Question 1

A garage has 5 black cars, 9 red cars and 10 silver cars for sale.

(a) A car is selected at random. What is the probability that:

(i) The car is black?

(ii) The car is black or red?

(b) A car is selected at random. Then a second car is selected at random from those remaining. What is the probability that:

(i) The first car is silver and the second car is black?

(ii) One of the selected cars is red and the other is black?

(c) Three of the black cars, two of the red cars and four of the silver cars have diesel engines. One car from the garage is again selected at random. What is the probability that it is a red car or a diesel car?

Question 2

When taking a penalty kick, the probability that Kevin scores is always $\frac{3}{4}$.

(a) Kevin takes a penalty. What is the probability that he does **not** score?

(b) Kevin takes two penalties. What is the probability that he scores both?

(c) Kevin takes three penalties. What is the probability that he scores exactly twice?

(d) Kevin takes five penalties. What is the probability that he scores for the first time on his fifth penalty?

Question 2 **(25 marks)**

A biased die is used in a game. The probabilities of getting the six different numbers on the die are shown in the table below.

Number	1	2	3	4	5	6
Probability	0·25	0·25	0·15	0·15	0·1	0·1

(a) Find the expected value of the random variable X, where X is the number thrown.

(b) There is a game at a funfair. It costs €3 to play the game. The player rolls a die once and wins back the number of euro shown on the die. The sentence below describes the difference between using the above biased die and using a fair (unbiased) die when playing this game. By doing the calculations required, complete the sentence.

"If you play the game many times with a fair die, you will win an average of __________ per game, but if you play with the biased die you will lose an average of __________ per game."

Question 4

Katie tossed a coin 200 times and threw 109 heads. Joe tossed the same coin 400 times and threw 238 heads. Lucy tossed the same coin 500 times and threw 291 heads. Katie, Joe and Lucy now think the coin may be biased.

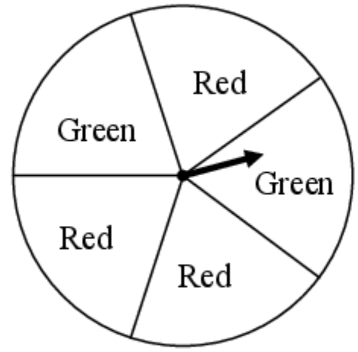
(a) Give a reason why they think that the coin may be biased.

(b) Lucy uses all the above data and calculates that the best estimate of the probability of throwing a head with this coin is 0·58. Show how Lucy might have calculated this probability.

(c) Joe agrees with Lucy's estimate of 0·58 as the probability of throwing a head with this coin. He claims that the probability of throwing 3 successive heads with this coin is **less** than the probability of throwing 2 successive tails. Calculate the probability of each event and state whether Joe's claim is true or not.

Question 5

An unbiased circular spinner has a movable pointer and five equal sectors, two coloured green and three coloured red.



(a) **(i)** Find the probability that the pointer stops on green for one spin of the spinner.

(ii) List all the possible outcomes of 3 successive spins of the spinner.

(b) A game consists of spinning the spinner 3 times. Each time the spinner stops on green the player wins €1; otherwise the player wins nothing. For example, if the outcome of one game is "green, red, green" the player wins €2.

Complete the following table:

Player wins	€0	€1	€2	€3
Required outcomes				

(c) Is one spin of the spinner above an example of a Bernoulli trial?

Answer: ____________________

Explain what a Bernoulli trial is.

Question 6

Question 2 **(25 marks)**

The 2006 census shows that the number of males living in Ireland is about the same as the number of females.

(a) If a person is selected at random, write down the probability that the person is male.

Answer: ______________

(b) Four people are chosen at random. We are interested in whether they are male or female.

(i) Complete the sample space below showing the sixteen equally likely outcomes.

M M M M			
M M M F			

(ii) Hence, or otherwise, complete the table of probabilities below.

four males	three males; one female	two males; two females	one male; three females	four females
$\frac{1}{16}$				

(c) A person states the following: "If you pick four people at random, it's **more likely than not** that you'll get two males and two females."

Is this statement correct? Justify your answer using the answer(s) to part **(b)**.

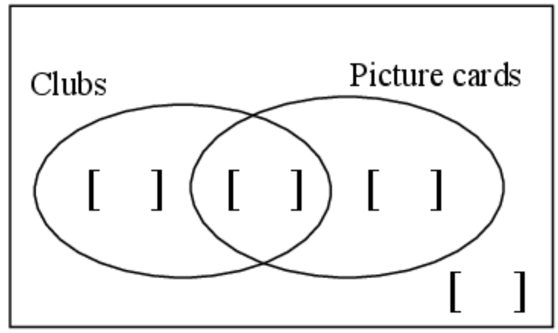
Answer: ______________

Justification:

Question 7

(a) In the Venn diagram below, the universal set is a normal deck of 52 playing cards. The two sets shown represent *clubs* and *picture cards* (kings, queens and jacks).

Show on the diagram the number of elements in each region.



(b) **(i)** A card is drawn from a pack of 52 cards.
Find the probability that the card drawn is the king of clubs.

(ii) A card is drawn from a pack of 52 cards.
Find the probability that the card drawn is a club or a picture card.

(iii) Two cards are drawn from a pack of 52 cards. Find the probability that neither of them is a club or a picture card. Give your answer correct to two decimal places.

Question 8

Question 2 **(25 marks)**

A biased die is used in a game. The probabilities of getting the six different numbers on the die are shown in the table below.

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(a) Find the expected value of the random variable X, where X is the number thrown.

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"If you play the game many times with a fair die, you will win an average of __________ per game, but if you play with the biased die you will lose an average of __________ per game."