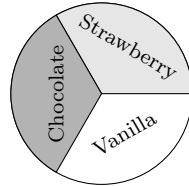# Worksheet 7 (Fair Division 2): The Lone Divider Method

Group Names: _____

Tom, Fred, and Janet are dividing a super-fancy gourmet cake worth $36 that is equal parts strawberry, vanilla and chocolate.

1. How much value is a fair share of the cake? _____

2. Tom divides the cake into three pieces (not necessarily the division shown above!) that he values equally. Janet and Fred value the pieces according to the following table:

	piece 1	piece 2	piece 3
Tom	$12	$12	$12
Janet	$7	$18	$11
Fred	$15	$18	$3

   (a) Which pieces represent a fair share for Janet? _____

   (b) Which pieces represent a fair share for Fred? _____

   (c) Is it possible to distribute the pieces of cake to the three people so that everyone gets a piece that is a fair share for them? If so, explain how to do so; if not, explain what happens next.

3. It turns out that Janet and Fred changed their mind on how they value the pieces of cake that Tom gave. Their new values are given in the following table:

	piece 1	piece 2	piece 3
Tom	$12	$12	$12
Janet	$6	$20	$10
Fred	$7	$18	$11

   (a) Which pieces represent a fair share for Janet? _____

   (b) Which pieces represent a fair share for Fred? _____

   (c) Is it possible to distribute the pieces of cake to the three people so that everyone gets a piece that is a fair share for them? If so, explain how to do so; if not, explain what happens next.
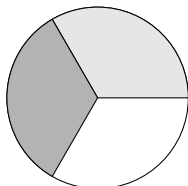
4. In a final cake scenario, suppose that the people valued the cake as follows:

   - Tom likes all three flavors equally.
   - Janet likes strawberry twice as much as vanilla. She likes chocolate SIX times as much as vanilla.
   - Fred likes vanilla and strawberry equally, but he likes chocolate four times as much as vanilla and strawberry.

   (a) If Tom portioned the cake into three pieces where each piece was a single flavor, determine the valuations that Janet and Fred would assign to the pieces of cake.

	vanilla	chocolate	strawberry
Tom	$12	$12	$12
Janet			
Fred			

   (b) Which pieces represent a fair share for Janet? _____

   (c) Which pieces represent a fair share for Fred? _____

   (d) Explain why it is not possible to distribute Tom's pieces of cake so that everyone gets a fair share.

   (e) Choose a piece of cake to assign to Tom, and explain why you chose that piece.

   (f) Now, use Divider-Chooser to determine the division of the rest of the cake. Suppose that you flipped a coin, and Janet was chosen to be the divider.

      i. Label Janet's values on the cake and draw a partition of the cake on Janet's side that Janet might make as the divider. (Don't forget to exclude the part Tom already has!)
      ii. Label Fred's values, determine which part of the cake he will choose, and determine the value of that part of the cake to him.

Janet's Values   Fred's Values