3 Tim has two bags of marbles, A and B.

Bag A contains 8 white, 4 red and 3 yellow marbles.

Bag B contains 6 white, 7 red and 2 yellow marbles.

Tim also has an ordinary fair 6-sided dice. He rolls the dice. If he obtains a 1 or 2, he chooses two marbles at random from bag A, without replacement. If he obtains a 3, 4, 5 or 6, he chooses two marbles at random from bag B, without replacement.

(a) Find the probability that both marbles are white. [3]

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(b) Find the probability that the two marbles come from bag B given that one is white and one is red. [4]

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3 Box A contains 6 green balls and 3 yellow balls.

Box B contains 4 green balls and x yellow balls.

A ball is chosen at random from box A and placed in box B. A ball is then chosen at random from box B.

(a) Draw a tree diagram to represent this information, showing the probability on each of the branches. [4]

The probability that both the balls chosen are the same colour is $\frac{8}{15}$.

(b) Find the value of x. [3]

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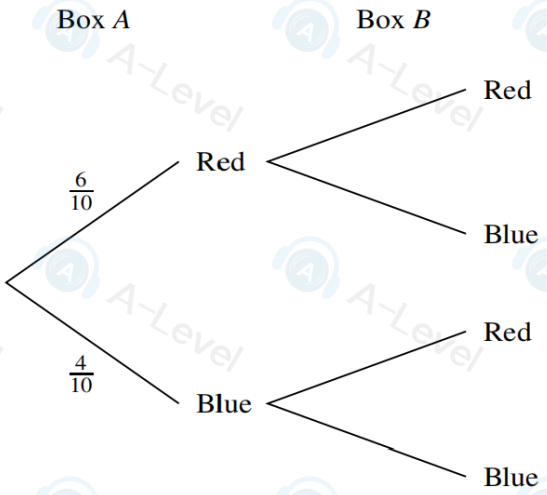
7 Box A contains 6 red balls and 4 blue balls. Box B contains x red balls and 9 blue balls. A ball is chosen at random from box A and placed in box B. A ball is then chosen at random from box B.

(a) Complete the tree diagram below, giving the remaining four probabilities in terms of x. [3]



(b) Show that the probability that both balls chosen are blue is $\frac{4}{x+10}$. [2]

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It is given that the probability that both balls chosen are blue is $\frac{1}{6}$.

(c) Find the probability, correct to 3 significant figures, that the ball chosen from box A is red given that the ball chosen from box B is red. [5]

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4 Three fair six-sided dice, each with faces marked 1, 2, 3, 4, 5, 6, are thrown at the same time, repeatedly. For a single throw of the three dice, the score is the sum of the numbers on the top faces.

(a) Find the probability that the score is 4 on a single throw of the three dice. [3]

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(b) Find the probability that a score of 18 is obtained for the first time on the 5th throw of the three dice. [3]

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7 Sam and Tom are playing a game which involves a bag containing 5 white discs and 3 red discs. They take turns to remove one disc from the bag at random. Discs that are removed are not replaced into the bag. The game ends as soon as one player has removed two red discs from the bag. That player wins the game.

Sam removes the first disc.

(a) Find the probability that Tom removes a red disc on his first turn. [2]

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(b) Find the probability that Tom wins the game on his second turn. [4]

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(c) Find the probability that Sam removes a red disc on his first turn given that Tom wins the game on his second turn. [2]

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1 Juan goes to college each day by any one of car or bus or walking. The probability that he goes by car is 0.2, the probability that he goes by bus is 0.45 and the probability that he walks is 0.35. When Juan goes by car, the probability that he arrives early is 0.6. When he goes by bus, the probability that he arrives early is 0.1. When he walks he always arrives early.

(a) Draw a fully labelled tree diagram to represent this information. [2]

(b) Find the probability that Juan goes to college by car given that he arrives early. [4]

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5 Bag A contains 6 red marbles, 5 blue marbles and 1 green marble.

Bag B contains 5 red marbles and 3 blue marbles.

A marble is chosen at random from bag A and placed in bag B.

A marble is now chosen at random from bag B.

(a) Draw a tree diagram to represent this information, giving the probability on each branch. [3]

(b) Find the probability that both marbles chosen are the same colour. [2]

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(c) Find the probability that the marble chosen from bag *A* is blue, given that the marble chosen from bag *B* is blue. [3]

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6 Sajid is practising for a long jump competition. He counts any jump that is longer than 6 m as a success. On any day, the probability that he has a success with his first jump is 0.2. For any subsequent jump, the probability of a success is 0.3 if the previous jump was a success and 0.1 otherwise. Sajid makes three jumps.

(a) Draw a tree diagram to illustrate this information, showing all the probabilities. [2]

(b) Find the probability that Sajid has exactly one success given that he has at least one success. [5]

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On another day, Sajid makes six jumps.

(c) Find the probability that only his first three jumps are successes or only his last three jumps are successes. [3]

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