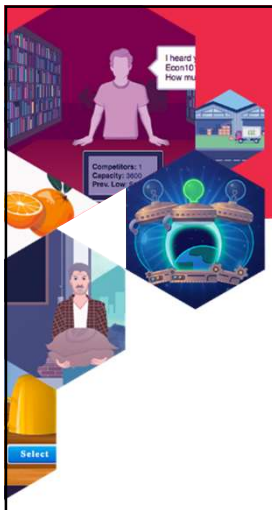

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Robot Dogs

A Classroom Experiment on Externalities

RobotDogs: Barking Up the Wrong Tree

Overview: Each Round

- Half in each market are buyers and half are sellers
- Transactions occur between buyers and sellers
- Each RobotDog's barking imposes a nuisance cost equally shared by all

Overview: Transacting

- Students can buy or sell one RobotDog at a time
- Buyers submit bids, or an offer to buy
- Sellers submit asks, or an offer to sell
- When a bid > ask, we have a sale!

Game Screen

Information on role and nuisance cost

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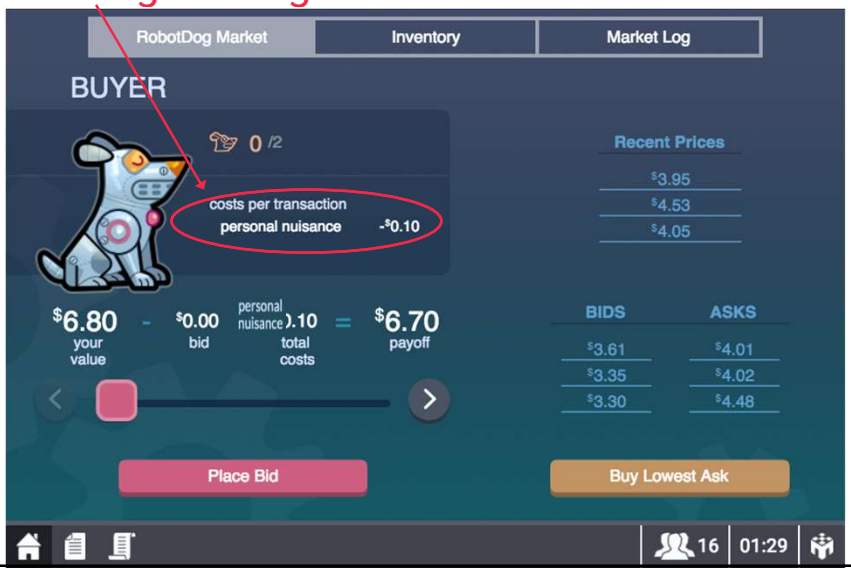
Game Screen

RobotDog barking



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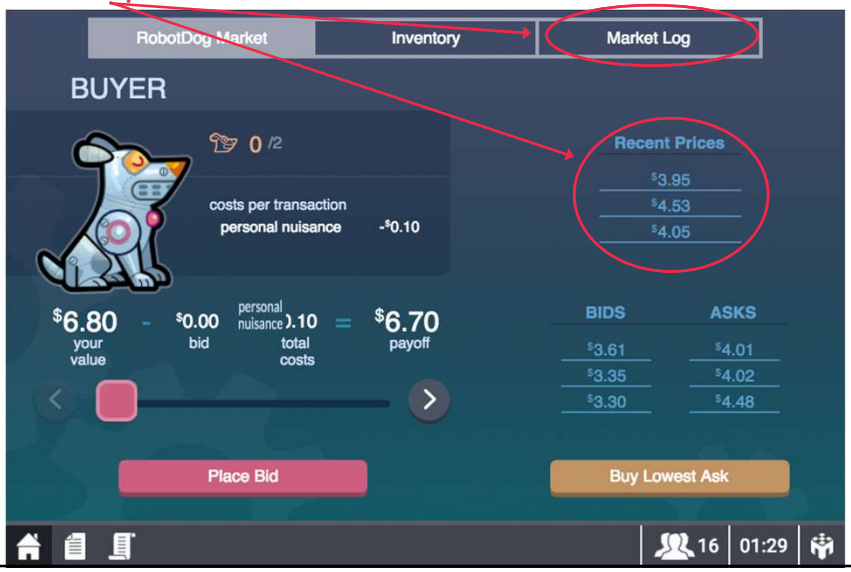
Game Screen

Previous prices in this market



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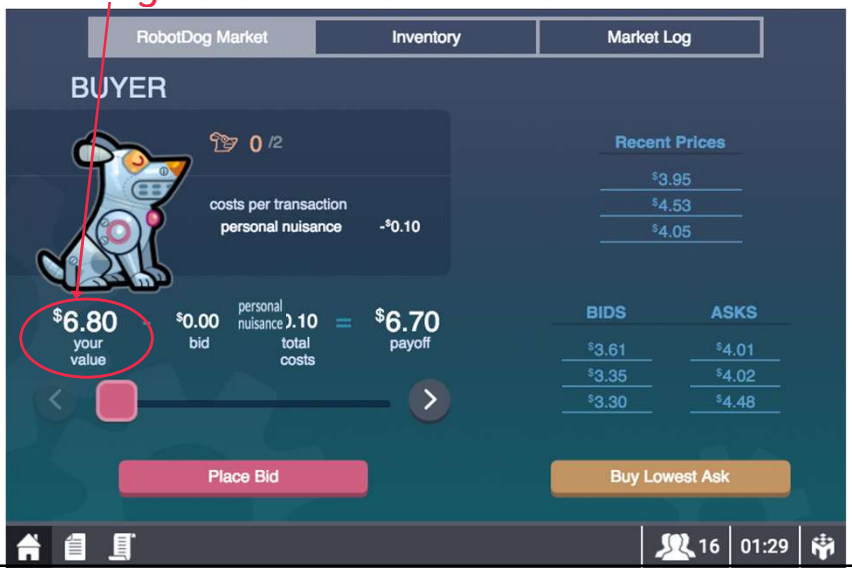
Buyer's Screen

RobotDog value



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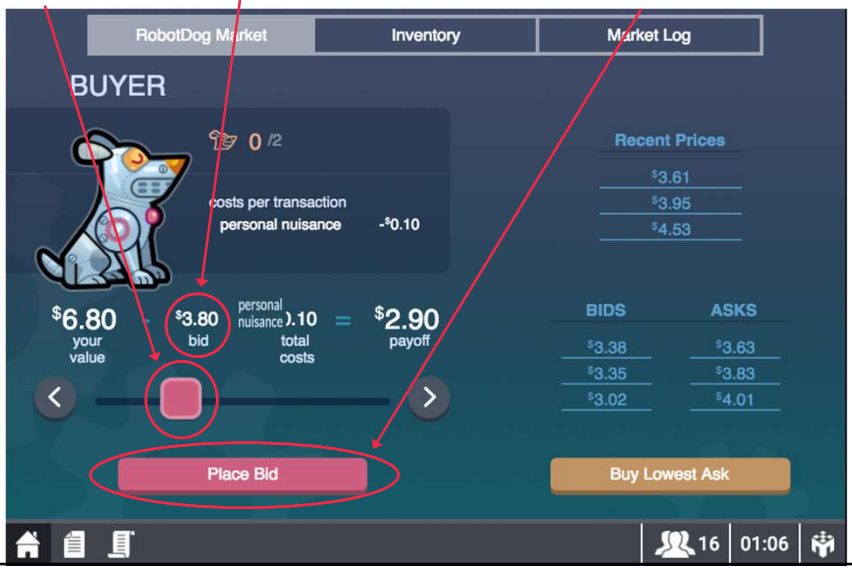
Buyer's Screen

Slide to desired bid

Press to submit



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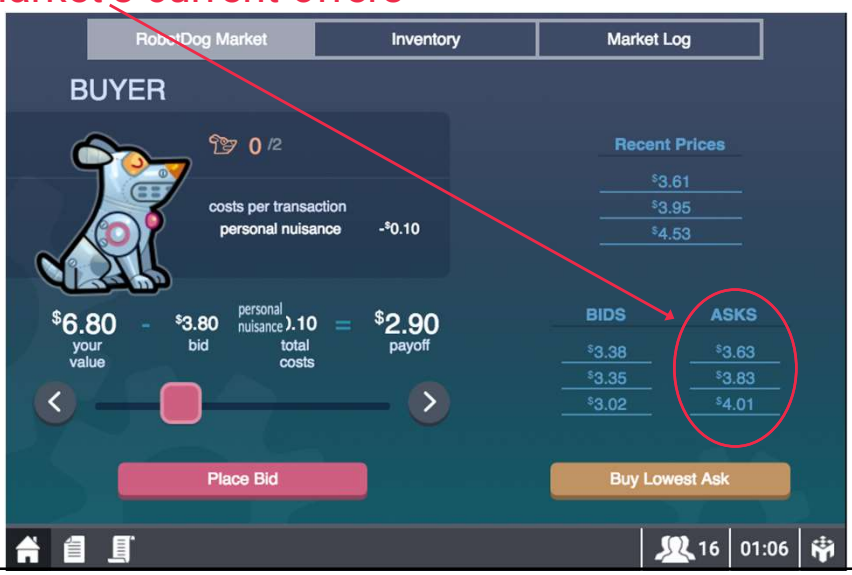
Buyer's Screen

Market's current offers



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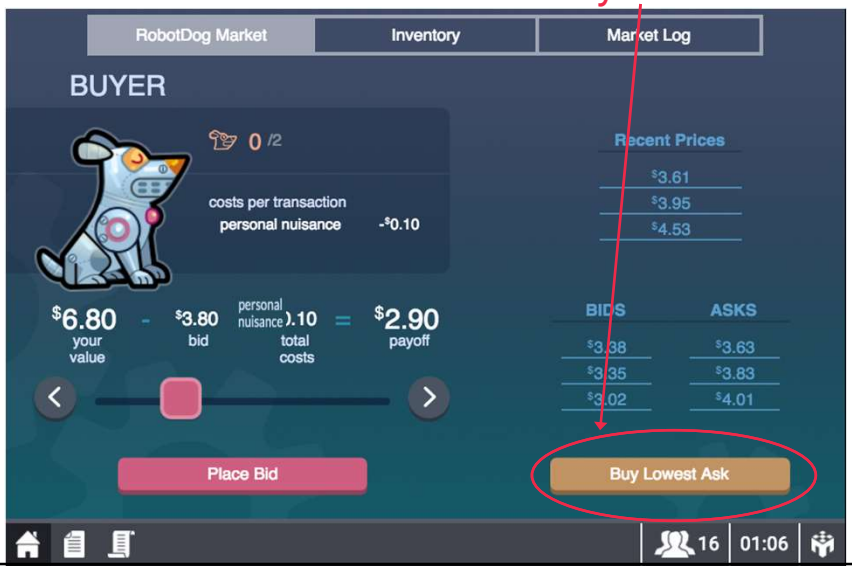
Buyer's Screen

Buy button



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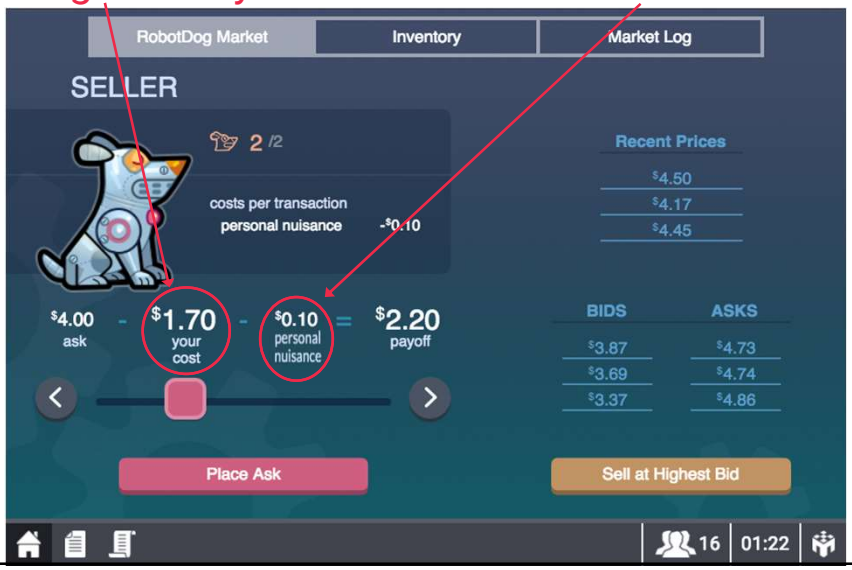
Seller's Screen

RobotDog cost if you sell

Personal nuisance cost



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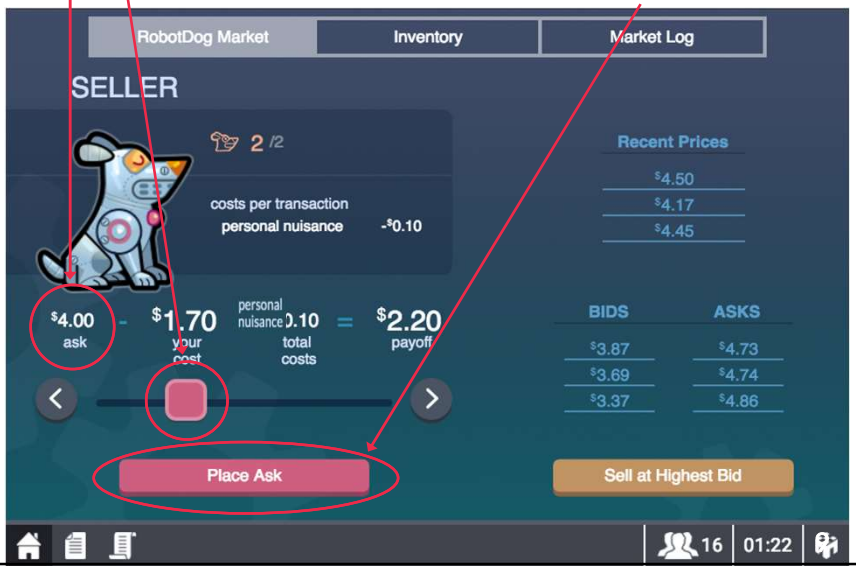
Seller's Screen

Slide to desired ask

Press to submit



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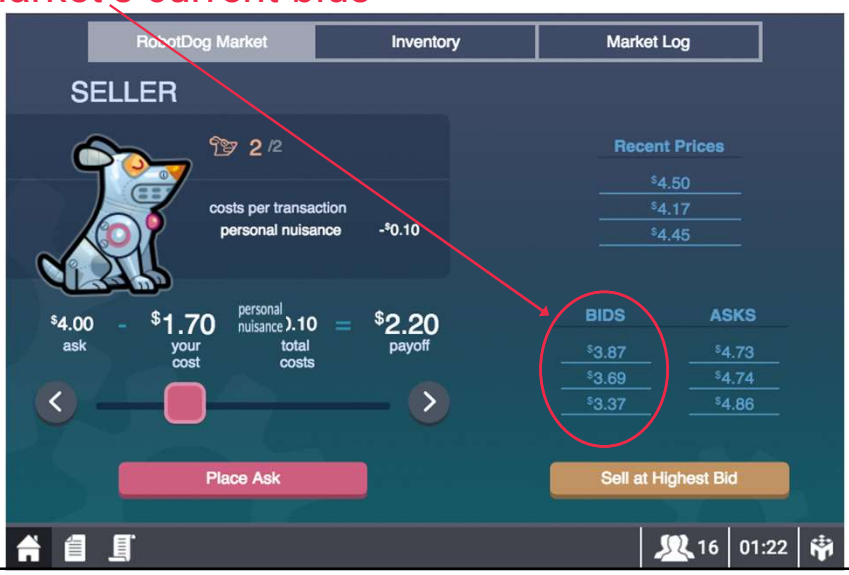
Seller's Screen

Market's current bids



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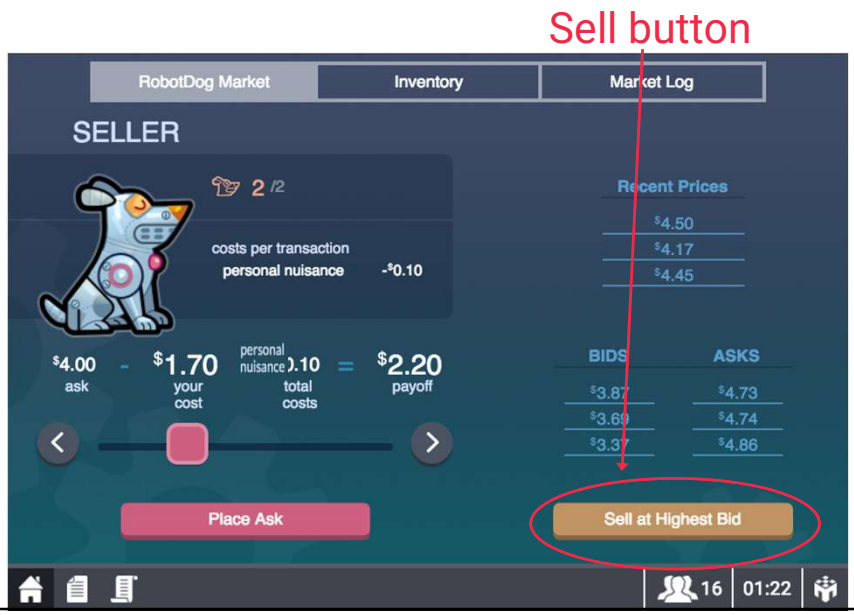
Seller's Screen



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Summary

You buy a RobotDog if

- You click **Buy at the Lowest Ask**, OR
- You have the highest Bid and a seller accepts highest bid

You sell a RobotDog if

- You click **Sell at the Highest Bid**, OR
- You have the lowest Ask and a buyer accepts lowest ask

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Payoffs

Buyer: Each RobotDog you buy

- Payoff = RobotDog value − Price paid − Personal nuisance cost

Seller: Each RobotDog you sell

- Payoff = Price fetched − RobotDog cost − Personal nuisance cost

Nuisance cost from others

- Others' RobotDogs × Personal nuisance cost

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Payoffs

Buyer: Each RobotDog you buy

- Payoff = RobotDog value − Price paid − Personal nuisance cost

Seller: Each RobotDog you sell

- Payoff = Price fetched − RobotDog cost − Personal nuisance cost

Nuisance cost from others

- Others' RobotDogs × Personal nuisance cost

Remember

- Total payoff = sum of payoff from transactions minus nuisance cost imposed by others
- The value (or cost) of each item is indicated on your screen
- **A negative number is smaller than zero!**

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Payoffs: An Example

- Consider 1 transaction.
  - Value to buyer: $2
  - Cost to seller: $1
  - Price agreement: $1.75
- Group size = 10
- Community nuisance: $0.50 per RobotDog

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Payoffs: An Example

- Consider 1 transaction.
  - Value to buyer: $2
  - Cost to seller: $1
  - Price agreement: $1.75
- Group size = 10
- Community nuisance: $0.50 per RobotDog

Buyer	–	**Personal Nuisance Cost**
	–	$0.05
Seller	–	**Personal Nuisance Cost**
	–	$0.05

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Payoffs: An Example

- Consider 1 transaction.
  - Value to buyer: $2
  - Cost to seller: $1
  - Price agreement: $1.75
- Group size = 10
- Community nuisance: $0.50 per RobotDog

Buyer	**Value**	–	**Price**	–	**Personal Nuisance Cost**	=	**Payoff**
	$2.00	–	$1.75	–	$0.05	=	$0.20
Seller				–	**Personal Nuisance Cost**		
				–	$0.05		

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Payoffs: An Example

- Consider 1 transaction.
  - Value to buyer: $2
  - Cost to seller: $1
  - Price agreement: $1.75
- Group size = 10
- Community nuisance: $0.50 per RobotDog

Buyer	**Value**	–	**Price**	–	**Personal Nuisance Cost**	=	**Payoff**
	$2.00	–	$1.75	–	$0.05	=	$0.20
Seller	**Price**	–	**Cost**	–	**Personal Nuisance Cost**	=	**Payoff**
	$1.75	–	$1.00	–	$0.05	=	$0.70

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Payoffs: An Example

Happy Playing!

- Keep in mind for total payoff
  - Sum the payoff from all your transactions
  - Subtract nuisance cost you incur from others' transactions

Buyer	Value	–	Price	–	Personal Nuisance Cost	=	Payoff
	$2.00	–	$1.75	–	$0.05	=	$0.20
Seller	**Price**	**–**	**Cost**	**–**	**Personal Nuisance Cost**	**=**	**Payoff**
	$1.75	–	$1.00	–	$0.05	=	$0.70

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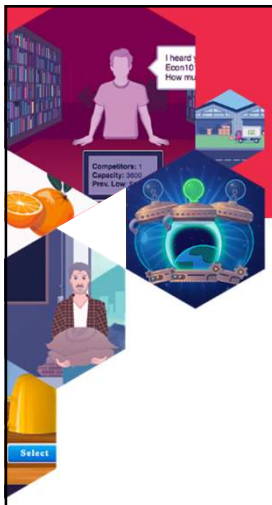

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Robot Dogs with Taxation

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Payoffs

Buyer: Each RobotDog you buy

- Payoff = RobotDog value − Price paid − Personal nuisance cost

Seller: Each RobotDog you sell

- Payoff = Price fetched − RobotDog cost − Personal nuisance cost - Tax

Nuisance cost from others

- Others' RobotDogs × Personal nuisance cost

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Payoffs

Buyer: Each RobotDog you buy

- Payoff = RobotDog value − Price paid − Personal nuisance cost

Seller: Each RobotDog you sell

- Payoff = Price fetched − RobotDog cost − Personal nuisance cost - Tax

Nuisance cost from others

- Others' RobotDogs × Personal nuisance cost

Remember

- Total payoff = sum of payoff from transactions minus nuisance cost imposed by others
- The value (or cost) of each item is indicated on your screen
- **A negative number is smaller than zero!**

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Payoffs: An Example

- Consider 1 transaction.
  - Value to buyer: $4
  - Cost to seller: $1
  - Price agreement: $3.75
  - Tax: $1.40
- Group size = 10
- Community nuisance: $0.50 per RobotDog

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Payoffs: An Example

- Consider 1 transaction.
  - Value to buyer: $4
  - Cost to seller: $1
  - Price agreement: $3.75, Tax: $1.40
- Group size = 10
- Community nuisance: $0.50 per RobotDog

Buyer	**Personal Nuisance Cost**	**=**	**Payoff**	
Seller	**Personal Nuisance Cost**	**− Tax**	**=**	**Payoff**

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Payoffs: An Example

- Consider 1 transaction.
  - Value to buyer: $4
  - Cost to seller: $1
  - Price agreement: $3.75, Tax: $1.40
- Group size = 10
- Community nuisance: $0.50 per RobotDog

Buyer	Value	–	Price	–	Personal Nuisance Cost			=	Payoff
	$4.00	–	$3.75	–	$0.05			=	$0.20
Seller					**Personal Nuisance Cost**	–	**Tax**	=	**Payoff**

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Payoffs: An Example

- Consider 1 transaction.
  - Value to buyer: $4
  - Cost to seller: $1
  - Price agreement: $3.75, Tax: $1.40
- Group size = 10
- Community nuisance: $0.50 per RobotDog

Buyer %	Value	–	Price	–	Personal Nuisance Cost			=	Payoff
	$4.00	–	$3.75	–	$0.05			=	$0.20
Seller	**Price**	–	**Cost**	–	**Personal Nuisance Cost**	–	**Tax**	=	**Payoff**
	$4.00	–	$1.00	–	$0.05	–	$1.40	=	$1.55

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Payoffs: An Example

Happy Playing!

- Keep in mind for total payoff
  - Sum the payoff from all your transactions
  - Subtract nuisance cost you incur from others' transactions

Buyer	Value	–	Price	–	Personal Nuisance Cost			=	Payoff
	$4.00	–	$3.75	–	$0.05			=	$0.20
Seller	**Price**	**–**	**Cost**	**–**	**Personal Nuisance Cost**	**–**	**Tax**	**=**	**Payoff**
	$4.00	–	$1.00	–	$0.05	–	$1.40	=	$1.55

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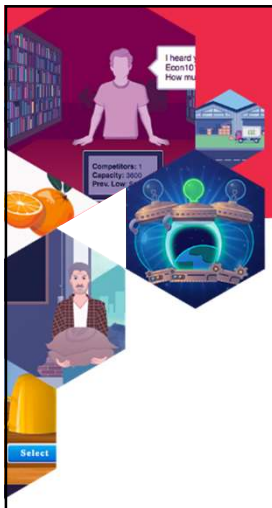

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Robot Dogs

PERMITS

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RobotDogs – Using Permits

A solution to the barking RobotDog nuisance?

- Each round, the government distributes a limited number of RobotDog permits
- A RobotDog buyer must have a permit
- If you have a permit, you can either
  - use it to purchase a RobotDog (if you are a RobotDog buyer)
  - sell it to someone who wants to buy a RobotDog
- The permit and RobotDogs markets simultaneously open
  - The permit market works like the market for RobotDogs (i.e., a permit is transacted when a bid ≥ an ask)
- Permits expire at end of round

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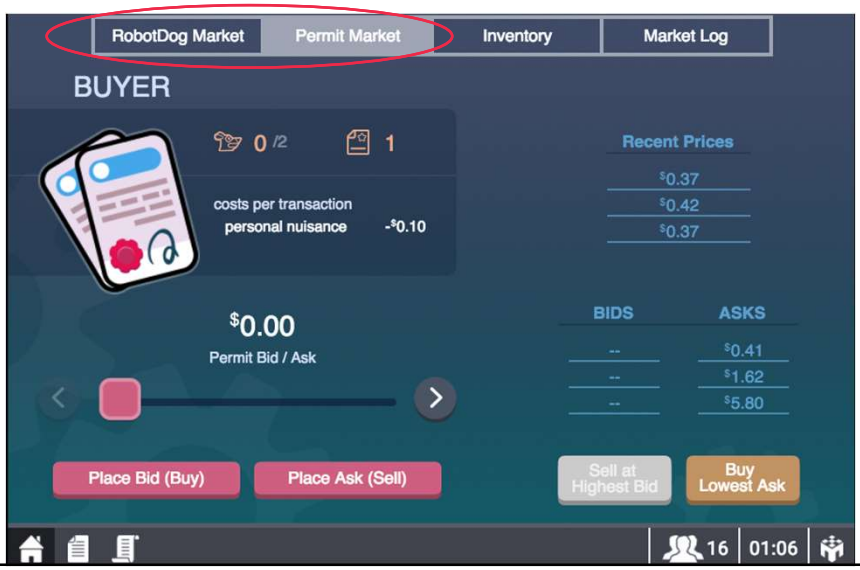
Permit Market Screen

Choose market to view



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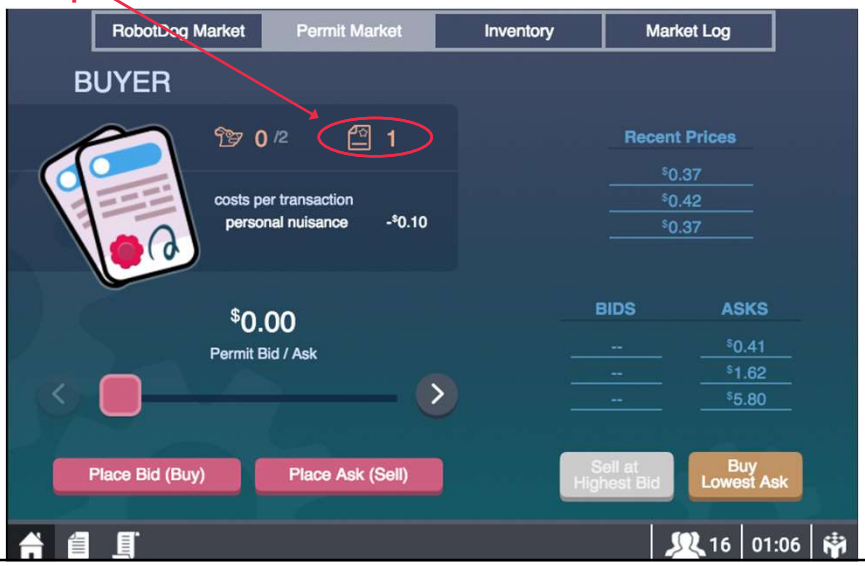
Permit Market Screen

Your permits



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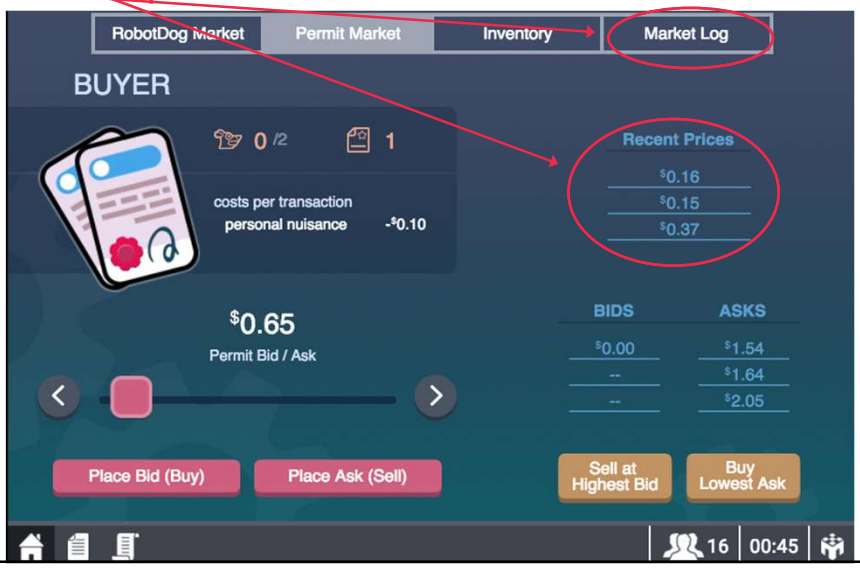
Permit Market Screen

Previous prices in both markets



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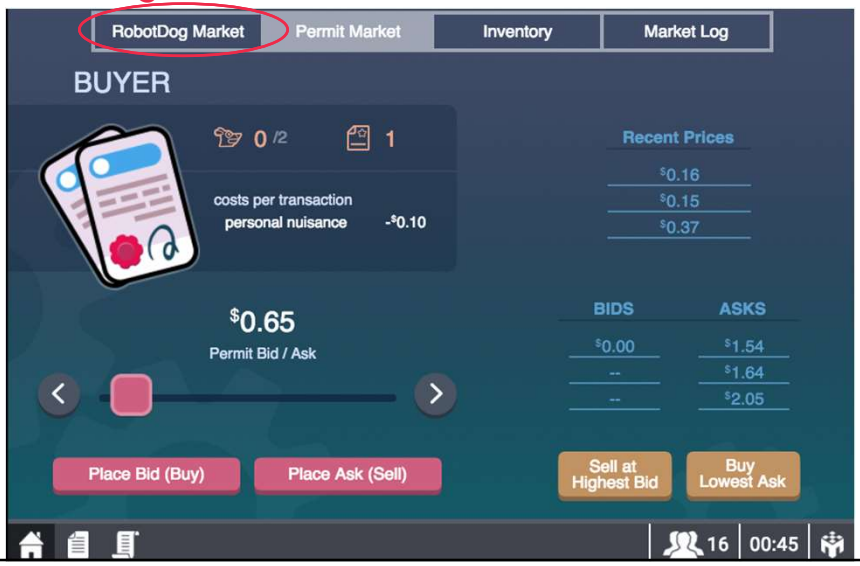
Permit Market Screen (Buyer)

RobotDog value



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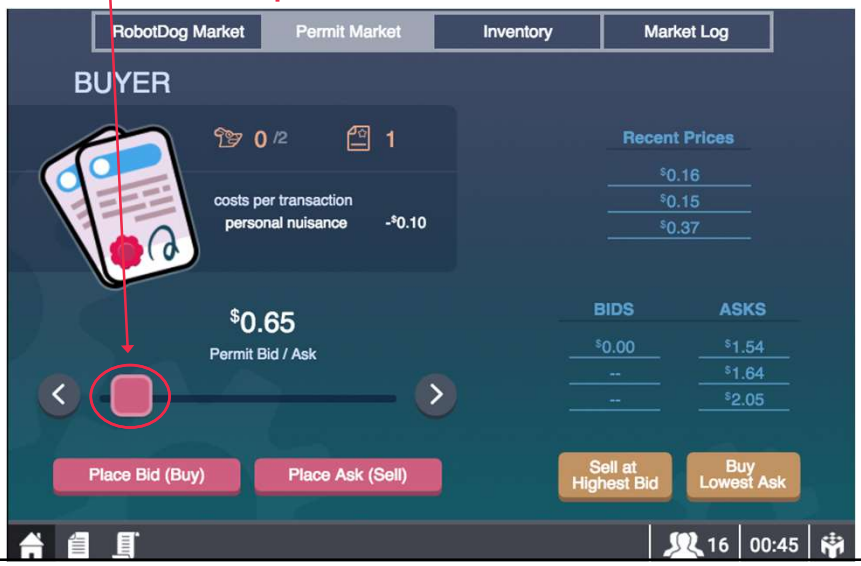
Permit Market Screen

Slide to desired price



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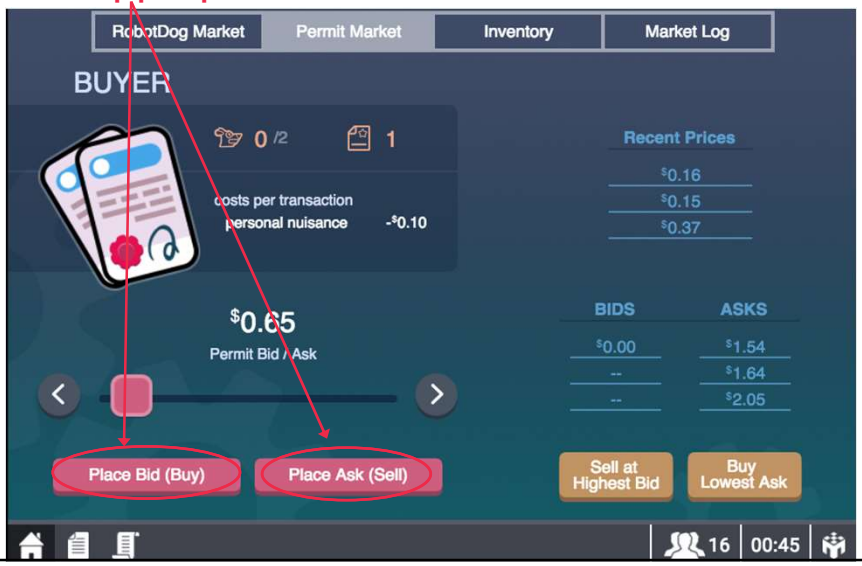
Permit Market Screen

Press appropriate button to submit



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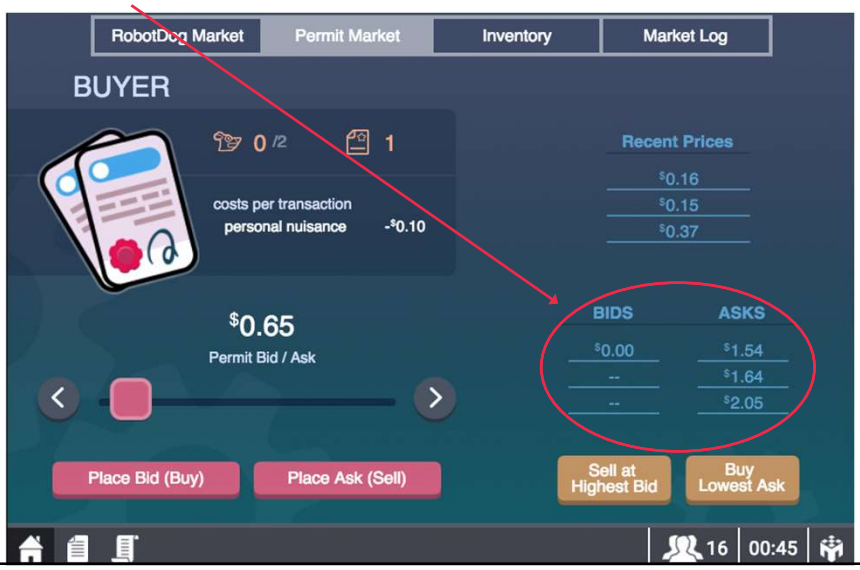
Permit Market Screen

Permit market's current offers



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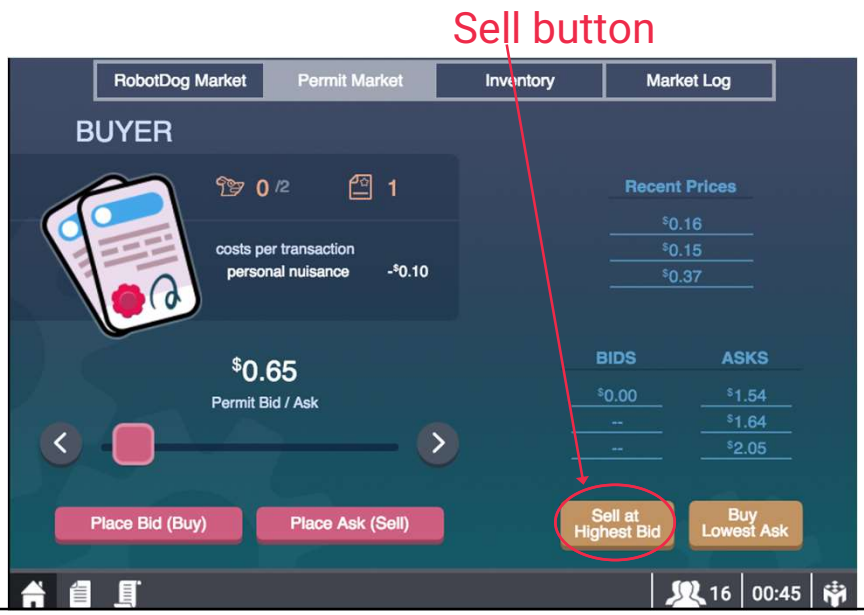
Permit Market Screen



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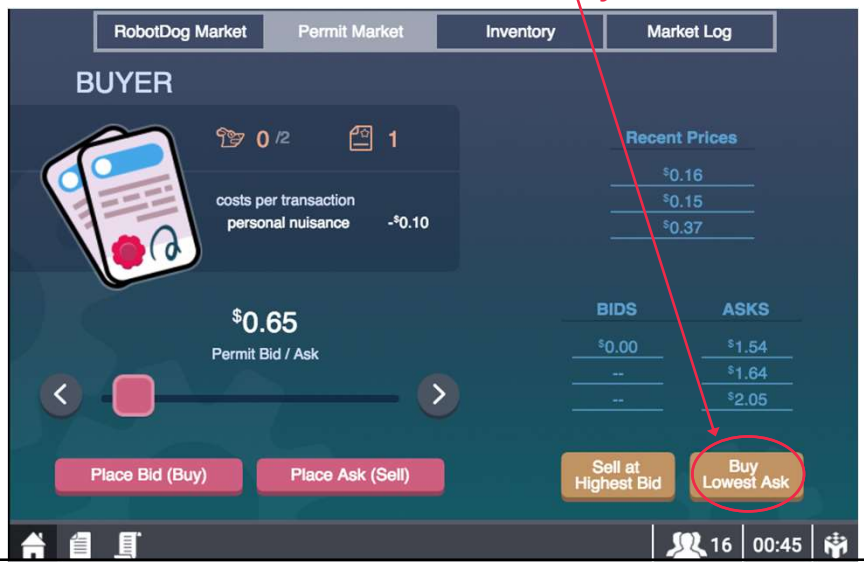
Permit Market Screen



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Payoffs

Happy Playing!

Your payoffs for the round:

- sum of payoffs from your RobotDog transactions
- **minus** nuisance cost from community RobotDogs
- **plus** price received for any permits you sell
- **minus** price paid for any permits you purchase

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