Thank you for participating in today's experiment. You have earned a \$5 show-up bonus for arriving on time. Whatever you earn in this session will be in addition to this \$5. If you read the instructions below carefully, you have the potential to earn significantly more.

The experiment will be run over two days, today and tomorrow. You will be paid in cash at the end of tomorrow's experiment.

In the experiment you will earn Experimental Dollars (E\$), which will be converted into cash (US Dollars) at the end of the experiment. For every 20,000 E\$ you have at the end of the experiment you will be paid 1 US Dollar in cash.

You will participate in the experiment along with 11 other students. Neither before nor after the experiment will you receive any information about the identity of other participants. During the experiment, you are not allowed to talk to other participants or to use cell phones. If you have any questions, please raise your hand, and an experimenter will assist you.

The experiment consists of four parts: Part A, B, C and D. We will first distribute the instructions for Part A. You will read them, answer a brief questionnaire, and then you will start playing. After you finish playing part A, we will distribute the instructions for part B, and you will play part B. Tomorrow, you will play Part C and Part D.

# **Instructions for Part A**

#### **Overview**

In today's experiment, you will buy and sell a product that we will call from now on a "widget." You will be able to buy or sell the widgets, by trading with the other participants.

You will play 15 rounds with the same procedures. The first 4 rounds are for practice only, whereas the remaining 11 rounds will determine your final payment.

#### **Description of the each round**

#### The Final Value of the Widgets

The final value of the widgets can be **High** or **Low**. This is determined by randomly choosing a ball from a box with **6** red balls and **4** green balls. If the ball turns out to be red, the value of the widget is High; if the ball turns out to be green, the value of the widget is Low. Since there are 6 red and 4 green balls in the box, the chance of the value of the widgets being High is **60 percent**; the chance of the value of the widgets being Low is **40 percent**.

We can represent the final value of the widgets by the following picture:



The ball is extracted from the box **<u>at the end</u>** of each round.

In each round we choose the ball from a new box. There are always 6 red and 4 green balls in the box, so the chance of the final value of the widgets being High or Low does not depend on whether it was High or Low in the previous round.

#### **Buyers and Sellers**

At the beginning of each round, you are randomly assigned to be either a Buyer or a Seller. Half of the participants (6 students) will be Buyers, and half of the participants (6 students) will be Sellers. In each round, you see whether you are a Buyer or a Seller by looking at the left column in your screen.

Here is why whether you are a Buyer or a Seller matters.

a) At the beginning of the round Buyers are given cash and Sellers are given widgets:

If you are a Buyer, you are given 15,000 E\$

If you are a Seller, you are given 100 widgets

b) Whether you are a Buyer or a Seller also determines the final value of the widgets for you.

When the value of the widget is Low, its final value is **<u>100 E</u>** for both Buyers and Sellers.

However, when the value of the widget is High, its final value is  $\underline{750 \text{ E}}$  for Buyers and  $\underline{250 \text{ E}}$  for Sellers. We can represent the final value of the widgets by the following picture:



When the final value of the widgets is Low, it is the same value for both Buyers and Sellers; but when the value of the widgets is High, widgets pay more to Buyers than to Sellers.

#### How to buy or sell widgets

The column labeled "Price" of your computer screen displays an array of prices. **For each of those prices**, Buyers should indicate the number of widgets they want to buy and Sellers should indicate the number of widgets they want to sell. After you made your choices, you should press OK. You can see how the screenshot appears for both buyers and sellers in the attached leaflet.

The computer requires you to be consistent in your choices. For instance, if you write that you want to buy 40 widgets at the price of 300, **you are not allowed to buy more** than 40 widgets at a price of 330. The opposite is true for a Seller: if you want to sell 40 widgets at the price of 300, **you are not allowed to sell more** than 40 widgets at the price of 270.

How Buyers pay for widgets

In each round, Buyers are allowed to buy widgets with the cash that they have.

In the computer screen, to the right of the price column there is a column that shows the maximum number of widgets Buyers can buy for each price.

Suppose you are a Buyer and are deciding how many widgets to buy at the price 300. You can at most buy 50 widgets (300\*50=15,000 E\$, which is the cash Buyers have at the beginning of the round).

# The final price

At which price does trading occur? **For each price**, we will sum up the number of widgets that all Buyers want to buy, and the number of widgets that all Sellers want to sell. We will choose the price for which the difference between these two numbers is the smallest. This is the **final price** in the round.

<u>Example</u>: Suppose that at the price of 300, each Buyer wants to buy 40 widgets, and each seller wants to sell 10. Therefore, at 300, all Buyers together want to buy 40\*6=240 widgets, and all sellers together want to sell 10\*6=60 widgets. The difference between amount bought and amount sold is 240-60=180. We compute this difference for all the other prices in the list, and we choose the price for which the difference is the smallest (that is, the price for which the difference is the closest to zero). This is the final price in the round.

You learn which is the final price **only after all participants have made their choices**. Therefore, at each price, you should indicate the number of widgets you want to buy or sell **as if** that price were the one at which transactions occur.

At the final price, each Buyer will buy (at most) the number of widgets he/she indicated he/she would buy at that price. Each Seller will sell (at most) the number of widgets he/she indicated he/she would sell at that price.

Why at most? Because sometimes you may not be able to buy or sell exactly the quantity you had indicated. It may happen that, at the final price, the number of widgets Buyers want to buy is larger (or smaller) than the number of widgets Sellers want to sell. In this case, we will reduce the widgets bought by Buyers (or sold by Sellers) by the same proportional amount. For instance, if the final price is 300 and the number of widgets sold by Sellers is 10% higher than the number of widgets that Buyers want to buy at this price, we will reduce the sale of each Seller by 10%.

### The bonus

In each round, you are given a per-round bonus of 10,000 E\$. The extra bonus is given only at the end of the round, and cannot be used to buy widgets. This bonus is in addition to the show-up bonus you received for arriving on time.

# The end of the Round

After the final price is determined, buying and selling occurs automatically. A summary on your screen will indicate the price for the widget, and how many widgets you bought or sold. Then, the value of the widgets will be extracted from the box, and your payoff for the round will appear on the computer screen.

Your payoff is computed in the following way:

1) If you are a Buyer

Your payoff = your remaining cash

+ (number of widgets you bought)\*(final value of the widgets)

- + bonus
- 2) If you are a Seller

Your payoff = the cash from selling the widgets

+ (number of widgets you did not sell)\*(final value of the widgets)

+ bonus

# <u>Examples</u>

Let's say the final value of the widgets is High, you are Buyer, and you bought 30 widgets at a price of 300. Your payoff is going to be

Cash=15,000-300\*30=15,000-9,000=6,000

Final value of the widgets=750\*30=22,500

Bonus=10,000

Final payoff in the round=22,500+6,000+10,000=38,500 E\$

Note that you made money out of the purchase of widgets, since you bought for 300 something that is worth 750.

 Let's say now you are a Seller and you sold 90 widgets (and kept 10) at a price of 150. The final value of the widgets is 100. Your payoff is going to be

Cash=90\*150=13,500 Final value of the remaining widgets=100\*10=1,000 Bonus=10,000

Final payoff in the round=13,500+1,000+10,000=24,500 E\$

Note that you made money out of the sale, since you sold for 150 something that is worth to you only 100.

# The new round

After the first round ends, you will move to round 2, then to round 3 and so on. At the beginning of each round, you will be told whether you are a Buyer or a Seller and you will be given cash (if a buyer) or widgets (if a seller) to play in the round. Each round is independent: **you will never be able to use the widgets or cash from previous rounds**. Your per-round payoff only matters to compute your final payment in dollars.

# After the game ends

After you have seen the payoff of the round, a new round starts. At the end of the 15<sup>th</sup> round, part A ends, and we will distribute the instructions for part B.

How is your final payment determined? For both part A and part B, we will discard the first 4 rounds, which are only for practice. Out of the remaining 22 rounds (11 for part A and 11 for part B), we will randomly draw 10 rounds (5 from part A and 5 from part B) and we will add your earnings from these randomly chosen 10 rounds. Finally, we will convert the earnings from E\$ into US Dollars at the exchange rate of 20,000.

Tomorrow, after playing the second day of the experiment, you will be paid the sum of today's and tomorrow's earnings. This is the end of the instructions for part A. If you have any questions, please raise your hand and an experimenter will assist you.

# **Instructions for Part B**

The experiment is exactly the same as in part A. The only difference is in the proportion of red and green balls that determine the final value of the widgets in each round. Now, there are 4 red ball and 6 green balls in the box.

Since there are 4 red and 6 green balls in the box, the chance of the value of the widgets being High is 40 percent (when before it was 60 percent); the chance of the value of the widgets being Low is 60 percent (when before it was 40 percent). We can represent this by the following picture:



As for Part A, Part B last for 15<sup>th</sup> rounds. When it ends, for both part A and part B, we will discard the first 4 rounds, which are only for practice. Out of the remaining 22 rounds (11 for part A and 11 for part B), we will randomly draw 10 rounds (5 from part A and 5 from part B) and we will add your earnings from these randomly chosen 10 rounds. Finally, we will convert the earnings from E\$ into US Dollars at the exchange rate of 20,000.

Tomorrow, after playing the second day of the experiment, you will be paid the sum of today's and tomorrow's earnings. This is the end of the instructions for part B. If you have any questions, please raise your hand and an experimenter will assist you.

This is the second day of the experiment. Today you will play parts C and D.

As in yesterday's experiment, today you will earn Experimental Dollars (E\$), which will be converted into cash (US Dollars) at the end of the experiment. For every 20,000 E\$ you have at the end of the experiment you will be paid 1 US Dollar in cash.

You will participate in the experiment along with 11 other students. Neither before nor after the experiment will you receive any information about the identity of other participants. During the experiment, you are not allowed to talk to other participants or to use cell phones. If you have any questions, please raise your hand, and an experimenter will assist you.

# **Instructions for Part C**

#### **Overview**

In today's experiment, you will buy and sell a product that we will call from now on a "widget." You will be able to buy or sell the widgets, by trading with the other participants.

You will play 15 rounds with the same procedures. The first 4 rounds are for practice only, whereas the remaining 11 rounds will determine your final payment.

#### **Description of the each round**

#### The Final Value of the Widgets

The final value of the widgets can be **High** or **Low**. This is determined by randomly choosing a ball from a box with **6** red balls and **4** green balls. If the ball turns out to be red, the value of the widget is High; if the ball turns out to be green, the value of the widget is Low. Since there are 6 red and 4 green balls in the box, the chance of the value of the widgets being High is **60 percent**; the chance of the value of the widgets being Low is **40 percent**.

We can represent the final value of the widgets by the following picture:



The ball is extracted from the box **<u>at the end</u>** of each round.

In each round we choose the ball from a new box. There are always 6 red and 4 green balls in the box, so the chance of the final value of the widgets being High or Low does not depend on whether it was High or Low in the previous round.

### **Buyers and Sellers**

At the beginning of each round, you are randomly assigned to be either a Buyer or a Seller. Half of the participants (6 students) will be Buyers, and half of the participants (6 students) will be Sellers. In each round, you see whether you are a Buyer or a Seller by looking at the left column in your screen.

Here is why whether you are a Buyer or a Seller matters.

a) At the beginning of the round Buyers are given cash and Sellers are given widgets:

If you are a Buyer, you are given 15,000 E\$

If you are a Seller, you are given <u>100</u> widgets

b) Whether you are a Buyer or a Seller also determines the final value of the widgets for you.

When the value of the widget is Low, its final value is **<u>100 E\$</u>** for both Buyers and Sellers.

However, when the value of the widget is High, its final value is  $\underline{750 \text{ E}\$}$  for Buyers and  $\underline{250 \text{ E}\$}$  for Sellers. We can represent the final value of the widgets by the following picture.



# When the final value of the widgets is Low, it is the same value for both Buyers and Sellers; but when the value of the widgets is High, widgets pay more to Buyers than to Sellers.

### How to buy or sell widgets

The column labeled "Price" of your computer screen displays an array of prices. **For each of those prices**, Buyers should indicate the number of widgets they want to buy and Sellers should indicate the number of widgets they want to sell. After you made your choices, you should press OK. You can see how the screenshot appears for both buyers and sellers in the attached leaflet.

The computer requires you to be consistent in your choices. For instance, if you write that you want to buy 40 widgets at the price of 300, **you are not allowed to buy more** than 40 widgets at a price of 330. The opposite is true for a Seller: if you want to sell 40 widgets at the price of 300, **you are not allowed to sell more** than 40 widgets at the price of 270.

# How Buyers pay for widgets

In each round, Buyers are allowed to buy widgets not only with the money that they have, but also by borrowing from a bank.

How does borrowing work? For each widget that a Buyer buys, the bank is going to lend him/her <u>up to</u> 100 E\$. Hence, for any given price, borrowing allows the Buyers to buy more widgets than if they could not borrow. At the end of the round Buyers will have to return what they borrowed.

In the computer screen, to the right of the price column, there are 4 columns that show the maximum number of widgets Buyers can buy for each price if: *i*) they do not want to borrow *ii*) if they want to borrow the maximum (100 E\$ per widget), *iii*) if they want to borrow only 30 E\$ per widget and *iv*) if they want to borrow only 60 E\$ per widget.

Buyers will indicate on the screen how many widgets they want to buy for each of the prices in the list. **Obviously you are not limited to borrowing 0, 30, 60 or 100.** Suppose the computer tells you that you can buy 150 widgets when borrowing 30 and 214 when borrowing 60, you can decide to buy a number between 150 and 214. In that case, you will borrow something between 30 and 60 per widget.

The following example shows how borrowing increases how many widgets Buyers can buy. Suppose you are deciding how many widgets to buy at the price 300. If you do not borrow, you could at most buy 50 widgets (300\*50=15,000 E\$, which is the cash Buyers have at the beginning of the round).

If you borrow, for each widget you buy you can get up to 100 E\$ in loans. Suppose you borrow 100 E\$, i.e. the maximum amount per widget. This means that for each widget you buy, you only need to put down 300-100=200 E\$ of your own cash. So with your 15,000 E\$ of cash, you can now afford to buy 75 widgets (200\*75=15,000 E\$), 25 more than if you did not borrow.

At the end of the round, you will have to repay your loan. Since you bought 75 widgets, you will have to repay 75\*100=7,500 E. If the value of the widgets turns out to be High (750 E\$), your payoff is 750\*75=56,250 E\$ minus your 7,500 E\$ loan, that is, 56,250-7,500=48,750 E\$.

If instead you only borrow 60 E\$ per widget, then for each widget you buy you need to put down 300-60=240 E\$; with your 15,000 E\$ of cash, you can now afford to buy 62 widgets (240\*62=14,880 E\$; you are left with 120 E\$ of cash, which are not enough to be an additional widget), 12 more than if you were not allowed to borrow (but 12 less than if you had borrowed the maximum amount of 100 E\$ per widget).

#### The final price

At which price does trading occur? **For each price**, we will sum up the number of widgets that all Buyers want to buy, and the number of widgets that all Sellers want to sell. We will choose the price for which the difference between these two numbers is the smallest. This is the **final price** in the round.

<u>Example</u>: Suppose that at the price of 300, each Buyer wants to buy 40 widgets, and each seller wants to sell 10. Therefore, at 300, all Buyers together want to buy 40\*6=240 widgets, and all sellers together want to sell 10\*6=60 widgets. The difference between amount bought and amount sold is 240-60=180. We compute this difference for all the other prices in the list, and we choose the price for which the difference is the smallest (that is, the price for which the difference is the closest to zero). This is the final price in the round.

You learn which is the final price **only after all participants have made their choices**. Therefore, at each price, you should indicate the number of widgets you want to buy or sell **as if** that price were the one at which transactions occur.

At the final price, each Buyer will buy (at most) the number of widgets he/she indicated he/she would buy at that price. Each Seller will sell (at most) the number of widgets he/she indicated he/she would sell at that price.

Why at most? Because sometimes you may not be able to buy or sell exactly the quantity you had indicated. It may happen that, at the final price, the number of widgets Buyers want to buy is larger (or smaller) than the number of widgets Sellers want to sell. In this case, we will reduce the widgets bought by Buyers (or sold by Sellers) by the same proportional amount. For instance, if the final price is 300 and the number of widgets sold by Sellers is 10% higher than the number of widgets that Buyers want to buy at this price, we will reduce the sale of each Seller by 10%.

# The bonus

In each round, you are given a per-round bonus of 10,000 E\$. The extra bonus is given only at the end of the round, and cannot be used to buy widgets. This bonus is in addition to the show-up bonus you received for arriving on time.

# The end of the Round

After the final price is determined, buying and selling occurs automatically. A summary on your screen will indicate the price for the widget, and how many widgets you bought or sold. Then, the value of the widgets will be extracted from the box, and your payoff for the round will appear on the computer screen.

Your payoff is computed in the following way:

```
1) If you are a Buyer
```

Your payoff = your remaining cash

+ (number of widgets you bought)\*(final value of the widgets)

+ bonus

- loan repayment

where the final term is there because you need to repay the amount you borrowed for each widget you bought.

2) If you are a Seller

Your payoff = the cash from selling the widgets

+ (number of widgets you did not sell)\*(final value of the widgets)

+ bonus

# **Examples**

1) Let's say the final value of the widgets is High and you are Buyer. You bought 60 widgets at a price of 300, and you borrowed 50 E\$ per widget. Your payoff is going to be

Cash=15000-(300-50)\*60=15,000-15,000=0

Loan repayment=50\*60=3,000

Final value of the widgets=750\*60=45,000

Bonus=10,000

Final payoff in the round=45,000-3,000+10,000=52,000 E\$

 Let's say now you are a Seller and you sold 90 widgets (and kept 10) at a price of 150. The final value of the widgets is 100. Your payoff is going to be

Cash=90\*150=13,500 Final value of the remaining widgets=100\*10=1,000 Bonus=10,000

Final payoff in the round=13,500+1,000+10,000=24,500 E\$

Note that you made money out of the sale, since you sold for 150 something that is worth to you only 100.

#### The new round

After the first round ends, you will move to round 2, then to round 3 and so on. At the beginning of each round, you will be told whether you are a Buyer or a Seller and you will be given cash (if a buyer) or widgets (if a seller) to play in the round. Each round is independent: **you will never be able to use the widgets or cash from previous rounds**. Your per-round payoff only matters to compute your final payment in dollars.

#### After the game ends

After you have seen the payoff of the round, a new round starts. At the end of the 15<sup>th</sup> round, part C ends, and we will distribute the instructions for part D.

How is your final payment determined? For both part C and part D, we will discard the first 4 rounds, which are only for practice. Out of the remaining 22 rounds (11 for part C and 11 for part D), we will randomly draw 10 rounds (5 from part C and 5 from part D) and we will add your earnings from these randomly chosen 10 rounds. Finally, we will convert the earnings from E\$ into US Dollars at the exchange rate of 20,000.

After playing part D, yesterday's and today's earnings will be summed up, and you will be paid in cash. This is the end of the instructions for part C. If you have any questions, please raise your hand and an experimenter will assist you.

# **Instructions for Part D**

The experiment is exactly the same as in part C. The only difference is in the proportion of red and green balls that determine the final value of the widgets in each round. Now, there are 4 red ball and 6 green balls in the box.

Since there are 4 red and 6 green balls in the box, the chance of the value of the widgets being High is 40 percent (when before it was 60 percent); the chance of the value of the widgets being Low is 60 percent (when before it was 40 percent). We can represent this by the following picture:



As for Part C, Part D last for 15<sup>th</sup> rounds. When it ends, for both part C and part D, we will discard the first 4 rounds, which are only for practice. Out of the remaining 22 rounds (11 for part C and 11 for part D), we will randomly draw 10 rounds (5 from part C and 5 from part D) and we will add your earnings from these randomly chosen 10 rounds. Finally, we will convert the earnings from E\$ into US Dollars at the exchange rate of 20,000.

After finishing playing part D, we will sum today's and yesterday's dollar earnings and pay you in cash. This is the end of the instructions for part D. If you have any questions, please raise your hand and an experimenter will assist you.

Rou	nd						
1 of 1					Remaining time [sec]: 120		
	You are a <b>BUYER.</b> You have <b>15000</b> in cash Widget Value if <b>HIGH</b> : <b>750</b> Widget Value if <b>LOW</b> : <b>100</b> You are in <b>Part A.</b>		Price	Maximum number of widgets you can buy	Number of widgets you want to buy		
		1	130	115			
		2	160	93			
		з	190	78			
		4	210	71			
		5	240	62			
		6	300	50			
		7	330	45			
		8	360	41			
		9	370	40			
		10	390	38			
	For each of the above prices, you should indicate the number of widgets you want to buy. When you are done, click OK.						
					ок		

# The Buyers' Screenshot

# The Sellers' Screenshot

1 of 1			Remaining time [sec]: 12				
			Price	Maximum number of widgets you can sell	Number of widgets you want to sell		
	You are a <b>SELLER.</b> You have <b>100 widgets.</b> Widget Value if <b>HIGH</b> : <b>250</b> Widget Value if <b>LOW</b> : <b>100</b> You are in <b>Part A.</b>	1	130	100			
		2	160	100			
		3	190	100			
		4	210	100			
Ya Widi		5	240	100			
Wid		6	300	100			
		7	330	100			
		8	360	100			
		9	370	100			
		10	390	100			
	For each of the above prices, you should indicate the number of widgets you want to sell. When you are done, click OK.						
					ок		

Round 1 of 1 Remaining time [sec]: 117										
[			Price	Maximum number o widgets you can buy	r					
	You are a <b>BUYER.</b> You have <b>15000</b> in cash Max you can borrow: <b>100</b> Widget Value if <b>HIGH : 750</b> Widget Value if <b>LOW : 100</b> You are in <b>Part B.</b>			lf you don't borrow	lf you borrow: 30	60	100	Number of widgets you want to buy		
		1	130	115	150	214	500			
		2	160	93	115	150	250			
		3	190	78	93	115	166			
		4	210	71	83	100	136			
		5	240	62	71	83	107			
		6	300	50	55	62	75			
		7	330	45	50	55	65			
		8	360	41	45	50	57			
		9	370	40	44	48	55			
		10	390	38	41	45	51			
	For each of the above prices, you should indicate the number of widgets you want to buy. When you are done, click <i>OK</i> .									

# The Buyers' Screenshot

# The Sellers' Screenshot

Round							
	1 of 1			Remaining time [sec]: 117			
	You are a SELLER. You have <b>100 widgets.</b> Widget Value if HIGH : 250 Widget Value if LOW : 100 You are in <b>Part B.</b>		Price	Maximum number of widgets you can sell	Number of widgets you want to sell		
		1	130	100			
		2	160	100			
		3	190	100			
		4	210	100			
		5	240	100			
		6	300	100		i l	
		7	330	100			
		8	360	100			
		9	370	100			
		10	390	100			
	For each of the above prices, you should indicate the number of widgets you want to sell. When you are done, click OK.						
					ОК		