# 4.17 Poisson distribution\_P\_1

**1a.** *[2 marks]*

## Markscheme

       ***(M1)***

**Note:** Award ***M1*** for a valid attempt at remainder theorem or polynomial division.

= −12     ***A1***

remainder = −12

***[2 marks]***

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

## Markscheme

 = 0      ***A1***

remainder = 0

***[1 mark]***

**1c.** *[4 marks]*

## Markscheme

 (is a zero)     A1

**Note:** Can be seen anywhere.

**EITHER**

factorise to get       ***(M1)A1***

 (for ) (or equivalent statement)      ***R1***

**Note:** Award ***R1***if correct two complex roots are given.

**OR**

    A1

attempting to show        ***M1***

*eg* discriminant = 36 – 96 < 0, completing the square

no turning points***R1***

**THEN**

only one real zero (as the curve is continuous)      ***AG***

***[4 marks]***

**1d.** *[2 marks]*

## Markscheme

new graph is      ***(M1)***

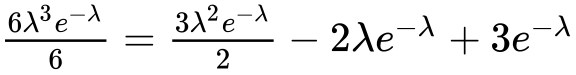
stretch parallel to the -axis (with  invariant), scale factor 0.5    ***A1***

**Note:** Accept “horizontal” instead of “parallel to the -axis”.

***[2 marks]***

**1e.** *[6 marks]*

## Markscheme

     ***M1A1***

**Note:** Allow factorials in the denominator for ***A1***.

    ***A1***

**Note:** Accept any correct cubic equation without factorials and .

**EITHER**

       ***(M1)***

      ***(A1)***

**OR**

       ***(M1)(A1)***

**THEN**

 = 1.5    ***A1***

***[6 marks]***

**2a.** *[6 marks]*

## Markscheme

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

**METHOD 1**

number of possible “deals”      ***A1***

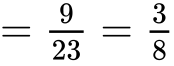
consider ways of achieving “no matches” (Chloe winning):

Selena could deal B, C, D (*ie*, 3 possibilities)

as her first card     ***R1***

for each of these matches, there are only 3 possible combinations for the remaining 3 cards     ***R1***

so no. ways achieving no matches      ***M1A1***

so probability Chloe wins      ***A1AG***

**METHOD 2**

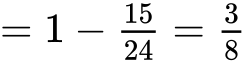
number of possible “deals”      ***A1***

consider ways of achieving a match (Selena winning)

Selena card A can match with Chloe card A*,* giving 6 possibilities for this happening     ***R1***

if Selena deals B as her first card, there are only 3 possible combinations for the remaining 3 cards. Similarly for dealing C and dealing D     ***R1***

so no. ways achieving one match is      ***M1A1***

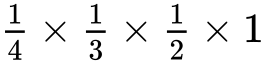
so probability Chloe wins      ***A1AG***

**METHOD 3**

systematic attempt to find number of outcomes where Chloe wins (no matches)

(using tree diag. or otherwise)     ***M1***

9 found     ***A1***

each has probability      ***M1***

     ***A1***

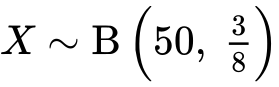
their 9 multiplied by their      ***M1A1***

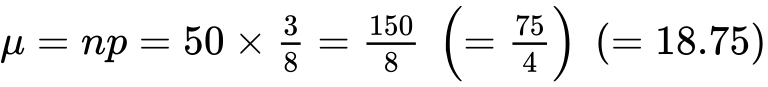
     ***AG***

***[6 marks]***

**2b.** *[3 marks]*

## Markscheme

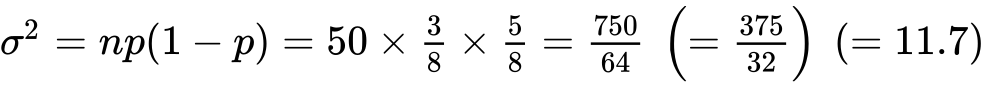
     ***(M1)***

     ***(M1)A1***

***[3 marks]***

**2c.** *[2 marks]*

## Markscheme

     ***(M1)A1***

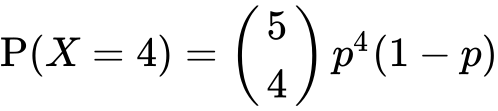
***[2 marks]***

**3a.** *[2 marks]*

## Markscheme

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

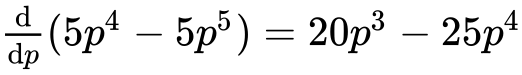
    ***(M1)***

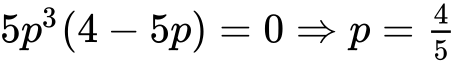
 (or equivalent)     ***A1***

***[2 marks]***

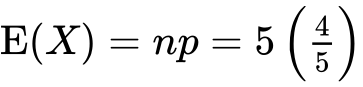
**3b.** *[6 marks]*

## Markscheme

(i)          ***M1A1***

    ***M1A1***

**Note:** Do not award the final ***A1*** if  is included in the answer.

(ii)          ***(M1)***

    ***A1***

***[6 marks]***

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