

ch 3: Fair Division

ch 3
1/6

HW: 1, 3, 5, 7, 9, 13, 17, 21, 29, 33, 35, 43, 45, 49  
51, 61, 63.

Q: What is a fair division

Q: What assumptions must we make and why?

methods (a) Divider-chooser

(1) Lone divider

(2) Lone chooser

(3) Lone Diminisher

(4) Sealed Bids

(5) method of markers

continuous

discrete

~~Q: Divider~~

Value systems.

ex1 Im 1

If matt values strawberry twice as much as chocolate & purchased the cake for \$18,

a) val of choc

b) " " straw

c) val of given slice.

ex 2: (Im 2)

ch 3
2/5

If the cake is worth \$24 & choc is twice as good as straw which is three times as good as vanilla ...

- value the flavors
- value the slices.

ex 3:

	s1	s2	s3
Al	40%	30	30
Ben	25	40	35
Gue	50	$16\frac{2}{3}$	$33\frac{1}{3}$

- fair shares
- fair division.

(b) Dividend chooser.

ex 4: (Im 4)

Ravi likes choc 3x more than straw

Karli likes choc 2x more than straw.

- cuts for Ravi & Karli
- choices for Karli & Ravi.

(1) Lone Divider method (3 players)

2/3
3/6

step 1: Division

step 2: Bidding

step 3: Distribution.

ex 5: D, C<sub>1</sub>, & C<sub>2</sub> are to divide land. D subdivides into parcels s<sub>1</sub>, s<sub>2</sub>, & s<sub>3</sub>. C<sub>1</sub> bids on {s<sub>1</sub>, s<sub>2</sub>, s<sub>3</sub>} & C<sub>2</sub> bids on {s<sub>1</sub>}

a) list all fair divisions.

ex 6: same as ex 5... 4 players. C<sub>1</sub> bids on {s<sub>1</sub>, s<sub>2</sub>}, C<sub>2</sub> bids on {s<sub>1</sub>, s<sub>2</sub>}, and C<sub>3</sub> on {s<sub>2</sub>}

a) how would you proceed?

ex 7: Find a fair division

	s <sub>1</sub>	s <sub>2</sub>	s <sub>3</sub>	s <sub>4</sub>
E		30	21	22
F	35	20		20
G		26	28	21
H	25	25		

(a) divider

(b) bids

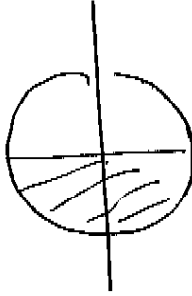
(c) fair div

where G gets s<sub>2</sub>

$\frac{2}{3}$   
 $\frac{4}{6}$

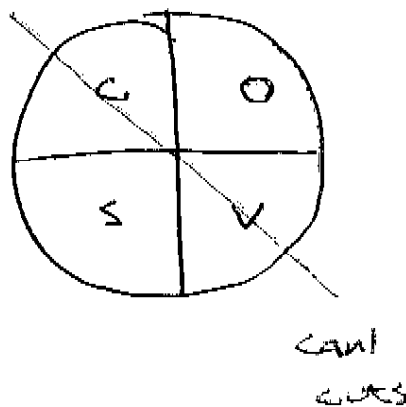
(2) Love - Chooser

ex 8: Im 6

The cake is cut to A  
←  to C  
→

- a) how do A & C cut their halves.
- b) what does Bob's cake?
- c) find the values.

ex 9:



The players

Andrew	likes	C & O
	hates	S & V
Brian	likes	C & S
	hates	O & V
Carl	likes	C & V
	hates	O & S

Andrew chooses half  
 Carl gets the other half

- a) How do A & C subdivide
- b) what is the final subdivision?
- c) what % of the total value (%) does each player get?

ch 3 5/6
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## (3) Last Diminisher.

The process

- (i) Prelims (set order)
- (ii) Rounds till only 2 players remain
- (iii) divider-choser.

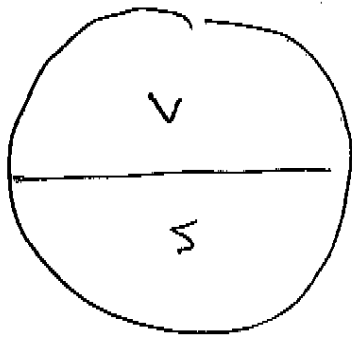
Forced to claim & fair share on diminish  
the current claim to a fair share.

ex 10: Funky island w/ volunteers. (cards for volunteers)

ex 11: A cake worth \$30 is to be split 4 ways among  $(P_1, P_2, P_3, P_4)$ .  $P_1$  makes the 1st cut (value to  $P_1$ ?). The table shows the value of the current claim @ the time each player ~~turn~~ comes.

	$P_2$	$P_3$	$P_4$
value	6.50	8.50	8.00

- a) who gets the piece in round 1
- b) what is the value of that player?
- c) who makes the cut to start R2?

ex 12:

players

ch
6/6

A. likes ~~S~~ <sup>S</sup> 2x more than V

B only likes V

C No pref.

D likes S 3x more than V

Order: D, C, B, A

wotes: R<sub>1</sub> all vanilla (Bert's gets 75%)  
 R<sub>2</sub> all strawberry (Dale gets 75%)

(IV) method of sealed bids.

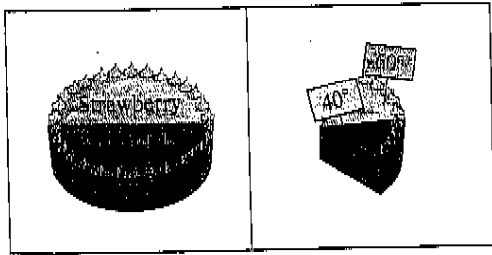
Auction - { instructor's solutions  
 void grade change form  
 candy.

(V) method of markers.

candy example.

FAIR DIVISION  
IMAGES 1

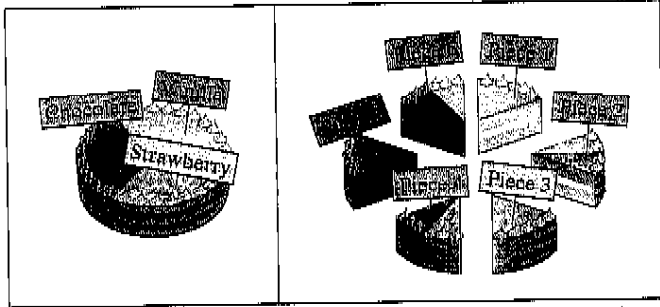
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(i)

(ii)

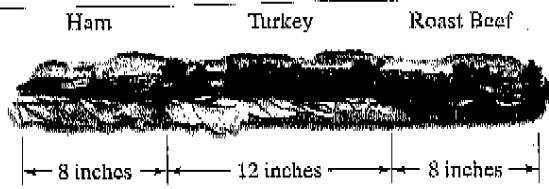
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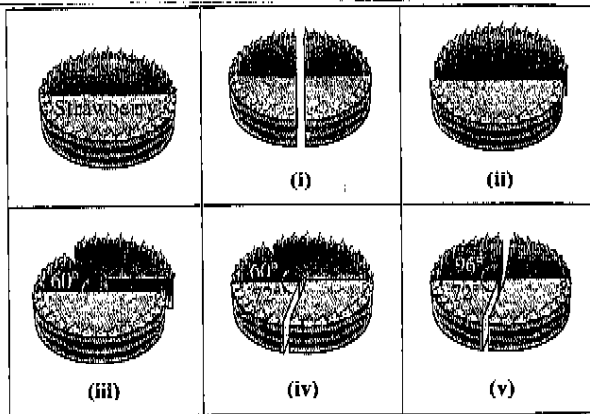
(i)

(ii)

3



4



(i)

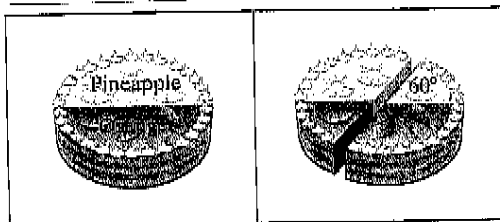
(ii)

(iii)

(iv)

(v)

5



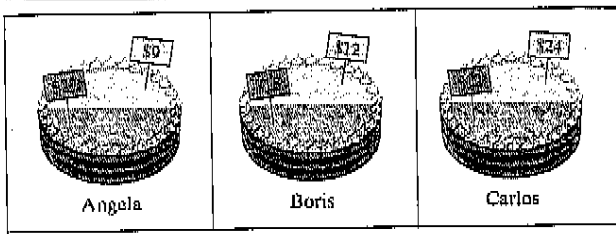
(i)

(ii)

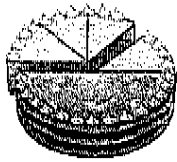
FAIR DIVISION

IMAGES 2

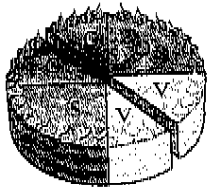
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8



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