Practice for L3 Probability #3

Question One

A student survey of personal music players was completed. 1205 students were asked if they had some sort of Apple iPod or another manufacturer. Some had both.

	Number of students	Apple iPod	Non-Apple MP3 player	Neither
Years 9-10	542	173	325	67
Years 11-13	663	225	378	85

a) Find the probability that a student, chosen at random, had both an iPod and an MP3 player?

b) Find the probability that a student chosen at random is in Years 11-13 given they have a non-Apple MP3 player.

Question Two

What is the probability that a family of three will all be boys if it is already known that two are boys, but the gender of the third is not known. *Assume P(boy) = 0.5.*

Question Three

Eight cards are printed, with two marked 1, two marked 2, two marked 3 and two marked 4.

If two cards are randomly drawn at the same time and their numbers added, what is the probability that they will add to give 6?

Question Four

The chance the grid power to a factory fails is 0.005 on any one day. It has a back-up generator, which fails 4% of the time.

a) If the failure of the back-up generator is independent of the grid failing, what is the probability that they will both fail during any one day?

b) The factory operates 350 days a year. What is the probability that at least once during the year that both the grid power and back-up generator will fail?

Answers: Practice for L3 Probability #3

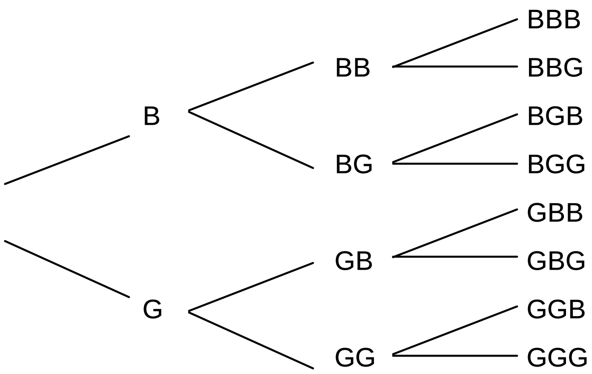
1. a) 23 in Years 9-10 have both kinds, 25 in Years 11-13 have both kinds

$\frac{48}{1205} = 0.03983$

b) $P(A \mid B) = \frac{P(A \cap B)}{P(B)}$ gives $\frac{378}{1205} \div \frac{703}{1205} = 0.425$

or there are 703 with MP3, of which 378 are in Year 11-13, so $\frac{378}{703} = 0.5377$

2.

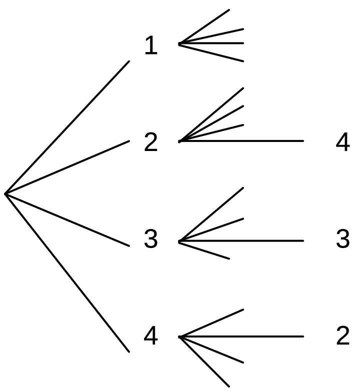


$0.5 \times 0.5 \times 0.5 = 0.125$ for each

There are four different ways to get two boys (BBB, BBG, BGB, GBB) and only one of these (BBB) is three boys.

P(3 boys | 2 boys) = $\frac{0.125}{0.5} = 0.25$

3.



$2/8 \times 0/7 = 0/56$

$2/8 \times 2/7 = 4/56$

$2/8 \times 1/7 = 2/56$

$2/8 \times 2/7 = 4/56$

P(total = 6) = 10/56 = 0.1786

4. a) Independent, so P(A and B) = $P(A \cap B) = P(A) \times P(B) = 0.005 \times 0.04 = 0.0002$

b) P(at least one double failure) = 1 – P(no failures) = $1 - (0.9998)^{350} = 0.0676$

(*but **not** 350 × 0.005 × 0.04 = 0.07, though it's a usual ball-park check*)