Section 1 – Independent Events

(1) Bob has a bag with 10 counters in. There are 2 black counters and the rest are white. Bob picks a counter at random, makes a note of its colour and then replaces it. He then takes another counter and does the same.
(a) Draw a tree diagram to represent the information given in the question.
(b) Explain what the two events in the question are and why they are independent.
(c) Explain how your tree diagram may be adapted if Bob chooses a third counter.
(d) Find the probability that both counters Bob chose were (i) White (ii) Black (iii) The same colour (iv) Different colours.

(2) Jane travels to and from school each day. On the way to school the probability of her catching the bus is 0.3. On the way home the probability of her catching the bus is 0.6. The morning journey doesn't dictate the method of transport used for the afternoon journey.
(a) Find the probability on any given day Jane travels to **and** from school on the bus.
(b) Find the probability that she only travels on the bus once on any given day.
(c) Explain why you can't find the probability of Jane walking to and from school.
Jane's mum says that the probability that Jane walks to and from school in one day is has a maximum value of p .
(d) Find the value of p as a simplified fraction.

(3) Kevin is playing a game with his friend to win £10. In order to win the £10 he can either:

Flip 5 heads in a row on a fair coin
Or
Roll the number 3 twice in a row on a fair 6 sided dice.

Advise Kevin on which one he should choose showing your full workings.

Section 2 – Conditional Probability 1

(1) In a bag there are two types of bead, green and red. There are 5 green beads & 4 red beads. One bead is taken out of the bag, its colour noted and put to one side. A second bead is then taken out, its colour noted and put to one side.
(a) Draw a tree diagram to represent the information given in the question.
(b) Find the probability that the 2 beads chosen are (i) red (ii) green (iii) different colours.
(c) State the probability of at least one bead being red.
(d) Can the probability of picking a red bead from the bag ever be 1 if the counters are not replaced each time they are picked?

(2) Frankie has a box of 12 chocolates. 3 of the chocolates in the box are toffee, 7 are mint and the rest are coffee.
Frankie takes one chocolate, eats it, then takes another chocolate and eats that one too.
(a) Find the probability that both chocolates Frankie ate were the same flavour.
(b) Find the probability that neither chocolate was a coffee.
Frankie now takes a third chocolate and eats it.
(c) Find the probability that all 3 chocolates were the same flavour.

(3) Bert has a 1p coin, 2p coin, 5p coin and two 10p coins in his pocket. He picks two coins out of his pocket without looking.
Find the probability that the sum of money he has in his hand when he looks at the two coins is less than 10p

(4) Joan has written two different vowels in the boxes below. She writes one vowel in Box 1 and a different vowel in Box 2.

      Box 1 ☐   Box 2 ☐
Pete tries to guess which vowel is in each box. Find the probability that he has picked the correct vowel for each box.

Section 3 – Conditional Probability 2

(1) Chance United are a football team. If they have won their previous game, the probability that they win their next game is 0.2. If they have lost their previous game, the probability that they win the next game is 0.1.
(a) Given that Chance United won their last game, find the probability they win the next 2 games.
(b) Given that Chance United lost their previous game find the probability they lose the next game but win the game after that.

(2) In a factory they make a range of toys. Some toys are Furry and some toys are Pink as shown in the Venn Diagram below
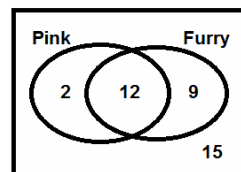
(a) What does the number 12 represent?
(b) Bob takes one toy at random. Given that the toy was Furry, find the probability it was Pink.
(c) Using the Venn Diagram, explain what the probability 1/19 represents.

(3) Camilla is sitting 2 tests. The Venn Diagram below shows **some** information about the probability of passing each test. The probability of her passing the second given that she has passed the first is 1/3.
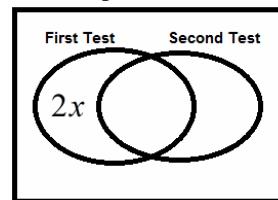
(a) Place and x in the Venn Diagram above to reflect the information given in the question explaining why you chose that position.
(b) Is it possible to complete the diagram?

Section 4 – Anything Goes!

(1) Ahmed is taking his driving test. The test consists of two components, a theory test and a practical test. The two components of the test are independent. The probability of Ahmed passing both components is 0.42 and the probability of Ahmed passing the practical test is 3/5. Find the probability that he only passes one component of the test.

(2) There are 8 counters in a bag. k counters are blue and the rest are red. One counter is taken at random, its colour noted and not replaced. A second counter is taken at random, its colour noted and not replaced. Given that the probability of both counters being blue is 3/28:
(a) Show that $(k-3)(k+2)=0$
(b) Hence find the number of blue balls originally in the bag.
(c) Explain clearly why the equation $(k+2)=0$ is not valid in the context of the question.

(3) Mr Lucky plays two games (Game A and Game B) where the probabilities are independent. The probability of him winning both games is 0.36. The probability of him winning the Game B is four times greater than the probability of him losing Game A.
Using algebra, complete the tree diagram below with the correct probabilities on each branch.