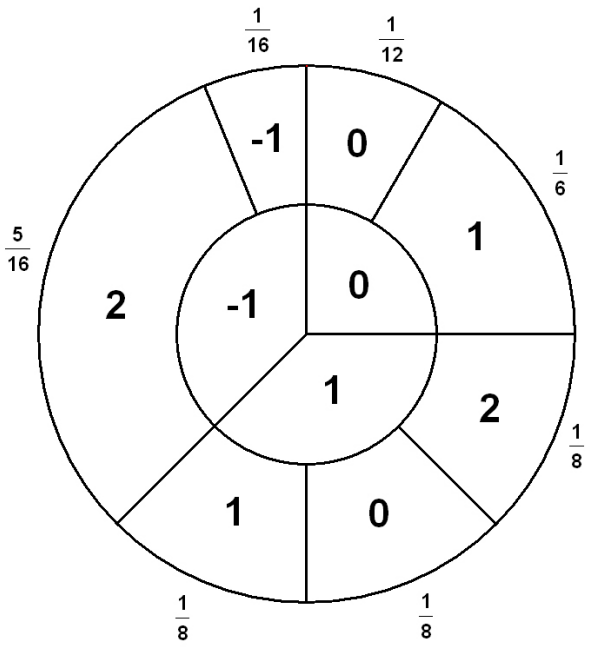
Peter Lucas **Homework 9** **Due 11-07-2014**

1. Suppose an urn contains 9 balls: 2 red balls, 3 yellow balls and 4 purple balls.
   (a) Suppose that a ball is drawn from the urn at random. Find the probability of getting a red, yellow and purple ball respectively.
   (b) Make a wheel that corresponds to the experiment
   (c) Suppose for a homework assignment I instructed the students to draw from the urn 1000 times (and put the ball back in after each draw) and report how many of each balls they get. One student reports back that he got 216 red balls, 274 yellow balls and 510 purple balls. I suspect he did not do his homework and made up his answers. I do a χ^2-test to test my theory.
      (a) State the null and alternative hypothesis.
      (b) Compute the χ^2 statistic.
      (c) I only want to accuse him of falsifying data if his data is only possible in 1 in 100 times this experiment is done. Do I have enough evidence?

2. Suppose you are given data that is reported to come from the outer values of the following wheel:



The data is:

value	number observed
-1	38
0	200
1	97
2	265

Do a χ^2 test to determine if there is enough evidence to say that the data does not come from this wheel.

3. Suppose $d = \gcd(52888, 47267)$.
   (a) Find d
   (b) Find k, l such that $d = 52888 \cdot k + 47267 \cdot l$.

4. For each of the following find $a^{-1} \pmod{m}$ or explain why no such inverse exists. That is, find c such that $ac \equiv 1 \pmod{m}$.
   (a) $a = 1026405, m = 2557009$
   (b) $a = 31565, m = 121009$.

5. Find $\phi(148500)$