

Fair Outcomes

4 Topics:

- 1) Fair Division
- 2) Apportionment
- 3) Election Theory
- 4) Voting Power

Is Equality the same as Fairness?



Types of Value

Face: printed/sale value

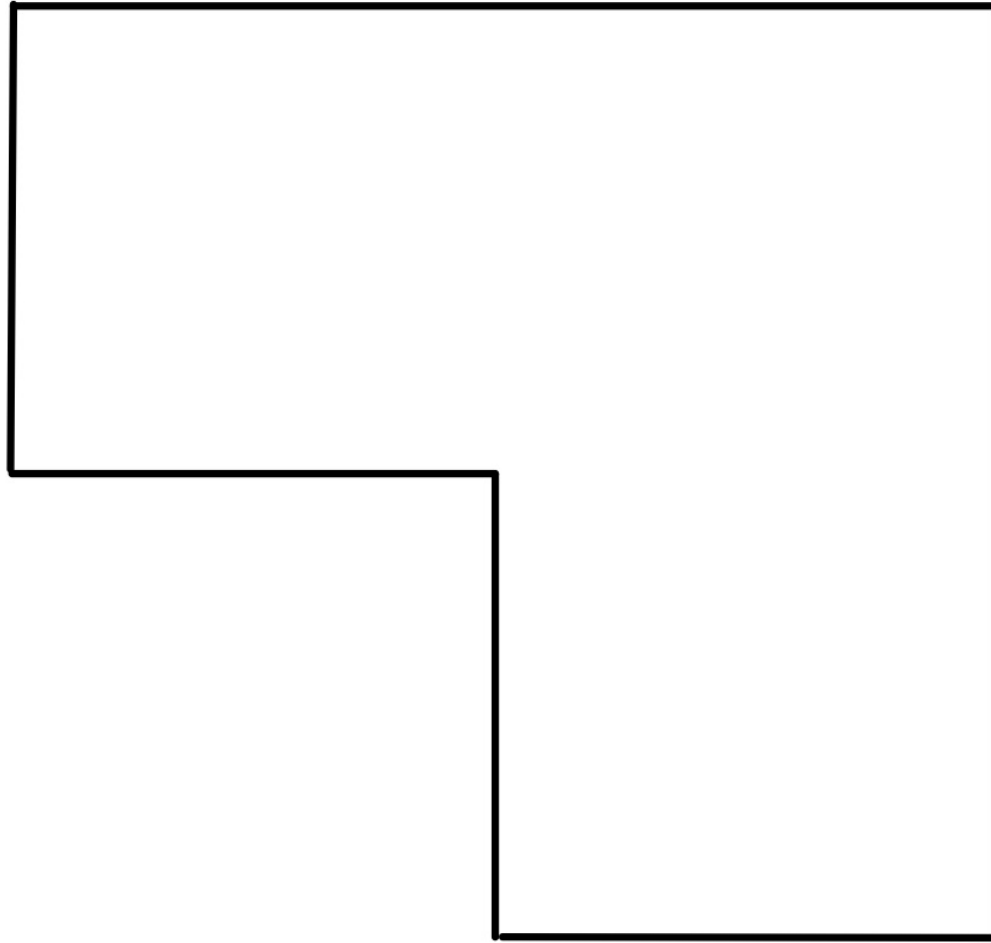
Scarcity: value of how rare

Intrinsic: value of its materials

Sentimental: personal value

**The larger value usually prevails,
but sentimental value typically
affects the others.**

Divide Shape Equally for 4 People



Fair Division Problems

Problem #1: how could a pizza be divided fairly between 2 people?

Problem #2: how could a cake be divided fairly between 3 people?

Problem #3: how would 47 similar items (marbles, jelly beans, rocks, etc.) be divided fairly between 3 people?

Problem #4: how could a car, a sofa, a trailer, and \$5,000 be divided fairly between 3 people? (Assume all 3 want everything)

Fair Division

Discrete: cannot be divided easily (objects)

Continuous: can be divided over and over (cash)

Fairness: all receive what is right

Parity: all the same/even; all receive equal

Discrete Methods:

Divider/Chooser Method: physically dividing among 2 or 3 people where one divides and another chooses.

Marker Method: dividing many similar items for any number of participants

Estate Division (Sealed bid): dividing among any number of items or participants using secret bids

Divider-Chooser Method

Division is ALWAYS fair for the DIVIDER (the one with all the power to divide) and the FIRST CHOOSER (the one who chooses their piece first).

STEPS:

- 1) 1st person divides into two (fair)**
- 2) 2nd person chooses either piece (fair)**
- 3) for 3 people, 1st and 2nd person then divide their pieces into three (fair)**
- 4) 3rd person chooses a piece from each (fair)**

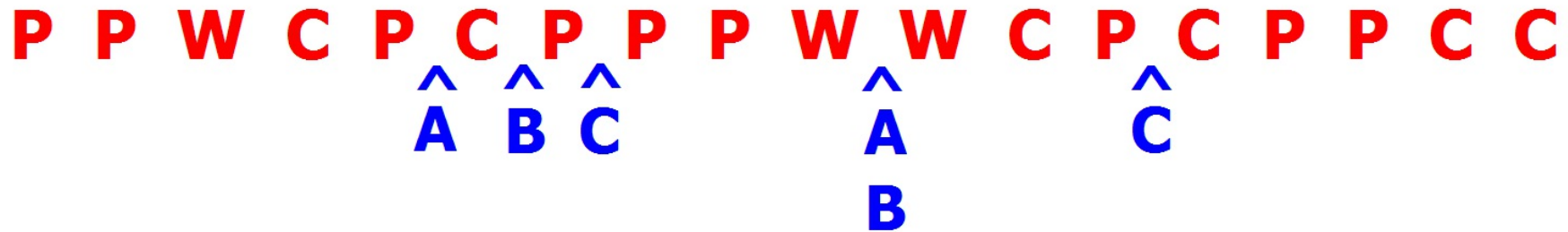
Marker Method

EACH person will divide and get a fair share

STEPS:

- 1) objects to be divided are laid out in a line**
- 2) each party secretly marks where items would be divided fairly**
- 3) leftmost marker's party receives portion to left of their marker (and removes markers)**
- 4) in NEXT set of markers, leftmost marker's party receives portion left to their marker**
- 5) repeat step 4 until only one party remains**
- 6) last party receives to right of their marker.**
- 7) surplus is divided**

Marker Method Example



- 1) Items are placed in a line.**
- 2) A, B, and C each secretly uses markers to divide the line into sections they feel are fair**
- 3) A is closest to left, so A takes left section (P, P, W, C, & P) and removes markers**
- 4) In NEXT set of markers, B is closest to left, so B takes section between markers (P, P, P, & W) and removes markers**
- 5) Finally, C gets section to right of marker (C, P, P, C, & C)**
- 6) Surplus to be further divided consists of C, W, C, & P.**



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Estate Division

STEPS:

- 1) everyone makes sealed bids
- 2) determine each party's fair share (add total bid and divide by number splitting)
- 3) distribute items to highest bidder
- 4) distribute each party's fair share making up differences with cash (pay or receive)
- 5) surplus (bonus) cash is divided equally

PROBLEMS:

- 1) Lack of cash can cause someone to pay
- 2) Sentimental value drives price up (priceless)
- 3) People who know each other manipulate bids

Estate Division Example 1

| Estate: | Wagon | Sled | \$20 |
|----------------|----------------|----------------|--------------------|
| Calvin | \$20.00 | \$10.00 | = \$50.00/2 |
| Hobbes | \$10.00 | \$15.00 | = \$45.00/2 |

Fair Share:

Calvin **\$25.00 = Wagon (\$20) + \$5.00**

Hobbes **\$22.50 = Sled (\$15) + \$7.50**

Cash: \$20.00 - \$12.50 = \$7.50 (surplus)

\$7.50/2 = \$3.75

Final disbursement:

Calvin **Wagon (\$20) + \$8.75**

Hobbes **Sled (\$15) + \$11.25**

Estate Division Example 2

| Estate: | Cottage | |
|------------------|-----------------|---------------------|
| Garfield | \$80,000 | = \$80,000/2 |
| Marmaduke | \$70,000 | = \$70,000/2 |

Fair Share:

| | | |
|------------------|-----------------|--|
| Garfield | \$40,000 | = Cottage (\$80,000) - \$40,000 |
| Marmaduke | \$35,000 | |

Cash: \$40,000 - \$35,000 = \$5,000 (paid in)
\$5,000/2 = \$2,500

Final disbursement:

| | |
|------------------|--------------------------------------|
| Garfield | Cottage (\$80,000) - \$37,500 |
| Marmaduke | \$37,500 |

Estate Division Example 3

| Estate: | House | Car | Boat | \$150,000 |
|-----------------|-----------------|----------------|-----------------|----------------------|
| Trey | \$80,000 | \$5,000 | \$8,000 | = \$243,000/3 |
| Keyshaun | \$76,000 | \$7,000 | \$13,000 | = \$246,000/3 |
| Maria | \$70,000 | \$9,000 | \$11,000 | = \$240,000/3 |

Fair Share:

Trey **\$81,000 = House (\$80,000) + \$1,000**

Keyshaun **\$82,000 = Boat (\$13,000) + \$69,000**

Maria **\$80,000 = Car (\$9,000) + \$71,000**

Cash: \$150,000 - \$141,000 = \$9,000 (surplus)

\$9,000/3 = \$3,000

Final disbursement:

Trey: **House (\$80,000) + \$4,000**

Keyshaun: **Boat (\$13,000) + \$72,000**

Maria: **Car (\$9,000) + \$74,000**

Estate Division Practice

Larry, Mo, and Curly are the heirs to an estate that consists of a deeded timeshare, a Jeep, a 4-piece furniture suite, and \$8,000 in cash.

| | Timeshare | Jeep | Furniture |
|--------------|------------------|-------------|------------------|
| Larry | \$2,350 | \$3,600 | \$450 |
| Mo | \$4,800 | \$2,200 | \$300 |
| Curly | \$3,500 | \$2,450 | \$150 |

After dividing up the estate fairly, what will each person end up with?

Larry: **Jeep + Furniture + \$1,500**

Mo: **Timeshare + \$1,050**

Curly: **\$5,450**