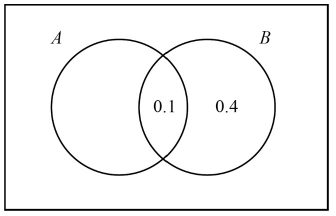
# 4.6 Combined\_mutually exclusive\_Conditional\_independence\_prob diagram\_P\_1

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

## Markscheme

\* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.

        ***(M1)***

**Note:** Award ***M1*** for a Venn diagram with at least one probability in the correct region.

**EITHER**

     ***(A1)***

     ***A1***

**OR**

     ***(A1)***

     ***A1***

***[3 marks]***

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

## Markscheme

**METHOD 1**

        ***(M1)***

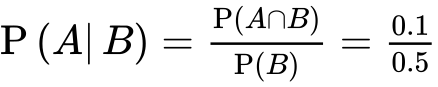
= 0.2      ***A1***

statement that their       ***R1***

**Note:** Award ***R1***for correct reasoning from their value.

⇒ ,  not independent     ***AG***

***METHOD 2***

        ***(M1)***

= 0.2      ***A1***

statement that their       ***R1***

**Note:** Award ***R1***for correct reasoning from their value.

⇒ ,  not independent     ***AG***

**Note:** Accept equivalent argument using .

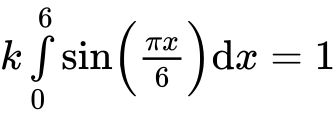
***[3 marks]***

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

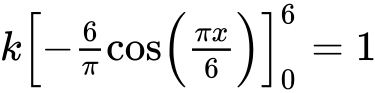
## Markscheme

\* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.

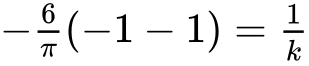
attempt to equate integral to 1 (may appear later)     ***M1***



correct integral     ***A1***



substituting limits     ***M1***



 ***A1***

***[4 marks]***

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

## Markscheme

mean      ***A1***

**Note:**     Award ***A1A0A0*** for three equal answers in .

***[1 mark]***

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

## Markscheme

median      ***A1***

**Note:**     Award ***A1A0A0*** for three equal answers in .

***[1 mark]***

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

## Markscheme

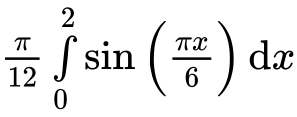
mode      ***A1***

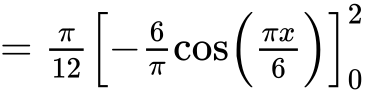
**Note:**     Award ***A1A0A0*** for three equal answers in .

***[1 mark]***

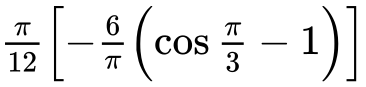
**2e.** *[4 marks]*

## Markscheme

    ***M1***

     ***A1***

**Note:**     Accept without the  at this stage if it is added later.

     ***M1***

     ***AG***

***[4 marks]***

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

## Markscheme

from (c)(i)      ***(A1)***

as the graph is symmetrical about the middle value      ***(A1)***

so interquartile range is

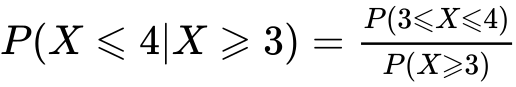


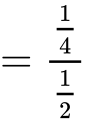
     ***A1***

***[3 marks]***

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

## Markscheme



     ***(M1)***

     ***A1***

***[2 marks]***

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

## Markscheme

\* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.

**METHOD 1**

    ***M1***

    ***M1A1***

    ***AG***

**METHOD 2**

    ***M1***

    ***M1***



    ***A1***

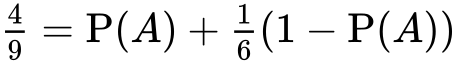
    ***AG***

***[3 marks]***

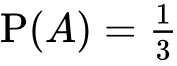
**3b.** *[6 marks]*

## Markscheme

(i)     use  and      ***(M1)***

    ***A1***

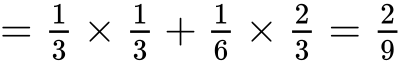
    ***M1***

    ***AG***

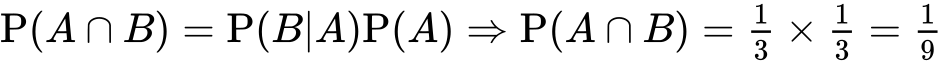
(ii)     **METHOD 1**

    ***M1***

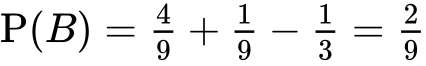
    ***M1***

    ***A1***

**METHOD 2**

    ***M1***

    ***M1***

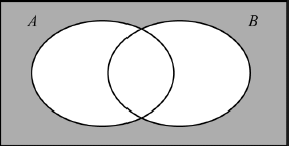
    ***A1***

***[6 marks]***

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

## Markscheme

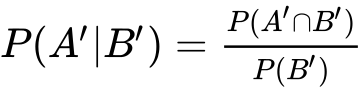
\* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.

     ***A1***

***[1 mark]***

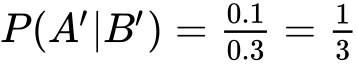
**4b.** *[4 marks]*

## Markscheme

    ***(M1)***

    ***(A1)***

    ***(A1)***

    ***A1***

***[4 marks]***

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

## Markscheme

\* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.



    ***(M1)***

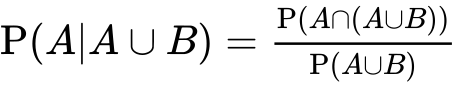
    ***A1***

    ***AG***

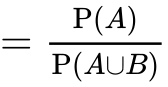
***[2 marks]***

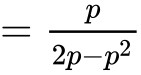
**5b.** *[4 marks]*

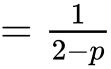
## Markscheme

    ***(M1)***

**Note:** Allow  if seen on the numerator.

    ***(A1)***

    ***A1***

    ***A1***

***[4 marks]***

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

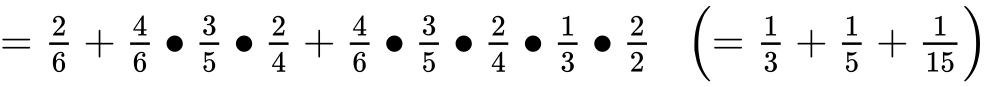
## Markscheme

\* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.

probability that Darren wins      ***(M1)***

**Note:** Only award ***M1*** if three terms are seen or are implied by the following numerical equivalent.

**Note:** Accept equivalent tree diagram for method mark.

     ***A2***

**Note:     *A1*** for two correct.

     ***A1***

***[4 marks]***

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

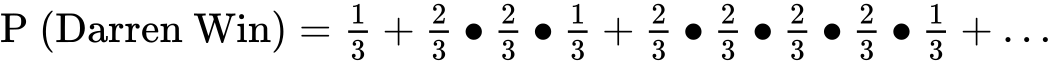
## Markscheme

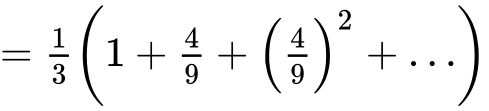
**METHOD 1**

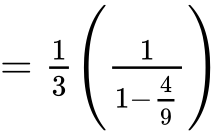
the probability that Darren wins is given by

     ***(M1)***

**Note:** Accept equivalent tree diagram with correctly indicated path for method mark.



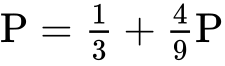
or      ***A1***

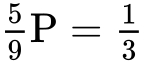
     ***A1***

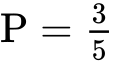
     ***AG***

**METHOD 2**



     ***M1A2***



     ***AG***

***[3 marks]***

***Total [7 marks]***

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

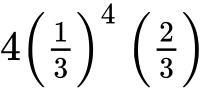
## Markscheme

\* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.

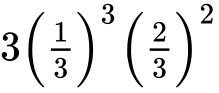
**METHOD 1**

to have  consecutive losses there must be exactly ,  or  losses

the probability of exactly  losses (must be  consecutive) is      ***A1***

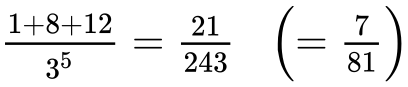
the probability of exactly  losses (with  consecutive) is      ***A1A1***

**Note:** First ***A1*** is for the factor  and second ***A1*** for the other  factors.

the probability of exactly  losses (with  consecutive) is      ***A1A1***

**Note:** First ***A1*** is for the factor  and second ***A1*** for the other  factors.

(Since the events are mutually exclusive)

the total probability is      ***A1***

***[6 marks]***

**METHOD 2**

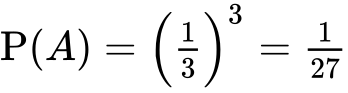
Roy loses his job if

A – first  games are all lost (so the last  games can be any result)

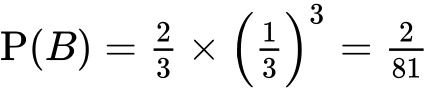
B – first  games are not all lost, but middle  games are all lost (so the first game is not a loss and the last game can be any result)

or C – first  games are not all lost, middle  games are not all lost but last  games are all lost, (so the first game can be any result but the second game is not a loss)

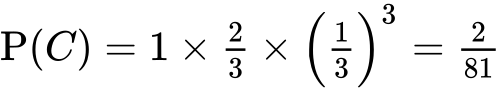
for A  &  games can be anything

     ***A1***

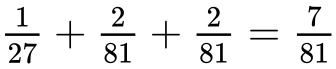
for B  game not a loss &  game can be anything     ***(R1)***

     ***A1***

for C  game anything,  game not a loss     ***(R1)***

     ***A1***

(Since the events are mutually exclusive)

total probability is      ***A1***

**Note:** In both methods all the ***A*** marks are independent.

**Note:** If the candidate misunderstands the question and thinks that it is asking for exactly  losses award ***A1 A1*** and ***A1*** for an answer of  as in the last lines of Method 1.

***[6 marks]***

***Total [6 marks]***

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

## Markscheme

\* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.



     ***M1***

     ***A1***

***[2 marks]***

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

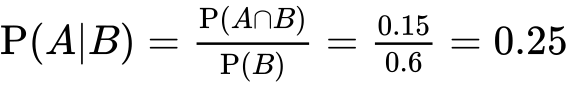
## Markscheme

**EITHER**

     ***A1***

 so independent     ***R1***

***OR***

     ***A1***

 so independent     ***R1***

**Note:** Allow follow through for incorrect answer to (a) that will result in events being dependent in (b).

***[2 marks]***

***Total [4 marks]***

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

## Markscheme

\* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.

(i)     use of      ***(M1)***



     ***A1***

(ii)     use of      ***(M1)***

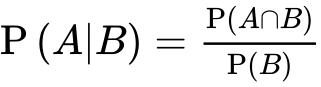


     ***A1***

***[4 marks]***

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

## Markscheme



 is a maximum when 

 is a minimum when 

     ***A1A1A1***

**Note:     *A1*** for each endpoint and ***A1*** for the correct inequalities.

***[3 marks]***

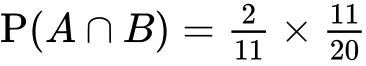
***Total [7 marks]***

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

## Markscheme

\* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.

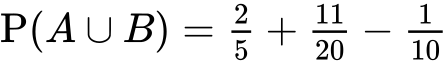
(a)     

     ***(M1)***

     ***A1***

***[2 marks]***

(b)     

     ***(M1)***

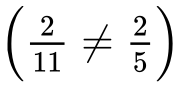
     ***A1***

***[2 marks]***

(c)     No – events *A* and *B* are not independent     ***A1***

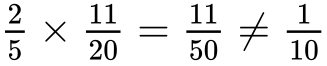
**EITHER**

     ***R1***



**OR**



     ***R1***

**Note:**     The numbers are required to gain ***R1*** in the ‘**OR**’ method only.

**Note:**     Do not award ***A1R0*** in either method.

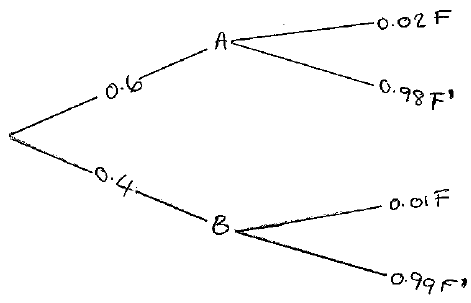
***[2 marks]***

***Total [6 marks]***

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

## Markscheme

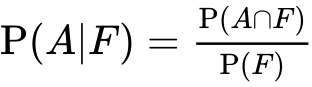
\* This question is from an exam for a previous syllabus, and may contain minor differences in marking or structure.

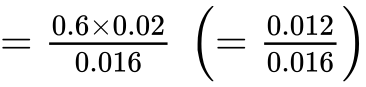
(i)  
     ***A1A1***

**Note:**     Award ***A1***for a correctly labelled tree diagram and ***A1***for correct probabilities.

(ii)          ***(M1)***

     ***A1***

(iii)     

     ***M1***

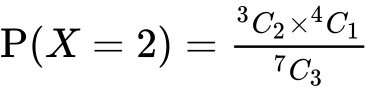
     ***A1***

***[6 marks]***

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

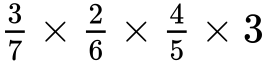
## Markscheme

(i)     **METHOD 1**

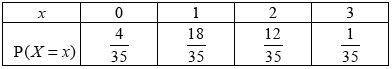
     ***(M1)***

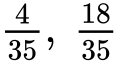
     ***A1***

**METHOD 2**

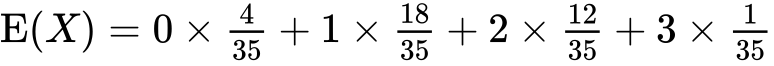
     ***(M1)***

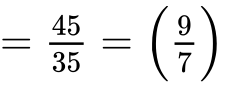
     ***A1***

(ii)          ***A2***

**Note:**     Award ***A1*** if  or  is obtained.

(iii)     

     ***M1***

     ***A1***

***[6 marks]***

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