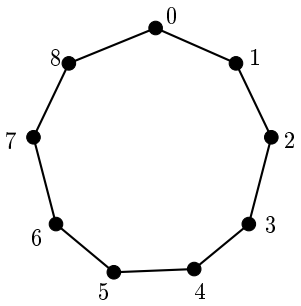
MATH 20 FALL 14 ASSIGNMENT 8, DUE Friday 11/7

The usual: you're encouraged to work with other students, hand in solutions to the problems on Friday at the beginning of class, send the code in by email by the same time.

1 Joint Distributions and Random Walks

1. You have a biased coin that comes up "tails" with probability p, where p is drawn from $[0,1]$ uniformly at random. The coin is tossed once. What is the expected value of p given that the toss comes up "tails?" Use what you know of joint random variables to explain your answer.
2. Suppose that X is picked uniformly at random from $(0,1)$ and Y is picked uniformly at random from $(0,x)$.
   - What is the sample space $\Omega_{X,Y} = \Omega_X \times \Omega_Y$?
   - What is the joint density $f_{X,Y}(x,y)$?
   - Check that $\int_{\Omega_X}\int_{\Omega_Y} f_{X,Y}(x,y)dydx = 1$.
   - What is $F_{X,Y}(a,b)$? *Hint: you may have to consider two different cases.*
3. Suppose you have a cycle on 9 nodes, as pictured.



A simple random walk starts at 0. Find a formula for the expected number of steps before it first reaches node 1, and for the expected number of steps before it first reaches node 4. *Hint: what you learned about times to absorption may be useful.*

2 Book problems

Section 11.1: Problems 1, 3

3 Code: Betting Game

This time you're going to write a simple interactive game. If you write:

```
var=raw_input("Enter something:")
```

The console will print *Enter something:* (That's your *prompt message*) and then you can click that place on the console, type whatever you wish, and press enter to input it. Try it. If you want it to be an integer value, make it:

```
var=int(raw_input("Enter something:"))
```

Now, to your actual task:

Write a game that asks you to enter an integer from -10 to 10, then simulates a 10-step simple random walk on integers starting at 0. If the final position matches the number you entered, it prints "you won", otherwise it prints "try again"

Tip: if you want to try out if your game works, do it with a just 4-step random walk, you're more likely to win. Also, this whole game can be coded in very few lines. How do you simulate this random walk?

For the class on Friday the 7th, try to think about how to construct a 10-step (not necessarily simple) random walk on integers starting at 0 that makes it less likely to make a successful bet, even if the person betting can see your code.