

Math 107
Dusty Wilson

Ch. 3 Group Project

Names: key

Complete the following problems. All partners should work together, and all are responsible to make sure that each problem is done correctly. Do not get help from other groups, and you must show your work to get full credit.

1. Five people wish to divide a cake using the Lone-Divider method. Player 1 (P_1) is chosen to be the divider while P_2 , P_3 , P_4 , and P_5 are choosers. P_1 divides the cake into pieces s_1 , s_2 , s_3 , s_4 , and s_5 .

- a) If P_2 finds s_2 and s_3 to be acceptable, P_3 finds only s_3 to be acceptable, P_4 finds s_1 and s_3 to be acceptable, and P_5 finds s_1 and s_5 to be acceptable, what is a fair division of the cake?

$$P_1 - s_4 ; P_2 - s_2 ; P_3 - s_3 ; P_4 - s_1 ; P_5 - s_5$$

- b) If P_2 finds only s_2 to be acceptable, P_3 also finds only s_2 to be acceptable, P_4 finds s_1 and s_2 to be acceptable while P_5 finds s_1 and s_5 to be acceptable, what is a fair division of the cake?

$$P_5 - s_5 ; P_4 - s_1 ; P_1 - s_3 \text{ or } s_4$$

combine s_2 & (s_4 or s_3)

P_2 & P_3 can divide this using the divider - chooser model

- c) If P_2 , P_3 , and P_4 each finds only s_3 to be acceptable and P_5 finds only s_1 to be acceptable, what is a fair division of the cake?

$$P_5 - s_1 ; P_1 - s_2 \text{ or } s_4 \text{ or } s_5$$

combine the remaining pieces & split 3 ways using the lone-divider method

2. An estate consists of a shop full of power tools (mostly Bosch, DeWalt, Festool, and Makita), a 2005 Toyota Camry XLE, a home theatre system (42 inch plasma screen, Yamaha stereo and Bose speakers) and 1/8 interest in a condominium in Ocean Shores, WA. Estimated values are: tools, \$3,500; car, \$21,500; theatre system, \$4,000; and condominium share, \$32,000. Melissa, Faith, and Dustin jointly inherit the estate and they submit sealed bids on the items as follows:

	Melissa	Faith	Dustin
Tools	\$3,500	\$3,000	\$4,000
Car	\$20,000	\$21,000	\$19,500
Theatre	\$3,500	\$4,000	\$4,500
Condo	\$33,000	\$35,000	\$32,000

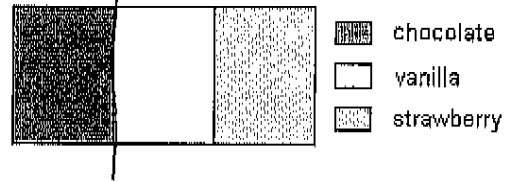
Describe a fair division of this estate. (Who gets what item? What does each pay into or receive from the estate?)

M - gets 20
 F - pays 35 surplus \$3500
 D - gets 11.5
 11.67 to each.

M - gets \$21167
 F - gets the car, condo & pays \$33233
 D - gets tools & the electronics & \$12667

Initial Division

3. Dusty, Dustin, and Charlene buy a carton of Neapolitan ice cream that is one-third chocolate, one-third vanilla, and one-third strawberry as shown below. They wish to fairly divide the ice cream using the **lone chooser** method. Dusty likes chocolate twice as much as vanilla or strawberry. Dustin likes strawberry but no other flavor. Charlene, the chooser, likes strawberry and vanilla twice as much as chocolate. In the first division, Dusty cuts the chocolate piece off and leaves the vanilla and strawberry together. (Assume future cuts are made vertically; that is, top to bottom.)



a) Which piece does Dustin take?

vanilla & strawberry.

b) How does Dustin do his subdivision?

1st: all v & 1/3 of s
 2nd: 1/3 of s
 3rd: 1/3 of s

c) What are the pieces that Charlene ends up choosing? (What fraction of the original chocolate, vanilla, and strawberry?)

piece 1 from Dustin
 and 1/3 of the C from Dusty.

Bonus: What is the final value (percentage of the whole value) that Charlene gets in her opinion?

V - 40%
 S - 1/3 * 40%
 C - 1/3 * 20%
 Charlene feels she gets 60%

4. A cake is to be divided among 5 people using the Last-Diminisher method. The order that the players participate is established arbitrarily so that P_1 is first, P_2 is second, ..., P_5 is last. Only P_3 diminishes the slice in the first round while P_2 and P_5 both diminish the slice in the second round and no-one diminishes the slice in the third round.

1st - P_3

a) Which player gets the slice in the second round?

2nd - P_5

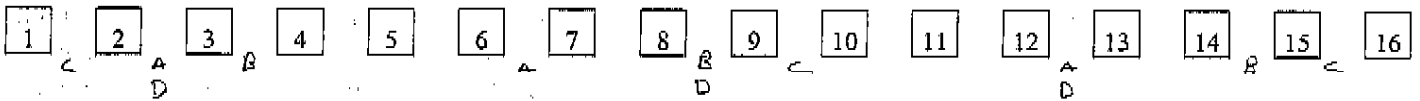
b) Which player cuts the slice for the third round?

(3rd) - P_1

c) Which players are left to share in the fourth round?

P_2 & P_4

5. Four players (A, B, C, D) agree to divide the 16 items below using the method of markers.



Each of the player's three markers are placed as follows:

- A: immediately to the right of items 2, 6, 12
- B: immediately to the right of items 3, 8, 14
- C: immediately to the right of items 1, 9, 15
- D: immediately to the right of items 2, 8, 12

a) Whose share is given out first and what items do they receive?

C - item 1

b) Whose share is given out second and what items do they receive?

A - items 3, 4, 5, 6

c) Whose share is given out third and what items do they receive?

D - items 9, 10, 11, 12

d) Whose share is given out last and what items do they receive?

B - 15, 16

e) What items are left over? 2, 7, 8, 13, 14

6. Melissa and Faith want to divide a 1/2 chocolate 1/2 strawberry cake fairly using the divider-chooser method. The total cost of the cake was \$6.00. Melissa values chocolate three times as much as she values strawberry, while Faith values strawberry four times as much as she values chocolate.

a) In Melissa's eyes, what is the chocolate is worth?

\$4.50

b) In Faith's eyes, what is the chocolate is worth?

\$1.20

c) In Melissa's eyes, what is the strawberry worth?

\$1.50

d) In Faith's eyes, what is the strawberry worth?

\$4.80

e) Melissa divides the cake into two pieces: piece 1 contains 1/3 of the strawberry and 5/9 of the chocolate, piece 2 contains 2/3 of the strawberry and 4/9 of the chocolate. Which piece will Faith choose and how much is it worth in her eyes?

P₁ - \$2.27

P₂ - \$3.73

Faith takes piece 2.

7. The three partners in a small business, Dustin, Chris, and Mark, decide to break up the partnership and to do this they each submit a bid to buy the business outright. Dustin bids \$192,000, Chris bids \$204,000 and Mark bids \$189,000. Who gets the business and what value does each partner receive?

Chris gets the business.

	FS	Initial	surplus	Final
D	64	gets 64		gets \$67k
C	68	pays 136	9	gets the bus so pays \$133k
M	63	gets 63		gets \$66