S1 Basic Test II

1. Consider the probability distribution

x	1	2	3	4
$\mathbb{P}(X=x)$	a	b	$\frac{1}{3}$	$\frac{1}{4}$

   (a) By considering the probabilities, find an equation involving a and b. $\boxed{\frac{5}{12} = a + b}$

   (b) Given that $\mathbb{E}(X) = 2\frac{3}{4}$, find another equation involving a and b. $\boxed{\frac{3}{4} = a + 2b}$

   (c) Hence find a and b. $\boxed{a = \frac{1}{12}, b = \frac{1}{3}}$

   (d) Calculate $\mathrm{Var}(X)$. $\boxed{\frac{41}{48}}$

2. A normal six sided die is thrown until it shows a two or a three. Calculate the probability of:

   (a) Success on the second throw. $\boxed{\frac{2}{9}}$

   (b) At least 5 throws being needed. $\boxed{\frac{16}{81}}$

   (c) Fewer than seven throws required. $\boxed{\frac{665}{729}}$

3. I wish to pick a committee of 5 people from 7 men and 8 women.

   (a) In how many ways can this selection be made with no restrictions? $\boxed{3003}$

   (b) In how many ways can I make this selection if I require exactly 3 men? $\boxed{980}$

   (c) In how many ways can I make this selection if I require more men than women? $\boxed{1281}$

   (d) A committee of 5 is selected at random. What is the probability of exactly 3 men? $\boxed{\frac{140}{429}}$

4. The number of people traveling in vehicles along a motorway was surveyed. The results for the survey are below.

Number of people in car	Number of cars
1	14
2	20
3	5
4	7
5	2
6	1

   (a) Find the mean number of people per car. $\boxed{\frac{113}{49}}$

   (b) Find the standard deviation of the number of people per car. $\boxed{1.2487}$

5. For the data

w	t
3	4
5	6
8	10
9	12

   (a) Calculate r. $\boxed{r = 0.9945}$

   (b) Use a suitable regression line to predict t when $w = 11$. $\boxed{\frac{1298}{91}}$

   (c) Comment on this prediction. $\boxed{\text{Poor 'cos extrapolating}}$