Discrete Math: 3.4.2 The Lone-Chooser Method
Date:

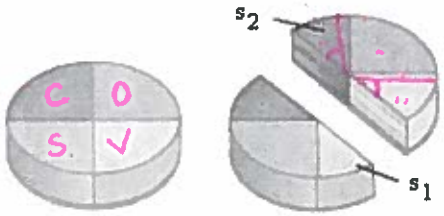
Name:
Period: Key

Arthur, Brian, and Carl are dividing the cake using the lone-chooser method. Arthur loves chocolate and strawberry cake equally but hates vanilla and orange cake. Brian loves strawberry and vanilla cake equally but hates orange and chocolate cake. Carl loves chocolate and vanilla cake equally by hates orange and strawberry cake. Suppose Carl and Arthur are dividers. In the first division, Carl makes the cut shown and Arthur picks up the share he likes better. In the second division, Arthur and Carl each subdivide their shares into three pieces. Assume all cuts are from the center to the edge of the cake. Describe each piece of cake by giving angles to its parts, as in "15° strawberry - 40° chcolate" or "60° orange."

Arthur: $S = C \neq V \neq O$

Brian: $S = V \neq C \neq O$

Carl: $C = V \neq O \neq S$



1. Describe which share (s_1 or s_2) Arthur picks and how he might subdivide it.

Arthur will pick $s_1 \rightarrow \frac{1}{2}C + S + \frac{1}{2}V$

(45°) (90°) (45°)

$\frac{135°}{3} = 45°$

S_{1a}: 45° C

S_{1b}: 45° S

S_{1c}: 45° S + 45° V

2. Describe how Carl might subdivde the other share.

Carl has $s_2 \rightarrow \frac{1}{2}C + O + \frac{1}{2}V$

(45°) (90°) (45°)

$\frac{90°}{3} = 30°$

S_{2a}: 30° C

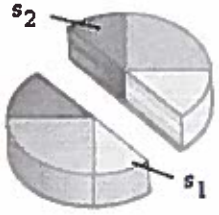
S_{2b}: 15° C, 90° O, 15° V

S_{2c}: 30° V

Only likes $\frac{45°C + 45°V}{3}$

30°

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



Arthur: 45°C, 45°V

Brian: 45°S/45°V(s_{1C}), 30°V (s_{2C})

Curl: 45°C, 90° Or, 15°V

4. For the final fair division described, find the value of each share (as a percentage of the total value of the cake) in the eyes of the player receiving it.

A: $\frac{45}{180}$ = 25% (only likes C)

B: $\frac{120}{180}$ = 67% (likes both S and V)

C: $\frac{60}{180}$ = 33% (likes C and V only, not Or)