5.6: Moving Knife

A somewhat different approach to continuous fair division is called the moving knife procedure.

Moving Knife Method

In this method, applied to a cake,

1) A referee starts moving a knife from left to right across a cake.

2) As soon as any player feels the piece to the left of the knife is worth a fair share, they shout “STOP.” The referee then cuts the cake at the current knife position and the player who called stop gets the piece to the left of the knife.

3) This procedure continues until there is only one player left. The player left gets the remaining cake.

Example 10

Suppose that our four salespeople from above decided to use this approach to divide Washington. Rather than move the “knife” from left to right, they decide to move it from top to bottom.

**Solution**
The referee starts moving a line down a map of the state. Henry is the first to call STOP when the knife is at the position shown, giving him the portion of the state above the line.

Marjo is the next to call STOP when the knife is at the position shown, giving her the second portion of the state.

Bob is the next to call STOP, leaving Beth with the southernmost portion of the state.

While this method guarantees a fair division, it clearly results in some potentially silly divisions in a case like this. The method is probably better suited to situations like dividing an actual cake.