# 4.6 Combined\_mutually exclusive\_Conditional\_independence\_prob diagram\_P\_1

**1a.** *[3 marks]*

Consider two events,  and , such that  and .

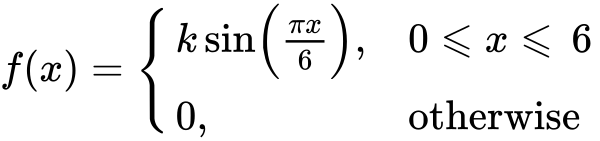
By drawing a Venn diagram, or otherwise, find .

**1b.** *[3 marks]*

Show that the events  and  are not independent.

**2a.** *[4 marks]*

The continuous random variable *X* has a probability density function given by

.

Find the value of .

**2b.** *[1 mark]*

By considering the graph of *f* write down the mean of ;

**2c.** *[1 mark]*

By considering the graph of *f* write down the median of ;

**2d.** *[1 mark]*

By considering the graph of *f* write down the mode of .

**2e.** *[4 marks]*

Show that .

**2f.** *[2 marks]*

Hence state the interquartile range of .

**2g.** *[2 marks]*

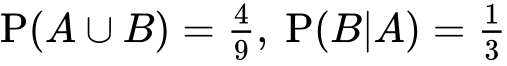
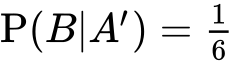
Calculate .

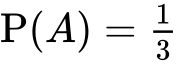
**3a.** *[3 marks]*

Consider two events  and  defined in the same sample space.

Show that .

**3b.** *[6 marks]*

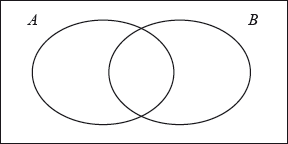
Given that  and ,

(i)     show that ;

(ii)     hence find .

**4a.** *[1 mark]*

On the Venn diagram shade the region .



**4b.** *[4 marks]*

Two events  and  are such that  and .

Find .

**5a.** *[2 marks]*

 and  are independent events such that .

Show that .

**5b.** *[4 marks]*

Find  in simplest form.

**6a.** *[4 marks]*

A box contains four red balls and two white balls. Darren and Marty play a game by each taking it in turn to take a ball from the box, without replacement. The first player to take a white ball is the winner.

Darren plays first, find the probability that he wins.

**6b.** *[3 marks]*

The game is now changed so that the ball chosen is replaced after each turn.

Darren still plays first.

Show that the probability of Darren winning has not changed.

**7.** *[6 marks]*

A football team, Melchester Rovers are playing a tournament of five matches.

The probabilities that they win, draw or lose a match are ,  and  respectively.

These probabilities remain constant; the result of a match is independent of the results of other matches. At the end of the tournament their coach Roy loses his job if they lose three **consecutive** matches, otherwise he does not lose his job. Find the probability that Roy loses his job.

**8a.** *[2 marks]*

 and  are two events such that  and .

Find .

**8b.** *[2 marks]*

Determine whether events  and  are independent.

**9a.** *[4 marks]*

Events  and  are such that  and .

Determine the value of  when

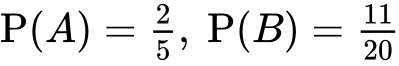
(i)      and  are mutually exclusive;

(ii)      and  are independent.

**9b.** *[3 marks]*

Determine the range of possible values of .

**10.** *[6 marks]*

Events  and  are such that  and .

(a)     Find .

(b)     Find .

(c)     State with a reason whether or not events  and  are independent.

**11a.** *[6 marks]*

Mobile phone batteries are produced by two machines. Machine A produces 60% of the daily output and machine B produces 40%. It is found by testing that on average 2% of batteries produced by machine A are faulty and 1% of batteries produced by machine B are faulty.

(i)     Draw a tree diagram clearly showing the respective probabilities.

(ii)     A battery is selected at random. Find the probability that it is faulty.

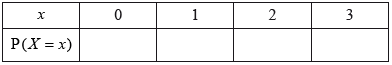
(iii)     A battery is selected at random and found to be faulty. Find the probability that it was produced by machine A.

**11b.** *[6 marks]*

In a pack of seven transistors, three are found to be defective. Three transistors are selected from the pack at random without replacement. The discrete random variable *X* represents the number of defective transistors selected.

(i)     Find .

(ii)     **Copy** and complete the following table:



(iii)     Determine .

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