Practice for L3 Probability #2

Question One

This is a table containing information about students with the iPod Touchs. The 663 students at a local college were interviewed.

	Has an iPod Touch	Does not
Years 9-10	83	201
Years 11-13	126	253

a) Three students in Years 9-10 were chosen at random for a further interview. Find the probability that exactly two of these have an iPod Touch.

b) Is the event "Being a Year 11-13 student" and the event "Having an iPod Touch" independent? *Give statistical reasoning for your answer.*

Question Two

The students were also asked how many nights they did homework last week.

This is the probability distribution of their replies.

w	0	1	2	3	4	5	6	7
P(W = w)	0.12	0.09	0.21	0.22	0.16	0.08	0.10	0.02

a) Calculate the mean number of nights students did homework in the last week.

b) Calculate the variance of the number of nights the students did homework in the last week.

Question Three

Of the students who had an iPod Touch, 20% had the latest model and the rest had older models. Of those who had older models, 25% had a GPS app. For all the students with an iPod Touch, 30% had a GPS app.

What percentage of students who have the latest model iPod Touch had a GPS app?

Question Four

There are seven Year 9s and eight Year 10s on hockey squad.

On a particular day a team of 11 players is chosen, at random.

Find the probability that the team will contain 3 more Year 10s than Year 9s.

Answers: Practice for L3 Probability #2

1. a) A tree shows three possible ways this can happen (TTN, TNT and NTT)

$$P(TTN) = \frac{83}{284} \times \frac{82}{283} \times \frac{201}{282} = 0.06036$$

Each branch is similar, so P(2 Touchs) = 3 × 0.06036 = 0.181

  b) Let A = Year 11-13 student, Let B = Has iPod Touch

$$P(A) = \frac{379}{663} \quad P(B) = \frac{209}{663} \text{ so } P(A).P(B) = 0.180 \text{ and } P(A \cap B) = \frac{126}{663} = 0.190$$

P(A).P(B) ≠ P(A ∩ B) so events A and B are **not** independent.

2.

w	0	1	2	3	4	5	6	7
P(W = w)	0.12	0.09	0.21	0.22	0.16	0.08	0.10	0.02
E(W)	0	0.09	0.42	0.66	0.64	0.4	0.6	0.14
E(W²)	0	0.09	0.84	1.98	2.56	2	3.6	0.98

  a) E(W) = 2.95

  b) $E(W^2) - E(X)^2 = 12.05 - 2.95^2 = Var(W) = 3.3475$

3.

	Latest	Older	
GPS	10	20	30
No GPS	10	60	70
	20	80	100

So P(GPS | latest) = 10 ÷ 20 = 0.5 = 50%

(Or, the logic method: Let *x* be the % of with the latest iPod Touch who had a GPS app.

0.8 × 0.25 + 0.2 *x* = 0.3, so *x* = 0.5 = 50%)

4. Three more Y10s means 7 Y10s (out of 8) and 4 Y9s (out of 7).

$$\frac{{}^8C_7 \times {}^7C_4}{{}^{15}C_{11}} = \frac{280}{1365} = 0.205$$