L2 Probability Revision #4

1. Between 8 a.m. and 9a.m. each day a traffic roundabout gets a mean of 168 cars with a standard deviation of 34 cars.

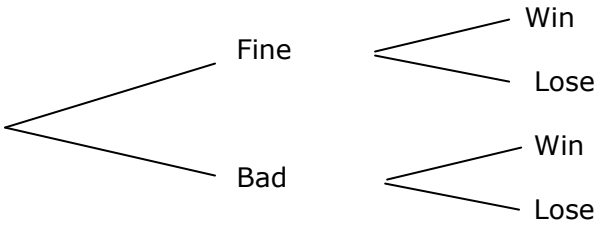
   a) What is the probability that more than 200 cars will go through in one hour?

   b) In a year what number of cars in the hour will the slowest ten days have?

   c) If the mean stays the same, what would the standard deviation have to be so that the busiest 10% of days had over 250 cars in the hour?

2. A tennis player wins 45% of his games when the weather is fine, but he wins 65% when the weather is bad. Bad weather is about 15% of his games.

   a) What is his overall winning percentage?



   b) Given that he won a game, what was the probability the weather was poor?

   c) If he wins 60% of games that go to three sets but only 40% of games that go to two sets, what proportion of his games go to three sets?

3. The members of three South American drug gangs were followed over two years:

	Compadres	Muchachos	Ceros
Prison	16	13	17
Killed	3	4	0
Neither	23	18	22

   a) How did the risk of either going to prison or being killed compare between the three gangs?

   b) If a member escaped prison or death, what was the probability he was in the Ceros?

   c) How much higher percentage was the relative risk of prison for the Ceros compared to the Compadres?

Answers: L2 Probability Revision #4

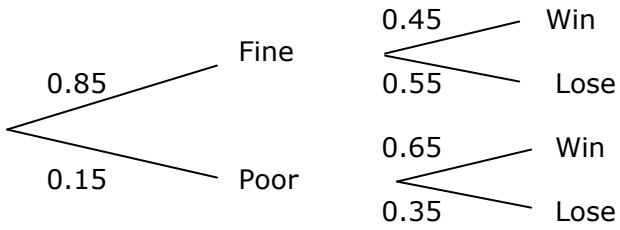
1.

a) Graphics normal distribution: Ncd: lower = 200, upper = 99999, σ = 34, μ = 168
P(x > 200) = **0.1733**

b) Ten days is $^{10}/_{365}$ of a year, which is the probability a day will be in the slowest 10.
Graphics: InvN: tail = left, area = 10 ÷ 365, σ = 34, μ = 168, = 102.7
but need whole numbers = **under 103 cars**

c) Graphics: InvN: tail = left, area = 0.9, σ = 1, μ = 0 gives **z = 1.2815**
⇒ the top ten days are 1.2815 standard deviations from the mean.
⇒ μ + z σ = bound, so 168 + 1.2815 × σ = 250 which solves to give **σ = 64**

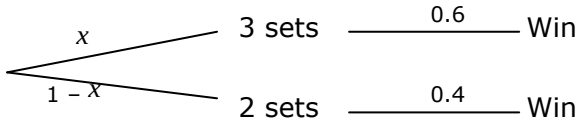
2.



a) P(Win) = 0.85 × 0.45 + 0.15 × 0.65 = overall **48% winning percentage**

b) P(win overall) = 0.48 as above of which P(win and poor) = 0.15 × 0.65 = 0.0975
P(poor weather if won) = 0.0975 ÷ 0.48 = **0.2031**

c)



where x is the P(3 sets)
so 1 – x is P(2 sets)

We know that 0.6 x + 0.4 (1 – x) = 0.48 which when solved gives x = 0.4 = **40%**

3.

	Compadres	Muchachos	Ceros	
Prison	16	13	17	46
Killed	3	4	0	7
Neither	23	18	22	63
	42	35	39	116

a) For Compadres risk was $^{19}/_{42}$ = **0.452**, For Muchachos risk = $^{17}/_{35}$ = **0.486**,
For Ceros risk was $^{17}/_{39}$ = **0.436** So the **risks were pretty similar**.

b) 63 had neither prison nor death, of which 22 were Ceros. P = $^{22}/_{63}$ = **0.349**

c) Risk of prison for Ceros = $^{17}/_{39}$ = 0.436 and for Compadres $^{16}/_{42}$ = 0.381
Relative risk for Ceros = 0.436 ÷ 0.381 = 1.144. **The risk is 14% higher**