Soma - Mobius - Water

1 Pouring Water

1. Given a 4-liter unmarked container, a 7-liter unmarked container, and an unlimited supply of water, can you obtain an accurate measure of 5 liters of water? If so, what is the minimum number of pourings necessary?

2. Given a 5-liter unmarked container, a 9-liter unmarked container, and an unlimited supply of water, can you obtain an accurate measure of 6 liters of water? If so, what is the minimum number of pourings necessary?

3. Under the same conditions, but with a 3-liter container and a 6-liter container, can you obtain a measure of 5 liters? If so, what is the minimum number of pourings necessary?

You can keep track of your pourings here.

4-liter	7-liter
0	0
4	0

4-liter	7-liter
0	0
0	7

5-liter	9-liter
0	0
5	0

5-liter	9-liter
0	0
0	9

3-liter	6-liter
0	0
3	0

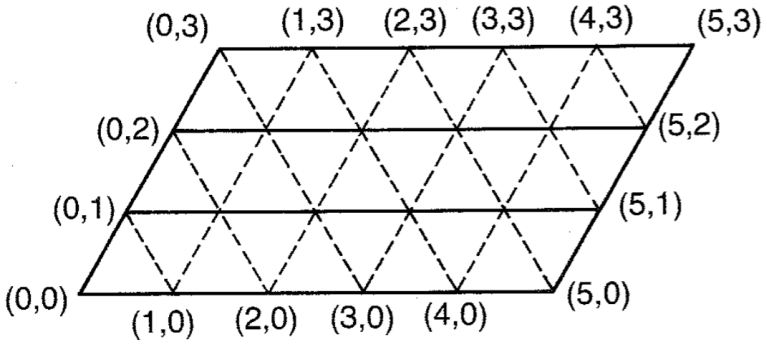
3-liter	6-liter
0	0
0	6

4. Given a 5-liter unmarked container, a 3-liter unmarked container, and an unlimited supply of water, can you obtain an accurate measure of 4 liters of water?

5-liter	3-liter
0	0
5	0

5-liter	3-liter
0	0
0	3

5. On the pool table shown below, a pool ball must be shot initially from the point $(0, 0)$ and must roll along the side to either $(0, 3)$ or $(5, 0)$. Each time the ball strikes another side, it will bounce off at an angle of $60°$ as indicated by the dotted lines. First, start at $(0, 0)$, and shoot the ball towards $(5, 0)$, and record the coordinates each time the ball strikes a side. Then start at $(0, 0)$, shoot the ball towards $(0, 3)$, and record the coordinates again. Can you relate your results to the previous problem?



(0,0)	(0,0)
(5,0)	(0,3)
(2,3)	(,)
(,)	(,)
(,)	(,)
(,)	(,)
(,)	(,)
	(,)
	(,)

2 Mobius Bands

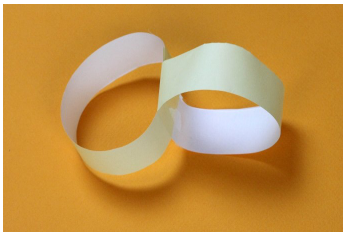
1. Make a Mobius band by taking a strip of paper and taping the ends together with a half-twist.

2. How many sides does a Mobius band have? Test your theory by drawing a line down the middle of each side.

3. Predict what will happen if you cut a Mobius band lengthwise down the middle. Then try it.

4. Predict what will happen if you cut a Mobius band lengthwise in thirds. Then try it.

5. Tape two ordinary loops together as shown. Cut each loop down the middle. What happens?



6. What happens if you tape one ordinary loop and one Mobius band together, or two Mobius bands together, and then cut down the middle of both?