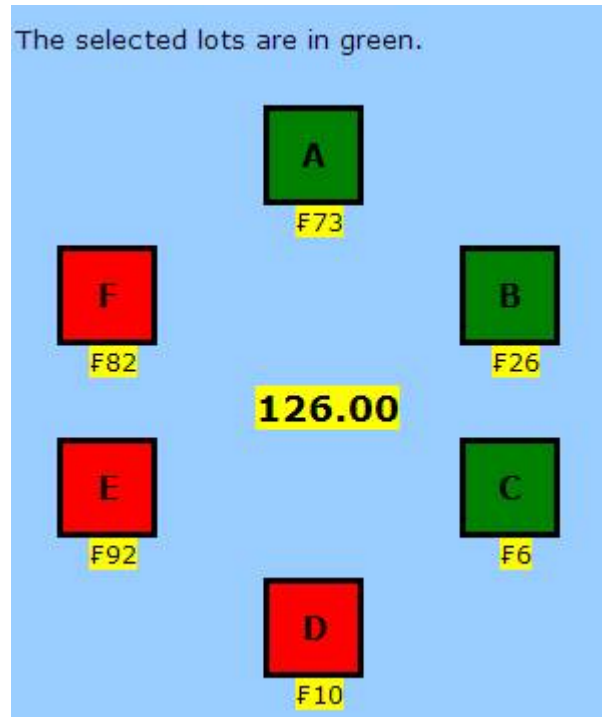


Figure 3.2. Finding values of item-combinations

To find your values for lot-combinations, you have to simply click on the lot(s). Then, the value of the lot(s) will be shown at the centre. For example, your value of ABC—shown in green in Figure 3.2—is €126.00.

You will not know the values of the other bidders.

## 8. Placing Bids

\*For Treatment 1

Bids can be placed by selecting the lots, entering a bid amount, and then pressing the **Submit Bid** button. You are only allowed to place integer bids, i.e., no decimals are allowed in the bids you place. An example snapshot of the auction screen is shown in Figure 4. The minimum bid increment is €1, i.e., to outbid an existing bid on a lot, you have to exceed it by €1.

Time Remaining: **07:55**  
mm:ss

The selected lots are in green.

**A**  
F73

**F**  
F82

**E**  
F92

**D**  
F10

**B**  
F26

**C**  
F6

Selected Items:  
**BC**

Enter your Bid:

(no decimals)

**Submit Bid**

**Refresh Bids**

Currently Active Bids		
Bid No.	Bid Item(s)	Bid Amount
<b>6.</b>	<b>ABC</b>	<b>F60</b>
<b>3.</b>	<b>DEF</b>	<b>F50</b>
2.	BC	F30
1.	A	F20

35.20

Minimum non-losing bid for your selected items: F31  
Minimum winning bid for your selected items: F41

**Figure 4.** Auction Interface

Each auction will last at least 15 minutes. The clock at the top will count down from 15 minutes. However, if a non-losing bid is placed in the last 30 seconds, the auction will be automatically extended by 30 seconds. For example, if a new non-losing bid is placed when 10 seconds are remaining, the countdown clock will be reset to 30 seconds. Thus, the auction will end only when no non-losing bids are placed by any of the bidders in the auction for 30 seconds. You will be informed when the auction ends.

During the auction, you will be able to see all the bids that are either winning or have a chance of winning (by virtue of a suitable complementary bid). All losing bids will be automatically removed (Bids 4 and 5 in Figure 4). The bids will be displayed in reverse chronological order with the ones you have placed highlighted on your screen (Bids 1 and 3 in Figure 4).

Further, the bids that are *winning* at a given state of the auction will be identified for you in bold red (Bids 3 and 6 in Figure 4). Note that Bids 1 and 2 are currently losing but have a chance of winning in future. Also note that if none of your bids (i.e., highlighted bids) are in bold red, it implies that you do not have any winning bid.

Whenever you select a lot or a lot-combination, in addition to the value of the lots you will also see the following information:

- The minimum that you need to bid on your selected lot(s) for your bid to at least stand a chance of winning in the future; and

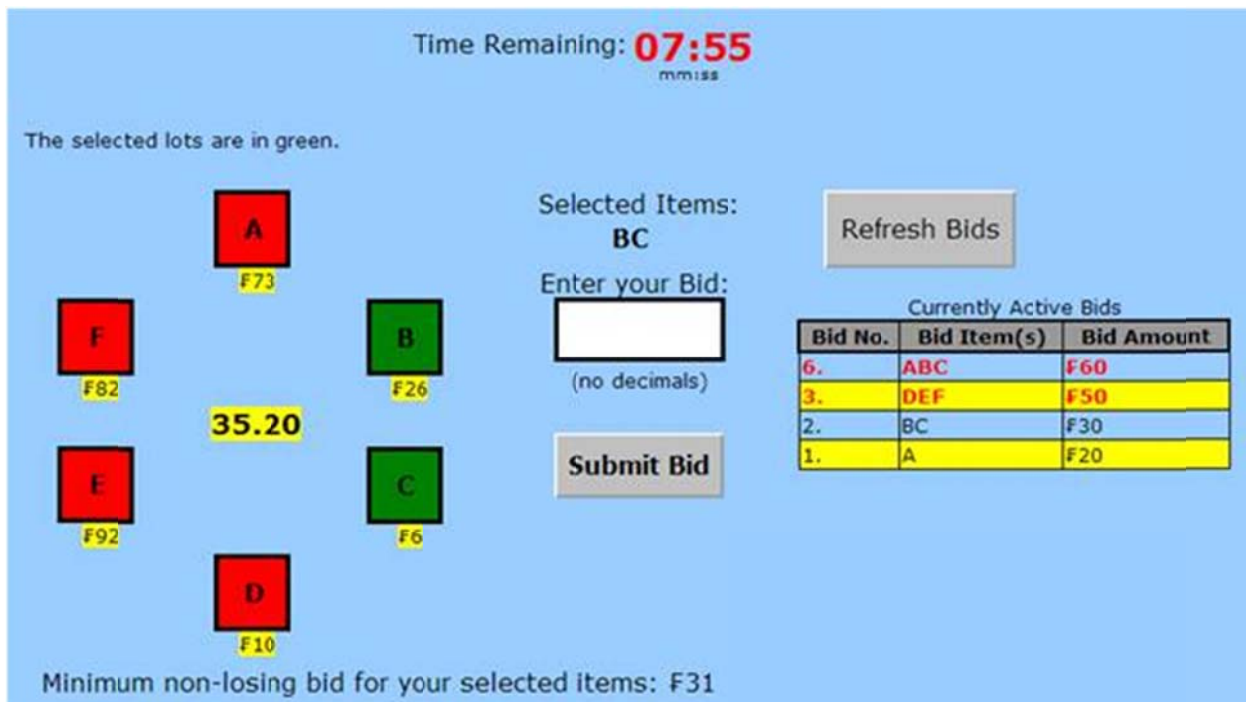
- The minimum that you need to bid on your selected lot(s) in order to be currently winning.

These values are shown at the bottom left of Figure 4. For example, if you choose to bid on BC, the minimum that you need to bid in order to stand a chance of winning in the future is ₦31. Otherwise, your bid will never be able to win because of the existing bid of ₦30 on BC (i.e., Bid 2). Similarly, the minimum that you need to bid in order to be winning is ₦41 because then, together with Bid 1, the total for ABC will be ₦61, which is greater than the ₦60 of Bid 6.

## 8. Placing Bids

\*For Treatment 2

Bids can be placed by selecting the lots, entering a bid amount, and then pressing the **Submit Bid** button. You are only allowed to place integer bids, i.e., no decimals are allowed in the bids you place. An example snapshot of the auction screen is shown in Figure 4. The minimum bid increment is ₦1, i.e., to outbid an existing bid on a lot, you have to exceed it by ₦1.



**Figure 4.** Auction Interface

Each auction will last at least 15 minutes. The clock at the top will count down from 15 minutes. However, if a non-losing bid is placed in the last 30 seconds, the auction will be automatically extended by 30 seconds. For example, if a new non-losing bid is placed when 10 seconds are remaining, the countdown clock will be reset to 30 seconds. Thus, the auction will end only

when no non-losing bids are placed by any of the bidders in the auction for 30 seconds. You will be informed when the auction ends.

During the auction, you will be able to see all the bids that are either winning or have a chance of winning (by virtue of a suitable complementary bid). All losing bids will be automatically removed (Bids 4 and 5 in Figure 4). The bids will be displayed in reverse chronological order with the ones you have placed highlighted on your screen (Bids 1 and 3 in Figure 4).

Further, the bids that are *winning* at a given state of the auction will be identified for you in bold red (Bids 3 and 6 in Figure 4). Note that Bids 1 and 2 are currently losing but have a chance of winning in future. Also note that if none of your bids (i.e., highlighted bids) are in bold red, it implies that you do not have any winning bid.

Whenever you select a lot or a lot-combination, in addition to the value of the lots you will also see the following information:

- The minimum that you need to bid on your selected lot(s) for your bid to at least stand a chance of winning in the future.

These value is shown at the bottom left of Figure 4. For example, if you choose to bid on BC, the minimum that you need to bid in order to stand a chance of winning in the future is £31. Otherwise, your bid will never be able to win because of the existing bid of £30 on BC (i.e., Bid 2). However, note that the minimum that you need to bid in order to be winning is £41 because then, together with Bid 1, the total for ABC will be £61, which is greater than the £60 of Bid 6.

## 8. Placing Bids

\*For Treatment 3

Bids can be placed by selecting the lots, entering a bid amount, and then pressing the **Submit Bid** button. You are only allowed to place integer bids, i.e., no decimals are allowed in the bids you place. An example snapshot of the auction screen is shown in Figure 4. The minimum bid increment is £1, i.e., to outbid an existing bid on a lot, you have to exceed it by £1.

Time Remaining: **07:55**  
mm:ss

The selected lots are in green.

**A**  
F73

**F**  
F82

**E**  
F92

**D**  
F10

**B**  
F26

**C**  
F6

Selected Items:  
**BC**

Enter your Bid:

(no decimals)

**Submit Bid**

**Refresh Bids**

Currently Active Bids		
Bid No.	Bid Item(s)	Bid Amount
<b>6.</b>	<b>ABC</b>	<b>F60</b>
<b>3.</b>	<b>DEF</b>	<b>F50</b>
2.	BC	F30
1.	A	F20

35.20

Minimum winning bid for your selected items: F41

**Figure 4.** Auction Interface

Each auction will last at least 15 minutes. The clock at the top will count down from 15 minutes. However, if a non-losing bid is placed in the last 30 seconds, the auction will be automatically extended by 30 seconds. For example, if a new non-losing bid is placed when 10 seconds are remaining, the countdown clock will be reset to 30 seconds. Thus, the auction will end only when no non-losing bids are placed by any of the bidders in the auction for 30 seconds. You will be informed when the auction ends.

During the auction, you will be able to see all the bids that are either winning or have a chance of winning (by virtue of a suitable complementary bid). All losing bids will be automatically removed (Bids 4 and 5 in Figure 4). The bids will be displayed in reverse chronological order with the ones you have placed highlighted on your screen (Bids 1 and 3 in Figure 4).

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Whenever you select a lot or a lot-combination, in addition to the value of the lots you will also see the following information:

- The minimum that you need to bid on your selected lot(s) in order to be currently winning.

This value is shown at the bottom left of Figure 4. For example, if you choose to bid on BC, the minimum that you need to bid in order to be winning is ₦41 because then, together with Bid 1, the total for ABC will be ₦61, which is greater than the ₦60 of Bid 6. Note that the minimum that you need to bid in order to stand a chance of winning in the future is ₦31 because your bid will then be greater than the existing bid of ₦30 on BC (i.e., Bid 2).

**Congratulations! You have completed reading all the instructions.**