Practice for L3 Probability #4

Question One

For two independent events, K and M, the following probabilities are known.

If P(K) = 0.6 and $P(K \cup M) = 0.8$. Find P(M).

Question Two

Eight cards are marked 3, 4, 4, 5, 5, 6, 7 and 8 respectively.

a) What is the expected value of three draws added together, if the cards are replaced and shuffled before each draw?

b) Find the variance of a the number for a single random draw.

c) What is the probability that if two cards are drawn at the same time that they will add to less than 10?

Question Three

An importer brought in 1318 stereos in a year.

16 were returned under warranty as faulty.

Six of the faulty stereos were from the 618 Brand A ones imported.

Is the probability of a fault independent of whether the stereo was Brand A or not?

Justify your answer.

Question Four

A flush in poker is when all the cards in a hand are the same suit.

In a standard deck of 52 cards, with 13 of each suit, what is the chance that five cards dealt randomly in a row will all be from the same suit?

Answers: Practice for L3 Probability #4

1. Let P(M) = x. As the events are independent P(K ∩ M) = P(K) × P(M) = 0.6 x.

   from formula sheet: P(K ∪ M) = P(K) + P(M) − P(K ∩ M) so 0.8 = 0.6 + x − 0.6 x

   Solving gives x = 0.5

2.

c	3	4	5	6	7	8
P(C =c)	0.125	0.25	0.25	0.125	0.125	0.125

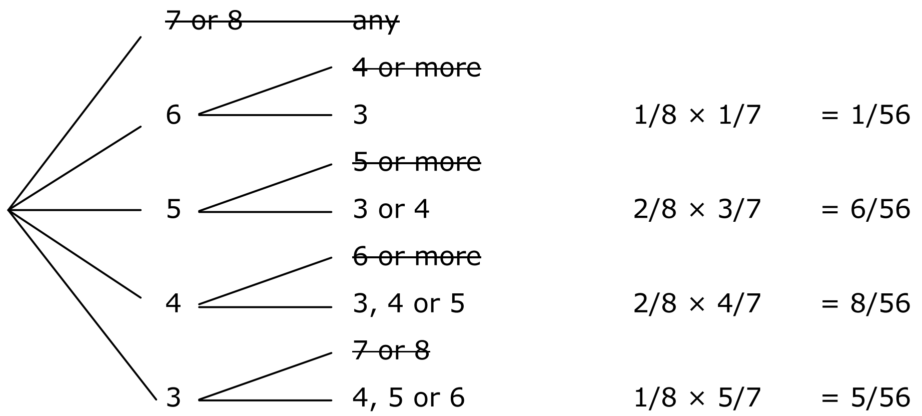
a) E(C) = 3 × 0.125 + 4 × 0.25 + 5 × 0.25 + 6 × 0.125 + 7 × 0.125 + 8 × 0.125 = 5.25

The expected value of three draws is 3 × E(one draw) = 3 × 5.25 = 15.75

b) E(C^2) = 3^2 × 0.125 + 4^2 × 0.25 + 5^2 × 0.25 + 6^2 × 0.125 + 7^2 × 0.125 + 8^2 × 0.125 = 30

Var(G) = 30 − 5.25^2 =2.4375

c)



P(total 2 cards < 10) = 20/56 = 0.3571

3.

	Brand A	Other Brand	
Faulty	6	10	16
Not faulty	612	690	1302
	618	700	1318

P(fault).P(Brand A) = $\frac{16}{1318} \times \frac{618}{1318}$ = 0.005692

P(Brand A faulty) = $\frac{6}{1318}$ = 0.004552 (≠ 0.00569) so the events are **not** independent.

4. The first card will be a suit. The next is the same 12 out of 51, then 11 out of 50 etc.

So P(flush) = $1 \times \frac{12}{51} \times \frac{11}{50} \times \frac{10}{49} \times \frac{9}{48}$ = 0.00198 (or $\frac{^{13}C_5}{^{52}C_5}$ × 4 for each suit = 0.00198)