1. You have a board set up like this:
Where a ball is dropped and it hits a peg it is equally likely to
go left or right. 6 buckets are set up below numbered 0 - 5.
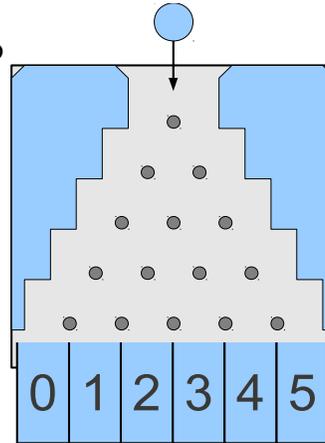
**If we drop 300 balls into this board, how many do we
expect to fall into bucket 4?**

**What is the mean value for the bucket a ball will land in?
What is the standard deviation?**

**** We keep all balls in their buckets except buckets 0 and
5, which we empty and drop through a second time. Now
how what is the <u>total</u> we expect to have in bucket 4?**

You place a stopper at the opening of the board so that the
ball is forced to drop left on the first peg.
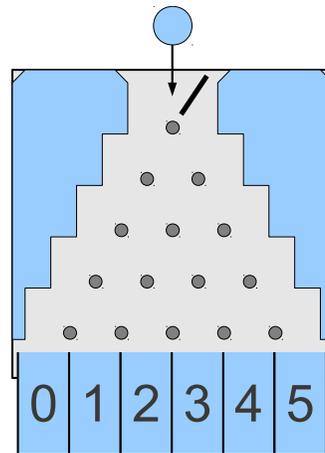
**Now if we drop 300 balls, how many do we expect to fall
into bucket 4?**

**What would be the mean value for the bucket, and what
would be the standard deviation?**

2. Given the following:

P(A) = .5, P(B) = .3, P(C) = .2
P(A|B) = .5
P(B∪C) = .44
P(A∩B∩C) = .01
P(A∩C)=.05

What is P(A∩B)?
Are B and C independent?
Are A and B disjoint?
What is P(B∩C^C)?
** What is P((A∪B∪C)^C)?

3. You have a group of students – some have sweatshirts on, some have glasses. Let S be the event "the student is wearing a sweatshirt" and G be the event "the student has glasses". How do you express the following in Probability notation:

- **The probability a student is wearing a sweatshirt**
- **The probability a student has glasses or is not wearing a sweatshirt**
- **The probability that a student wearing a sweatshirt is wearing glasses**
- **The probability a student is wearing glasses and a sweatshirt**
- **The probability a student is wearing glasses but no sweatshirt OR a sweatshirt but no glasses**

How can we check if the S and G are independent?
How can we check if S and G are disjoint?

4. You draw cards from a deck until you have 1 heart or 5 cards, whichever comes first.
Make a probability distribution for X = #cards you draw
What is the probability you draw a heart on the first try?
What is the probability you draw 3 or more cards?
What is the probability you have a heart by the time you are done?
What is the probability you have 2 hearts by your third draw?

5. $P(A|B)=.35$, $P(B|A)=.42$, A and B are independent.
What is $P((A \cup B)^C)$?

6. $P(A|B) = .30$ and $P(B|A) = .30$
What does this imply? Are B and A independent? Disjoint?
***If A and B are not necessarily independent, give an example.
***If A and B are independent, what must be P(A) and P(B)?

7. You have a Die with a skull on 3 sides, and the remaining sides have a 1, 2 and 3. You roll the die 30 times.
What is the mean number of times you expect to get a skull? What is its standard deviation?
What is the mean number of times you expect to roll an odd number? What is its standard deviation?

8. $P(A) = P(B)$
Is it possible for the two events to be independent? If so, give an example.
Is it possible for the two events to be disjoint? If so, give an example.

9. Jerry lives near the swamp, and he is always getting mosquitoes in his apartment. On any given day he swats any number of mosquitoes, from 0 up to 15. He calculated the mean number of mosqitoes to be 4.5 with a standard deviation of 1.23
He wanted to estimate how many he'd kill over the course of a week. He figures since E(X) = 4.5, E(7X) = 7*E(X) = 7*4.5 = 31.5, and SD(X)=1.23, so SD(7X) = 7*SD(X) = 7*1.23 = 8.61
What is wrong with Jerry's reasoning/calculations?

10. You are taking a multiple choice test with 20 questions. Each problem has 4 choices. You didn't study at all, so you just guess on every single question.
What is the probability of getting the first two questions right?
What is the probability of getting exactly 5 questions right?
What is the probability of getting 3 or more questions right?
What is the probability of getting every odd question wrong?

11. In the swamp you can find bullfrogs – some have a green spot on their heads and some do not. 27% of the frogs have the green spot. Let's go frog catching!
What probability distribution is appropriate to model the chance a frog you catch will have a green spot?

What probability distribution is appropriate to model the expected number of green spot frogs if you catch 30 frogs? What would be its expected value and standard deviation?

What probability distribution is appropriate to model the number of frogs you need to catch until you get a green-spot frog? What would be the expected value and standard deviation?

*** Suppose the green-spot frogs are better at hiding, and you are half as likely to catch a green-spot frog as the regular kind. If you go out and catch 30 frogs, what is the expected number of green-spot frogs you'll catch?

12. Which are requirements for a valid probability distribution for random variable X?
  (a) All probabilities are known
  (b) The probabilities of all possible values of X must add up to 1
  (c) The probabilities must be in ascending order
  (d) Every possible value of X must have a probability between 0 and 1
  (e) Every value must have a positive probability
  (f) There must be a finite number of possible values for X
  (g) X can only take discrete values

13. The following table gives the percentages of the population who wear glasses and own SUVs:

		Glasses	
		Wear Glasses	No Glasses
SUV	Owns an SUV	0.05	x
	Doesn't own an SUV	0.4	y

If "Owning an SUV" and "Wearing Glasses" are independent, what are the values of x and y?