

Lone-Chooser Method: 1 Chooser, the rest are dividers

Preliminaries: decide who is C or D by random draw

Step 1:
Division: $D_1 + D_2$ divide S into 2 fair shares ($s_1 + s_2$)

Step 2:
Subdivision: each D divides his share into 3 subshares
 $s_1 \rightarrow s_{1a}, s_{1b}, s_{1c}$
 $s_2 \rightarrow s_{2a}, s_{2b}, s_{2c}$

Step 3:
Selection: C selects one of D_1 's subshares + 1 of D_2 's subshares
 D_1 keeps remaining two shares, D_2 keeps his remaining 2 from s_2

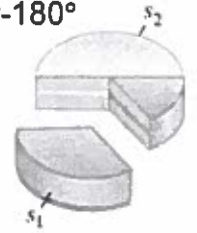
Angela, Boris, and Carlos are dividing the vanilla-strawberry cake shown using the lone-chooser method. The table shows the value that each player places on each part of the cake. Suppose that Angela and Boris are dividing and Carlos is the chooser. In the first division, Angela cuts the cake into two shares s_1 and s_2 . Boris picks the share he likes best, and Angela gets the other share. In the second division, Angela and Boris subdivide each of their pieces into three pieces.

\$	Strawberry	Vanilla
Angela	27	9
Boris	45	5
Carlos	14	28



- Describe which share (s_1 or s_2) Boris picks and how he might subdivide it. The shares are shown. Share s_1 is a 120° strawberry piece and share s_2 is a 60° strawberry- 180° vanilla. How might Boris subdivide his share?

Boris: $s_1 = \frac{2}{3}(45) = \30 He will select s_1 .
 $s_2 = \frac{1}{3}(45) + 5 = \20



$s_{1a}: s_{1b}: s_{1c}: 40^\circ, 40^\circ, 40^\circ$ - Strawberry slices
 $\$10 \quad \$10 \quad \$10$



2. Describe how Angela would subdivide her share of the cake.

$$\frac{1}{3}(27) + 9 = \$18$$

$$\frac{18}{3} = \$6.00 \text{ per share}$$

$$\text{Vanilla: } \frac{180^\circ}{9} = \frac{x}{6}$$

$$x = 120^\circ$$

$$\text{Str: } \frac{60^\circ}{9} = \frac{x}{6}$$

$$x = 40^\circ$$

$$S_{2a}: 120^\circ \text{ V}$$

$$S_{2b}: 60^\circ \text{ V} \\ 20^\circ \text{ S}$$

$$S_{2c}: 40^\circ \text{ S}$$

3. Based on the subdivisions, describe a possible fair division of the cake.

$$\text{Carlos: } S_{2a} + S_{1a} \quad (120^\circ \text{ V} + 40^\circ \text{ S})$$

$$\text{Baris: } S_{1b} + S_{1c} \quad (40^\circ \text{ S} + 40^\circ \text{ S})$$

$$\text{Angela: } S_{2b} + S_{2c} \quad (60^\circ \text{ V} / 20^\circ \text{ S} + 40^\circ \text{ S})$$

4. For the final fair division, find the value of each share in the eyes of the player receiving it.

$$\text{Carlos: } \frac{120}{180}(28) + \frac{40}{180}(14) = \$21.78$$

$$\text{Baris: } \frac{80}{180}(45) = \$20$$

$$\text{Angela: } \frac{60}{180}(9) + \frac{60}{180}(27) = \$12$$