Math 164 (Spring 2008)

Solutions for Homework #6

<u>Section 5.1</u>: 34, 35, 36, 37, 41, 42, 43, 44, 53, 54

#34 In this problem, the sample space (outcome space) S consists of the 365 days of the year, all equally likely. All you have to do in each part is to apply $P(E) = \frac{N(E)}{N(S)}$, with $N(S)$ being 365. (Note: In reality, it is not quite true that all 365 days are equally likely. But that is the assumption we are asked to base our computation on in this exercise.)

(a) $\frac{12}{365}$. This means that if you randomly pick a person from the population, and do so a large number of times, then in the long run it is expected that in roughly 12/365 of the cases the person has a birthday on the first day of a month (Jan 1, Feb 1, …, Dec 1).

(b) $\frac{7}{365}$. (The interpretation is similar to that in (a). Note that the 7 comes from the fact that only Jan, Mar, May, Jun, Jul, Oct, Dec have the 31st day.)

(c) $\frac{31}{365}$ (Again, you give the interpretation, similar to (a)).

(d) $\frac{1}{365}$ (You give the interpretation.)

(e) No. (The probability that you hit on the right answer is only 1/365, which is lower than the usual cutoff of 0.05 for “unusual” events.)

(f) No!!! The key is that the 365 days are, in reality, not equally likely. It is known that some portions of the year somehow are more popular.

#35 (a) {SS, Ss, sS, ss} (b) $\frac{1}{4}$. (c) This means the probability of Ss or sS, so $\frac{2}{4}$, i.e. $\frac{1}{2}$.

#36 (a) {SS, Ss, sS, ss} (b) $\frac{1}{4}$. (c) $\frac{3}{4}$

#37

(a)

		Probability
Never	125	0.0261725
Rarely	324	0.0678392
Sometimes	552	0.1155779
Most of the time	1257	0.2631910
Always	2518	0.5272194
sum	4776	1.0000000

(b) Yes. That probability is 0.026, which is lower than the usual cutoff of 0.05 for “unusual” events.

#41 A, B, C, F
#42 A
#43 B
#44 F

#53 Answer: 0.5. This is because, by the very definition of the median, 50% of the population has an income greater than the median income.

#54 Answer: 0.17

<u>Section 5.2</u>: 27, 29, 30, 31, 37, 39

#27 First, let's work out the sum of the second column:

Age	Number of Multiple Births
15 - 19	93
20 - 24	511
25 - 29	1628
30 - 34	2832
35 - 39	1843
40 - 44	377
45 - 54	117
sum	7401

(a) $\frac{2832+1843}{7401} = \frac{4675}{7401} \approx 0.632$

(b) $1-0.632 = 0.368$

(c)

$P(less\ than\ 45\ years\ old) = 1 - P(45\ years\ old\ or\ older)$

$= 1 - \frac{117}{7401} \approx 1 - 0.016 = 0.984$

(d)

$P(at\ least\ 20\ years\ old) = 1 - P(younger\ than\ 20\ years\ old)$

$= 1 - \frac{93}{7401} \approx 1 - 0.013 = 0.987$

#29 (a) $\frac{13+13}{52} = \frac{1}{2}$ (b) $\frac{13+13+13}{52} = \frac{3}{4}$ (c) $\frac{4+13-1}{52} = \frac{16}{52} = \frac{4}{13}$

#30 (a) $\frac{4+4}{52} = \frac{8}{52} = \frac{2}{13}$ (b) $\frac{4+4+4}{52} = \frac{12}{52} = \frac{3}{13}$ (c) $\frac{4+13-1}{52} = \frac{16}{52} = \frac{4}{13}$

#31

(a) $1 - P(\text{Nov. } 8) = 1 - \frac{1}{365} = \frac{364}{365}$

(b) $1 - P(1^{\text{st}} \text{ day of a month}) = 1 - \frac{12}{365} = \frac{353}{365}$

(c) $1 - P(31^{\text{st}} \text{ day of a month}) = 1 - \frac{7}{365} = \frac{358}{365}$

(d) $1 - P(\text{December}) = 1 - \frac{31}{365} = \frac{334}{365}$

#37

	Died from cancer	Did not die from cancer	
Never smoke cigars	782	120,747	121,529
Former cigar smoker	91	7,757	7,848
Current cigar smoker	141	7,725	7,866
	1,014	136,229	137,243

(a) $\frac{1014}{137244} \approx 0.007$

(b) $\frac{7866}{137244} \approx 0.057$

(c) $\frac{141}{137244} \approx 0.001$

(d) $\frac{782+91+141+7725}{137244} = \frac{8739}{137244} \approx 0.064$.

Of course, this is the same as $\frac{1014}{137244} + \frac{7866}{137244} - \frac{141}{137244} = \frac{8739}{137244} \approx 0.064$

#39

(a) $\frac{231}{375} \approx 0.616$ (b) $\frac{94}{375} \approx 0.251$ (c) $\frac{64}{375} \approx 0.171$

(d) $\frac{231}{375} + \frac{94}{375} - \frac{64}{375} = \frac{261}{375} \approx 0.696$ or, simply

$\frac{57+49+64+61+16+14}{375} = \frac{231+16+14}{375} = \frac{261}{375} \approx 0.696$