

EECS 498 System Design of a Search Engine

Winter 2026

Lecture 21: Negotiations

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agenda

1. details
2. negotiations
3. the Maine house
4. Rose Bowl viewing party

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details

1. Please read my ranking paper.
2. The best heuristics are the ones that can cherry pick the really good matches out of the sea of trash.
3. Lab on getting starting on GCP will be this Friday. You'll go from logging in the first time to building and running your LinuxGetSsl utility.

details

1. I will be working on publishing guidance on presentations, final reports, final exam, and team meetings this week.
2. Today will be negotiations, next will be organizational behavior, followed by time value of money.
3. For time value of money, you'll need to download a free HP-12 calculator emulator.

you'll need an HP-12 emulator



Fortunately, HP released a free one.
<https://www.educalc.net/page/2338917/>

HP 12c Emulator | Educalc.net

educalc.net/page/...

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HP 12c Emulator for MS Windows

This emulator is able to run on all versions of Microsoft Windows. It has also been tested to work with MacOS* and Linux* computers.

- with [Wine compatibility layer](#) installed.

Download from our tertiary cached server media.educalc.net (filesize 6MB)

After installing the HP 12c Emulator. Run Emulator from Start > Programs > HP Calculators > HP 12c Virtual Calculator

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Good news on tee shirts. We should have them by Friday!

Custom Ink Order Tracking - Order #86849282

customink.com/track/86849282-35002052

1403 Cameras Seattle PI WSJ WSJ NY Times WaPost Canvas Crappy Scheduler BofA Wikipedia Import ICS event NetMBA 485 F20 DeOrio

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My Account

My Account > Order History > Order #86849282

Order Status

#86849282 • Ordered March 28, 2026

[View Invoice](#)

Status **On Track** Get It By **April 3rd, 2026**

1 Artwork Review Completed Mar 30 2 Preparing to Print Mar 30 3 **Printing** Mar 31 4 Shipping 5 Delivery

Printing

It's all happening! Your order is being decorated by our expert team. Each and every item will go through quality assurance before getting packed up for shipping.

This part is usually pretty speedy. Don't worry if your printing day is only a day or two before your order is expected to arrive.

[Products](#) Proofs

Order Summary

Our mascot is named Octavious. It never got to 50% but we exhausted the votes.

	Round 1	Round 2	Round 3	Round 4
Octavious	8	8	8	10
Octothorpe	8	5	5	7
Rahul	8	3	3	3
tf/idf	3	3	3	3
Zork	3	3	3	4
George	2	2	2	
Hamilton	2	2	4	4
Jeff	2	2	2	
Sami	2	2	3	
Ultros	2	2	2	
Jess	1	1		
Purple	1	1		
So Cute	1	1		
Carlos	0			
Gilbert	0			
Nicky	0			
Searchy	0			
Seashell	0			
Squishy	0			

agenda

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negotiations

Intended as a helpful topic for life.

examples

1. Buying a car from a dealer.
2. Buying or selling a car from through Craigslist.
3. Buying or selling a house.
4. Negotiating a starting salary or title.
5. Negotiating a quantity discount.
6. Negotiating a licensing agreement.
7. Negotiating with a potential investor.
8. A union negotiating with an employer.
9. Where to have dinner with friends.
10. With your spouse about whether it's a good time to have another child.

bargaining is cultural

Americans expect to pay posted prices except on cars and houses or when buying outside the usual retail channel.

People growing up in other parts of the world often expect to bargain over everything.

Everything is negotiable.

Everything is negotiable
until you find out for sure it's not.

Going into a negotiation, it's helpful to know:

1. What you want.
2. The minimum you would accept.
3. What you think the other side wants.
4. What you think the other side would accept.
5. What happens if you don't get an agreement.

Example: Buying a new car, you might research typical prices paid or dealer invoice prices.



BEST CARS

Car Rankings & Advice



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Used Cars

Car Rankings

Financing

News

Find a Car:

All Makes

All Models

Year

GO

Home > Honda > 2015 Honda Accord > Prices

2015 Honda Accord

2014

Used

Repairs



More Photos >

American Honda Motor Co., Inc.

#5 in Affordable Midsize Cars

Avg. Paid: \$22,070 - \$33,033

MSRP: \$22,105 - \$33,630

Invoice: \$20,237 - \$30,749

MSRP: \$22,105 - \$33,630

Find the best local price: Zip Code GO

How the Best Price Program works >

Review

Prices

Specs

Performance

Interior

Safety

Reliability

Pictures

Honda Accord Prices

Use the U.S. News Best Price Program to lock in a great price on the Honda Accord without the hassle. Shoppers have seen average savings of \$3,221 off MSRP across vehicles. You can also research what others have paid for the Honda Accord to make sure you don't overpay. [Learn more >](#)



LX Manual Sedan

Find the best local price: Zip Code Get Best Price >

Average Paid*: See what others paid in your area >

MSRP: \$22,105

Invoice: \$20,237

See all specs and options >

Front Wheel Drive
Manual
Regular Unleaded I-4 2.4 L/144
24 City / 34 Hwy

U.S. News Auto Rankings

Rankings for Affordable Midsize Cars

- #1 2015 Hyundai Sonata
- #2 2014 Toyota Camry Hybrid
- #3 2014 Ford Fusion Hybrid
- #3 2014 Honda Accord Hybrid
- #5 2015 Honda Accord

[Compare with the Accord >](#)

2014 U.S. News Best Car Awards



Best Cars for the Money

Great cars that are also great values

Best Cars for Families

Cars that the whole family will love

Monthly Payment Calculator

Calculate your monthly payment for the 2015 Honda Accord.

Avg. Paid: \$22,070 - \$33,033

MSRP: \$22,105 - \$33,630



Calculate Monthly Payment >

Find out **how much to pay for a new car** with our expanded local pricing information

The Consumer Reports New Car Price Report shows you what others really paid, regional dealer marketing fees, and other information to help you get a great deal on a new car.

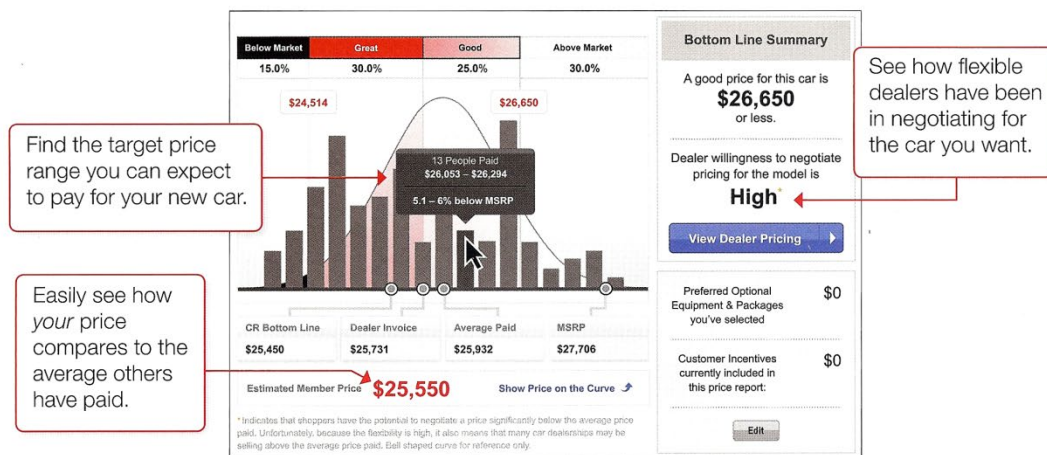
The enhanced Report now features an easy-to-read price curve that includes:

- Great, Good, and Above Market price ranges for your area
- The average price others paid for the same car
- The Build & Buy Service, providing a transparent car-buying experience through a network of pre-qualified dealers
- A rating of a dealer's willingness to negotiate on the model you've chosen



ConsumerReports®
New Car Price Service

**Arm yourself with the New Car Price Report.
Save Time. Save Money.**



Call Now For Your \$14 Report.
\$12 for each additional report ordered at the same time.

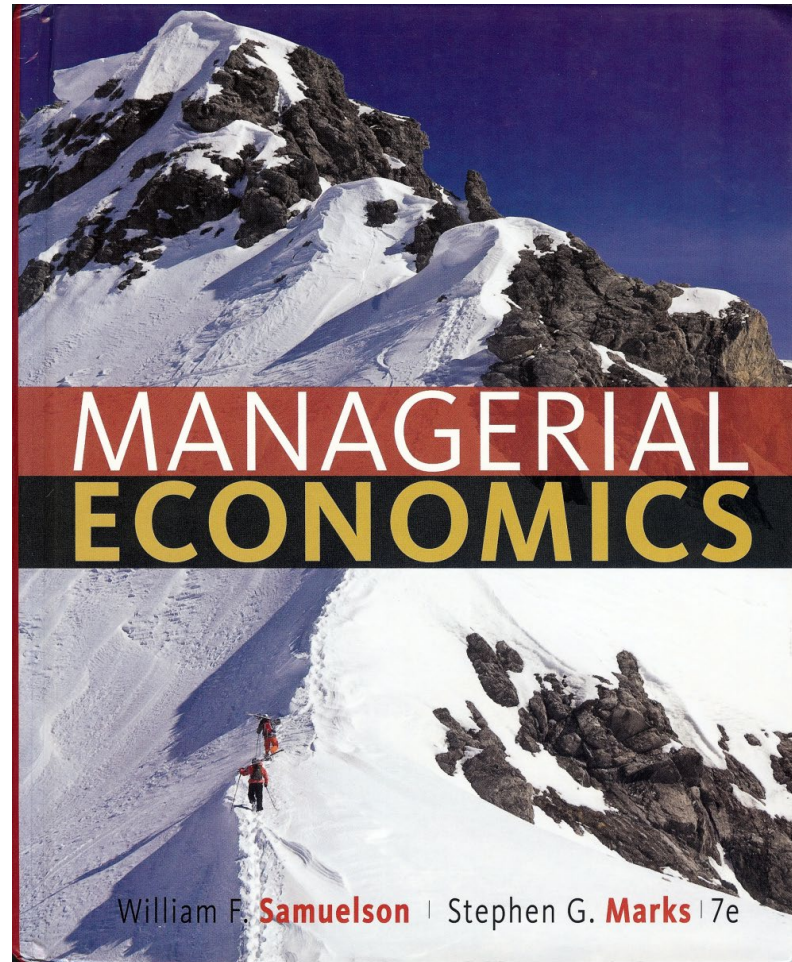
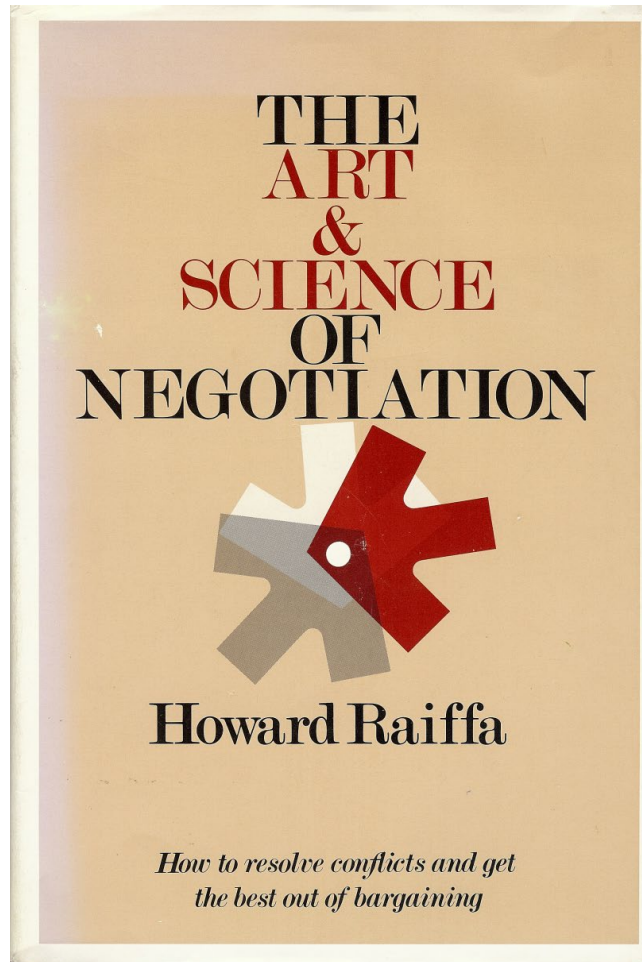
1-800-651-4636

Or go to www.ConsumerReports.org/cr/BigSavings514

For service in Canada, go to: www.ConsumerReports.org/48canada

PE44CURVES

I'm going borrow from these sources.



Lots of negotiations are simple.

One buyer, one seller, one issue: price.

These are purely distributive.

One party's gain is the other's loss.

Zero sum.

example: selling a warehouse

Two firms negotiating the sale of a warehouse, the equipment and inventory.

The main issue is price.

Present owner is closing down.

Valuable location to the buyer, who could make use of the equipment and inventory.

Buyer estimates the value at \$600K.

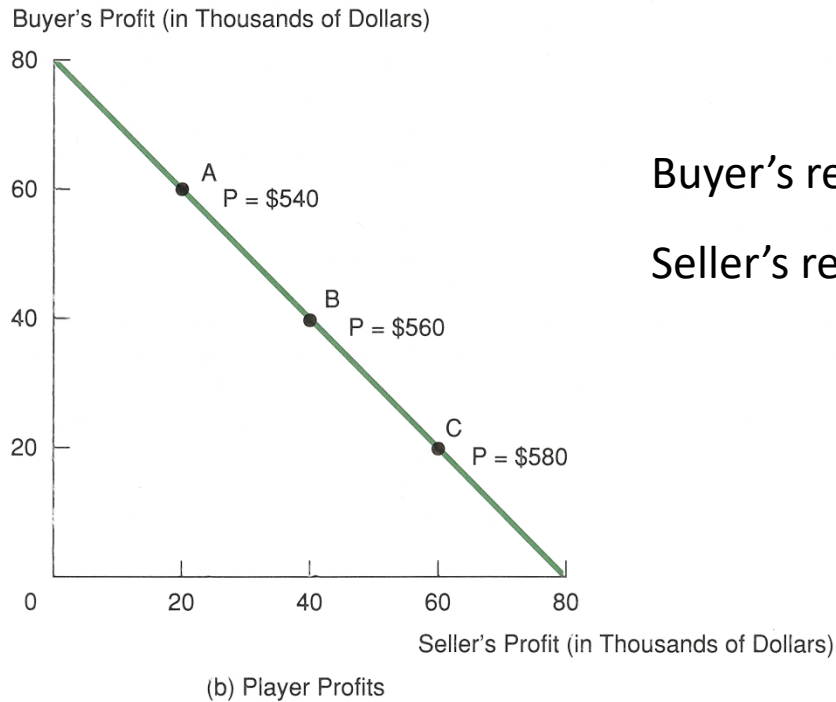
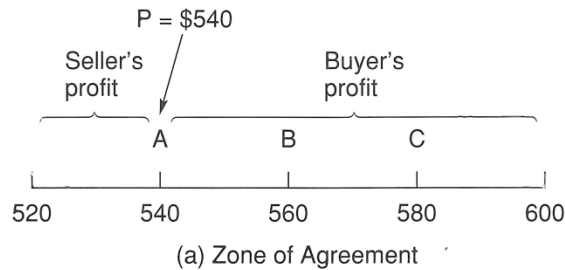
Seller estimates the value at \$520K.

These are their ***reservation prices*** or ***walk-away prices***.

Source: Samuelson & Marks, *Managerial Economics*, 7e, p. 631.

FIGURE 15.1

The Zone of Agreement and the Payoff Frontier



Buyer's reserve \$600K.

Seller's reserve \$520K.

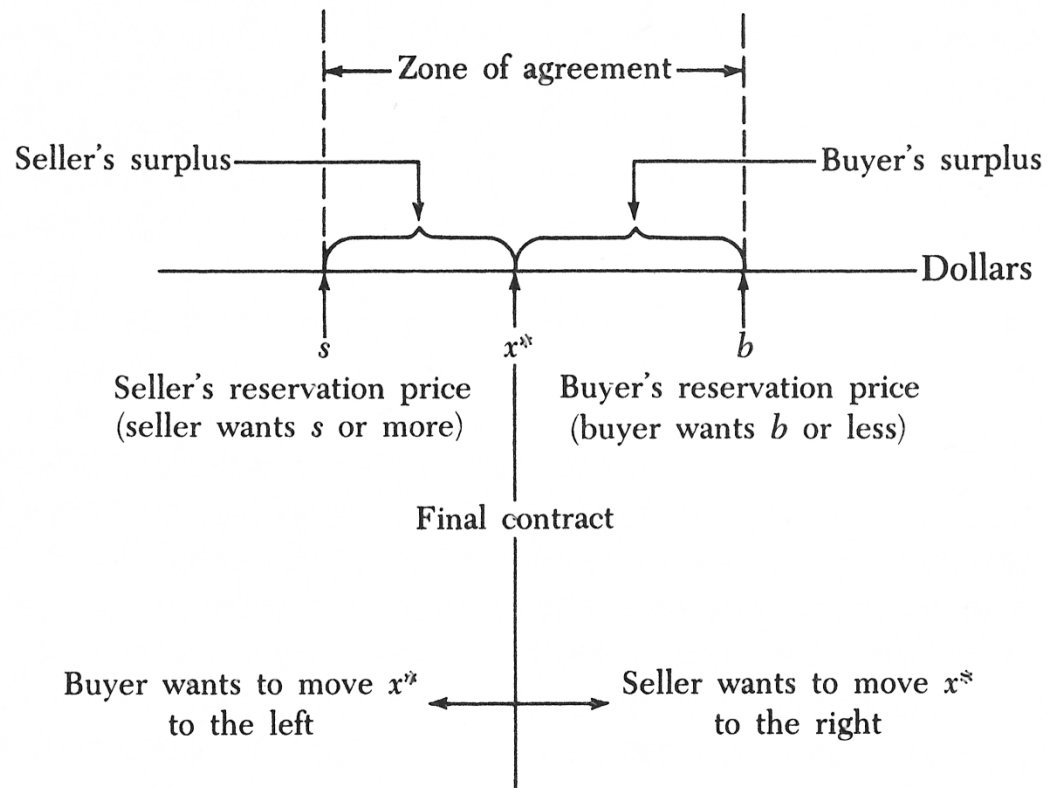


Figure 2. The geometry of distributive bargaining. (Note: If $b < s$, there is no zone of agreement.)

Source: Howard Raiffa, *The Art & Science of Negotiation*, p. 46.

48 / TWO PARTIES, ONE ISSUE

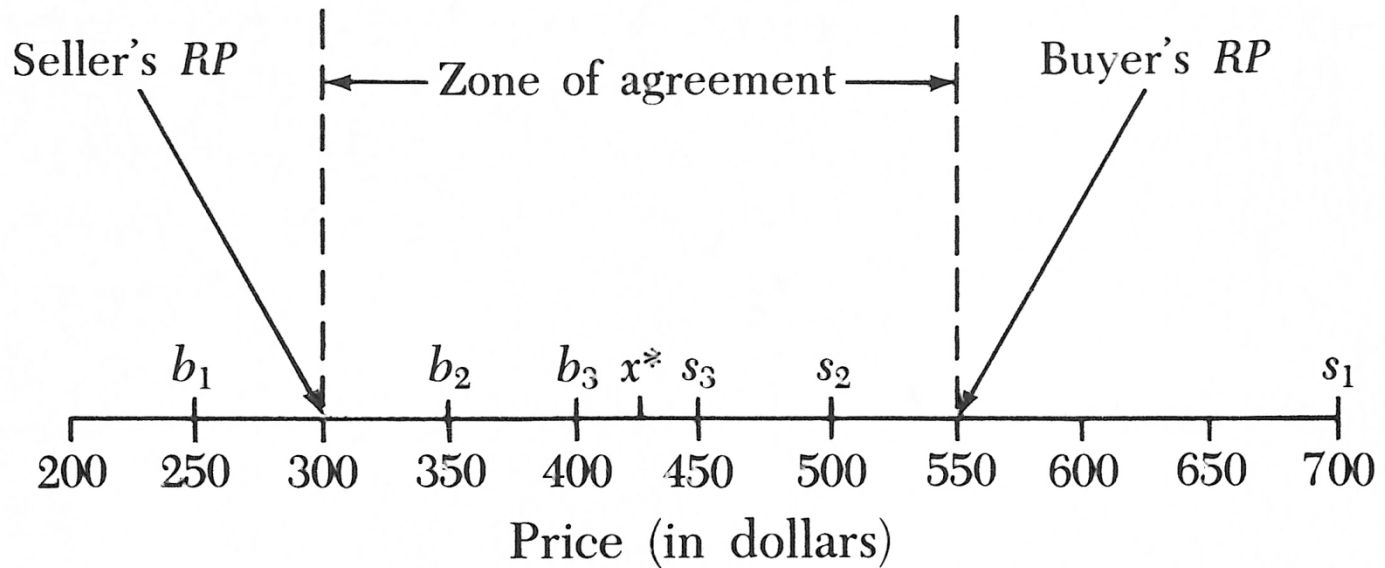


Figure 3. The negotiation dance (x^* = final-contract price).

Source: Howard Raiffa, *The Art & Science of Negotiation*, p. 48.

When there are multiple issues, there is often an opportunity to enlarge the pie with concessions that are worth more to one side than the other.

The ***efficient frontier*** – also called the Pareto Optimal Frontier – is the locus of achievable joint evaluations from which no joint gains are possible.

Source: Raiffa, *The Art & Science of Negotiation*, p. 139.

Hypothetical case

Associated Metropolitan Police Officers (AMPO) versus City.

The issues to be settled were the following:

1. starting salaries for police officers
2. maximum salaries for police officers
3. vacation for officers with less than five years' service
4. vacation for officers with more than five years' service
5. the status of fourteen officers under suspension
6. the percent of two-man patrol cars
7. creation of the rank of corporal
8. expansion of the number of sergeants
9. the fate of the police commissioner, Mr. Daniels
10. the status of the Police Civilian Review Board.

Source: Raiffa, *The Art & Science of Negotiation*, p. 133 – 140.

TABLE 7. *Scoring schedule for AMPO and City.*

Issue	Setting	Payoff (in points)	
		City	AMPO
Increase in salary: starting	\$0-99	0	0
	100-199	0	100
	200-299	0	200
	300-399	0	300
	400-499	0	400
	500	0	550
	501-599	-4	550
	600	-4	700
	601-699	-8	700
	700	-8	850
	701-799	-16	850
	800	-16	1,000
	801-899	-32	1,000
	900	-32	1,150
	901-999	-64	1,150
	1,000	-64	1,300
	1,000+	NA	1,300+
Increase in salary: maximum	\$0-499	0 to -12	NA
	500	-12	0
	501-600	-24	2-200 ^a
	601-700	-48	202-400 ^a
	701-750	-96	402-500 ^a
	750+	NA	500+
Increase in vacation: less than 5 years' service	0 days	0	0
	2	-3	40
	3	-6	60
	4	-10	85
	5	-15	110
	5+	NA	110+
Increase in vacation: more than 5 years' service	0 days	0	0
	1	-2	0
	2	-6	60
	3	-14	85
	3+	NA	85+
Bonus if increase in vacation for all officers is held to zero		+10	

TABLE 7 continued.

Issue	Setting	Payoff (in points)	
		City	AMPO
Reinstatement	No	0	NA
	Yes, without back pay	-50	-100
	Yes, with back pay	-70	0
Two-man patrols	Status quo	+15	-25
	Less than 20% increase	-5	25
	Greater than 20% increase, but less than strictly two-man patrols	-5	50
	Strictly two-man patrols	NA	100
Create rank of corporal	No	+5	0
	Yes, limit of 20	-15	50
	Yes, unlimited	-20	50
Increase number of sergeants	0	+5	0
	1	-2	10
	2	-4	20
	3	-6	30
	4	-8	40
	5	-10	50
	6	-13	60
	7	-16	70
	8	-19	80
	9	-22	90
Commissioner Daniels	Fire	+40	200
	Keep	0	0
Police Civilian Review Board	Disband	-100	250
	Add police, no vote change	-20	150
	Add police, change vote	+20	100
	No police, no vote change	0	25
	No police, change vote	+20	-25

Note: If the City and AMPO failed to reach agreement on a sufficient number of issues (which were specified in the confidential information sheets), the City representative received a *total* score of -250 and the AMPO representative received a *total* score of 600. These scores were City's and AMPO's reservation prices.

NA indicates that such a setting was not acceptable as part of the agreement. A City representative who agreed to a setting that was not acceptable to City received a *total* score of -250, and an AMPO representative who agreed to a setting that was not acceptable to AMPO received a *total* score of 600.

a. For these settings, the AMPO representative received 2 points for every dollar over \$500.

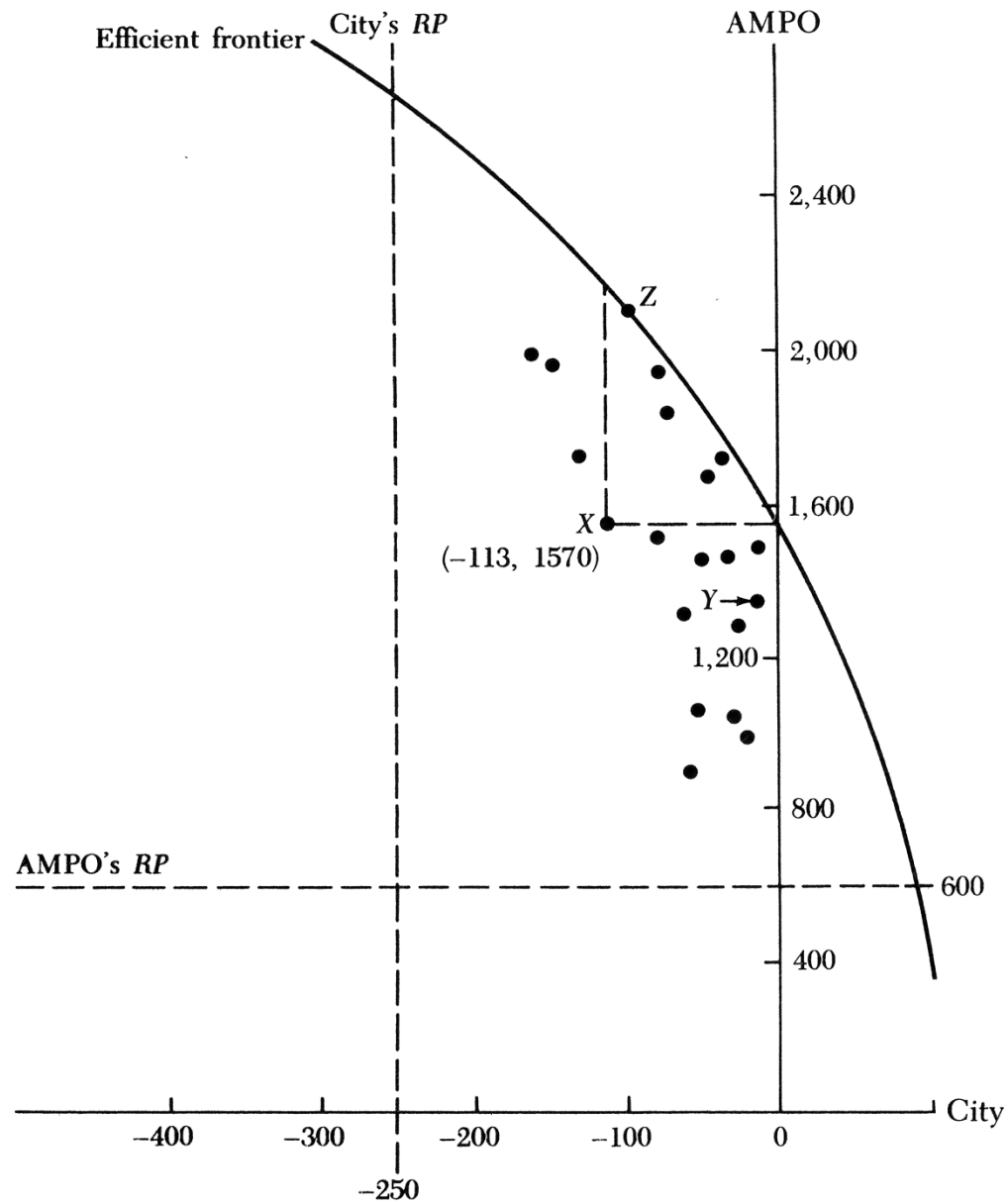


Figure 23. Selected joint evaluations and the efficient frontier.

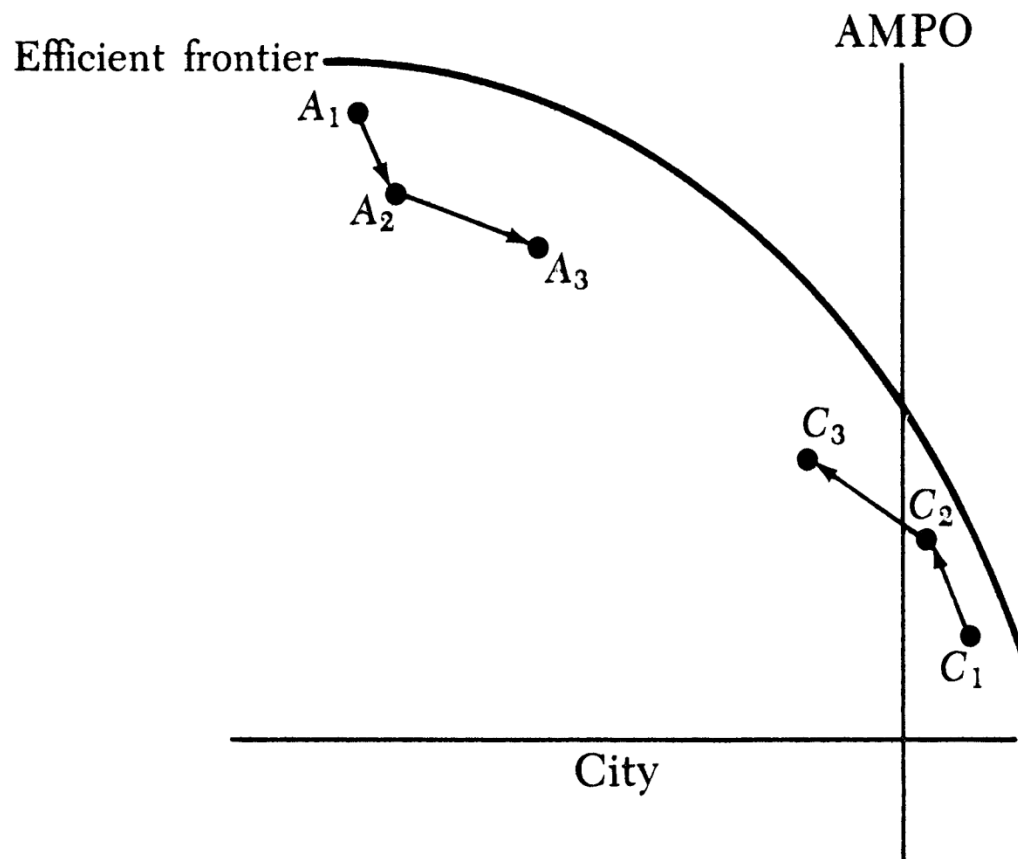


Figure 24. A dance of complete packages.

What makes a negotiation more complex?

possible complexities

1. Are there more than 2 parties?
2. Are the parties monolithic?
3. Is the game repetitive?
4. Are there linkage effects?
5. Is there more than one issue?
6. Is an agreement required?
7. Is ratification required?
8. Are threats possible?
9. Are there time constraints or time-related costs?
10. Are the contracts binding?
11. Are the negotiations private or public?
12. What are the group norms?
13. Is third party intervention possible?

Source: Howard Raiffa, *The Art & Science of Negotiation*, pp. 11-19.

“The most important thing in acting is honesty. Once you’ve learned to fake that, you’ve got it made.”

-- Samuel Goldwyn

agenda

1. details
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4. Rose Bowl viewing party

selling a Maine house

Game designed by Bill Samuelson at Boston University.

Some of you will be buyers, others sellers.

Not all of you will have the same information.

You will have 10 minutes to read and prepare for the negotiation and 15 minutes to do it and report.

We'll count off pairs and let you decide who's a buyer and who's a seller.

Some of you will even-numbered pairs and some will be odd-numbered. Instructions are posted in the Files > Maine House folder on Canvas.

It is up to you to decide who is the buyer and who is the seller.

Remember your pair number and keep track of:

1. Your first offers,
2. The total number of offers back-and-forth.
3. The final price and the number of acres sold.

After you finish, report your results here:

<https://tinyurl.com/W26MaineHouse>

STOP HERE UNTIL AFTER YOU'VE
FINISHED THE EXERCISE

How many think they did really well?

Did anyone get skunked (zero profit)?

Strategies that worked or did not work?

How many chose the 17 acre option?

How many chose the 14 acre option?

What worked well
or not so well?

observations

Make the pie bigger. Try to create a larger zone of agreement to share.

Negotiations tend to end in the middle between the opening offers.

Biggest mistake is being too generous in the first offer. Need to ask for a lot but not so much that the expected midpoint is outside any zone of agreement. Helps to compare offers by calculating profit.

Helps to ask questions like, “Suppose we changed the deal this way? What would that do?”

It also helps to be obstinate but being unreasonable doesn't help.

Lots of negotiations end “on the courthouse steps.”

two versions

All buyers had same information:

Reserve price of \$150K for house + 17 acres
or \$127K for house + 14 acres

Odd sellers:

Reserve price of \$120K for house + 17 acres
or \$107K for house + 14 acres

Even sellers:

Reserve price of \$120K for house + 17 acres
or \$85K for house + 14 acres

odd pairs

House + 17 acres:

Buyer's reserve	\$150K
-----------------	--------

Seller's reserve	\$120K
------------------	--------

"Profit" to be split	\$ 30K
----------------------	--------

Most odd pairs should pick the house + 17 acres option because there's more profit to split.

House + 14 acres:

Buyer's reserve	\$127K
-----------------	--------

Seller's reserve	\$107K
------------------	--------

"Profit" to be split	\$ 20K
----------------------	--------

even pairs

House + 17 acres:

Buyer's reserve	\$150K
Seller's reserve	\$120K
"Profit" to be split	\$ 30K

House + 14 acres:

Buyer's reserve	\$127K
Seller's reserve	\$ 85K
"Profit" to be split	\$ 42K

Most even pairs should
pick the house + 14 acres
option.

agenda

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4. **Rose Bowl viewing party**

another negotiation

You are to negotiate a menu and price at a sports bar for an alumni Rose Bowl viewing party.

The menu is mostly settled except for the choice of deviled eggs or shrimp as an appetizer.

Major Event Grill's published buffet menu.

Build your own buffet! All prices are per person.

Antipasto Plate (V) (G) \$4
Assorted Gourmet Pizzas (V) \$4
Bacon Wrapped Shrimp with a Smokey Remoulade (G) \$5
Teriyaki Chicken & Pineapple Kabobs (G) \$4
Cocktail Crab Cakes with Lemon Aioli \$6
Coconut Crusted Shrimp with Louie Sauce \$5
Crab & Artichoke Dip with Crackers \$5
Creamy Spinach and Artichoke Dip with Tortilla Chips \$3
Crispy Chicken Tenders with Trio of Dipping Sauces \$4
Sliders with Tomato & Cheese (Angus Beef, Chicken, BBQ Pork, Veggie) (V) \$4
Fresh Tomato & Garlic Bruschetta (V) \$3
Pork Pot Stickers with Soy Dipping Sauce \$3

Portabella Mushroom Skewers Stuffed with Roasted Garlic (V) (G) \$3
Skewered Meatballs with Sweet & Spicy BBQ or Garlic-Tomato Sauce \$3
Spanakopita - Filo Triangles Stuffed with Spinach and Feta \$4
Stuffed Mushroom Caps \$3
(choice of bacon (G), cream cheese & onion (G) or spinach & parmesan)
Teriyaki Beef Skewers with Toasted Sesame Seeds (G) \$4
Thai Chicken Skewers with Peanut Dipping Sauce (G) \$4
Vegetable Spring Rolls with Sweet Chili Sauce (V) \$3.50
Zesty Queso Dip with Fresh Tortilla Chips (V) \$3
Quesadilla (Chicken, or Cheese) (V) \$3/\$2.50
(V)=Vegetarian Friendly
(G) = Gluten Free Option
Dessert
Homestyle Cookies \$4
Miniature Cheesecakes \$4
Apple Crisp \$4
Assorted Desserts \$10

the planned menu

As Guests Arrive

Stuffed Mushroom Caps with Spinach & Parmesan

Fresh-made Tortilla Chips

Teriyaki Beef Skewers with Toasted Sesame Seeds

One additional appetizer: either Chilled Shrimp with Cocktail Sauce or Deviled Eggs

At Start of Game

Assorted Gourmet Pizzas

French Fries

Angus Beef Sliders with Tomato & Cheese

BBQ Pork Sliders

Roasted Chicken Legs, Thighs and Breasts with Garlic & Rosemary

Tossed Field Greens with Assorted Dressings & Toppings

At Halftime

Apple Crisp

Mini Cheesecakes

another negotiation

Same rules as before, sellers can only go down, buyers can only go up, but you can repeat the same offer and you can change the appetizer any time you like.

Details on Canvas in the Files > Rose Bowl party folder.

Some of you are A teams, some are B.

Record your results here: <https://tinyurl.com/W26RoseBowl>

non-serious offers

Would a real buyer offer \$1?

Would a real seller try to charge \$48?

What would actually happen?

how many buffets is this?

As Guests Arrive

Stuffed Mushroom Caps with Spinach & Parmesan

Fresh-made Tortilla Chips

Teriyaki Beef Skewers with Toasted Sesame Seeds

One additional appetizer: either Chilled Shrimp with Cocktail Sauce or Deviled Eggs

At Start of Game

Assorted Gourmet Pizzas

French Fries

Angus Beef Sliders with Tomato & Cheese

BBQ Pork Sliders

Roasted Chicken Legs, Thighs and Breasts with Garlic & Rosemary

Tossed Field Greens with Assorted Dressings & Toppings

At Halftime

Apple Crisp

Mini Cheesecakes

eggs or shrimp

the deviled eggs

Who wants them?

Is it important to the buyer?

What difference does that make to the seller?

How hard can this be?

FOOLPROOF BOILED EGGS

MAKES 6 EGGS

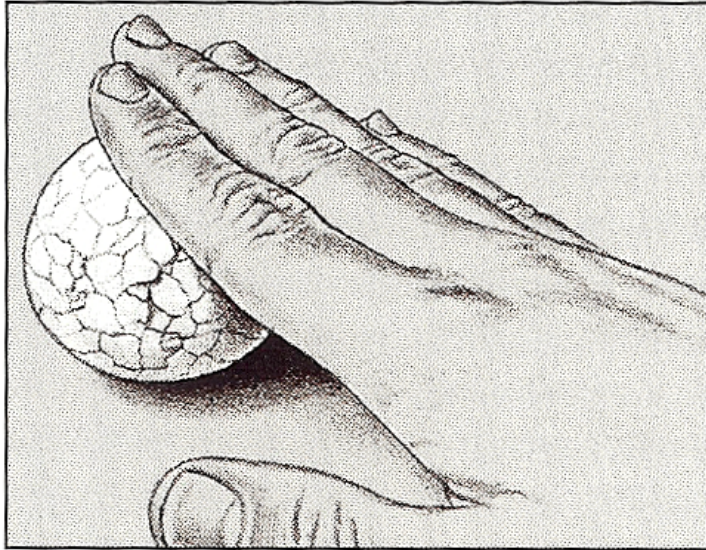
You may double or triple this recipe as long as you use a pot large enough to hold the eggs in a single layer, covered by an inch of water.

6 large eggs

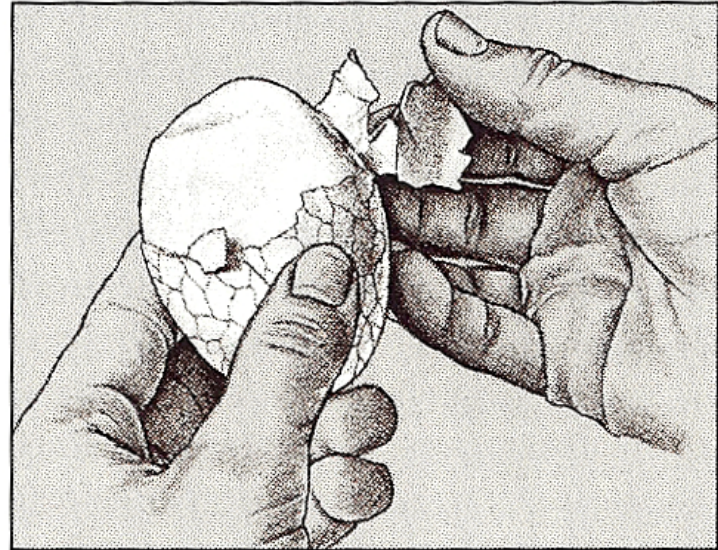
Place eggs in medium saucepan, cover with 1 inch of water, and bring to boil over high heat. Remove pan from heat, cover, and let sit for 10 minutes. Meanwhile, fill a medium bowl with 1 quart water and 1 tray of ice cubes (or equivalent). Transfer eggs to ice water bath with slotted spoon; let sit 5 minutes. Following illustrations 1 and 2, peel and use as desired, or proceed with one of the salad recipes on page 15.

Source: *Cook's Illustrated*, March/April 1999, p. 14

STEP-BY-STEP | FOOLPROOF PEELING



1. Tap the egg all over against the counter surface, then roll it gently back and forth a few times on the counter.



2. Begin peeling from the air pocket end. The shell should come off in spiral strips attached to the thin membrane.

I've been looking for
an easier way.

I have not found it.



Recently discovered
at Costco.

But you still have to
make the deviled
eggs.



(SERVES 4)

DEVEILED EGGS

If you want the eggs to look elegant, use a pastry tube to pipe the creamy yolk mixture into the white. Imaginative garnishes such as a fat caper on top or a cross of slivers of green or red pepper, a slice of olive or pickle, a sprinkling of fresh herbs or watercress, makes stuffed eggs particularly lovely.

4 hard-boiled eggs (p. 341)
3 tablespoons mayonnaise
1 teaspoon Dijon mustard
Salt

Freshly ground pepper
1 tablespoon minced parsley or fresh
herbs (optional)

Shell the eggs and slice them in half lengthwise. Remove the yolks and mash them with the mayonnaise, mustard, and salt and pepper to taste until it is smoothly blended and creamy. Stuff equal amounts into the hollow of each egg white. Sprinkle parsley or fresh herbs on top, if desired.

Anchovy-stuffed Eggs. Omit the mustard and add 1–1½ *teaspoons anchovy paste*, to taste.

Ham-stuffed Eggs. Add 1 *heaping tablespoon finely chopped ham* to the filling.

Cheese-stuffed Eggs. Use 2 *tablespoons freshly grated Parmesan cheese* instead of the mustard.

Curried-stuffed Eggs. Add 2 *teaspoons curry powder* to the filling.

Source: Marion Cunningham, *The Fannie Farmer Cookbook*, p. 57

You also have to
make them look
nice.



Source: https://en.wikipedia.org/wiki/Deviled_egg

Cold boiled shrimp recipe

1. Thaw.
2. Serve.



Raw materials cost comparison

Deviled eggs

Assuming 3 eggs: ~ \$1

Shrimp

Assuming 5 large shrimp: ~ \$4

but ...

You have to know where to get the already-peeled eggs.

You still have to make them and they need to look nice.

You have to clean up anything that's dropped.

Shrimp *looks* higher value and takes almost no work at all.

in real life

Minus the completely imaginary drama, I actually did this negotiation in 2012 with the World Sports Grill in Seattle on behalf of the Stanford Alumni Club of Seattle.

The actual price I got was \$18.

in real life

When I did this negotiation, I actually did ask about deviled eggs.

The manager *instantly* pointed out and explained why it would be really difficult in her kitchen with her staff.