S1 Test II

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

Number of people in car (x)	Number of cars (f)
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. $\boxed{1.2487}$

2. Consider the probability distribution

x	1	2	3	4
$\mathbb{P}(X=x)$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{10}$	a

   (a) Find a. $\boxed{\frac{3}{20}}$

   (b) Find $\mathbb{E}(X)$. $\boxed{\frac{19}{10}}$

   (c) Find $\mathrm{Var}(X)$. $\boxed{\frac{119}{100}}$

3. Four (distinct) men and three (distinct) women queue for a film. In how many ways can they line up, such that the men and women alternate? $\boxed{144}$

4. A bag contains 7 red and 3 black balls. Two balls are removed from the bag simultaneously.

   (a) Draw a tree diagram of the situation.

   (b) Find the probability they are both the same colour. $\boxed{\frac{8}{15}}$

   (c) Given that they are the same colour, find the probability they are both red. $\boxed{\frac{7}{8}}$

5. 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? $\boxed{\frac{140}{429}}$

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

7. I take 6 cards from a standard deck of cards at once. Find the probability my hand has *exactly* four hearts and *exactly* one club (and one other). $\boxed{0.01187}$