HOMEWORK ASSIGNMENT # 8

(1) Powerball is played in 31 U.S. states, Washington D.C. and the US Virgin Islands. Five numbers are selected by the player between 1 and 55 and a bonus number from 1 to 42. Twice weekly five balls are drawn from a drum with 55 white balls and one ball from a drum with 42 red balls choosing the five winning and the bonus numbers (note: the bonus can be the same as the other numbers). The prizes and their probabilities are listed in the table below.

Example: I played my lucky numbers

3, 8, 13, 30, 40 and I chose 23 for my Powerball number.
On November 15, 2006 the winning numbers were 11, 28, 30, 34, 43, Powerball: 29.
I did not win.

POWERBALL	approx. probability of winning	prizes
5 numbers and bonus	1 in 146,107,962	grand prize
5 numbers	1 in 3,563,608.83	$200,000
4 numbers and bonus	1 in 584,431.85	$10,000
4 numbers	1 in 14,254.44	$100
3 number and bonus	1 in 11,927.18	$100
3 numbers	1 in 290.91	$7
2 numbers and bonus	1 in 745.45	$7
1 number and bonus	1 in 126.88	$4
bonus only	1 in 68.96	$3

Explain the probabilities in the table above.

(2) Determine the expected value of a $1 bet on Powerball if the '5 numbers and bonus' wins $50 million.

(3) Determine the expected value of a $1 bet on Powerball if the '5 numbers and bonus' wins $150 million.

From the FAQ section of the Powerball website:

> Q: I see no guarantee of an honest game on your website. Does Powerball guarantee players an honest game?

> A: Anytime you see someone offer a guarantee of honesty, run.